If you plan to submit a bid directly to the Department of Transportation

PREQUALIFICATION

Any contractor who desires to become pre-qualified to bid on work advertised by IDOT must submit the properly completed pre-qualification forms to the Bureau of Construction no later that 4:30 p.m. prevailing time twenty-one days prior to the letting of interest. This pre-qualification requirement applies to first time contractors, contractors renewing expired ratings, contractors maintaining continuous pre-qualification or contractors requesting revised ratings. To be eligible to bid, existing pre-qualification ratings must be effective through the date of letting.

REQUESTS FOR AUTHORIZATION TO BID

Contractors wanting to bid on items included in a particular letting must submit the properly completed "Request for Authorization to Bid/or Not For Bid Status" (BDE 124) and the ORIGINAL "Affidavit of Availability" (BC 57) to the proper office no later than 4:30 p.m. prevailing time, three (3) days prior to the letting date. This does not apply to Small Business Set-Asides.

WHO CAN BID ?

Bids will be accepted from only those companies that request and receive written **Authorization to Bid** from IDOT's Central Bureau of Construction. This does not apply to Small Business Set-Asides.

WHAT CONSTITUTES WRITTEN AUTHORIZATION TO BID?: When a prospective prime bidder submits a "Request for Authorization to Bid/or Not For Bid Status"(BDE 124) he/she must indicate at that time which items are being requested For Bidding purposes. Only those items requested For Bidding will be analyzed. After the request has been analyzed, the bidder will be issued an **Authorization to Bid or Not for Bid Report**, approved by the Central Bureau of Construction that indicates which items have been approved For Bidding. If **Authorization to Bid** cannot be approved, the **Authorization to Bid or Not for Bid Report** will indicate the reason for denial.

ABOUT AUTHORIZATION TO BID: Firms that have not received an authorization form within a reasonable time of complete and correct original document submittal should contact the department as to status. This is critical in the week before the letting. These documents must be received three days before the letting date. Firms unsure as to authorization status should call the Prequalification Section of the Bureau of Construction at the number listed at the end of these instructions.

ADDENDA AND REVISIONS: It is the contractor's responsibility to determine which, if any, addenda or revisions pertain to any project they may be bidding. Failure to incorporate all relevant addenda or revisions may cause the bid to be declared unacceptable.

Each addendum will be placed with the contract number. Addenda and revisions will also be placed on the Addendum/Revision Checklist and each subscription service subscriber will be notified by e-mail of each addendum and revision issued.

The Internet is the Department's primary way of doing business. The subscription server e-mails are an added courtesy the Department provides. It is suggested that bidders check IDOT's website at http://www.dot.il.gov/desenv/delett.html before submitting final bid information.

IDOT IS NOT RESPONSIBLE FOR ANY E-MAIL FAILURES.

Addenda Questions may be directed to the Plans and Contracts Office at (217)782-7806 or D&Econtracts@dot.il.gov

Technical Questions about downloading these files may be directed to Tim Garman (217)524-1642 or Timothy.Garman@illinois.gov.

WHAT MUST BE INCLUDED WHEN BIDS ARE SUBMITTED?: Bidders need not return the entire proposal when bids are submitted. That portion of the proposal that must be returned includes the following:

1. All documents from the Proposal Cover Sheet through the Proposal Bid Bond
2. Other special documentation and/or information that may be required by the contract special provisions

All proposal documents, including Proposal Guaranty Checks or Proposal Bid Bonds, should be stapled together to prevent loss when bids are processed by IDOT personnel.

ABOUT SUBMITTING BIDS: It is recommended that bidders deliver bids in person to insure they arrive at the proper location prior to the time specified for the receipt of bids. Any bid received at the place of letting after the time specified will not be accepted.

WHO SHOULD BE CALLED IF ASSISTANCE IS NEEDED?

Questions Regarding	**Call**
Prequalification and/or Authorization to Bid	217/782-3413
Preparation and submittal of bids	217/782-7806
Mailing of plans and proposals	217/782-7806

ADDENDUMS AND REVISIONS TO THE PROPOSAL FORMS

Bidders should verify that they have received and incorporated any addendum and/or revision prior to submitting their bid. Failure by the bidder to include an addendum or revision could result in a bid being rejected as irregular.

RETURN WITH BID

Proposal Submitted By
Name
Address
City

251

Letting June 17, 2011

BIDDERS NEED NOT RETURN THE ENTIRE PROPOSAL
(See instructions inside front cover)

NOTICE TO PROSPECTIVE BIDDERS
This proposal can be used for bidding purposes by only those companies that request and receive written AUTHORIZATION TO BID from IDOT's Central Bureau of Construction. This does not apply to Small Business Set-Asides.
(SEE INSTRUCTIONS ON THE INSIDE OF COVER)

Notice to Bidders, Specifications, Proposal, Contract and Contract Bond

Illinois Department of Transportation

Springfield, Illinois 62764

Contract No. 82726
DUPAGE County
Section 59(SA,SB&SF)1
Route FAP 365
Project F-0365(014)
District 1 Construction Funds

PLEASE MARK THE APPROPRIATE BOX BELOW:

☐ A Bid Bond is included.

☐ A Cashier's Check or a Certified Check is included

Prepared by

Checked by F

(Printed by authority of the State of Illinois)

INSTRUCTIONS

ABOUT IDOT PROPOSALS: All proposals issued by IDOT are potential bidding proposals. Each proposal contains all Certifications and Affidavits, a Proposal Signature Sheet and a Proposal Bid Bond. In addition, this proposal contains new statutory requirements applicable to the use of subcontractors and, in particular, includes the State Required Ethical Standards Governing Subcontractors to be signed and incorporated into all subcontracts.

WHO CAN BID?: Bids will be accepted from only those companies that request and receive written **Authorization to Bid** from IDOT's Central Bureau of Construction. To request authorization, a potential bidder must complete and submit Part B of the Request for Authorization to Bid/or Not For Bid Status form (BDE 124) and submit an original Affidavit of Availability (BC 57). This does not apply to Small Business Set-Asides.

WHAT CONSTITUTES WRITTEN AUTHORIZATION TO BID?: When a prospective prime bidder submits a "**Authorization to Bid or Not for Bid**" form, he/she must indicate at that time which items are being requested For Bidding purposes. Only those items requested For Bidding will be analyzed. After the request has been analyzed, the bidder will be issued a **Authorization to Bid or Not for Bid Report**, approved by the Central Bureau of Construction, that indicates which items have been approved For Bidding. If **Authorization to Bid** cannot be approved, the **Authorization to Bid or Not for Bid Report** will indicate the reason for denial. If a contractor has requested to bid but has not received a **Authorization to Bid or Not for Bid Report**, they should contact the Central Bureau of Construction in advance of the letting date.

WHAT MUST BE INCLUDED WHEN BIDS ARE SUBMITTED?: Bidders need not return the entire proposal when bids are submitted. That portion of the proposal that must be returned includes the following:

1. All documents from the Proposal Cover Sheet through the Proposal Bid Bond

2. Other special documentation and/or information that may be required by the contract special provisions

All proposal documents, including Proposal Guaranty Checks or Proposal Bid Bonds, should be stapled together to prevent loss when bids are processed by IDOT personnel.

ABOUT SUBMITTING BIDS: It is recommended that bidders deliver bids in person to insure they arrive at the proper location prior to the time specified for the receipt of bids. Any bid received at the place of letting after the time specified will not be accepted.

WHO SHOULD BE CALLED IF ASSISTANCE IS NEEDED?

Questions Regarding	Call
Prequalification and/or Authorization to Bid	217/782-3413
Preparation and submittal of bids	217/782-7806

RETURN WITH BID

PROPOSAL

TO THE DEPARTMENT OF TRANSPORTATION

1. Proposal of _____

   _____

Taxpayer Identification Number (Mandatory) _____

for the improvement identified and advertised for bids in the Invitation for Bids as:

Contract No. 82726
DUPAGE County
Section 59(SA,SB&SF)1
Project F-0365(014)
Route FAP 365
District 1 Construction Funds

Pump station rehabilitation of Pump Station No. 48 along IL Route 56 (Butterfield Road) in DuPage County.

2. The undersigned bidder will furnish all labor, material and equipment to complete the above described project in a good and workmanlike manner as provided in the contract documents provided by the Department of Transportation. This proposal will become part of the contract and the terms and conditions contained in the contract documents shall govern performance and payments.

3. **ASSURANCE OF EXAMINATION AND INSPECTION/WAIVER.** The undersigned further declares that he/she has carefully examined the proposal, plans, specifications, addenda form of contract and contract bond, and special provisions, and that he/she has inspected in detail the site of the proposed work, and that he/she has familiarized themselves with all of the local conditions affecting the contract and the detailed requirements of construction, and understands that in making this proposal he/she waives all right to plead any misunderstanding regarding the same.

4. **EXECUTION OF CONTRACT AND CONTRACT BOND.** The undersigned further agrees to execute a contract for this work and present the same to the department within fifteen (15) days after the contract has been mailed to him/her. The undersigned further agrees that he/she and his/her surety will execute and present within fifteen (15) days after the contract has been mailed to him/her contract bond satisfactory to and in the form prescribed by the Department of Transportation, in the penal sum of the full amount of the contract, guaranteeing the faithful performance of the work in accordance with the terms of the contract.

5. **PROPOSAL GUARANTY.** Accompanying this proposal is either a bid bond on the department form, executed by a corporate surety company satisfactory to the department, or a proposal guaranty check consisting of a bank cashier's check or a properly certified check for not less than 5 per cent of the amount bid or for the amount specified in the following schedule:

Amount of Bid			Proposal Guaranty	Amount of Bid			Proposal Guaranty
Up to		$5,000	$150	$2,000,000	to	$3,000,000	$100,000
$5,000	to	$10,000	$300	$3,000,000	to	$5,000,000	$150,000
$10,000	to	$50,000	$1,000	$5,000,000	to	$7,500,000	$250,000
$50,000	to	$100,000	$3,000	$7,500,000	to	$10,000,000	$400,000
$100,000	to	$150,000	$5,000	$10,000,000	to	$15,000,000	$500,000
$150,000	to	$250,000	$7,500	$15,000,000	to	$20,000,000	$600,000
$250,000	to	$500,000	$12,500	$20,000,000	to	$25,000,000	$700,000
$500,000	to	$1,000,000	$25,000	$25,000,000	to	$30,000,000	$800,000
$1,000,000	to	$1,500,000	$50,000	$30,000,000	to	$35,000,000	$900,000
$1,500,000	to	$2,000,000	$75,000	over		$35,000,000	$1,000,000

Bank cashier's checks or properly certified checks accompanying proposals shall be made payable to the Treasurer, State of Illinois, when the state is awarding authority; the county treasurer, when a county is the awarding authority; or the city, village, or town treasurer, when a city, village, or town is the awarding authority.

If a combination bid is submitted, the proposal guaranties which accompany the individual proposals making up the combination will be considered as also covering the combination bid.

The amount of the proposal guaranty check is _____ $( ). If this proposal is accepted and the undersigned shall fail to execute a contract bond as required herein, it is hereby agreed that the amount of the proposal guaranty shall become the property of the State of Illinois, and shall be considered as payment of damages due to delay and other causes suffered by the State because of the failure to execute said contract and contract bond; otherwise, the bid bond shall become void or the proposal guaranty check shall be returned to the undersigned.

Attach Cashier's Check or Certified Check Here

In the event that one proposal guaranty check is intended to cover two or more proposals, the amount must be equal to the sum of the proposal guaranties which would be required for each individual proposal. If the guaranty check is placed in another proposal, state below where it may be found.

The proposal guaranty check will be found in the proposal for:

Item _____

Section No. _____

County _____

Mark the proposal cover sheet as to the type of proposal guaranty submitted.

6. **COMBINATION BIDS.** The undersigned further agrees that if awarded the contract for the sections contained in the following combination, he/she will perform the work in accordance with the requirements of each individual proposal comprising the combination bid specified in the schedule below, and that the combination bid shall be prorated against each section in proportion to the bid submitted for the same. If an error is found to exist in the gross sum bid for one or more of the individual sections included in a combination, the combination bid shall be corrected as provided in the specifications.

When a combination bid is submitted, the schedule below must be completed in each proposal comprising the combination.

If alternate bids are submitted for one or more of the sections comprising the combination, a combination bid must be submitted for each alternate.

Schedule of Combination Bids

Combination No.	Sections Included in Combination	Combination Bid Dollars	Cents

7. **SCHEDULE OF PRICES.** The undersigned bidder submits herewith, in accordance with the rules and instructions, a schedule of prices for the items of work for which bids are sought. The unit prices bid are in U.S. dollars and cents, and all extensions and summations have been made. The bidder understands that the quantities appearing in the bid schedule are approximate and are provided for the purpose of obtaining a gross sum for the comparison of bids. If there is an error in the extension of the unit prices, the unit prices shall govern. Payment to the contractor awarded the contract will be made only for actual quantities of work performed and accepted or materials furnished according to the contract. The scheduled quantities of work to be done and materials to be furnished may be increased, decreased or omitted as provided elsewhere in the contract.

8. **AUTHORITY TO DO BUSINESS IN ILLINOIS.** Section 20-43 of the Illinois Procurement Code (30 ILCS 500/20-43) provides that a person (other than an individual acting as a sole proprietor) must be a legal entity authorized to do business in the State of Illinois prior to submitting the bid.

9. **The services of a subcontractor will or may be used.**

Check box Yes ☐
Check box No ☐

For known subcontractors with subcontracts with an annual value of more than $25,000, the contract shall include their name, address, and the dollar allocation for each subcontractor.

_____

_____

10. **EXECUTION OF CONTRACT**: The Department of Transportation will, in accordance with the rules governing Department procurements, execute the contract and shall be the sole entity having the authority to accept performance and make payments under the contract. Execution of the contract by the Chief Procurement Officer or the State Purchasing Officer is for approval of the procurement process and execution of the contract by the Department. Neither the Chief Procurement Officer nor the State Purchasing Officer shall be responsible for administration of the contract or determinations respecting performance or payment there under except as otherwise permitted in the Illinois Procurement Code.

ILLINOIS DEPARTMENT OF TRANSPORTATION
SCHEDULE OF PRICES
CONTRACT NUMBER - 82726

State Job # - C-91-155-94
PPS NBR - 1-72617-0200
County Name - DUPAGE- -
Code - 43 - -
District - 1 - -
Section Number - 59(SA, SB & SF) 1

Project Number F-0365/014/

Route FAP 365

Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
X0301028	PUMP STA SCADA EQUIP	L SUM	1.000				
X0323880	COMP SPARE M-PUMP ASM	L SUM	1.000				
X0323881	COMP SPARE LF PMP ASM	L SUM	1.000				
X0325156	REM & DISP LEAD PAINT	SQ FT	3,400.000				
X0335700	P.S. GENERAL WORK	L SUM	1.000				
X0783300	P.S. ELECTRICAL WORK	L SUM	1.000				
X0783500	P.S. MECHANICAL WORK	L SUM	1.000				
X6640570	CH LK FENCE 8 SPL	FOOT	210.000				
X8040305	ELECT SERV CONNECT	L SUM	1.000				
20200100	EARTH EXCAVATION	CU YD	300.000				
35101800	AGG BASE CSE B 6	SQ YD	820.000				
40600100	BIT MATLS PR CT	GALLON	90.000				
40603080	HMA BC IL-19.0 N50	TON	75.000				
40603310	HMA SC "C" N50	TON	75.000				
50102400	CONC REM	CU YD	4.000				

ILLINOIS DEPARTMENT OF TRANSPORTATION
SCHEDULE OF PRICES
CONTRACT NUMBER - 82726

State Job # - C-91-155-94
PPS NBR - 1-72617-0200
County Name - DUPAGE- -
Code - 43 - -
District - 1 - -
Section Number - 59(SA, SB & SF) 1

Project Number F-0365/014/

Route FAP 365

Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
50200100	STRUCTURE EXCAVATION	CU YD	300.000				
50300225	CONC STRUCT	CU YD	90.000				
50500405	F & E STRUCT STEEL	POUND	1,350.000				
50800205	REINF BARS, EPOXY CTD	POUND	9,000.000				
66409400	CH LK GATES 8X12 DBL	EACH	1.000				
67000400	ENGR FIELD OFFICE A	CAL MO	20.000				
67100100	MOBILIZATION	L SUM	1.000				

CONTRACT NUMBER **82726**

THIS IS THE TOTAL BID **$** _____

NOTES:

1. **Each PAY ITEM should have a UNIT PRICE and a TOTAL PRICE.**
2. **The UNIT PRICE shall govern if no TOTAL PRICE is shown or if there is a discrepancy between the product of the UNIT PRICE multiplied by the QUANTITY.**
3. **If a UNIT PRICE is omitted, the TOTAL PRICE will be divided by the QUANTITY in order to establish a UNIT PRICE.**
4. **A bid may be declared UNACCEPTABLE if neither a unit price nor a total price is shown.**

RETURN WITH BID

STATE REQUIRED ETHICAL STANDARDS GOVERNING CONTRACT PROCUREMENT: ASSURANCES, CERTIFICATIONS AND DISCLOSURES

I. GENERAL

A. Article 50 of the Illinois Procurement Code establishes the duty of all State chief procurement officers, State purchasing officers, and their designees to maximize the value of the expenditure of public moneys in procuring goods, services, and contracts for the State of Illinois and to act in a manner that maintains the integrity and public trust of State government. In discharging this duty, they are charged by law to use all available information, reasonable efforts, and reasonable actions to protect, safeguard, and maintain the procurement process of the State of Illinois.

B. In order to comply with the provisions of Article 50 and to carry out the duty established therein, all bidders are to adhere to ethical standards established for the procurement process, and to make such assurances, disclosures and certifications required by law. Except as otherwise required in subsection III, paragraphs J-M, by execution of the Proposal Signature Sheet, the bidder indicates that each of the mandated assurances have been read and understood, that each certification is made and understood, and that each disclosure requirement has been understood and completed.

C. In addition to all other remedies provided by law, failure to comply with any assurance, failure to make any disclosure or the making of a false certification shall be grounds for the chief procurement officer to void the contract, or subcontract, and may result in the suspension or debarment of the bidder or subcontractor.

II. ASSURANCES

The assurances hereinafter made by the bidder are each a material representation of fact upon which reliance is placed should the Department enter into the contract with the bidder.

A. Conflicts of Interest

1. The Illinois Procurement Code provides in pertinent part:

Section 50-13. Conflicts of Interest.

(a) Prohibition. It is unlawful for any person holding an elective office in this State, holding a seat in the General Assembly, or appointed to or employed in any of the offices or agencies of state government and who receives compensation for such employment in excess of 60% of the salary of the Governor of the State of Illinois, or who is an officer or employee of the Capital Development Board or the Illinois Toll Highway Authority, or who is the spouse or minor child of any such person to have or acquire any contract, or any direct pecuniary interest in any contract therein, whether for stationery, printing, paper, or any services, materials, or supplies, that will be wholly or partially satisfied by the payment of funds appropriated by the General Assembly of the State of Illinois or in any contract of the Capital Development Board or the Illinois Toll Highway authority.

(b) Interests. It is unlawful for any firm, partnership, association or corporation, in which any person listed in subsection (a) is entitled to receive (i) more than 7 1/2% of the total distributable income or (ii) an amount in excess of the salary of the Governor, to have or acquire any such contract or direct pecuniary interest therein.

(c) Combined interests. It is unlawful for any firm, partnership, association, or corporation, in which any person listed in subsection (a) together with his or her spouse or minor children is entitled to receive (i) more than 15%, in the aggregate, of the total distributable income or (ii) an amount in excess of 2 times the salary of the Governor, to have or acquire any such contract or direct pecuniary interest therein.

(d) Securities. Nothing in this Section invalidates the provisions of any bond or other security previously offered or to be offered for sale or sold by or for the State of Illinois.

(e) Prior interests. This Section does not affect the validity of any contract made between the State and an officer or employee of the State or member of the General Assembly, his or her spouse, minor child or any combination of those persons if that contract was in existence before his or her election or employment as an officer, member, or employee. The contract is voidable, however, if it cannot be completed within 365 days after the officer, member, or employee takes office or is employed.

The current salary of the Governor is $177,412.00. Sixty percent of the salary is $106,447.20.

2. The bidder assures the Department that the award and execution of the contract would not cause a violation of Section 50-13, or that an effective exemption has been issued by the Board of Ethics to any individual subject to the Section 50-13 prohibitions pursuant to the provisions of Section 50-20 of the Code and Executive Order Number 3 (1998). Information concerning the exemption process is available from the Department upon request.

B. Negotiations

1. The Illinois Procurement Code provides in pertinent part:

Section 50-15. Negotiations.

(a) It is unlawful for any person employed in or on a continual contractual relationship with any of the offices or agencies of State government to participate in contract negotiations on behalf of that office or agency with any firm, partnership, association, or corporation with whom that person has a contract for future employment or is negotiating concerning possible future employment.

2. The bidder assures the Department that the award and execution of the contract would not cause a violation of Section 50-15, and that the bidder has no knowledge of any facts relevant to the kinds of acts prohibited therein.

C. Inducements

1. The Illinois Procurement Code provides:

Section 50-25. Inducement. Any person who offers or pays any money or other valuable thing to any person to induce him or her not to bid for a State contract or as recompense for not having bid on a State contract is guilty of a Class 4 felony. Any person who accepts any money or other valuable thing for not bidding for a State contract or who withholds a bid in consideration of the promise for the payment of money or other valuable thing is guilty of a Class 4 felony.

2. The bidder assures the Department that the award and execution of the contract would not cause a violation of Section 50-25, and that the bidder has no knowledge of any facts relevant to the kinds of acts prohibited therein.

D. Revolving Door Prohibition

1. The Illinois Procurement Code provides:

Section 50-30. Revolving door prohibition. Chief procurement officers, State purchasing officers, procurement compliance monitors, their designees whose principal duties are directly related to State procurement, and executive officers confirmed by the Senate are expressly prohibited for a period of 2 years after terminating an affected position from engaging in any procurement activity relating to the State agency most recently employing them in an affected position for a period of at least 6 months. The prohibition includes, but is not limited to: lobbying the procurement process; specifying; bidding; proposing bid, proposal, or contract documents; on their own behalf or on behalf of any firm, partnership, association, or corporation. This Section applies only to persons who terminate an affected position on or after January 15, 1999.

2. The bidder assures the Department that the award and execution of the contract would not cause a violation of Section 50-30, and that the bidder has no knowledge of any facts relevant to the kinds of acts prohibited therein.

E. Reporting Anticompetitive Practices

1. The Illinois Procurement Code provides:

Section 50-40. Reporting anticompetitive practices. When, for any reason, any vendor, bidder, contractor, chief procurement officer, State purchasing officer, designee, elected official, or State employee suspects collusion or other anticompetitive practice among any bidders, offerors, contractors, proposers, or employees of the State, a notice of the relevant facts shall be transmitted to the Attorney General and the chief procurement officer.

2. The bidder assures the Department that it has not failed to report any relevant facts concerning the practices addressed in Section 50-40 which may involve the contract for which the bid is submitted.

F. Confidentiality

1. The Illinois Procurement Code provides:

Section 50-45. Confidentiality. Any chief procurement officer, State purchasing officer, designee, or executive officer who willfully uses or allows the use of specifications, competitive bid documents, proprietary competitive information, proposals, contracts, or selection information to compromise the fairness or integrity of the procurement, bidding, or contract process shall be subject to immediate dismissal, regardless of the Personnel code, any contract, or any collective bargaining agreement, and may in addition be subject to criminal prosecution.

2. The bidder assures the Department that it has no knowledge of any fact relevant to the practices addressed in Section 50-45 which may involve the contract for which the bid is submitted.

G. Insider Information

1. The Illinois Procurement Act provides:

Section 50-50. Insider information. It is unlawful for any current or former elected or appointed State official or State employee to knowingly use confidential information available only by virtue of that office or employment for actual or anticipated gain for themselves or another person.

2. The bidder assures the Department that it has no knowledge of any facts relevant to the practices addressed in Section 50-50 which may involve the contract for which the bid is submitted.

III. CERTIFICATIONS

The certifications hereinafter made by the bidder are each a material representation of fact upon which reliance is placed should the Department enter into the contract with the bidder. Section 50-2 of the Illinois Procurement Code provides that every person that has entered into a multi-year contract and every subcontractor with a multi-year subcontract shall certify, by July 1 of each fiscal year covered by the contract after the initial fiscal year, to the responsible chief procurement officer whether it continues to satisfy the requirements of Article 50 pertaining to the eligibility for a contract award. If a contractor or subcontractor is not able to truthfully certify that it continues to meet all requirements, it shall provide with its certification a detailed explanation of the circumstances leading to the change in certification status. A contractor or subcontractor that makes a false statement material to any given certification required under Article 50 is, in addition to any other penalties or consequences prescribed by law, subject to liability under the Whistleblower Reward and Protection Act for submission of a false claim.

A. Bribery

1. The Illinois Procurement Code provides:

Section 50-5. Bribery.

(a) Prohibition. No person or business shall be awarded a contract or subcontract under this Code who:

(1) has been convicted under the laws of Illinois or any other state of bribery or attempting to bribe an officer or employee of the State of Illinois or any other state in that officer's or employee's official capacity; or

(2) has made an admission of guilt of that conduct that is a matter of record but has not been prosecuted for that conduct.

(b) Businesses. No business shall be barred from contracting with any unit of State or local government, or subcontracting under such a contract, as a result of a conviction under this Section of any employee or agent of the business if the employee or agent is no longer employed by the business and:

(1) the business has been finally adjudicated not guilty; or

(2) the business demonstrates to the governmental entity with which it seeks to contract, or which is signatory to the contract which the subcontract relates, and that entity finds that the commission of the offense was not authorized, requested, commanded, or performed by a director, officer, or high managerial agent on behalf of the business as provided in paragraph (2) of subsection (a) of Section 5-4 of the Criminal Code of 1961.

(c) Conduct on behalf of business. For purposes of this Section, when an official, agent, or employee of a business committed the bribery or attempted bribery on behalf of the business and in accordance with the direction or authorization of a responsible official of the business, the business shall be chargeable with the conduct.

(d) Certification. Every bid submitted to and contract executed by the State, and every subcontract subject to Section 20-120 of the Procurement Code shall contain a certification by the contractor or the subcontractor, respectively, that the contractor or subcontractor is not barred from being awarded a contract or subcontract under this Section and acknowledges that the chief procurement officer may declare the related contract void if any certifications required by this Section are false. A contractor who makes a false statement, material to the certification, commits a Class 3 felony.

2. The contractor or subcontractor certifies that it is not barred from being awarded a contract under Section 50.5.

B. Felons

1. The Illinois Procurement Code provides:

Section 50-10. Felons. Unless otherwise provided, no person or business convicted of a felony shall do business with the State of Illinois or any State agency, or enter into a subcontract, from the date of conviction until 5 years after the date of completion of the sentence for that felony, unless no person held responsible by a prosecutorial office for the facts upon which the conviction was based continues to have any involvement with the business.

3. Certification. Every bid submitted to and contract executed by the State and every subcontract subject to Section 20-120 of the Procurement Code shall contain a certification by the bidder or contractor or subcontractor, respectively, that the bidder, contractor, or subcontractor is not barred from being awarded a contract or subcontract under this Section and acknowledges that the chief procurement officer may declare the related contract void if any of the certifications required by this Section are false.

C. Debt Delinquency

1. The Illinois Procurement Code provides:

Section 50-11 and 50-12. Debt Delinquency.

The contractor or bidder or subcontractor, respectively, certifies that it, or any affiliate, is not barred from being awarded a contract or subcontract under the Procurement Code. Section 50-11 prohibits a person from entering into a contract with a State agency, or entering into a subcontract, if it knows or should know that it, or any affiliate, is delinquent in the payment of any debt to the State as defined by the Debt Collection Board. Section 50-12 prohibits a person from entering into a contract with a State agency, or entering into a subcontract, if it, or any affiliate, has failed to collect and remit Illinois Use Tax on all sales of tangible personal property into the State of Illinois in accordance with the provisions of the Illinois Use Tax Act. The bidder or contractor or subcontractor, respectively, further acknowledges that the chief procurement officer may declare the related contract void if this certification is false or if the bidder, contractor, or subcontractor, or any affiliate, is determined to be delinquent in the payment of any debt to the State during the term of the contract.

D. Prohibited Bidders, Contractors and Subcontractors

1. The Illinois Procurement Code provides:

Section 50-10.5 and 50-60(c). Prohibited bidders, contractors and subcontractors.
The bidder or contractor or subcontractor, respectively, certifies in accordance with 30 ILCS 500/50-10.5 that no officer, director, partner or other managerial agent of the contracting business has been convicted of a felony under the Sarbanes-Oxley Act of 2002 or a Class 3 or Class 2 felony under the Illinois Securities Law of 1953 or if in violation of Subsection (c) for a period of five years from the date of conviction. Every bid submitted to and contract executed by the State and every subcontract subject to Section 20-120 of the Procurement Code shall contain a certification by the bidder, contractor, or subcontractor, respectively, that the bidder, contractor, or subcontractor is not barred from being awarded a contract or subcontract under this Section and acknowledges that the chief procurement officer shall declare the related contract void if any of the certifications completed pursuant to this Section are false.

E. Section 42 of the Environmental Protection Act

The bidder or contractor or subcontractor, respectively, certifies in accordance with 30 ILCS 500/50-12 that the bidder, contractor, or subcontractor, is not barred from being awarded a contract or entering into a subcontract under this Section which prohibits the bidding on or entering into contracts with the State of Illinois or a State agency, or entering into any subcontract, that is subject to the Procurement Code by a person or business found by a court or the Pollution Control Board to have committed a willful or knowing violation of Section 42 of the Environmental Protection Act for a period of five years from the date of the order. The bidder or contractor or subcontractor, respectively, acknowledges that the chief procurement officer may declare the contract void if this certification is false.

F. Educational Loan

1. Section 3 of the Educational Loan Default Act provides:

§ 3. No State agency shall contract with an individual for goods or services if that individual is in default, as defined in Section 2 of this Act, on an educational loan. Any contract used by any State agency shall include a statement certifying that the individual is not in default on an educational loan as provided in this Section.

2. The bidder, if an individual as opposed to a corporation, partnership or other form of business organization, certifies that the bidder is not in default on an educational loan as provided in Section 3 of the Act.

G. Bid-Rigging/Bid Rotating

1. Section 33E-11 of the Criminal Code of 1961 provides:

§ 33E-11. (a) Every bid submitted to and public contract executed pursuant to such bid by the State or a unit of local government shall contain a certification by the prime contractor that the prime contractor is not barred from contracting with any unit of State or local government as a result of a violation of either Section 33E-3 or 33E-4 of this Article. The State and units of local government shall provide the appropriate forms for such certification.

(b) A contractor who makes a false statement, material to the certification, commits a Class 3 felony.

A violation of Section 33E-3 would be represented by a conviction of the crime of bid-rigging which, in addition to Class 3 felony sentencing, provides that any person convicted of this offense or any similar offense of any state or the United States which contains the same elements as this offense shall be barred for 5 years from the date of conviction from contracting with any unit of State or local government. No corporation shall be barred from contracting with any unit of State or local government as a result of a conviction under this Section of any employee or agent of such corporation if the employee so convicted is no longer employed by the corporation and: (1) it has been finally adjudicated not guilty or (2) if it demonstrates to the governmental entity with which it seeks to contract and that entity finds that the commission of the offense was neither authorized, requested, commanded, nor performed by a director, officer or a high managerial agent in behalf of the corporation.

A violation of Section 33E-4 would be represented by a conviction of the crime of bid-rotating which, in addition to Class 2 felony sentencing, provides that any person convicted of this offense or any similar offense of any state or the United States which contains the same elements as this offense shall be permanently barred from contracting with any unit of State or local government. No corporation shall be barred from contracting with any unit of State or local government as a result of a conviction under this Section of any employee or agent of such corporation if the employee so convicted is no longer employed by the corporation and: (1) it has been finally adjudicated not guilty or (2) if it demonstrates to the governmental entity with which it seeks to contract and that entity finds that the commission of the offense was neither authorized, requested, commanded, nor performed by a director, officer or a high managerial agent in behalf of the corporation.

2. The bidder certifies that it is not barred from contracting with the Department by reason of a violation of either Section 33E-3 or Section 33E-4.

H. International Anti-Boycott

1. Section 5 of the International Anti-Boycott Certification Act provides:

§ 5. State contracts. Every contract entered into by the State of Illinois for the manufacture, furnishing, or purchasing of supplies, material, or equipment or for the furnishing of work, labor, or services, in an amount exceeding the threshold for small purchases according to the purchasing laws of this State or $10,000.00, whichever is less, shall contain certification, as a material condition of the contract, by which the contractor agrees that neither the contractor nor any substantially-owned affiliated company is participating or shall participate in an international boycott in violation of the provisions of the U.S. Export Administration Act of 1979 or the regulations of the U.S. Department of Commerce promulgated under that Act.

2. The bidder makes the certification set forth in Section 5 of the Act.

I. Drug Free Workplace

1. The Illinois “Drug Free Workplace Act” applies to this contract and it is necessary to comply with the provisions of the “Act” if the contractor is a corporation, partnership, or other entity (including a sole proprietorship) which has 25 or more employees.

2. The bidder certifies that if awarded a contract in excess of $5,000 it will provide a drug free workplace by:

(a) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensation, possession or use of a controlled substance, including cannabis, is prohibited in the contractor’s workplace; specifying the actions that will be taken against employees for violations of such prohibition; and notifying the employee that, as a condition of employment on such contract, the employee shall abide by the terms of the statement, and notify the employer of any criminal drug statute conviction for a violation occurring in the workplace no later than five (5) days after such conviction.

(b) Establishing a drug free awareness program to inform employees about the dangers of drug abuse in the workplace; the contractor’s policy of maintaining a drug free workplace; any available drug counseling, rehabilitation, and employee assistance programs; and the penalties that may be imposed upon employees for drug violations.

(c) Providing a copy of the statement required by subparagraph (1) to each employee engaged in the performance of the contract and to post the statement in a prominent place in the workplace.

(d) Notifying the Department within ten (10) days after receiving notice from an employee or otherwise receiving actual notice of the conviction of an employee for a violation of any criminal drug statute occurring in the workplace.

(e) Imposing or requiring, within 30 days after receiving notice from an employee of a conviction or actual notice of such a conviction, an appropriate personnel action, up to and including termination, or the satisfactory participation in a drug abuse assistance or rehabilitation program approved by a federal, state or local health, law enforcement or other appropriate agency.

(f) Assisting employees in selecting a course of action in the event drug counseling, treatment, and rehabilitation is required and indicating that a trained referral team is in place.

(g) Making a good faith effort to continue to maintain a drug free workplace through implementation of the actions and efforts stated in this certification.

J. Disclosure of Business Operations in Iran

Section 50-36 of the Illinois Procurement Code, 30ILCS 500/50-36 provides that each bid, offer, or proposal submitted for a State contract shall include a disclosure of whether or not the Company acting as the bidder, offeror, or proposing entity, or any of its corporate parents or subsidiaries, within the 24 months before submission of the bid, offer, or proposal had business operations that involved contracts with or provision of supplies or services to the Government of Iran, companies in which the Government of Iran has any direct or indirect equity share, consortiums or projects commissioned by the Government of Iran, or companies involved in consortiums or projects commissioned by the Government of Iran and either of the following conditions apply:

(1) More than 10% of the Company's revenues produced in or assets located in Iran involve oil-related activities or mineral-extraction activities; less than 75% of the Company's revenues produced in or assets located in Iran involve contracts with or provision of oil-related or mineral-extraction products or services to the Government of Iran or a project or consortium created exclusively by that government; and the Company has failed to take substantial action.

(2) The Company has, on or after August 5, 1996, made an investment of $20 million or more, or any combination of investments of at least $10 million each that in the aggregate equals or exceeds $20 million in any 12-month period, which directly or significantly contributes to the enhancement of Iran's ability to develop petroleum resources of Iran.

The terms “Business operations”, “Company”, “Mineral-extraction activities”, “Oil-related activities”, “Petroleum resources”, and “Substantial action” are all defined in the Code.

Failure to make the disclosure required by the Code shall cause the bid, offer or proposal to be considered not responsive. The disclosure will be considered when evaluating the bid, offer, or proposal or awarding the contract. The name of each Company disclosed as doing business or having done business in Iran will be provided to the State Comptroller.

Check the appropriate statement:

/___/ Company has no business operations in Iran to disclose.

/___/ Company has business operations in Iran as disclosed the attached document.

K. Apprenticeship and Training Certification (Does not apply to federal aid projects)

In accordance with the provisions of Section 30-22 (6) of the Illinois Procurement Code, the bidder certifies that it is a participant, either as an individual or as part of a group program, in the approved apprenticeship and training programs applicable to each type of work or craft that the bidder will perform with its own forces. The bidder further certifies for work that will be performed by subcontract that each of its subcontractors submitted for approval either (a) is, at the time of such bid, participating in an approved, applicable apprenticeship and training program; or (b) will, prior to commencement of performance of work pursuant to this contract, begin participation in an approved apprenticeship and training program applicable to the work of the subcontract. The Department, at any time before or after award, may require the production of a copy of each applicable Certificate of Registration issued by the United States Department of Labor evidencing such participation by the contractor and any or all of its subcontractors. Applicable apprenticeship and training programs are those that have been approved and registered with the United States Department of Labor. The bidder shall list in the space below, the official name of the program sponsor holding the Certificate of Registration for all of the types of work or crafts in which the bidder is a participant and that will be performed with the bidder’s forces. Types of work or craft work that will be subcontracted shall be included and listed as subcontract work. The list shall also indicate any type of work or craft job category that does not have an applicable apprenticeship or training program. **The bidder is responsible for making a complete report and shall make certain that each type of work or craft job category that will be utilized on the project as reported on the Construction Employee Workforce Projection (Form BC-1256) and returned with the bid is accounted for and listed.**

NA-FEDERAL

The requirements of this certification and disclosure are a material part of the contract, and the contractor shall require this certification provision to be included in all approved subcontracts. In order to fulfill this requirement, it shall not be necessary that an applicable program sponsor be currently taking or that it will take applications for apprenticeship, training or employment during the performance of the work of this contract.

L. Political Contributions and Registration with the State Board of Elections

Sections 20-160 and 50-37 of the Illinois Procurement Code regulate political contributions from business entities and any affiliated entities or affiliated persons bidding on or contracting with the state. Generally under Section 50-37, any business entity, and any affiliated entity or affiliated person of the business entity, whose current year contracts with all state agencies exceed an awarded value of $50,000, are prohibited from making any contributions to any political committees established to promote the candidacy of the officeholder responsible for the awarding of the contracts or any other declared candidate for that office for the duration of the term of office of the incumbent officeholder or a period 2 years after the termination of the contract, whichever is longer. Any business entity and affiliated entities or affiliated persons whose state contracts in the current year do not exceed an awarded value of $50,000, but whose aggregate pending bids and proposals on state contracts exceed $50,000, either alone or in combination with contracts not exceeding $50,000, are prohibited from making any political contributions to any political committee established to promote the candidacy of the officeholder responsible for awarding the pending contract during the period beginning on the date the invitation for bids or request for proposals is issued and ending on the day after the date of award or selection if the entity was not awarded or selected. Section 20-160 requires certification of registration of affected business entities in accordance with procedures found in Section 9-35 of The Election Code.

By submission of a bid, the contractor business entity acknowledges and agrees that it has read and understands Sections 20-160 and 50-37 of the Illinois Procurement Code, and that it makes the following certification:

The undersigned business entity certifies that it has registered as a business with the State Board of Elections and acknowledges a continuing duty to update the registration in accordance with the above referenced statutes. A copy of the certificate of registration shall be submitted with the bid. The bidder is cautioned that the Department will not award a contract without submission of the certificate of registration.

These requirements and compliance with the above referenced statutory sections are a material part of the contract, and any breach thereof shall be cause to void the contract under Section 50-60 of the Illinois Procurement Code. This provision does not apply to Federal-aid contracts.

M. Lobbyist Disclosure

Section 50-38 of the Illinois Procurement Code requires that any bidder or offeror on a State contract that hires a person required to register under the Lobbyist Registration Act to assist in obtaining a contract shall:

(i) Disclose all costs, fees, compensation, reimbursements, and other remunerations paid or to be paid to the lobbyist related to the contract,
(ii) Not bill or otherwise cause the State of Illinois to pay for any of the lobbyist's costs, fees, compensation, reimbursements, or other remuneration, and
(iii) Sign a verification certifying that none of the lobbyist's costs, fees, compensation, reimbursements, or other remuneration were billed to the State.

This information, along with all supporting documents, shall be filed with the agency awarding the contract and with the Secretary of State. The chief procurement officer shall post this information, together with the contract award notice, in the online Procurement Bulletin.

Pursuant to Subsection (c) of this Section, no person or entity shall retain a person or entity to attempt to influence the outcome of a procurement decision made under the Procurement Code for compensation contingent in whole or in part upon the decision or procurement. Any person who violates this subsection is guilty of a business offense and shall be fined not more than $10,000.

Bidder acknowledges that it is required to disclose the hiring of any person required to register pursuant to the Illinois Lobbyist Registration Act (25 ILCS 170) in connection with this contract.

☐ Bidder has not hired any person required to register pursuant to the Illinois Lobbyist Registration Act in connection with this contract.

Or

☐ Bidder has hired the following persons required to register pursuant to the Illinois Lobbyist Registration Act in connection with the contract:

Name and address of person: _____
All costs, fees, compensation, reimbursements and other remuneration paid to said person: _____
_____
_____
_____

IV. DISCLOSURES

A. The disclosures hereinafter made by the bidder are each a material representation of fact upon which reliance is placed should the Department enter into the contract with the bidder. The bidder further certifies that the Department has received the disclosure forms for each bid.

The chief procurement officer may void the bid, contract, or subcontract, respectively, if it is later determined that the bidder or subcontractor rendered a false or erroneous disclosure. A contractor or subcontractor may be suspended or debarred for violations of the Procurement Code. Furthermore, the chief procurement officer may void the contract and the surety providing the performance bond shall be responsible for completion of the contract.

B. Financial Interests and Conflicts of Interest

1. Section 50-35 of the Illinois Procurement Code provides that all bids of more than $25,000 shall be accompanied by disclosure of the financial interests of the bidder. This disclosed information for the successful bidder, will be maintained as public information subject to release by request pursuant to the Freedom of Information Act, filed with the Procurement Policy Board, and shall be incorporated as a material term of the contract. Furthermore, pursuant to Section 5-5, the Procurement Policy Board may review a proposal, bid, or contract and issue a recommendation to void a contract or reject a proposal or bid based on any violation of the Procurement Code or the existence of a conflict of interest as provided in subsections (b) and (d) of Section 50-35.

The financial interests to be disclosed shall include ownership or distributive income share that is in excess of 5%, or an amount greater than 60% of the annual salary of the Governor, of the bidding entity or its parent entity, whichever is less, unless the contractor or bidder is a publicly traded entity subject to Federal 10K reporting, in which case it may submit its 10K disclosure in place of the prescribed disclosure. If a bidder is a privately held entity that is exempt from Federal 10K reporting, but has more than 400 shareholders, it may submit the information that Federal 10K companies are required to report, and list the names of any person or entity holding any ownership share that is in excess of 5%. The disclosure shall include the names, addresses, and dollar or proportionate share of ownership of each person making the disclosure, their instrument of ownership or beneficial relationship, and notice of any potential conflict of interest resulting from the current ownership or beneficial interest of each person making the disclosure having any of the relationships identified in Section 50-35 and on the disclosure form.
The current annual salary of the Governor is $177,412.00.

In addition, all disclosures shall indicate any other current or pending contracts, proposals, leases, or other ongoing procurement relationships the bidding entity has with any other unit of state government and shall clearly identify the unit and the contract, proposal, lease, or other relationship.

2. Disclosure Forms. Disclosure Form A is attached for use concerning the individuals meeting the above ownership or distributive share requirements. Subject individuals should be covered each by one form. In addition, a second form (Disclosure Form B) provides for the disclosure of current or pending procurement relationships with other (non-IDOT) state agencies. **The forms must be included with each bid.**

C. Disclosure Form Instructions

Form A Instructions for Financial Information & Potential Conflicts of Interest

If the bidder is a publicly traded entity subject to Federal 10K reporting, the 10K Report may be submitted to meet the requirements of Form A. If a bidder is a privately held entity that is exempt from Federal 10K reporting, but has more than 400 shareholders, it may submit the information that Federal 10K companies are required to report, and list the names of any person or entity holding any ownership share that is in excess of 5%. If a bidder is not subject to Federal 10K reporting, the bidder must determine if any individuals are required by law to complete a financial disclosure form. To do this, the bidder should answer each of the following questions. A "YES" answer indicates Form A must be completed. If the answer to each of the following questions is "NO", then the NOT APPLICABLE STATEMENT on Form A must be signed and dated by a person that is authorized to execute contracts for the bidding company. Note: These questions are for assistance only and are not required to be completed.

1. Does anyone in your organization have a direct or beneficial ownership share of greater than 5% of the bidding entity or parent entity? YES ___ NO ___
2. Does anyone in your organization have a direct or beneficial ownership share of less than 5%, but which has a value greater than 60% of the annual salary of the Governor? YES ___ NO
3. Does anyone in your organization receive more than 60% of the annual salary of the Governor of the bidding entity's or parent entity's distributive income? YES ___ NO __
4. Does anyone in your organization receive greater than 5% of the bidding entity's or parent entity's total distributive income, but which is less than 60% of the annual salary of the Governor? YES ___ NO __

   (Note: Only one set of forms needs to be completed per person per bid even if a specific individual would require a yes answer to more than one question.)

A "YES" answer to any of these questions requires the completion of Form A. The bidder must determine each individual in the bidding entity or the bidding entity's parent company that would cause the questions to be answered "Yes". Each form must be signed and dated by a person that is authorized to execute contracts for your organization. **Photocopied or stamped signatures are not acceptable**. The person signing can be, but does not have to be, the person for which the form is being completed. The bidder is responsible for the accuracy of any information provided.

If the answer to each of the above questions is "NO", then the NOT APPLICABLE STATEMENT of Form A must be signed and dated by a person that is authorized to execute contracts for your company.

Form B: Instructions for Identifying Other Contracts & Procurement Related Information

Disclosure Form B must be completed for each bid submitted by the bidding entity. *Note: Checking the NOT APPLICABLE STATEMENT on Form A does not allow the bidder to ignore Form B. Form B must be completed, checked, and dated or the bidder may be considered nonresponsive and the bid will not be accepted.*

The Bidder shall identify, by checking Yes or No on Form B, whether it has any pending contracts (including leases), bids, proposals, or other ongoing procurement relationship with any other (non-IDOT) State of Illinois agency. If "No" is checked, the bidder only needs to complete the check box on the bottom of Form B. If "Yes" is checked, the bidder must do one of the following:

Option I: If the bidder did not submit an Affidavit of Availability to obtain authorization to bid, the bidder must list all non-IDOT State of Illinois agency pending contracts, leases, bids, proposals, and other ongoing procurement relationships. These items may be listed on Form B or on an attached sheet(s). Do not include IDOT contracts. Contracts with cities, counties, villages, etc. are not considered State of Illinois agency contracts and are not to be included. Contracts with other State of Illinois agencies such as the Department of Natural Resources or the Capital Development Board must be included. Bidders who submit Affidavits of Availability are suggested to use Option II.

Option II: If the bidder is required and has submitted an Affidavit of Availability in order to obtain authorization to bid, the bidder may write or type "See Affidavit of Availability" which indicates that the Affidavit of Availability is incorporated by reference and includes all non-IDOT State of Illinois agency pending contracts, leases, bids, proposals, and other ongoing procurement relationships. For any contracts that are not covered by the Affidavit of Availability, the bidder must identify them on Form B or on an attached sheet(s). These might be such things as leases.

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ILLINOIS DEPARTMENT OF TRANSPORTATION

Form A
Financial Information & Potential Conflicts of Interest Disclosure

Contractor Name		
Legal Address		
City, State, Zip		
Telephone Number	Email Address	Fax Number (if available)

Disclosure of the information contained in this Form is required by the Section 50-35 of the Illinois Procurement Code (30 ILCS 500). Vendors desiring to enter into a contract with the State of Illinois must disclose the financial information and potential conflict of interest information as specified in this Disclosure Form. This information shall become part of the publicly available contract file. This Form A must be completed for bids in excess of $25,000, and for all open-ended contracts. **A publicly traded company may submit a 10K disclosure (or equivalent if applicable) in satisfaction of the requirements set forth in Form A. See Disclosure Form Instructions.**

The current annual salary of the Governor is $177,412.00.

DISCLOSURE OF FINANCIAL INFORMATION

1. **Disclosure of Financial Information.** The individual named below has an interest in the BIDDER (or its parent) in terms of ownership or distributive income share in excess of 5%, or an interest which has a value of more than 60% of the annual salary of the Governor. **(Make copies of this form as necessary and attach a separate Disclosure Form A for each individual meeting these requirements)**

FOR INDIVIDUAL (type or print information)

NAME: _____

ADDRESS _____

_____

Type of ownership/distributable income share:

stock _____ sole proprietorship _____ Partnership _____ other: (explain on separate sheet):

% or $ value of ownership/distributable income share: _____

2. Disclosure of Potential Conflicts of Interest. Check "Yes" or "No" to indicate which, if any, of the following potential conflict of interest relationships apply. If the answer to any question is "Yes", please attach additional pages and describe.

(a) State employment, currently or in the previous 3 years, including contractual employment of services.

Yes ___ No __

If your answer is yes, please answer each of the following questions.

1. Are you currently an officer or employee of either the Capitol Development Board or the Illinois State Toll Highway Authority? Yes ___ No __

2. Are you currently appointed to or employed by any agency of the State of Illinois? If you are currently appointed to or employed by any agency of the State of Illinois, and your annual salary exceeds 60% of the annual salary of the Governor provide the name the State agency for which you are employed and your annual salary. _____

_____

3. If you are currently appointed to or employed by any agency of the State of Illinois, and your annual salary exceeds 60% of the annual salary of the Governor, are you entitled to receive (i) more than 7 1/2% of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess of 100% of the annual salary of the Governor? Yes ___ No __

4. If you are currently appointed to or employed by any agency of the State of Illinois, and your annual salary exceeds 60% of the annual salary of the Governor, are you and your spouse or minor children entitled to receive (i) more than 15% in aggregate of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess of two times the salary of the Governor? Yes ___ No __

(b) State employment of spouse, father, mother, son, or daughter, including contractual employment for services in the previous 2 years.

Yes ___No __

If your answer is yes, please answer each of the following questions.

1. Is your spouse or any minor children currently an officer or employee of the Capitol Development Board or the Illinois State Toll Highway Authority? Yes ___No __

2. Is your spouse or any minor children currently appointed to or employed by any agency of the State of Illinois? If your spouse or minor children is/are currently appointed to or employed by any agency of the State of Illinois, and his/her annual salary exceeds 60% of the annual salary of the Governor, provide the name of the spouse and/or minor children, the name of the State agency for which he/she is employed and his/her annual salary. _____
_____

3. If your spouse or any minor children is/are currently appointed to or employed by any agency of the State of Illinois, and his/her annual salary exceeds 60% of the annual salary of the Governor, are you entitled to receive (i) more than 71/2% of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess 100% of the annual salary of the Governor? Yes ___ No __

4. If your spouse or any minor children are currently appointed to or employed by any agency of the State of Illinois, and his/her annual salary exceeds 60% of the annual salary of the Governor, are you and your spouse or any minor children entitled to receive (i) more than 15% in the aggregate of the total distributable income from your firm, partnership, association or corporation, or (ii) an amount in excess of two times the salary of the Governor?

Yes ___ No __

(c) Elective status; the holding of elective office of the State of Illinois, the government of the United States, any unit of local government authorized by the Constitution of the State of Illinois or the statutes of the State of Illinois currently or in the previous 3 years. Yes ___No __

(d) Relationship to anyone holding elective office currently or in the previous 2 years; spouse, father, mother, son, or daughter. Yes ___No __

(e) Appointive office; the holding of any appointive government office of the State of Illinois, the United State of America, or any unit of local government authorized by the Constitution of the State of Illinois or the statues of the State of Illinois, which office entitles the holder to compensation in excess of the expenses incurred in the discharge of that office currently or in the previous 3 years. Yes ___No __

(f) Relationship to anyone holding appointive office currently or in the previous 2 years; spouse, father, mother, son, or daughter. Yes ___No __

(g) Employment, currently or in the previous 3 years, as or by any registered lobbyist of the State government. Yes ___No __

(h) Relationship to anyone who is or was a registered lobbyist in the previous 2 years; spouse, father, mother, son, or daughter. Yes ___No __

(i) Compensated employment, currently or in the previous 3 years, by any registered election or reelection committee registered with the Secretary of State or any county clerk of the State of Illinois, or any political action committee registered with either the Secretary of State or the Federal Board of Elections.
Yes ___ No __

(j) Relationship to anyone; spouse, father, mother, son, or daughter; who was a compensated employee in the last 2 years by any registered election or re-election committee registered with the Secretary of State or any county clerk of the State of Illinois, or any political action committee registered with either the Secretary of State or the Federal Board of Elections.
Yes ___ No __

---

3. Communication Disclosure.

Disclose the name and address of each lobbyist and other agent of the bidder or offeror who is not identified in Section 2 of this form, who is has communicated, is communicating, or may communicate with any State officer or employee concerning the bid or offer. This disclosure is a continuing obligation and must be promptly supplemented for accuracy throughout the process and throughout the term of the contract. If no person is identified, enter "None" on the line below:

Name and address of person(s): _____

_____

_____

_____

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4. Debarment Disclosure. For each of the persons identified under Sections 2 and 3 of this form, disclose whether any of the following has occurred within the previous 10 years: debarment from contracting with any governmental entity; professional licensure discipline; bankruptcies; adverse civil judgments and administrative findings; and criminal felony convictions. This disclosure is a continuing obligation and must be promptly supplemented for accuracy throughout the procurement process and term of the contract. If no person is identified, enter "None" on the line below:

Name of person(s): _____

Nature of disclosure: _____

_____

_____

_____

APPLICABLE STATEMENT

This Disclosure Form A is submitted on behalf of the INDIVIDUAL named on previous page. Under penalty of perjury, I certify the contents of this disclosure to be true and accurate to the best of my knowledge.

Completed by: ☐ _____ _____

Signature of Individual or Authorized Representative — Date

NOT APPLICABLE STATEMENT

Under penalty of perjury, I have determined that no individuals associated with this organization meet the criteria that would require the completion of this Form A.

This Disclosure Form A is submitted on behalf of the CONTRACTOR listed on the previous page.

☐ _____ _____

Signature of Authorized Representative — Date

The bidder has a continuing obligation to supplement these disclosures under Sec. 50-35 of the Procurement Code.

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ILLINOIS DEPARTMENT OF TRANSPORTATION

Form B
Other Contracts & Procurement Related Information Disclosure

Contractor Name		
Legal Address		
City, State, Zip		
Telephone Number	Email Address	Fax Number (if available)

Disclosure of the information contained in this Form is required by the Section 50-35 of the Illinois Procurement Act (30 ILCS 500). This information shall become part of the publicly available contract file. This Form B must be completed for bids in excess of $25,000, and for all open-ended contracts.

DISCLOSURE OF OTHER CONTRACTS AND PROCUREMENT RELATED INFORMATION

1. Identifying Other Contracts & Procurement Related Information. The BIDDER shall identify whether it has any pending contracts (including leases), bids, proposals, or other ongoing procurement relationship with any other State of Illinois agency: Yes ___ No __
If "No" is checked, the bidder only needs to complete the signature box on the bottom of this page.

2. If "Yes" is checked. Identify each such relationship by showing State of Illinois agency name and other descriptive information such as bid or project number (attach additional pages as necessary). SEE DISCLOSURE FORM INSTRUCTIONS:

THE FOLLOWING STATEMENT MUST BE CHECKED

☐ _____ _____
Signature of Authorized Representative Date

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SPECIAL NOTICE TO CONTRACTORS

The following requirements of the Illinois Department of Human Rights' Rules and Regulations are applicable to bidders on all construction contracts advertised by the Illinois Department of Transportation:

CONSTRUCTION EMPLOYEE UTILIZATION PROJECTION

(a) All bidders on construction contracts shall complete and submit, along with and as part of their bids, a Bidder's Employee Utilization Form (Form BC-1256) setting forth a projection and breakdown of the total workforce intended to be hired and/or allocated to such contract work by the bidder including a projection of minority and female employee utilization in all job classifications on the contract project.

(b) The Department of Transportation shall review the Employee Utilization Form, and workforce projections contained therein, of the contract awardee to determine if such projections reflect an underutilization of minority persons and/or women in any job classification in accordance with the Equal Employment Opportunity Clause and Section 7.2 of the Illinois Department of Human Rights' Rules and Regulations for Public Contracts adopted as amended on September 17, 1980. If it is determined that the contract awardee's projections reflect an underutilization of minority persons and/or women in any job classification, it shall be advised in writing of the manner in which it is underutilizing and such awardee shall be considered to be in breach of the contract unless, prior to commencement of work on the contract project, it submits revised satisfactory projections or an acceptable written affirmative action plan to correct such underutilization including a specific timetable geared to the completion stages of the contract.

(c) The Department of Transportation shall provide to the Department of Human Rights a copy of the contract awardee's Employee Utilization Form, a copy of any required written affirmative action plan, and any written correspondence related thereto. The Department of Human Rights may review and revise any action taken by the Department of Transportation with respect to these requirements.

RETURN WITH BID

Illinois Department of Transportation

Contract No. 82726
DUPAGE County
Section 59(SA,SB&SF)1
Project F-0365(014)
Route FAP 365
District 1 Construction Funds

PART I. IDENTIFICATION

Dept. Human Rights # _____ Duration of Project: _____

Name of Bidder: _____

PART II. WORKFORCE PROJECTION

A. The undersigned bidder has analyzed minority group and female populations, unemployment rates and availability of workers for the location in which this contract work is to be performed, and for the locations from which the bidder recruits employees, and hereby submits the following workforce projection including a projection for minority and female employee utilization in all job categories in the workforce to be allocated to this contract:

TABLE A

TOTAL Workforce Projection for Contract													TABLE B: CURRENT EMPLOYEES TO BE ASSIGNED TO CONTRACT			
			MINORITY EMPLOYEES						TRAINEES				TOTAL EMPLOYEES		MINORITY EMPLOYEES	
JOB CATEGORIES	TOTAL EMPLOYEES		BLACK		HISPANIC		*OTHER MINOR.		APPREN-TICES		ON THE JOB TRAINEES					
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
OFFICIALS (MANAGERS)																
SUPERVISORS																
FOREMEN																
CLERICAL																
EQUIPMENT OPERATORS																
MECHANICS																
TRUCK DRIVERS																
IRONWORKERS																
CARPENTERS																
CEMENT MASONS																
ELECTRICIANS																
PIPEFITTERS, PLUMBERS																
PAINTERS																
LABORERS, SEMI-SKILLED																
LABORERS, UNSKILLED																
TOTAL																

TABLE C

TOTAL Training Projection for Contract								
EMPLOYEES IN TRAINING	TOTAL EMPLOYEES		BLACK		HISPANIC		*OTHER MINOR.	
	M	F	M	F	M	F	M	F
APPRENTICES								
ON THE JOB TRAINEES								

*Other minorities are defined as Asians (A) or Native Americans (N).
Please specify race of each employee shown in Other Minorities column.

FOR DEPARTMENT USE ONLY

BC 1256 (Rev. 12/11/08)

Note: See instructions on page 2

PART II. WORKFORCE PROJECTION - continued

B. Included in "Total Employees" under Table A is the total number of **new hires** that would be employed in the event the undersigned bidder is awarded this contract.

The undersigned bidder projects that: (number) _____ new hires would be recruited from the area in which the contract project is located; and/or (number) _____ new hires would be recruited from the area in which the bidder's principal office or base of operation is located.

C. Included in "Total Employees" under Table A is a projection of numbers of persons to be employed directly by the undersigned bidder as well as a projection of numbers of persons to be employed by subcontractors.

The undersigned bidder estimates that (number) _____ persons will be directly employed by the prime contractor and that (number) _____ persons will be employed by subcontractors.

PART III. AFFIRMATIVE ACTION PLAN

A. The undersigned bidder understands and agrees that in the event the foregoing minority and female employee utilization projection included under **PART II** is determined to be an underutilization of minority persons or women in any job category, and in the event that the undersigned bidder is awarded this contract, he/she will, prior to commencement of work, develop and submit a written Affirmative Action Plan including a specific timetable (geared to the completion stages of the contract) whereby deficiencies in minority and/or female employee utilization are corrected. Such Affirmative Action Plan will be subject to approval by the contracting agency and the **Department of Human Rights**.

B. The undersigned bidder understands and agrees that the minority and female employee utilization projection submitted herein, and the goals and timetable included under an Affirmative Action Plan if required, are deemed to be part of the contract specifications.

Company _____ Telephone Number _____

_____

Address _____

NOTICE REGARDING SIGNATURE

The Bidder's signature on the Proposal Signature Sheet will constitute the signing of this form. The following signature block needs to be completed only if revisions are required.

Signature: ☐ _____ Title: _____ Date: _____

Instructions: All tables must include subcontractor personnel in addition to prime contractor personnel.

Table A - Include both the number of employees that would be hired to perform the contract work and the total number currently employed (Table B) that will be allocated to contract work, and include all apprentices and on-the-job trainees. The "Total Employees" column should include all employees including all minorities, apprentices and on-the-job trainees to be employed on the contract work.

Table B - Include all employees currently employed that will be allocated to the contract work including any apprentices and on-the-job trainees currently employed.

Table C - Indicate the racial breakdown of the total apprentices and on-the-job trainees shown in Table A.

RETURN WITH BID

ADDITIONAL FEDERAL REQUIREMENTS

In addition to the Required Contract Provisions for Federal-Aid Construction Contracts (FHWA 1273), all bidders make the following certifications.

A. By the execution of this proposal, the signing bidder certifies that the bidding entity has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action, in restraint of free competitive bidding in connection with the submitted bid. This statement made by the undersigned bidder is true and correct under penalty of perjury under the laws of the United States.

B. CERTIFICATION, EQUAL EMPLOYMENT OPPORTUNITY:

1. Have you participated in any previous contracts or subcontracts subject to the equal opportunity clause. YES _____ NO _____

2. If answer to #1 is yes, have you filed with the Joint Reporting Committee, the Director of OFCC, any Federal agency, or the former President's Committee on Equal Employment Opportunity, all reports due under the applicable filing requirements of those organizations? YES _____ NO _____

RETURN WITH BID

Contract No. 82726
DUPAGE County
Section 59(SA,SB&SF)1
Project F-0365(014)
Route FAP 365
District 1 Construction Funds

PROPOSAL SIGNATURE SHEET

The undersigned bidder hereby makes and submits this bid on the subject Proposal, thereby assuring the Department that all requirements of the Invitation for Bids and rules of the Department have been met, that there is no misunderstanding of the requirements of paragraph 3 of this Proposal, and that the contract will be executed in accordance with the rules of the Department if an award is made on this bid.

Firm Name _____

(IF AN INDIVIDUAL) Signature of Owner _____

Business Address _____

_____

Firm Name _____

By _____

(IF A CO-PARTNERSHIP) Business Address _____

_____
Name and Address of All Members of the Firm:

_____ _____

Corporate Name _____

By _____
Signature of Authorized Representative

(IF A CORPORATION)

_____
Typed or printed name and title of Authorized Representative

Attest _____
Signature

(IF A JOINT VENTURE, USE THIS SECTION FOR THE MANAGING PARTY AND THE SECOND PARTY SHOULD SIGN BELOW) Business Address _____

Corporate Name _____

By _____
Signature of Authorized Representative

(IF A JOINT VENTURE)

_____
Typed or printed name and title of Authorized Representative

Attest _____
Signature

Business Address _____

_____

If more than two parties are in the joint venture, please attach an additional signature sheet.

Illinois Department of Transportation

Return with Bid

Division of Highways
Proposal Bid Bond
(Effective November 1, 1992)

Item No. _____

Letting Date _____

KNOW ALL MEN BY THESE PRESENTS, That We _____

_____

as PRINCIPAL, and _____

_____ as SURETY, are held jointly, severally and firmly bound unto the STATE OF ILLINOIS in the penal sum of 5 percent of the total bid price, or for the amount specified in Article 102.09 of the "Standard Specifications for Road and Bridge Construction" in effect on the date of invitation for bids, whichever is the lesser sum, well and truly to be paid unto said STATE OF ILLINOIS, for the payment of which we bind ourselves, our heirs, executors, administrators, successors and assigns.

THE CONDITION OF THE FOREGOING OBLIGATION IS SUCH, that whereas, the PRINCIPAL has submitted a bid proposal to the STATE OF ILLINOIS, acting through the Department of Transportation, for the improvement designated by the Transportation Bulletin Item Number and Letting Date indicated above.

NOW, THEREFORE, if the Department shall accept the bid proposal of the PRINCIPAL; and if the PRINCIPAL shall, within the time and as specified in the bidding and contract documents, submit a DBE Utilization Plan that is accepted and approved by the Department; and if, after award by the Department, the PRINCIPAL shall enter into a contract in accordance with the terms of the bidding and contract documents including evidence of the required insurance coverages and providing such bond as specified with good and sufficient surety for the faithful performance of such contract and for the prompt payment of labor and material furnished in the prosecution thereof; or if, in the event of the failure of the PRINCIPAL to make the required DBE submission or to enter into such contract and to give the specified bond, the PRINCIPAL pays to the Department the difference not to exceed the penalty hereof between the amount specified in the bid proposal and such larger amount for which the Department may contract with another party to perform the work covered by said bid proposal, then this obligation shall be null and void, otherwise, it shall remain in full force and effect.

IN THE EVENT the Department determines the PRINCIPAL has failed to comply with any requirement as set forth in the preceding paragraph, then Surety shall pay the penal sum to the Department within fifteen (15) days of written demand therefor. If Surety does not make full payment within such period of time, the Department may bring an action to collect the amount owed. Surety is liable to the Department for all its expenses, including attorney's fees, incurred in any litigation in which it prevails either in whole or in part.

In TESTIMONY WHEREOF, the said PRINCIPAL and the said SURETY have caused this instrument to be signed by

their respective officers this _____ day of _____ A.D., _____ .

PRINCIPAL	**SURETY**
_____ (Company Name)	_____ (Company Name)
By _____ (Signature & Title)	By: _____ (Signature of Attorney-in-Fact)

Notary Certification for Principal and Surety

STATE OF ILLINOIS,
County of _____

I, _____ , a Notary Public in and for said County, do hereby certify that

_____ and _____
(Insert names of individuals signing on behalf of PRINCIPAL & SURETY)

who are each personally known to me to be the same persons whose names are subscribed to the foregoing instrument on behalf of PRINCIPAL and SURETY, appeared before me this day in person and acknowledged respectively, that they signed and delivered said instrument as their free and voluntary act for the uses and purposes therein set forth.

Given under my hand and notarial seal this _____ day of _____ A.D. _____

My commission expires _____ _____
Notary Public

In lieu of completing the above section of the Proposal Bid Form, the Principal may file an Electronic Bid Bond. By signing the proposal and marking the check box next to the Signature and Title line below, the Principal is ensuring the identified electronic bid bond has been executed and the Principal and Surety are firmly bound unto the State of Illinois under the conditions of the bid bond as shown above.

Electronic Bid Bond ID#	Company / Bidder Name	☐ Signature and Title

Illinois Department of Transportation

DBE Utilization Plan

(1) Policy

It is public policy that disadvantaged businesses as defined in 49 CFR Part 26 and the Special Provision shall have the maximum opportunity to participate in the performance of contracts financed in whole or in part with Federal or State funds. Consequently the requirements of 49 CFR Part 26 apply to this contract.

(2) Obligation

The contractor agrees to ensure that disadvantaged businesses as defined in 49 CFR Part 26 and the Special Provision have the maximum opportunity to participate in the performance of contracts or subcontracts financed in whole or in part with Federal or State funds. The contractor shall take all necessary and reasonable steps in accordance with 49 CFR Part 26 and the Special Provision to ensure that said businesses have the maximum opportunity to compete for and perform under this contract. The contractor shall not discriminate on the basis of race, color, national origin or sex in the award and performance of contracts.

(3) Project and Bid Identification

Complete the following information concerning the project and bid:

Route _____ Total Bid _____

Section _____ Contract DBE Goal _____ (Percent) _____ (Dollar Amount)

Project _____

County _____

Letting Date _____

Contract No. _____

Letting Item No. _____

(4) Assurance

I, acting in my capacity as an officer of the undersigned bidder (or bidders if a joint venture), hereby assure the Department that on this project my company : (check one)

☐ Meets or exceeds contract award goals and has provided documented participation as follows:

Disadvantaged Business Participation _____ percent

Attached are the signed participation statements, forms SBE 2025, required by the Special Provision evidencing availability and use of each business participating in this plan and assuring that each business will perform a commercially useful function in the work of the contract.

☐ Failed to meet contract award goals and has included good faith effort documentation to meet the goals and that my company has provided participation as follows:

Disadvantaged Business Participation _____ percent

The contract goals should be accordingly modified or waived. Attached is all information required by the Special Provision in support of this request including good faith effort. Also attached are the signed participation statements, forms SBE 2025, required by the Special Provision evidencing availability and use of each business participating in this plan and assuring that each business will perform a commercially useful function in the work of the contract.

_____
Company

By _____

Title _____

Date _____

The "as read" Low Bidder is required to comply with the Special Provision.

Submit only one utilization plan for each project. The utilization plan shall be submitted in accordance with the special provision.

Bureau of Small Business Enterprises
2300 South Dirksen Parkway
Springfield, Illinois 62764

Local Let Projects
Submit forms to the
Local Agency

The Department of Transportation is requesting disclosure of information that is necessary to accomplish the purpose as outlined under State and Federal law. Disclosure of this information is **REQUIRED**. Failure to provide any information will result in the contract not being awarded. This form has been approved by the State Forms Manager Center.

Illinois Department of Transportation

DBE Participation Statement

Subcontractor Registration _____ Letting _____

Participation Statement Item No. _____

(1) Instructions Contract _____

This form must be completed for each disadvantaged business participating in the Utilization Plan. This form shall be submitted in accordance with the special provision and will be attached to the Utilization Plan form.. If additional space is needed complete an additional form for the firm.

(2) Work

Pay Item No.	Description	Quantity	Unit Price	Total
			Total	

(3) Partial Payment Items

For any of the above items which are partial pay items, specifically describe the work and subcontract dollar amount:

(4) Commitment

The undersigned certify that the information included herein is true and correct, and that the DBE firm listed below has agreed to perform a commercially useful function in the work of the contract item(s) listed above and to execute a contract with the prime contractor. The undersigned further understand that no changes to this statement may be made without prior approval from the Department's Bureau of Small Business Enterprises and that complete and accurate information regarding actual work performed on this project and the payment therefore must be provided to the Department.

_____ _____

Signature for Prime Contractor Signature for DBE Firm

Title _____ Title _____

Date _____ Date _____

Contact _____ Contact Person _____

Phone _____ Phone _____

Firm Name _____ Firm Name _____

Address _____ Address _____

City/State/Zip _____ City/State/Zip _____

E _____

WC _____

The Department of Transportation is requesting disclosure of information that is necessary to accomplish the statutory purpose as outlined under the state and federal law. Disclosure of this information is **REQUIRED**. Failure to provide any information will result in the contract not being awarded. This form has been approved by the State Forms Management Center.

PROPOSAL ENVELOPE

Illinois Department of Transportation

PROPOSALS

for construction work advertised for bids by the
Illinois Department of Transportation

Item No.	Item No.	Item No.

Submitted By:

Name:
Address:
Phone No.

Bidders should use an IDOT proposal envelope or affix this form to the front of a 10” x 13” envelope for the submittal of bids. If proposals are mailed, they should be enclosed in a second or outer envelope addressed to:

Engineer of Design and Environment - Room 326
Illinois Department of Transportation
2300 South Dirksen Parkway
Springfield, Illinois 62764

NOTICE

Individual bids, including Bid Bond and/or supplemental information if required, should be securely stapled.

CONTRACTOR OFFICE COPY OF CONTRACT SPECIFICATIONS

NOTICE

None of the following material needs to be returned with the bid package unless the special provisions require documentation and/or other information to be submitted.

Contract No. 82726
DUPAGE County
Section 59(SA,SB&SF)1
Project F-0365(014)
Route FAP 365
District 1 Construction Funds

Illinois Department of Transportation

SUBCONTRACTOR DOCUMENTATION

Public Acts 96-0795 and 96-0920, enacted substantial changes to the provisions of the Illinois Procurement Code (30 ILCS 500). Among the changes are provisions affecting subcontractors. The Contractor awarded this contract will be required as a material condition of the contract to implement and enforce the contract requirements applicable to subcontractors approved in accordance with article 108.01 of the Standard Specifications for Road and Bridge Construction.

If the Contractor seeks approval of subcontractors to perform a portion of the work, and approval is granted by the Department, the Contractor shall provide a copy of the subcontract to the Chief Procurement Officer within 20 calendar days after execution of the subcontract.

The subcontract shall contain the certifications required to be made by subcontractors pursuant to Article 50 of the Illinois Procurement Code. This Notice to Bidders includes a document incorporating all required subcontractor certifications and disclosures for use by the Contractor in compliance with this mandate. The document is entitled State Required Ethical Standards Governing Subcontractors.

RETURN WITH SUBCONTRACT

STATE ETHICAL STANDARDS GOVERNING SUBCONTRACTORS

Article 50 of the Illinois Procurement Code establishes the duty of all State chief procurement officers, State purchasing officers, and their designees to maximize the value of the expenditure of public moneys in procuring goods, services, and contracts for the State of Illinois and to act in a manner that maintains the integrity and public trust of State government. In discharging this duty, they are charged by law to use all available information, reasonable efforts, and reasonable actions to protect, safeguard, and maintain the procurement process of the State of Illinois.

The certifications hereinafter made by the subcontractor are each a material representation of fact upon which reliance is placed should the Department approve the subcontractor. The chief procurement officer may terminate or void the subcontract approval if it is later determined that the bidder or subcontractor rendered a false or erroneous certification.

Section 50-2 of the Illinois Procurement Code provides that every person that has entered into a multi-year contract and every subcontractor with a multi-year subcontract shall certify, by July 1 of each fiscal year covered by the contract after the initial fiscal year, to the responsible chief procurement officer whether it continues to satisfy the requirements of Article 50 pertaining to the eligibility for a contract award. If a contractor or subcontractor is not able to truthfully certify that it continues to meet all requirements, it shall provide with its certification a detailed explanation of the circumstances leading to the change in certification status. A contractor or subcontractor that makes a false statement material to any given certification required under Article 50 is, in addition to any other penalties or consequences prescribed by law, subject to liability under the Whistleblower Reward and Protection Act for submission of a false claim.

A. Bribery

1. The Illinois Procurement Code provides:

Section 50-5. Bribery.

(a) Prohibition. No person or business shall be awarded a contract or subcontract under this Code who:

(1) has been convicted under the laws of Illinois or any other state of bribery or attempting to bribe an officer or employee of the State of Illinois or any other state in that officer's or employee's official capacity; or

(2) has made an admission of guilt of that conduct that is a matter of record but has not been prosecuted for that conduct.

(b) Businesses. No business shall be barred from contracting with any unit of State or local government, or subcontracting under such a contract, as a result of a conviction under this Section of any employee or agent of the business if the employee or agent is no longer employed by the business and:

(1) the business has been finally adjudicated not guilty; or

(2) the business demonstrates to the governmental entity with which it seeks to contract, or which is signatory to the contract to which the subcontract relates, and that entity finds that the commission of the offense was not authorized, requested, commanded, or performed by a director, officer, or high managerial agent on behalf of the business as provided in paragraph (2) of subsection (a) of Section 5-4 of the Criminal Code of 1961.

(c) Conduct on behalf of business. For purposes of this Section, when an official, agent, or employee of a business committed the bribery or attempted bribery on behalf of the business and in accordance with the direction or authorization of a responsible official of the business, the business shall be chargeable with the conduct.

(d) Certification. Every bid submitted to and contract executed by the State, and every subcontract subject to Section 20-120 of the Procurement Code shall contain a certification by the contractor or the subcontractor, respectively, that the contractor or subcontractor is not barred from being awarded a contract or subcontract under this Section and acknowledges that the chief procurement officer may declare the related contract void if any certifications required by this Section are false. A contractor who makes a false statement, material to the certification, commits a Class 3 felony.

2. The contractor or subcontractor certifies that it is not barred from being awarded a contract under Section 50.5.

B. Felons

1. The Illinois Procurement Code provides:

Section 50-10. Felons. Unless otherwise provided, no person or business convicted of a felony shall do business with the State of Illinois or any State agency, or enter into a subcontract, from the date of conviction until 5 years after the date of completion of the sentence for that felony, unless no person held responsible by a prosecutorial office for the facts upon which the conviction was based continues to have any involvement with the business.

2. Certification. Every bid submitted to and contract executed by the State and every subcontract subject to Section 20-120 of the Procurement Code shall contain a certification by the bidder or contractor or subcontractor, respectively, that the bidder, contractor, or subcontractor is not barred from being awarded a contract or subcontract under this Section and acknowledges that the chief procurement officer may declare the related contract void if any of the certifications required by this Section are false.

RETURN WITH SUBCONTRACT

C. Debt Delinquency

1. The Illinois Procurement Code provides:

Section 50-11 and 50-12. Debt Delinquency.

The contractor or bidder or subcontractor, respectively, certifies that it, or any affiliate, is not barred from being awarded a contract or subcontract under the Procurement Code. Section 50-11 prohibits a person from entering into a contract with a State agency, or entering into a subcontract, if it knows or should know that it, or any affiliate, is delinquent in the payment of any debt to the State as defined by the Debt Collection Board. Section 50-12 prohibits a person from entering into a contract with a State agency, or entering into a subcontract, if it, or any affiliate, has failed to collect and remit Illinois Use Tax on all sales of tangible personal property into the State of Illinois in accordance with the provisions of the Illinois Use Tax Act. The bidder or contractor or subcontractor, respectively, further acknowledges that the chief procurement officer may declare the related contract void if this certification is false or if the bidder, contractor, or subcontractor, or any affiliate, is determined to be delinquent in the payment of any debt to the State during the term of the contract.

D. Prohibited Bidders, Contractors and Subcontractors

1. The Illinois Procurement Code provides:

Section 50-10.5 and 50-60(c). Prohibited bidders, contractors and subcontractors.
The bidder or contractor or subcontractor, respectively, certifies in accordance with 30 ILCS 500/50-10.5 that no officer, director, partner or other managerial agent of the contracting business has been convicted of a felony under the Sarbanes-Oxley Act of 2002 or a Class 3 or Class 2 felony under the Illinois Securities Law of 1953 or if in violation of Subsection (c) for a period of five years from the date of conviction.. Every bid submitted to and contract executed by the State and every subcontract subject to Section 20-120 of the Procurement Code shall contain a certification by the bidder, contractor, or subcontractor, respectively, that the bidder, contractor, or subcontractor is not barred from being awarded a contract or subcontract under this Section and acknowledges that the chief procurement officer shall declare the related contract void if any of the certifications completed pursuant to this Section are false.

E. Section 42 of the Environmental Protection Act

The bidder or contractor or subcontractor, respectively, certifies in accordance with 30 ILCS 500/50-12 that the bidder, contractor, or subcontractor, is not barred from being awarded a contract or entering into a subcontract under this Section which prohibits the bidding on or entering into contracts with the State of Illinois or a State agency, or entering into any subcontract, that is subject to the Procurement Code by a person or business found by a court or the Pollution Control Board to have committed a willful or knowing violation of Section 42 of the Environmental Protection Act for a period of five years from the date of the order. The bidder or contractor or subcontractor, respectively, acknowledges that the chief procurement officer may declare the contract void if this certification is false.

The undersigned, on behalf of the subcontracting company, has read and understands the above certifications and makes the certifications as required by law.

_____
Name of Subcontracting Company

_____ _____
Authorized Officer Date

RETURN WITH SUBCONTRACT

SUBCONTRACTOR DISCLOSURES

I. DISCLOSURES

A. The disclosures hereinafter made by the subcontractor are each a material representation of fact upon which reliance is placed. The subcontractor further certifies that the Department has received the disclosure forms for each subcontract.

The chief procurement officer may void the bid, contract, or subcontract, respectively, if it is later determined that the bidder or subcontractor rendered a false or erroneous disclosure. A contractor or subcontractor may be suspended or debarred for violations of the Procurement Code. Furthermore, the chief procurement officer may void the contract or subcontract.

B. Financial Interests and Conflicts of Interest

1. Section 50-35 of the Illinois Procurement Code provides that all subcontracts with a total value of $25,000 or more, from subcontractors identified in Section 20-120 of the Illinois Procurement Code, shall be accompanied by disclosure of the financial interests of the subcontractor. This disclosed information for the subcontractor, will be maintained as public information subject to release by request pursuant to the Freedom of Information Act, filed with the Procurement Policy Board, and shall be incorporated as a material term of the Prime Contractor's contract. Furthermore, pursuant to this Section, the Procurement Policy Board may recommend to allow or void a contract or subcontract based on a potential conflict of interest.

The financial interests to be disclosed shall include ownership or distributive income share that is in excess of 5%, or an amount greater than 60% of the annual salary of the Governor, of the subcontracting entity or its parent entity, whichever is less, unless the subcontractor is a publicly traded entity subject to Federal 10K reporting, in which case it may submit its 10K disclosure in place of the prescribed disclosure. If a subcontractor is a privately held entity that is exempt from Federal 10K reporting, but has more than 400 shareholders, it may submit the information that Federal 10K companies are required to report, and list the names of any person or entity holding any ownership share that is in excess of 5%. The disclosure shall include the names, addresses, and dollar or proportionate share of ownership of each person making the disclosure, their instrument of ownership or beneficial relationship, and notice of any potential conflict of interest resulting from the current ownership or beneficial interest of each person making the disclosure having any of the relationships identified in Section 50-35 and on the disclosure form.
The current annual salary of the Governor is $177,412.00.

In addition, all disclosures shall indicate any other current or pending contracts, subcontracts, proposals, leases, or other ongoing procurement relationships the subcontracting entity has with any other unit of state government and shall clearly identify the unit and the contract, subcontract, proposal, lease, or other relationship.

2. Disclosure Forms. Disclosure Form A is attached for use concerning the individuals meeting the above ownership or distributive share requirements. Subject individuals should be covered each by one form. In addition, a second form (Disclosure Form B) provides for the disclosure of current or pending procurement relationships with other (non-IDOT) state agencies.

C. Disclosure Form Instructions

Form A Instructions for Financial Information & Potential Conflicts of Interest

If the subcontractor is a publicly traded entity subject to Federal 10K reporting, the 10K Report may be submitted to meet the requirements of Form A. If a subcontractor is a privately held entity that is exempt from Federal 10K reporting, but has more than 400 shareholders, it may submit the information that Federal 10K companies are required to report, and list the names of any person or entity holding any ownership share that is in excess of 5%. If a subcontractor is not subject to Federal 10K reporting, the subcontractor must determine if any individuals are required by law to complete a financial disclosure form. To do this, the subcontractor should answer each of the following questions. A "YES" answer indicates Form A must be completed. If the answer to each of the following questions is "NO", then the NOT APPLICABLE STATEMENT on the second page of Form A must be signed and dated by a person that is authorized to execute contracts for the subcontracting company. Note: These questions are for assistance only and are not required to be completed.

1. Does anyone in your organization have a direct or beneficial ownership share of greater than 5% of the bidding entity or parent entity? YES ___ NO___
2. Does anyone in your organization have a direct or beneficial ownership share of less than 5%, but which has a value greater than 60% of the annual salary of the Governor? YES ___ NO___
3. Does anyone in your organization receive more than 60% of the annual salary of the Governor of the subcontracting entity's or parent entity's distributive income? YES ___ NO __

   (Note: Distributive income is, for these purposes, any type of distribution of profits. An annual salary is not distributive income.)
4. Does anyone in your organization receive greater than 5% of the subcontracting entity's or parent entity's total distributive income, but which is less than 60% of the annual salary of the Governor? YES ___ NO __

   (Note: Only one set of forms needs to be completed per person per subcontract even if a specific individual would require a yes answer to more than one question.)

A "YES" answer to any of these questions requires the completion of Form A. The subcontractor must determine each individual in the subcontracting entity or the subcontracting entity's parent company that would cause the questions to be answered "Yes". Each form must be signed and dated by a person that is authorized to execute contracts for your organization. **Photocopied or stamped signatures are not acceptable**. The person signing can be, but does not have to be, the person for which the form is being completed. The subcontractor is responsible for the accuracy of any information provided.

If the answer to each of the above questions is "NO", then the NOT APPLICABLE STATEMENT on page 2 of Form A must be signed and dated by a person that is authorized to execute contracts for your company.

RETURN WITH SUBCONTRACT

Form B: **Instructions for Identifying Other Contracts & Procurement Related Information**

Disclosure Form B must be completed for each subcontract submitted by the subcontracting entity. *Note: Checking the NOT APPLICABLE STATEMENT on Form A does not allow the subcontractor to ignore Form B. Form B must be completed, checked, and dated or the subcontract will not be approved.*

The Subcontractor shall identify, by checking Yes or No on Form B, whether it has any pending contracts, subcontracts, leases, bids, proposals, or other ongoing procurement relationship with any other (non-IDOT) State of Illinois agency. If "No" is checked, the subcontractor only needs to complete the check box on the bottom of Form B. If "Yes" is checked, the subcontractor must list all non-IDOT State of Illinois agency pending contracts, subcontracts, leases, bids, proposals, and other ongoing procurement relationships. These items may be listed on Form B or on an attached sheet(s). Contracts with cities, counties, villages, etc. are not considered State of Illinois agency contracts and are not to be included. Contracts or subcontracts with other State of Illinois agencies such as the Department of Natural Resources or the Capital Development Board must be included.

RETURN WITH SUBCONTRACT

ILLINOIS DEPARTMENT OF TRANSPORTATION

Form A
Subcontractor: Financial Information & Potential Conflicts of Interest Disclosure

Subcontractor Name		
Legal Address		
City, State, Zip		
Telephone Number	Email Address	Fax Number (if available)

Disclosure of the information contained in this Form is required by the Section 50-35 of the Illinois Procurement Code (30 ILCS 500). Subcontractors desiring to enter into a subcontract of a State of Illinois contract must disclose the financial information and potential conflict of interest information as specified in this Disclosure Form. This information shall become part of the publicly available contract file. This Form A must be completed for subcontracts with a total value of $25,000 or more, from subcontractors identified in Section 20-120 of the Illinois Procurement Code, and for all open-ended contracts. **A publicly traded company may submit a 10K disclosure (or equivalent if applicable) in satisfaction of the requirements set forth in Form A. See Disclosure Form Instructions.**

The current annual salary of the Governor is $177,412.00.

DISCLOSURE OF FINANCIAL INFORMATION

1. Disclosure of Financial Information. The individual named below has an interest in the SUBCONTRACTOR (or its parent) in terms of ownership or distributive income share in excess of 5%, or an interest which has a value of more than 60% of the annual salary of the Governor. **(Make copies of this form as necessary and attach a separate Disclosure Form A for each individual meeting these requirements)**

FOR INDIVIDUAL (type or print information)

NAME: _____

ADDRESS _____

_____

Type of ownership/distributable income share:

stock _____ sole proprietorship _____ Partnership _____ other: (explain on separate sheet):

% or $ value of ownership/distributable income share: _____

2. Disclosure of Potential Conflicts of Interest. Check "Yes" or "No" to indicate which, if any, of the following potential conflict of interest relationships apply. If the answer to any question is "Yes", please attach additional pages and describe.

(a) State employment, currently or in the previous 3 years, including contractual employment of services.

Yes ___ No __

If your answer is yes, please answer each of the following questions.

1. Are you currently an officer or employee of either the Capitol Development Board or the Illinois State Toll Highway Authority? Yes ___ No __

2. Are you currently appointed to or employed by any agency of the State of Illinois? If you are currently appointed to or employed by any agency of the State of Illinois, and your annual salary exceeds 60% of the annual salary of the Governor, provide the name the State agency for which you are employed and your annual salary. _____

_____

3. If you are currently appointed to or employed by any agency of the State of Illinois, and your annual salary exceeds 60% of the annual salary of the Governor, are you entitled to receive (i) more than 7 1/2% of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess of 100% of the annual salary of the Governor?
   Yes ___No __

4. If you are currently appointed to or employed by any agency of the State of Illinois, and your annual salary exceeds 60% of the annual salary of the Governor, are you and your spouse or minor children entitled to receive (i) more than 15 % in the aggregate of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess of two times the salary of the Governor? Yes ___No __

(b) State employment of spouse, father, mother, son, or daughter, including contractual employment services in the previous 2 years.
   Yes ___No __

If your answer is yes, please answer each of the following questions.

1. Is your spouse or any minor children currently an officer or employee of the Capitol Development Board or the Illinois State Toll Highway Authority? Yes ___No __

2. Is your spouse or any minor children currently appointed to or employed by any agency of the State of Illinois? If your spouse or minor children is/are currently appointed to or employed by any agency of the State of Illinois, and his/her annual salary exceeds 60% of the annual salary of the Governor, provide the name of your spouse and/or minor children, the name of the State agency for which he/she is employed and his/her annual salary. _____
   _____

3. If your spouse or any minor children is/are currently appointed to or employed by any agency of the State of Illinois, and his/her annual salary exceeds 60% of the annual salary of the Governor, are you entitled to receive (i) more than 71/2% of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess of of 100% of the annual salary of the Governor? Yes ___No __

4. If your spouse or any minor children are currently appointed to or employed by any agency of the State of Illinois, and his/her annual salary exceeds 60% of the annual salary of the Governor, are you and your spouse or minor children entitled to receive (i) more than 15 % in the aggregate of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess of two times the salary of the Governor?
   Yes ___No __

(c) Elective status; the holding of elective office of the State of Illinois, the government of the United States, any unit of local government authorized by the Constitution of the State of Illinois or the statutes of the State of Illinois currently or in the previous 3 years. Yes ___No __

(d) Relationship to anyone holding elective office currently or in the previous 2 years; spouse, father, mother, son, or daughter. Yes ___No __

(e) Appointive office; the holding of any appointive government office of the State of Illinois, the United States of America, or any unit of local government authorized by the Constitution of the State of Illinois or the statutes of the State of Illinois, which office entitles the holder to compensation in excess of the expenses incurred in the discharge of that office currently or in the previous 3 years. Yes ___No __

(f) Relationship to anyone holding appointive office currently or in the previous 2 years; spouse, father, mother, son, or daughter. Yes ___No __

(g) Employment, currently or in the previous 3 years, as or by any registered lobbyist of the State government.
   Yes ___No __

(h) Relationship to anyone who is or was a registered lobbyist in the previous 2 years; spouse, father, mother, son, or daughter. Yes ___ No __

(i) Compensated employment, currently or in the previous 3 years, by any registered election or reelection committee registered with the Secretary of State or any county clerk of the State of Illinois, or any political action committee registered with either the Secretary of State or the Federal Board of Elections.
Yes ___ No __

(j) Relationship to anyone; spouse, father, mother, son, or daughter; who was a compensated employee in the last 2 years by any registered election or re-election committee registered with the Secretary of State or any county clerk of the State of Illinois, or any political action committee registered with either the Secretary of State or the Federal Board of Elections.
Yes ___ No __

---

3. Communication Disclosure.

Disclose the name and address of each lobbyist and other agent of the bidder or offeror who is not identified in Section 2 of this form, who is has communicated, is communicating, or may communicate with any State officer or employee concerning the bid or offer. This disclosure is a continuing obligation and must be promptly supplemented for accuracy throughout the process and throughout the term of the contract. If no person is identified, enter "None" on the line below:

Name and address of person(s): _____

_____

_____

_____

RETURN WITH SUBCONTRACT

4. Debarment Disclosure. For each of the persons identified under Sections 2 and 3 of this form, disclose whether any of the following has occurred within the previous 10 years: debarment from contracting with any governmental entity; professional licensure discipline; bankruptcies; adverse civil judgments and administrative findings; and criminal felony convictions. This disclosure is a continuing obligation and must be promptly supplemented for accuracy throughout the procurement process and term of the contract. If no person is identified, enter "None" on the line below:

Name of person(s): _____

Nature of disclosure: _____

_____

_____

_____

APPLICABLE STATEMENT

This Disclosure Form A is submitted on behalf of the INDIVIDUAL named on previous page. Under penalty of perjury, I certify the contents of this disclosure to be true and accurate to the best of my knowledge.

Completed by: ☐ _____ _____

Signature of Individual or Authorized Officer — Date

NOT APPLICABLE STATEMENT

Under penalty of perjury, I have determined that no individuals associated with this organization meet the criteria that would require the completion of this Form A.

This Disclosure Form A is submitted on behalf of the SUBCONTRACTOR listed on the previous page.

☐ _____ _____

Signature of Authorized Officer — Date

RETURN WITH SUBCONTRACT

ILLINOIS DEPARTMENT OF TRANSPORTATION

Form B
Subcontractor: Other Contracts & Procurement Related Information Disclosure

Subcontractor Name		
Legal Address		
City, State, Zip		
Telephone Number	Email Address	Fax Number (if available)

Disclosure of the information contained in this Form is required by the Section 50-35 of the Illinois Procurement Act (30 ILCS 500). This information shall become part of the publicly available contract file. This Form B must be completed for subcontracts with a total value of $25,000 or more, from subcontractors identified in Section 20-120 of the Illinois Procurement Code, and for all open-ended contracts.

DISCLOSURE OF OTHER CONTRACTS, SUBCONTRACTS, AND PROCUREMENT RELATED INFORMATION

1. Identifying Other Contracts & Procurement Related Information. The SUBCONTRACTOR shall identify whether it has any pending contracts, subcontracts, including leases, bids, proposals, or other ongoing procurement relationship with any other State of Illinois agency: Yes ___ No __
If "No" is checked, the subcontractor only needs to complete the signature box on the bottom of this page.

2. If "Yes" is checked. Identify each such relationship by showing State of Illinois agency name and other descriptive information such as bid or project number (attach additional pages as necessary). SEE DISCLOSURE FORM INSTRUCTIONS:

THE FOLLOWING STATEMENT MUST BE CHECKED

☐ _____ _____
Signature of Authorized Officer Date

Illinois Department of Transportation

NOTICE TO BIDDERS

1. **TIME AND PLACE OF OPENING BIDS.** Sealed proposals for the improvement described herein will be received by the Department of Transportation at the Harry R. Hanley Building, 2300 South Dirksen Parkway, in Springfield, Illinois until 10:00 o'clock a.m., June 17, 2011. All bids will be gathered, sorted, publicly opened and read in the auditorium at the Department of Transportation's Harry R. Hanley Building shortly after the 10:00 a.m. cut off time.

2. **DESCRIPTION OF WORK**. The proposed improvement is identified and advertised for bids in the Invitation for Bids as:

   Contract No. 82726
   DUPAGE County
   Section 59(SA,SB&SF)1
   Project F-0365(014)
   Route FAP 365
   District 1 Construction Funds

Pump station rehabilitation of Pump Station No. 48 along IL Route 56 (Butterfield Road) in DuPage County.

3. **INSTRUCTIONS TO BIDDERS**. (a) This Notice, the invitation for bids, proposal and letter of award shall, together with all other documents in accordance with Article 101.09 of the Standard Specifications for Road and Bridge Construction, become part of the contract. Bidders are cautioned to read and examine carefully all documents, to make all required inspections, and to inquire or seek explanation of the same prior to submission of a bid.

   (b) State law, and, if the work is to be paid wholly or in part with Federal-aid funds, Federal law requires the bidder to make various certifications as a part of the proposal and contract. By execution and submission of the proposal, the bidder makes the certification contained therein. A false or fraudulent certification shall, in addition to all other remedies provided by law, be a breach of contract and may result in termination of the contract.

4. **AWARD CRITERIA AND REJECTION OF BIDS**. This contract will be awarded to the lowest responsive and responsible bidder considering conformity with the terms and conditions established by the Department in the rules, Invitation for Bids and contract documents. The issuance of plans and proposal forms for bidding based upon a prequalification rating shall not be the sole determinant of responsibility. The Department reserves the right to determine responsibility at the time of award, to reject any or all proposals, to readvertise the proposed improvement, and to waive technicalities.

By Order of the
Illinois Department of Transportation

Gary Hannig,
Secretary

INDEX
FOR
SUPPLEMENTAL SPECIFICATIONS
AND RECURRING SPECIAL PROVISIONS

Adopted January 1, 2011

This index contains a listing of SUPPLEMENTAL SPECIFICATIONS and frequently used RECURRING SPECIAL PROVISIONS.

ERRATA Standard Specifications for Road and Bridge Construction (Adopted 1-1-07) (Revised 1-1-11)

SUPPLEMENTAL SPECIFICATIONS

RECURRING SPECIAL PROVISIONS

The following RECURRING SPECIAL PROVISIONS indicated by an "X" are applicable to this contract and are included by reference:

TABLE OF CONTENTS

STATE OF ILLINOIS

SPECIAL PROVISIONS

The following Special Provisions supplement the "Standard Specifications for Road and Bridge Construction," adopted January 1, 2007 the latest edition of the “Manual on Uniform Traffic Control Devices for Streets and Highways” and the “Manual of Test Procedures for Materials” in effect on the date of invitations for Bids and the "Supplemental Specifications and Recurring Special Provisions" indicated on the "Check Sheet" included herein which apply to and govern construction of FAP 365 (IL 56), Project F-0365 (014), Section 59 (SA, SB & SF) 1 located in DuPage County, Contract 82726 and in case of conflict with any part or parts of said specifications, the said Special Provisions shall take precedence and shall govern.

LOCATION OF IMPROVEMENT

The Project is located at the existing State of Illinois Storm Water Pump Station No. 48 located at the northwest quadrant of the intersection of the EJ & E RR Railroad and IL 56 (Butterfield Road) in Warrenville, DuPage County, District 1.

DESCRIPTION OF IMPROVEMENT

This improvement shall consist of the rehabilitation of the existing building including but not limited to, partial demolition and material removal, concrete work, reinforcement bars, glass block and masonry work, doors and frame, metal works, single ply roofing, sheet metal work, painting and site work, as specified herein. Further, the improvement shall include mechanical work consisting of relocation of the existing pumps including motors, fabricated metal, bowls, and impellers and removal of the existing heating and ventilating equipment, piping for pump and recirculation system and electrical distribution, control, instrumentation, intrusion and fire alarm, lighting, equipment, conduit and wiring, all in the existing pump station and a new electric service to the facility and modifications of the existing Supervisory Control and Data Acquisition (SCADA) System.

STAGING AND SEQUENCE OF CONSTRUCTION

Construction Staging: The Contractor shall be responsible for and include all work for implementing and maintaining and construction staging as may be required and as described in the Contract Documents and indicated on the Drawings to maintain all pumping capabilities through the relocation work under this Contract. Operation of pumps shall be maintained as described under Division 1, General Requirements, Division 15, Mechanical, and Division 16, Electrical, and in order to complete all construction by the completion date specified in the Contract Document and as approved by the Engineer.

The Contractor shall confine his construction operations within the limits of work indicated on the Drawings. In the event the Contractor requires additional area or areas for his construction operations, he shall be responsible for leasing such additional area or areas. No additional payment will be made for leasing additional area or areas. This expense shall be deemed as included in prices in the Contract.

The Contractor shall obtain all permits, easements or other requirements and shall pay all fees, rent or other expense for easements for access to the work area or for storage of materials, equipment or construction operations. The contractor shall submit shop drawings or proposed access plan and for such additional areas, as he may require, to the Engineer for approval before commencing construction. No separate measurements or payment will be made for providing, maintaining and restoring any areas used for access or other construction operations.

In general, the work described herein and on the Drawings shall be considered as all inclusive and will not be listed in order but only to give a brief description of the work required and which shall be executed concurrently under this Contract.

The Contractor shall prepare and submit to the Engineer for approval his proposed sequence of operations for the relocation of the Pump Station. The submittal shall include all details and descriptions for the work under this Contract including, but not limited to, maintenance of electric service to existing and new pumps; maintenance of pumping capacity as specified in the Contract Documents; protection of existing and new equipment during all relocation work; reconstruction sequence; the proposed construction schedule indicating critical path the Contractor proposes to purse on all work under this Contract; and all matters relating to this Contract. The submittal shall be a form acceptable to the State and shall be subject to approval by the State.

COMPLETION DATE PLUS WORKING DAYS

Effective: September 30, 1985 Revised: January 1, 2007

Revise Article 108.05 (b) of the Standard Specifications as follows:

> "When a completion date plus working days is specified, the Contractor shall complete all contract items and safely open all roadways to traffic by 11:59 PM on, December 31, 2012 except as specified herein.
>
> The Contractor will be allowed to complete all clean-up work and punch list items within 5 working days after the completion date for opening the roadway to traffic. Under extenuating circumstances the Engineer may direct that certain items of work, not affecting the safe opening of the roadway to traffic, may be completed within the working days allowed for clean-up work and punch list items. Temporary lane closures for this work may be allowed at the discretion of the Engineer.

This completion date is based on an expedited work schedule.

FAILURE TO COMPLETE THE WORK ON TIME

Should the Contractor fail to complete the work on or before the specified completion date or within such extended time as may be allowed, the Contractor shall be liable to the Department in the amount of $1,130.00, not as a penalty but as liquidated damages, for each calendar day or a portion thereof, of overrun in the Contract time or such extended time as may have been allowed.

A calendar day is every day on the calendar and starts at 12:00 midnight and ends at the following 12:00 midnight, twenty-four hours later.

PRE-BID SITE INSPECTION OF PUMP STATION

The Pump Station No. 48 site will be open for Contractor's inspection on Friday, June 3, 2011 between 9:00 A.M. to 12:00 P.M. local time. A representative of the State will be on hand during this stated time period. In the event the date or time is not suitable, an alternative inspection date and time can be arranged with Mr. Naser Gholer of IDOT's Bureau of Electrical Operations, Maintenance Division, at (847) 221-3089.

CONTRACTOR COOPERATION

The attention of the Contractor is directed to the fact that other contracts are or may be in force that adjoins the limits of this project. The Contractor shall cooperate with the other contractors in the phasing and performance of his work so as not to delay, interrupt or hinder the progress or completion of work being performed by the other contractors.

No additional compensation will be allowed this Contractor for compliance with the above requirements, nor for any delays or inconvenience resulting from the activities of the other contractors.

PROGRESS SCHEDULE

Time is of the essence in this Contract. It may be necessary for the Contractor to work longer hours, use additional crews, and work during weekends in order to complete the work within the required time limit. The Contractor shall submit a Critical Path Method (CPM) Progress Schedule for the Engineer's approval before the work can be started.

In the event the Contractor falls more than three (3) days behind the approved progress schedule, the Contractor shall work seven (7) days a week at extended hours in order to meet the specified Completion Date.

The Contractor will not be allowed any extra compensation for working longer hours or using extra shifts; and working on weekends or during holidays; working during winter months, etc., to meet the specified Completion Date.

FINE AGGREGATE FOR HOT- MIX ASPHALT (HMA) (D-1)
Effective: May 1, 2007 Revised: January 15, 2010

Add the following to the gradation tables of Article 1003.01(c) of the Standard Specifications:

FINE AGGREGATE GRADATIONS					
Grad No.	Sieve Size and Percent Passing				
	3/8	No. 4	No. 8	No. 16	No. 200
FA 22	100	6/	6/	8±8	2±2

FINE AGGREGATE GRADATIONS (metric)					
	Sieve Size and Percent Passing				
Grad No.	9.5 mm	4.75 mm	2.36 mm	1.16 mm	75 µm
FA 22	100	6/	6/	8±8	2±2

6/ For the fine aggregate gradations FA 22, the aggregate producer shall set the midpoint percent passing, and the Department will apply a range of ± ten percent. The midpoint shall not be changed without Department approval.

Revise Article 1003.03(a) of the Standard Specifications to read:

"(a) Description. Fine aggregate for HMA shall consist of sand, stone sand, chats, slag sand, or steel slag sand. For gradation FA 22, uncrushed material will not be permitted."

Revise Article 1003.03 (c) of the Standard Specifications to read:

"(c) Gradation. The fine aggregate gradation for all HMA shall be FA1, FA 2, FA 20, FA 21 or FA 22. When Reclaimed Asphalt Pavement (RAP) is incorporated in the HMA design, the use of FA 21 Gradation will not be permitted.

Gradation FA 1, FA 2, or FA 3 shall be used when required for prime coat aggregate application for HMA."

COARSE AGGREGATE FOR HOT-MIX ASPHALT (HMA) (D-1)
Effective: March 16, 2009

Revise Article 1004.03 of the Standard Specifications to read:

1004.03 Coarse Aggregate for Hot-Mix Asphalt (HMA). The aggregate shall be according to Article 1004.01 and the following.

(a) Description. The coarse aggregate for HMA shall be according to the following table.

Use	Mixture	Aggregates Allowed
Class A	Seal or Cover	Gravel Crushed Gravel Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag Crushed Concrete
HMA All Other	Stabilized Subbase or Shoulders	Gravel Crushed Gravel Crushed Stone Crushed Sandstone Crushed Slag Crushed Concrete The coarse aggregate for stabilized subbase, if approved by the Engineer, may be produced by blending aggregates according to Article 1004.04(a).

Use	Mixture	Aggregates Allowed
HMA High ESAL Low ESAL	IL-25.0, IL-19.0, or IL-19.0L	Crushed Gravel Crushed Stone Crushed Sandstone Crushed Slag (ACBF)
HMA High ESAL Low ESAL	C Surface IL-12.5,IL-9.5, or IL-9.5L	Gravel (only when used in IL-9.5L) Crushed Gravel Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag (except when used as leveling binder)
HMA High ESAL	D Surface IL-12.5 or IL-9.5	Crushed Gravel Crushed Stone (other than Limestone) Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag (except when used as leveling binder) Limestone may be used in Mixture D if blended by volume in the following coarse aggregate percentages: Up to 25% Limestone with at least 75% Dolomite. Up to 50% Limestone with at least 50% any aggregate listed for Mixture D except Dolomite. Up to 75% Limestone with at least 25% Crushed Slag (ACBF) or Crushed Sandstone.
HMA High ESAL	E Surface IL-12.5 or IL-9.5	Crushed Gravel Crushed Stone (other than Limestone and Dolomite) Crushed Sandstone No Limestone. Dolomite may be used in Mixture E if blended by volume in the following coarse aggregate percentages: Up to 75% Dolomite with at least 25% Crushed Sandstone, Crushed Slag (ACBF), or Crushed Steel Slag. When Crushed Slag (ACBF) or Crushed Steel Slag are used in the blend, the blend shall contain a minimum of 25% to a maximum of 75% of either Slag by volume. Up to 50% Dolomite with at least 50% of any aggregate listed for Mixture E. If required to meet design criteria, Crushed Gravel or Crushed Stone (other than Limestone or Dolomite) may be blended by volume in the following coarse aggregate percentages: Up to 75% Crushed Gravel or Crushed Stone (other than Limestone or Dolomite) with at least 25% Crushed Sandstone, Crushed Slag (ACBF), or Crushed Steel Slag. When Crushed Slag (ACBF) or Crushed Steel Slag are used in the blend, the blend shall contain a minimum of 25% to a maximum of 50% of either Slag by volume.

Use	Mixture	Aggregates Allowed
HMA High ESAL	F Surface IL-12.5 or IL-9.5	Crushed Sandstone No Limestone. Crushed Gravel, Crushed Concrete, or Crushed Dolomite may be used in Mixture F if blended by volume in the following coarse aggregate percentages: Up to 50% Crushed Gravel, Crushed Concrete or Crushed Dolomite with at least 50% Crushed Sandstone, Crushed Slag (ACBF), Crushed Steel Slag, or any Other Crushed Stone (to include Granite, Diabase, Rhyolite or Quartzite). When Crushed Slag (ACBF) or Crushed Steel Slag are used in the blend, the blend shall contain a minimum of 50% to a maximum of 75% of either Slag by volume.

(b) Quality. For surface courses and binder courses when used as surface course, the coarse aggregate shall be Class B quality or better. For Class A (seal or cover coat), other binder courses, and surface course IL-9.5L (Low ESAL), the coarse aggregate shall be Class C quality or better. For All Other courses, the coarse aggregate shall be Class D quality or better.

(c) Gradation. The coarse aggregate gradations shall be as listed in the following table.

Use	Size/Application	Gradation No.
Class A-1, 2, & 3	3/8 in. (10 mm) Seal	CA 16
Class A-1	1/2 in. (13 mm) Seal	CA 15
Class A-2 & 3	Cover	CA 14
HMA High ESAL	IL-25.0 IL-19.0 IL-12.5 IL-9.5	CA 7 [1/] or CA 8 [1/] CA 11 [1/] CA 16 and/or CA 13 CA 16
HMA Low ESAL	IL-19.0L IL-9.5L	CA 11 [1/] CA 16
HMA All Other	Stabilized Subbase or Shoulders	CA 6 [2/], CA 10, or CA 12

1/ CA 16 or CA 13 may be blended with the gradations listed.

2/ CA 6 will not be permitted in the top lift of shoulders.

TEMPERATURE CONTROLFOR CONCRETE PLACEMENT (DISTRICT ONE)
Effective: May 1, 2007

Delete the second and third sentences of the second paragraph of Article 1020.14(a) of the Standard Specifications.

USE OF RAP (DIST 1)
Effective: January 1, 2007 Revised: September 15, 2010

In Article 1030.02(g) of the Standard Specifications, delete the last sentence of the first paragraph in (Note 2).

Revise Section 1031 of the Standard Specifications to read:

"**SECTION 1031. RECLAIMED ASPHALT PAVEMENT**

1031.01 Description. Reclaimed asphalt pavement (RAP) results from the cold milling or crushing of an existing hot-mix asphalt (HMA) pavement. The Contractor shall supply written documentation that the RAP originated from routes or airfields under federal, state, or local agency jurisdiction. The contractor can also request that a processed pile be tested by the Department to determine the aggregate quality as described in Article 1031.04, herein.

1031.02 Stockpiles. The Contractor shall construct individual, sealed RAP stockpiles meeting one of the following definitions. No additional RAP shall be added to the pile after the pile has been sealed. Stockpiles shall be sufficiently separated to prevent intermingling at the base. Stockpiles shall be identified by signs indicating the type and size as listed below (i.e. "Homogenous Surface").

Prior to milling or removal of an HMA pavement, the Contractor may request the District to provide verification of the existing mix composition to clarify appropriate stockpile.

(a) Homogeneous. Homogeneous RAP stockpiles shall consist of RAP from Class I, Superpave (High ESAL), HMA (High ESAL), or equivalent mixtures and represent: 1) the same aggregate quality, but shall be at least C quality; 2) the same type of crushed aggregate (either crushed natural aggregate, ACBF slag, or steel slag); 3) similar gradation; and 4) similar asphalt binder content. If approved by the Engineer, combined single pass surface/binder millings may be considered "homogenous" with a quality rating dictated by the lowest coarse aggregate quality present in the mixture.

(b) Conglomerate 5/8. Conglomerate 5/8 RAP stockpiles shall consist of RAP from Class I, Superpave (High ESAL), HMA (High ESAL), or equivalent mixtures. The coarse aggregate in this RAP shall be crushed aggregate and may represent more than one aggregate type and/or quality but shall be at least C quality. This RAP may have an inconsistent gradation and/or asphalt binder content prior to processing. All conglomerate 5/8 RAP shall be processed prior to testing by crushing to where all RAP shall pass the 5/8 in. (16 mm) or smaller screen.

(c) Conglomerate 3/8. Conglomerate 3/8 RAP stockpiles shall consist of RAP from Class I, Superpave (High ESAL), HMA (High ESAL), or equivalent mixtures. The coarse aggregate in this RAP shall be crushed aggregate and may represent more than one aggregate type and/or quality but shall be at least B quality. This RAP may have an inconsistent gradation and/or asphalt binder content prior to processing. All conglomerate 3/8 RAP shall be processed prior to testing by crushing to where all RAP shall pass the 3/8 in (9.5 mm) or smaller screen.

(d) Conglomerate Variable Size. Conglomerate variable size RAP shall consist of RAP from Class I, Superpave (High ESAL), HMA (High ESAL), or equivalent mixtures. The coarse aggregate in this RAP shall be crushed aggregate and may represent more than one aggregate type and/or quality but shall be at least B quality. This RAP may have an inconsistent gradation and/or asphalt binder content prior to processing. All conglomerate variable size RAP shall be processed prior to testing by crushing and screening to where all RAP is separated into various sizes. All the conglomerate variable size RAP shall pass the 3/4 in. (19 mm) screen and shall be a minimum of two sizes.

(e) Conglomerate "D" Quality (DQ). Conglomerate DQ RAP stockpiles shall consist of RAP from Class I, Superpave (High or Low ESAL), HMA (High or Low Esal), or equivalent mixtures. The coarse aggregate in this RAP may be crushed or round but shall be at least D quality. This RAP may have an in consistent gradation and/or asphalt binder content.

(f) Non-Quality. RAP stockpiles that do not meet the requirements of the stockpile categories listed above shall be classified as "Non-Quality".

RAP containing contaminants, such as earth, brick, sand, concrete, sheet asphalt, bituminous surface treatment (i.e. chip seal), pavement fabric, joint sealants, etc., will be unacceptable unless the contaminants are removed to the satisfaction of the Engineer. Sheet asphalt shall be stockpiled separately.

1031.03 Testing. When used in HMA, the RAP shall be sampled and tested either during or after stockpiling.

For testing during stockpiling, washed extraction samples shall be run at the minimum frequency of one sample per 500 tons (450 metric tons) for the first 2000 tons (1800 metric tons) and one sample per 2000 tons (1800 metric tons) thereafter. A minimum of five tests shall be required for stockpiles less than 4000 tons (3600 metric tons).

For testing after stockpiling, the Contractor shall submit a plan for approval to the District proposing a satisfactory method of sampling and testing the RAP pile either in-situ or by restockpiling. The sampling plan shall meet the minimum frequency required above and detail the procedure used to obtain representative samples throughout the pile for testing.

Before extraction, each field sample shall be split to obtain two samples of test sample size. One of the two test samples from the final split shall be labeled and stored for Department use. The Contractor shall extract the other test sample according to Department procedure. The Engineer reserves the right to test any sample (split or Department-taken) to verify Contractor test results.

(a) Testing Conglomerate 3/8 and Conglomerate Variable Size. In addition to the requirements above, conglomerate 3/8 and variable size RAP shall be tested for maximum theoretical specific gravity (G_{mm}) at a frequency of one sample per 500 tons (450 metric tons) for the first 2000 tons (1800 metric tons) and one sample per 2000 tons (1800 metric tons) thereafter. A minimum of five tests shall be required for stockpiles less than 4000 tons (3600 metric tons).

(b) Evaluation of Test Results. All of the extraction results shall be compiled and averaged for asphalt binder content and gradation and, when applicable G_{mm}. Individual extraction test results, when compared to the averages, will be accepted if within the tolerances listed below.

Parameter	Homogeneous/ Conglomerate	Conglomerate "D" Quality
1 in. (25 mm)		± 5%
3/4 in. (19 mm)		
1/2 in. (12.5 mm)	± 8%	± 15%
No. 4 (4.75 mm)	± 6%	± 13%
No. 8 (2.36 mm)	±5%	
No. 16 (1.18 mm)		± 15%
No. 30 (600 μm)	± 5%	
No. 200 (75 μm)	± 2.0%	± 4.0%
Asphalt Binder	± 0.4% 1/	± 0.5%
G_{mm} G_{mm}	±0.02 2/ ±0.03 3/	

1/ The tolerance for conglomerate 3/8 shall be ± 0.3 %.

2/ Applies only to conglomerate 3/8. When variation of the G_{mm} exceeds the $\pm$ 0.02 tolerance, a new conglomerate 3/8 stockpile shall be created which will also require an additional mix design.

3/ Applies only to conglomerate variable size. When variation of the G_{mm} exceeds the $\pm$ 0.03 tolerance, a new conglomerate variable size stockpile shall be created which will also require an additional mix design.

If more than 20 percent of the individual sieves are out of the gradation tolerances, or if more than 20 percent of the asphalt binder content test results fall outside the appropriate tolerances, the RAP shall not be used in HMA unless the RAP representing the failing tests is removed from the stockpile. All test data and acceptance ranges shall be sent to the District for evaluation.

With the approval of the Engineer, the ignition oven may be substituted for extractions according to the Illinois Test Procedure, "Calibration of the Ignition Oven for the Purpose of Characterizing Reclaimed Asphalt Pavement (RAP)".

1031.04 Quality Designation of Aggregate in RAP. The quality of the RAP shall be set by the lowest quality of coarse aggregate in the RAP stockpile and are designated as follows.

(a) RAP from Class I, Superpave (High ESAL), or HMA (High ESAL) surface mixtures are designated as containing Class B quality coarse aggregate.
(b) RAP from Superpave (Low ESAL)/HMA (Low ESAL) IL-19.0L binder and IL-9.5L surface mixtures are designated as Class D quality coarse aggregate.
(c) RAP from Class I, Superpave (High ESAL), or HMA (High ESAL) binder mixtures, bituminous base course mixtures, and bituminous base course widening mixtures are designated as containing Class C quality coarse aggregate.
(d) RAP from bituminous stabilized subbase and BAM shoulders are designated as containing Class D quality coarse aggregate.

Aggregate Quality Testing of RAP:

The processed pile shall have a maximum tonnage of 5,000 tons (4500 metric tons). The pile shall be crushed and screened with 100 percent of the material passing the 3/4 in. (19 mm) sieve. The pile shall be tested for AC content and gradation and shall conform to all requirements of Article 1031.03 Testing, herein. Once the uniformity of the gradation and AC content has been established, the Contractor shall obtain a representative sample with district oversight of the sampling. This sample shall be no less than 50 lbs (25 kg) and this sample shall be delivered to a Consultant Lab, prequalified by the Department for extraction testing according to Illinois Modified AASHTO T 164. After the AC has been extracted, the Consultant Lab shall submit the test results along with the recovered aggregate to the District Office. The cost for this testing shall be paid directly by the Contractor. The District will forward the sample to the BMPR Aggregate Lab for MicroDeval Testing, according to Illinois Modified AASHTO T 327. A maximum loss of 15.0 percent will be applied for all HMA applications.

1031.05 Use of RAP in HMA. The use of RAP in HMA shall be as follows.

(a) Coarse Aggregate Size. The coarse aggregate in all RAP shall be equal to or less than the nominal maximum size requirement for the HMA mixture to be produced.

(b) Use in HMA Surface Mixtures (High and Low ESAL). RAP stockpiles for use in HMA surface mixtures (High and Low ESAL) shall be either homogeneous or conglomerate 3/8 or variable size in which the coarse aggregate is Class B quality or better.

(c) Use in HMA Binder Mixtures (High and Low ESAL), HMA Base Course, and HMA Base Course Widening. RAP stockpiles for use in HMA binder mixtures (High and Low ESAL), HMA base course, and HMA base course widening shall be homogeneous, conglomerate 5/8, or conglomerate 3/8, conglomerate variable size, in which the coarse aggregate is Class C quality or better.

(d) Use in Shoulders and Subbase. RAP stockpiles for use in HMA shoulders and stabilized subbase (HMA) shall be homogeneous, conglomerate 5/8, conglomerate 3/8, conglomerate variable size, or conglomerate DQ.

(e) The use of RAP shall be a contractor's option when constructing HMA in all contracts. When the Contractor chooses the RAP option, the percentage of RAP shall not exceed the amounts indicated in the table for a given N Design.

Maximum Mixture RAP Percentage

HMA Mixtures [1/ 3/]		Maximum % RAP	
Ndesign	Binder/Leveling Binder	Surface	Polymer Modified
30	30/40 [2/]	30	10
50	25/40 [2/ 4/]	15/25 [2/]	10 [4/]
70	25/30 [2/]	10/20 [2/]	10
90	25/30 [2/]	10/15 [2/]	10
105	25/30 [2/]	10/15 [2/]	10

1/ For HMA Shoulder and Stabilized Sub-Base (HMA) N-30, the amount of RAP shall not exceed 50 percent of the mixture.
2/ Value of Max percent RAP if 3/8 Rap or conglomerate variable size RAP is utilized.
3/ When RAP exceeds 20 percent the AC shall be PG58 -22. However, when RAP exceeds 20 percent and is used in full depth HMA pavement the AC shall be PG58 -28.
4/ Polymerized Leveling Binder, IL-4.75 is 15 percent

1031.06 HMA Mix Designs. At the Contractor's option, HMA mixtures may be constructed utilizing RAP material meeting the above detailed requirements.

RAP designs shall be submitted for volumetric verification. If additional RAP stockpiles are tested and found that no more than 20 percent of the results, as defined under "Testing" herein, are outside of the control tolerances set for the original RAP stockpile and HMA mix design, and meets all of the requirements herein, the additional RAP stockpiles may be used in the original mix design at the percent previously verified.

1031.07 HMA Production. The coarse aggregate in all RAP used shall be equal to or less than the nominal maximum size requirement for the HMA mixture being produced.

To remove or reduce agglomerated material, a scalping screen, crushing unit, or comparable sizing device approved by the Engineer shall be used in the RAP feed system to remove or reduce oversized material. If material passing the sizing device adversely affects the mix production or quality of the mix, the sizing device shall be set at a size specified by the Engineer.

If the RAP control tolerances or QC/QA test results require corrective action, the Contractor shall cease production of the mixture containing RAP and either switch to the virgin aggregate design or submit a new RAP design. When producing mixtures containing conglomerate 3/8 or conglomerate variable size RAP, a positive dust control system shall be utilized.

HMA plants utilizing RAP shall be capable of automatically recording and printing the following information.

(a) Drier Drum Plants

(1) Date, month, year, and time to the nearest minute for each print.

(2) HMA Mix number assigned by the Department

(3) Accumulated weight of dry aggregate (combined or individual) in tons (metric tons) to the nearest 0.1 ton (0.1 metric ton)

(4) Accumulated dry weight of RAP in tons (metric tons) to the nearest 0.1 ton (0.1 metric ton)

(5) Accumulated mineral filler in revolutions, tons (metric tons), etc. to the nearest 0.1 unit.

(6) Accumulated asphalt binder in gallons (liters), tons (metric tons), etc. to the nearest 0.1 unit.

(7) Residual asphalt binder in the RAP material (per size) as a percent of the total mix to the nearest 0.1 unit.

(8) Aggregate and RAP moisture compensators in percent as set on the control panel (Required when accumulated or individual aggregate and RAP are printed in wet condition).

(b) Batch Plants

(1) Date, month, year, and time to the nearest minute for each print.
(2) HMA mix number assigned by the Department.
(3) Individual virgin aggregate hot bin batch weights to the nearest pound (kilogram)
(4) Mineral filler weight to the nearest pound (kilogram).
(5) Individual RAP Aggregate weight to the nearest pound (kilogram).
(6) Virgin asphalt binder weight to the nearest pound (kilogram)
(7) Residual asphalt binder of each RAP size material as a percent of the total mix to the nearest 0.1 percent.

The printouts shall be maintained in a file at the plant for a minimum of one year or as directed by the Engineer and shall be made available upon request. The printing system will be inspected by the Engineer prior to production and verified at the beginning of each construction season thereafter.

1031.08 RAP in Aggregate Surface Course and Aggregate Shoulders. The use of RAP in aggregate surface course and aggregate shoulders shall be as follows.

(a) Stockpiles and Testing. RAP stockpiles may be any of those listed in Article 1031.02, except "Other". The testing requirements of Article 1031.03 shall not apply.

(b) Gradation. One hundred percent of the RAP material shall pass the 1 1/2 in. (37.5 mm) sieve. The RAP material shall be reasonably well graded from coarse to fine. RAP material that is gap-graded or single sized will not be accepted."

USE OF RAS (D-1)

Effective: August 15, 2010
Revised: October 25, 2010

Description. Reclaimed asphalt shingles (RAS) meeting Type I or Type 2 requirements will be permitted in HMA mixtures as specified herein for overlay applications only. RAS shall not be used in full depth HMA pavement. RAS shall be a clean and uniform material with a maximum of 0.5 percent unacceptable materials, as defined in Bureau of Materials and Physical Research Policy Memorandom 28-10.0, by weight of RAS. All RAS used shall come from a BMPR approved processing facility.

Definitions. RAS shall meet either Type I or Type 2 requirements as specified herein.

(a) Type I. Type I RAS shall be processed, preconsumer asphalt shingles salvaged from the manufacture of residential asphalt roofing shingles.

(b) Type 2. Type 2 RAS shall be processed post-consumer shingles only, salvaged from residential, or four unit or less dwellings not subject to the National Emission Standards for Hazardous Air Pollutants (NESHAP).

Stockpiles. RAS shall be ground and processed to 100 percent passing the 3/8 in. sieve and 93 percent passing the #4 sieve based on a dry shake gradation. RAS shall be uniform in gradation and asphalt binder content and shall meet the testing requirements specified herein. Type 1 and Type 2 RAS shall be stockpiled separately and shall not be intermingled. Each stockpile shall be signed indicating what type of RAS is present.

Unless otherwise approved by the Engineer, mechanically blending a maximum of 5.0 percent by weight of the aggregate blend in HMA design, manufactured sand (FM20 or FM 22) with the processed RAS will be permitted to improve workability. The sand shall be "B Quality" or better from an approved Aggregate Gradation Control System source. The sand shall be accounted for in the mix design and during HMA production.

Records identifying the shingle processing facility supplying the RAS, RAS type and lot number shall be filed by Department contract number and kept for a minimum of 3 years.

Testing. RAS shall be sampled and tested during stockpiling.

For testing during stockpiling, washed extraction, G_{mm} and testing for unnacceptable materials shall be run at the minimum frequency of one sample per 200 tons (180 metric tons) for the first 1000 tons (900 metric tons) and one sample per 250 tons (225 metric tons) thereafter. A minimum of five tests are required to establish an average gradation and asphalt cement content of the RAS for use in an HMA mix design.

A Bulk Specific Gravity value of 2.300 shall be used for RAS when used in an HMA mix design. Other Gravity Values maybe used in an HMA design but shall be verified by the Department.

Before testing, each field sample shall be split to obtain two samples. One of the two test samples from the final split shall be labeled and stored for Department use. The Contractor shall extract the other test sample according to Department procedures. The Engineer reserves the right to test any sample (split or Department-taken) to verify Contractor test results.

Evaluation of Test Results. All of the test results, with the exception of percent unacceptable materials, shall be compiled and averaged for asphalt binder content, gradation and G_{mm}. Individual test results, when compared to the averages, will be accepted if within the tolerances listed below.

Parameter	RAS
No. 8 (2.36 mm)	± 5 %
No. 16 (1.18 mm)	± 5 %
No. 30 (600 μm)	± 4%
No. 200 (75 μm)	± 2.0 %
Asphalt Binder Content	± 1.5 %
G_{mm}	± 0.04

If more than 20 percent of the individual sieves are out of the gradation tolerances, or if more than 20 percent of the asphalt binder content, or G_{mm} test results fall outside the specified tolerance, or if the percent unnacceptable materials exceeds 0.5 percent by weight of material retained on the #4 sieve, the RAS shall not be used in Department projects. All test data and acceptance ranges shall be sent to the District for evaluation.

Use of RAS in HMA. Type 1 or Type 2 RAS may be used in All HMA Mixtures as follows:

(a) SMA and High ESAL Surface Mixes:

(1) The maximum allowable RAS usage in SMA and IL 4.75 shall be as follows:

a. RAS shall not exceed 5.0 percent by weight of total mix.

b. If used in conjuction with Reclaimed Asphalt Pavement (RAP) the contribution of asphalt binder from the RAS and RAP combined shall not exceed 20 percent of the total asphalt binder.

(2) The virgin asphalt binder grade shall be as follows:

Mix Type	Percent RAS/RAP Asphalt Binder Replacement			
	< 10%		10-20%	
	Type 1	Type 2	Type 1	Type 2
SMA and High ESAL Surface Mixes	No grade [1/] bump	No grade [1/] bump	Reduce high temperature by one grade [1/]	Reduce high temperature by one grade [1/]

1/ One asphalt binder grade bump represents a change of 6º Celsius.

b) High ESAL Binder and Leveling Binder Mixes:

(1) The maximum allowable RAS usage in HMA High ESAL Binder and Leveling Binder Mixes shall be as follows:

a. RAS shall not exceed 5.0 percent by total weight of mix.

b. If used in conjuction with RAP the contribution of asphalt binder from the RAS and RAP combined shall not exceed 30 percent of the total asphalt binder.

(2) Virgin asphalt binder grade shall be as follows:

	Percent RAS/RAP Asphalt Binder Replacement			
	10-19%		20-30%	
Mix Type	Type 1	Type 2	Type 1	Type 2
High ESAL Binder and Leveling Binder Mixes	No grade 1/ bump	Reduce high temperature by one grade 1/	Reduce high & low temperature by one grade 1/	Reduce high & low temperature by one grade 1/

1/ One asphalt binder grade bump represents a change of 6º Celsius.

2/ No grade bump necessary for percent RAS/RAP/FRAP asphalt binder replacement less than 10 percent

c) HMA Low ESAL and HMA “All Other”

(1) The maximum allowable RAS usage in HMA Low ESAL and HMA “All Other” mixtures shall be as follows:

a. RAS shall not exceed 5.0 percent by total weight of mix.

b. If used in conjuction with RAP the contribution of asphalt binder from the RAS and RAP combined shall not exceed 40 percent of the total asphalt binder.

(2) Virgin asphalt binder grade shall be as follows:

	Percent RAS/RAP Asphalt Binder Replacement			
	< 20%		20-40%	
Mix Type	Type 1	Type 2	Type 1	Type 2
HMA Low ESAL and HMA “All Other”	No grade 1/ bump	Reduce low temperature by one grade 1/	Reduce high & low temperature by one grade 1/	Reduce high & low temperature by one grade 1/

1/ One asphalt binder grade bump represents a change of 6º Celsius.

HMA Mix Designs. RAS and RAS/RAP designs shall be submitted for volumetric verification. Type 1 and Type 2 RAS are not interchangeable in a mix design.

HMA Production. RAS shall be incorporated into the HMA mixture either by a separate weight depletion system or by using the RAP weigh belt. Either feed system shall be interlocked with the aggregate feed or weigh system to maintain correct proportions for all rates of production and batch sizes. The portion of RAS shall be controlled accurately to within ± 0.5 percent of the amount of RAS utilized. When using the weight depletion system, flow indicators or sensing devices shall be provided and interlocked with the plant controls such that mixture production is halted when RAS flow is interrupted.

When producing HMA containing RAS, a positive dust control system shall be utilized.

HMA plants utilizing RAS shall be capable of automatically recording and printing the following information.

(a) Dryer Drum Plants.

(1) Date, month, year, and time to the nearest minute for each print.

(2) HMA mix number assigned by the Department.

(3) Accumulated weight of dry aggregate (combined or individual) in tons (metric tons) to the nearest 0.1 ton (0.1 metric ton).

(4) Accumulated dry weight of RAS in tons (metric tons) to the nearest 0.1 ton (0.1 metric ton).

(5) Accumulated mineral filler in revolutions, tons (metric tons), etc. to the nearest 0.1 unit.

(6) Accumulated asphalt binder in gallons (liters), tons (metric tons), etc. to the nearest 0.1 unit.

(7) Residual asphalt binder in the RAS material as a percent of the total mix to the nearest 0.1 percent.

(8) Aggregate and RAS moisture compensators in percent as set on the control panel. (Required when accumulated or individual aggregate and RAS are printed in wet condition.)

(b) Batch Plants.

(1) Date, month, year, and time to the nearest minute for each print.
(2) HMA mix number assigned by the Department.
(3) Individual virgin aggregate hot bin batch weights to the nearest pound (kilogram).
(4) Mineral filler weight to the nearest pound (kilogram).
(5) RAS weight to the nearest pound (kilogram).
(6) Virgin asphalt binder weight to the nearest pound (kilogram).
(7) Residual asphalt binder in the RAS material as a percent of the total mix to the nearest 0.1 percent.

The printouts shall be maintained in a file at the plant for a minimum of one year or as directed by the Engineer and shall be made available upon request. The printing system will be inspected by the Engineer prior to production and verified at the beginning of each construction season thereafter."

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 1A - SUMMARY OF WORK

1. GENERAL:

1.1 General Work

1.1.1 The requirements of Division 1, General Requirements, shall apply to all Pump Station General Work.

1.1.2 The Pump Station General Work shall include, but not be limited to, the following:

(a) All existing pump station maintenance during construction and continuous operation as described and specified in Division 1, General Requirements.

(b) All site work consisting of site clearing, new pavement, earth excavation and backfill, installation of new fence and gate as indicated on the Drawings and as specified in Section 2A, Site Work.

(c) All general demolition work as indicated on the Drawings as described in Section 2B, Demolition.

(d) All grout as indicated on the Drawings and as specified in Section 3B, Grout.

(e) All unit masonry work consisting of glass block work and faced brickwork as indicated on the Drawings and as specified in Section 4A, Unit Masonry.

(f) All miscellaneous metal work as indicated on the Drawings and as specified in Division 5, Metals.

(g) All carpentry work as indicated on the Drawings and as specified in Section 6A, Rough Carpentry.

(h) All roofing work as indicated on the Drawings and as specified in Section 7A, Elastomeric Sheet Roofing- Fully Adhered/Ballasted Cover.

(i) All sheet metal work as indicated on the Drawings and as specified in Section 7B, Sheet Metal Flashing and Trim.

(j) All sealant work as indicated on the Drawings and as specified in Section 7C, Joint Sealers.

(k) All board insulation work as indicated on the Drawings and as specified in Section 7D, Board Insulation.

(l) All doors and hardware as indicated on the Drawings and as specified in Division 8, Doors and Windows.

(m) All painting as indicated on the Drawings and as specified in Section 9A, Painting.

(n) The station identification plate, shop desk, pump dolly, bulletin board, staff gauges, first aid kit, fire extinguishers, electric clock and trash can as indicated on the Drawings and as specified in Section 10A, Specialties.

(o) Fiberglass ladder and railing as specified in Section 10B, Fiberglass Reinforced Plastic Products and Fabrications

1.1.3 All removal and disposal of existing lead based paint as indicated on the Drawings and as specified in Section 9B, Removal and Disposal of Lead Based Paint, shall be paid under pay item Removal and Disposal of Lead Based Paint.

1.1.4 The following items of general work at the Pump Station are indicated on the drawings and as specified under the respective Sections of the Standard Specifications with separate pay items included in the Contract.

(a)	Earth Excavation	Section 202
(b)	Concrete Removal	Section 501
(c)	Excavation for Structures	Section 502
(d))	Furnishing and Erecting Structural Steel	Section 505
(e)	Reinforced Bar	Section 508
(f)	Storm Sewers	Section 550
(g)	Chain Link Fence	Section 664
(h)	Aggregate Base Course	Section 351
(i)	Bituminous Materials (Prime Coat)	Section 406
(e)	Engineer's Field Office, Type A	Section 670

1.1.5 Mobilization shall be paid for with a separate pay item and shall be in accordance with the requirements of Standard Specifications for Road and Bridge.

1.2 Description: Mechanical

1.2.1 The requirements of Division 1, General Requirements, shall apply to all Pump Station Mechanical Work.

1.2.2 The Pump Station Mechanical Work shall be as shown on the Drawings and as specified and include, but not be limited to, furnishing and installing the following:

(a) Removal of existing piping and appurtenances and replace with new piping and appurtenances as indicated on the Drawings and as specified in all Contract Documents.

(b) Relocate existing pumps and removal of existing pump steel angle, beam and plate support, piping and fittings as indicated on the Drawings.

(c) New storm water pumps, complete with all appurtenances.

(d) Removal of existing ventilation system including, but not limited to, exhaust fans, supply units, duct work and all appurtenances.

(e) New ventilation system including, but not limited to, exhaust fans with motorized louver/damper combination, supply units, duct work, louvers, controls and all appurtenances.

(f) New flow recirculation system including, but not limited to, slide gate valve, piping, actuator and all appurtenances.

(g) Removal and disposal of miscellaneous mechanical items consisting of float stilling well, grating, handrail, ladder and drain piping.

(h) New miscellaneous mechanical items consisting of cable support, stilling well and ladder.

(i) All monorail system, hoist and trolley work as indicated on the Drawings and as specified in Section 14A, Monorail system, Hoist and Trolley.

1.2.4 Complete spare main pump assembly shall be paid under pay item Complete Spare Main Pump Assembly.

1.2.5 Complete spare low flow pump assembly shall be paid under pay item Complete Spare Low Flow Pump Assembly.

1.3 Description: Electrical

1.3.1 The requirements of Division 1, General Requirements, shall apply to all Pump Station Electrical Work.

1.3.2 The pump Station Electrical Work shall include, but not be limited to, furnishing and installing the following:

1.3.3 The requirements of the Special Provisions and Division 1, General Requirements, shall apply to all Pump Station Electrical Work.

1.3.4 The pump Station Electrical Work shall include, but not be limited to, furnishing and installing the following:

(a) All demolition work as described in Section 16A, and as indicated on the Contract Drawings.

(b) Disconnection and removal of existing electric service, including all metering.

(c) Installation and connection of a new electric service including all metering in accordance with Commonwealth Edison Requirements.

(d) New motor control center.

(e) Disconnect switches and motor starters.

(f) New control and SCADA panels.

(g) New lighting fixtures, lighting panel board, lighting transformer and wiring devices.

(h) New power, lighting, control and signal wires and cables.

(i) New conduit and raceway system.

(j) New electric heaters, complete.

(k) Float type level sensing control system.

(l) Combustible gas detectors, smoke detectors and intrusion alarm system.

(m) Branch wiring and conduit for main pumps, low flow pumps, unit heaters, slide gate actuator, recirculation slide gate valve, ventilation system, SCADA panel and other electrical equipment as shown on the Drawings.

(m) Emergency diesel engine generator set

(o) Pavement flood float sensing system.

(p) Testing.

1.3.5 Electrical service connection shall be paid under pay item Electrical Service Connection.

1.3.6 Control and SCADA panels shall be paid under pay item Pump Station SCADA System Equipment.

1.4 Scope of Work

1.4.1 It is the intent of the Contract Drawings and referenced Standard Specifications, to define the work required for the rehabilitation of the pump station and to maintain operations of the existing pump station facility during construction. No portion of the work required to provide a coordinated complete installation may be omitted even though not expressly specified or indicated.

1.4.2 These Contract Specifications for work on Pump Station 48 are presented as various listed Divisions. In general, these Divisions address the requirements for work items which are listed as pay items and as described under the various Divisions.

1.5 Existing Pump Station Maintenance during Construction

1.5.1 From the first day the Contractor begins work at the site until the day of final acceptance by the Engineer, the Contractor shall be fully responsible for maintenance of the existing Pump Station 48. Maintenance shall be in full compliance with the District 1 Electrical Maintenance Contract, 2008/2009 or the most recent contract from the date of BID.

1.5.2 Prior to the starting of work, the Contractor shall notify the Engineer and arrange for a pre-construction inspection. At the pre-construction inspection, the facility and its equipment shall be examined and defective or missing items shall be repaired by the State's Electrical Maintenance Contractor or shall otherwise be noted. A record of inspection shall be furnished to the Engineer.

1.5.3 Emergency Service Requirements:

The Contractor shall be responsible for providing 24-hour, 7 days a week emergency response to existing pumping station alarms. Upon notification of a pump station alarm, the Contractor shall dispatch emergency service personnel to the station immediately and shall arrive at the station within one (1) hour of the receipt of the alarm. All necessary emergency repairs required to restore the pump station to its normal operating condition shall be done by the Contractor immediately. Emergency service personnel shall remain at the station to monitor the situation until the alarm(s) are cleared or otherwise notified by the IDOT engineer.

(a) The IDOT COMCENTER shall be immediately notified by the Contractor whenever an "Entry Alarm", "Water on Pavement Alarm" or "High Water on Pavement Alarm" are received, the IDOT COMCENTER shall be notified with the following information: number of pumps running, water depth in wet well, depth of water on pavement and if the drainage inlets are clogged.

(b) Failure to respond or meet the emergency service requirements of a pumping station alarm, the Contractor shall be liable to the Department in the amount paid to other subcontractors hired by the State to perform the necessary alarm response.

1.5.4 Routine Maintenance Requirements:

Ongoing maintenance activities are required to maintain the existing Pump Station 48 for proper roadway drainage. Routine maintenance inspections of all equipment shall be conducted by the Contractor. Routine maintenance items shall be done at intervals and as outlined in the District 1 Electrical Maintenance Contract, Article 15.0 "Routine Patrol Requirements".

(a) Failure to meet the routine maintenance requirements of the pumping station, the Contractor shall be liable to the Department in the amount paid to other subcontractors hired by the State to perform the necessary routing maintenance.

1.5.5 The Contractor shall ensure that two sets of construction lock and entry keys for all construction facilities are provided to the IDOT engineer and IDOT Bureau of Electrical Operations (two sets each).

1.5.6 All surrounding landscaping of the existing Pump Station 48 shall be maintained by the Contractor during construction. All grass areas shall be mowed and maintained at a maximum two (2) inch height. Snow plowing of the facility shall be provided no more than two working days after a snow fall of one (1) inch or more.

1.5.7 Should it become necessary to perform maintenance work beyond the scope of the Contract or routine maintenance/patrol, as outlined in the Electrical Maintenance Contract, the Contractor shall be reimbursed the exact amount of the pay item as outlined in the Electrical Maintenance Contract plus an additional administrative cost equal to five (5) percent of the first $10,000 and one (1) percent of any amount over $10,000 of the total approved costs of such work. If the item is not covered under the Electrical Maintenance Contract, extra work shall be paid as outlined in the Standard Specifications for Road and Bridge Construction.

1.5.8 This work shall be paid as part of the Contract lump sum price for PUMP STATION GENERAL WORK, which shall be payment in full for the work described herein.

1.6 Continuous Operation

1.6.1 The existing Pump Station 48 shall remain in continuous operation during construction. Brief shut-down periods may be permitted to facilitate construction needs when approved by the Engineer.

The Contractor shall submit, to the Engineer, all requests for a brief shut-down indicating detailed written description of all particulars such as date, time of day, length of shut-down and all related details. The work required to meet this requirement shall be included at no additional cost.

1.6.2 Continuous operation may require that some of the existing electrical equipment be disconnected, relocated and reconnected as temporary systems.

1.6.3 Continuous operation may require temporary pumping arrangements. Existing station specified pumping capacity 5,800 gpm shall be maintained. All necessary temporary pumping provisions and arrangements shall be made to maintain the above specified pumping capacity of the pumping station. There are two (2) existing 2,900 gpm main pumps. The total installed pumping capacity is 5,800 gpm. The low flow pump capacity may be included in the calculations for providing temporary pumping provisions for continuous operation requirement. A possible pumping sequences for Contractor's consideration to satisfy the continuous operation is described in subsection 1.22 of this Section.

1.6.5 Continuous operation will require that existing pump relocation, new pump and piping be installed sequentially. The wet pit shall be thoroughly cleaned to the satisfaction of the Engineer prior to the installation of the new pump and existing pump relocation. Temporary pumping provisions, if any, shall not be removed until the new pump and existing pump relocation are installed and accepted by the Engineer or otherwise approved for removal by the Engineer.

1.6.6 Continuous operation will also require providing temporary pumping equipment to pump the storm water from discharge chamber to the downstream manhole for the construction of the new discharge chamber expansion. The total temporary pumping capacity shall be 5,800 gpm.

1.6.7 This work shall be paid as part of the Contract lump sum price for PUMP STATION GENERAL WORK, which shall be payment in full for the work described herein.

1.7 Protection of Drainage Facilities during Construction

1.7.1 Unless otherwise noted in the Contract Drawings, the existing drainage facilities shall remain in use during the period of the new pump station construction.

1.7.2 Locations of existing drainage structures and sewers as indicated on the Contract Drawings are approximate. Prior to commencing work, the Contractor, at his own expense, shall determine the exact location of the existing structures which are within the proposed construction site.

1.7.3 All drainage structures are to be kept free from any debris resulting from construction operations. All work and material necessary to prevent accumulation of debris in the drainage structures will be considered as incidental to the Contract.

Any accumulation of debris in the drainage structure resulting from construction operations shall be removed at the Contractor's expense and no extra compensation will be allowed.

1.8 Submittals

1.8.1 Except as specified elsewhere herein, materials and equipment shall be in conformance with the requirements of Section 106 of the Standard Specifications.

1.8.2 Materials and equipment shall be the products of established and reputable manufacturers and shall be suitable for the service required. Unless otherwise specifically indicated, all materials and equipment shall be new. The Contractor is obligated to conduct his own search into the timely availability of the specified equipment and materials to ensure that they are in strict conformance with the contract documents and that delivery schedules are compatible with project time constraints. Materials or equipment items which are similar or identical shall be the product of the same manufacturer. The cost of submittals, certifications, any required samples, and similar costs shall not be separately paid for but shall be included in the pay item bid price for the respective material or work.

1.8.3 All equipment, products and materials incorporated in the work shall be submitted for approval.

1.8.4 Specific submittals required for individual elements of work are specified in the individual Specification sections. Except as otherwise indicated in Specification sections, requirements specified herein shall be complied with for each indicated type of submittal. Procedures concerning items such as listing of manufacturers, suppliers, subcontractors, construction progress schedule, schedule of Shop Drawing submissions, bonds, payment applications, insurance certificates, and schedule of values are specified elsewhere.

1.8.5 Work-Related Submittals

(a) Substitution or "Or Equal" Items include material or equipment CONTRACTOR requests ENGINEER to accept, after Bids are received, as substitute for items specified or described in Specifications by using name of a proprietary item or name of particular supplier.

(b) Shop Drawings include technical data and drawings specially prepared for this Project, including fabrication and installation drawings, diagrams, actual performance curves, data sheets, schedules, templates, patterns, reports, instructions, design mix formulas, measurements, and similar information not in standard printed form. Standard information prepared without specific reference to the Project is not considered a Shop Drawing.

(c) Product Data include standard printed information on manufactured products and systems that has not been specially prepared for this Project, including manufacturer's product specifications and installation instructions, catalog cuts, standard wiring diagrams, printed performance curves, mill reports, and standard color charts.

(d) Samples include both fabricated and manufactured physical examples of materials, products, and units of work, partial cuts of manufactured or fabricated work, swatches showing color, texture, and pattern, and units of work to be used for independent inspection and testing. Mock-ups are special forms of samples which are too large or otherwise inconvenient for handling in manner specified for transmittal of sample submittals.

(e) Miscellaneous Submittals are work-related submittals that do not fit in the previous categories, such as guarantees, warranties, certifications, experience records, maintenance agreements, Operating and Maintenance Manuals, workmanship bonds, survey data and reports, physical work records, quality testing and certifying reports, copies of industry standards, record drawings, field measurement data, and similar information, devices, and materials applicable to the Work.

1.8.6 Scheduling

(a) A preliminary schedule of shop drawings and samples submittals shall be submitted for approval, in duplicate.

(b) Each submittal shall be prepared and transmitted to ENGINEER sufficiently in advance of scheduled performance of related work and other applicable activities.

(c) Within 60 days of the contract award, the Contractor shall submit, for approval, complete manufacturer's product data (for standard products and components) and detailed shop drawings (for fabricated equipment). Submittals need not include all project equipment and materials in one submittal, however, the submittals for the equipment and materials for each individual pay item shall be complete in every respect. Partial submittals may be returned without review. The Contractor may request, in writing, permission to make a partial submittal; the Engineer will evaluate the circumstances of the request and may accept to review such partial submittal. However, no additional compensation or extension of time will be allowed for extra costs or delays incurred due to partial or late submittals.

1.8.7 Each submittal shall be accompanied by a transmittal containing the following information:

(a) Contractor's Name
(b) Supplier's Name

(c) Manufacturer's Name
(d) Date of submittal and dates of previous submittals containing the same material
(e) Project Route/Name
(f) Section
(g) Submittal and transmittal number
(h) Contract identification
(i) Identification of equipment and material with equipment identification numbers, motor numbers, and Specification section number Variations from Contract Documents and any limitations which may impact the Work Drawing sheet and detail number as appropriate
(j) Variations from Contract Documents and any limitations which may impact the Work.

(k) Drawing sheet and detail number as appropriate.

Multi-part submittal forms will be provided by the department to the Contractor to facilitate the submittal and review process. The Contractor shall complete all submittal information on the form and shall sign the submittal as indicated.

1.8.8 Exceptions, Deviations, and Substitutions

(a) In general, exceptions to and deviations from the requirements of the Contract Documents will not be allowed. It is the CONTRACTOR's responsibility to note any deviations from Contract requirements at the time of submittal and to make any requests for deviations in writing. In general, substitutions must demonstrate that the proposed substitution is superior to the equipment or material required by the Contract Documents. No exceptions, deviations, or substitutions will be permitted without approval.

(b) Data for items to be submitted for review as substitution shall be collected into one submittal for each item of material or equipment.

(c) Request shall be submitted with other scheduled submittals for the material or equipment allowing time for ENGINEER to evaluate the additional information required to be submitted. If CONTRACTOR requests to substitute for material or equipment specified but not identified in Specifications as requiring submittals, substitution submittal request shall be included in Submittal schedule and submitted as scheduled.

1.8.9 Shop Drawings

(a) Shop drawing information shall be newly prepared and submitted with graphic information at accurate scale. The name of manufacturer or supplier (firm name) shall be indicated. Dimensions shall be shown and clearly noted which are based on field measurement; materials and products which are included in the Work shall be identified; revision shall be identified.

Compliance with standards and notation of coordination requirements with other work shall be indicated. Variations from Contract Documents or previous submittals shall be highlighted, encircled or otherwise indicated.

(b) The following information shall be included on each drawing or page:

1) Submittal date and revision dates.
2) Project name, division number and descriptions.
3) Detailed specifications section number and page number.
4) Identification of equipment, product or material.
5) Name of CONTRACTOR and Subcontractor.
6) Name of Supplier and Manufacturer.
7) Relation to adjacent structure or material.
8) Field dimensions, clearly identified.
9) Standards or Industry Specification references.
10) Identification of deviations from the Contract Documents.
11) CONTRACTOR's stamp, initialed or signed, dated and certifying to review of submittal, certification of field measurements and compliance with Contract.
12) Physical location and location relative to other connected or attached material at which the equipment or materials are to be installed.

(c) An 8-inch by 3-inch blank space shall be provided for CONTRACTOR and ENGINEER stamps.

(d) Three blue line or black line prints or two reverse sepia reproducible and 1 blue or black line print shall be submitted. One reproducible or one print will be returned.

(e) Materials, products or systems shall not be installed until copy of applicable product data showing only approved information is in possession of installer. One set of product data (for each submittal) shall be maintained at Project site. Five additional copies shall be marked with the date of approval and forwarded to the ENGINEER for use in field and for OWNER'S records.

1.8.10 Product Data

(a) Required product data shall be collected into a single submittal for each element of work or system. Where product data has been printed to include information on several similar products, some of which are not required for use on Project or are not included in submittal, copies shall be marked to clearly show such information is not applicable.

(b) Where product data must be specially prepared for required products, materials or systems, because standard printed data are not suitable for use, data shall be submitted as a Shop Drawing and not as product data.

(c) Submittal is for information and record, and to determine that products, materials, and systems comply with Contract Documents. Submittal shall be final when returned by ENGINEER marked "Approved".

(d) Four submittal copies, in addition to the number the Contractor requires returned, including those required for Operation and Maintenance Manuals, shall be submitted to the Engineer. An additional submittal copy shall be submitted to the Design Engineer:

AB&H, A Donohue Group

125 South Wacker Drive, Suite 1850

Chicago, Illinois 60606

Attn: Kou H. Chang

(e) Materials, products or systems shall not be installed until copy of applicable product data showing only approval information is in possession of installer. One set of product data (for each submittal) shall be maintained at Project site, available for reference by ENGINEER and others.

1.8.11 Samples

(a) Where possible, samples shall be physically identical with proposed materials or products to be incorporated into the Work. Where variations in color, pattern or texture are inherent in material or product represented by sample, multiple units (not less than 3 units) shall be submitted showing approximate limits of variations.

(b) A full set of optional samples shall be provided where ENGINEER's selection required. Samples shall be prepared to match ENGINEER's selection where so indicated.

(c) Each sample shall include generic description, source or product name and manufacturer, limitations, and compliance with standards.

(d) Samples for ENGINEER's visual review and final check of coordination of these characteristics with other related elements of work shall be of general generic kind, color, pattern, texture.

(e) At CONTRACTOR's option, and depending upon nature of anticipated response from ENGINEER, initial submittal of samples may be either preliminary or final submittal.

A preliminary submittal, consisting of a single set of samples, is required where specifications indicate ENGINEER's selection of color, pattern, texture or similar characteristics from manufacturer's range of standard choices is necessary. Preliminary submittals will be reviewed and returned with ENGINEER's "Action" marking.

Three sets of samples shall be submitted in final submittal, 1 set will be returned.

(f) The returned final set of samples shall be maintained at Project site, in suitable condition and available for quality control comparisons throughout course of performing work.

Returned samples intended or permitted to be incorporated in the Work are indicated in Specification sections, and shall be in undamaged condition at time of use.

1.8.12 Mock-ups and similar samples specified in Specification sections are recognized as special type of samples. Requirements for samples submittal shall be complied with to greatest extent possible. Transmittal forms shall be processed to provide record of activity.

1.8.13 Miscellaneous Submittals

(a) Inspection and Test Reports

1) Each inspection and test report shall be classified as either "Shop Drawings" or "product data", depending on whether report is specially prepared for Project or standard publication of workmanship control testing at point of production. Inspection and test reports shall be processed accordingly.

(b) Guarantees, Warranties, Maintenance Agreements, and Workmanship Bonds

1) Refer to Specification sections and section Guarantees and Warranties of this Division for specific requirements. Submittal is final when returned by ENGINEER marked "Approved" or "Approved as Noted".

2) In addition to copies desired for CONTRACTOR's use, 2 executed copies shall be furnished. Two additional copies shall be provided where required for maintenance data.

(c) Certifications

1) Refer to Specification sections for specific requirements on submittal of certifications. Seven copies shall be submitted. Certifications are submitted for review of conformance with specified requirements and information. Submittal shall be final when returned by ENGINEER marked "Approved".

2) Where certifications are specified, the information submitted for approval shall incorporate certification information. When a certification can be made prior to manufacture, the certification shall be included with initial submittal information.

When certification is possible only after manufacture, the initial submittal information shall include a statement of intent to furnish the certification after equipment approval and manufacture. Certifications involving inspections and/or tests shall be complete with all test data presented in a neat, descriptive format, with all test data, applicable dates, times, and persons responsible.

(d) Tools

1) Spare parts, extra and overrun stock, maintenance tools and devices, keys, and similar physical units shall be submitted.

2) Special tools are considered to be those tools which, because of their limited use, are not normally available but which are necessary for maintenance of particular equipment.

3) For each type of equipment provided under this CONTRACT, a complete set of all special tools shall be furnished including grease guns and other lubricating devices, which may be needed for the adjustment, operation, maintenance, and disassembly of such equipment. Tools shall be of high grade, smooth forged alloy tool steel. Grease guns shall be of the lever type.

4) One or more neat and substantial steel wall cases or cabinets shall be furnished and erected with flat key locks and clips or hooks to hold each special tool in a convenient arrangement.

1.8.14 Operation and Maintenance Manuals

(a) Operation and Maintenance Manuals shall be submitted in accordance with Subsection 1.12, Operation and Maintenance Manuals, in this Section.

1.8.15 Contractor's Stamp

(a) Prior to submittal, the Contractor shall review the submittal material and shall affix his stamp of approval, with comments as applicable, signed by a responsible representative, to each appropriate submittal item. In the case of Subcontractor's submittals, both the Sub- contractor and the General Contractor shall review and stamp the submittal. Submittals which are not approved or approved-as-noted by the Contractor shall not be submitted to the Engineer. The Contractor shall not give an approved-as-noted status to submittals having incompleteness or major corrective notations as this will only delay the ultimate approval process.

(b) The receipt of submittal information from the Contractor will be construed as the Contractor's assurance that he has reviewed the submittal information and attests to the submittal's accuracy and conformance to the requirements of the contract documents.

Submitted information shall be complete and in sufficient detail to demonstrate compliance with all requirement of the contract documents, including fitting in the space provided and meeting all salient features of the specifications.

1.8.16 Submittal information must be particularly detailed in every respect. Product data shall present information to demonstrate the complete nature of the product, including dimensions, wiring diagrams, operating information, and the like. Shop drawings shall be extremely detailed and shall include all appropriate dimensions, fabrication details, component bill of material, information relative to mounting, detailed wiring, finish, and the like. Wiring diagrams shall include both schematic and point-to-point representations, complete with references to circuiting as indicated on the Contract Drawings as well as terminal points of component devices.

1.8.17 Unless required elsewhere, submittals shall be distributed to subcontractors, suppliers, governing authorities, and others as necessary for proper performance of work.

1.8.18 Except for submittals for record and similar purposes, where action and return on submittals are required or requested, ENGINEER will review each submittal, mark with appropriate action, and return. Where submittal must be held for coordination, ENGINEER will also advise CONTRACTOR without delay. ENGINEER will stamp each submittal with uniform, self-explanatory action stamp, appropriately marked with submittal action.

1.8.19 Where submittals are marked "Approved", Work covered by submittal may proceed <u>PROVIDED IT COMPLIES WITH CONTRACT DOCUMENTS</u>. Acceptance of Work will depend upon that compliance.

1.8.20 When submittals are marked "Approved as Noted" or "Approved Subject to Corrections Marked", Work covered by submittal may proceed provided it complies with both ENGINEER's notations or corrections on submittal and with Contract Documents. Acceptance of Work will depend on that compliance. Re-submittal is not required.

1.8.21 When submittals are marked "Examined and Returned for Correction or disapproved", Work covered by submittal shall not proceed. Work covered by submittal shall not be used at Project site or elsewhere where Work is in progress. The submittal shall be revised or a new submittal shall be prepared in accordance with ENGINEER's notations in accordance with Re-submittal Preparation procedures specified in this section. The submittal shall be resubmitted without delay and repeated if necessary to obtain different action marking.

1.8.22 Any need for more than one resubmission, or any other delay in ENGINEER's review of submittals, will not entitle CONTRACTOR to extension of the Contract Time.

1.8.23 Coordination

(a) Preparation and processing of submittals shall be coordinated with performance of the work, other submittals and related activities such as substitution requests, testing, purchasing, fabrication, delivery, and similar activities that require sequential activity.

(b) Submission of different units of interrelated work shall be coordinated so that one submittal will not be delayed by ENGINEER's need to review a related submittal. ENGINEER may withhold action on any submittal requiring coordination with other submittals until related submittals are forthcoming.

1.8.24 Unless otherwise indicated, guarantees as specified herein shall be included with the submittal information of all applicable equipment and materials. Incompleteness, inaccuracy, or lack of coordination shall be grounds for rejection. The Contractor shall clearly understand no equipment or material shall be installed prior to approval and that any equipment or material installed prior to approval is subject to removal from the right-of-way solely at the Contractor's expense.

1.9. Re-submittal Preparation

1.9.1 Re-submittal Preparation shall comply with the requirements described in subsection 1.8, Submittal, of this section. In addition, it shall be identified on the transmittal form that the submittal is a resubmission.

1.9.2 Any corrections or changes in submittals required by ENGINEER's notations shall be made on returned submittal.

1.9.3 On the transmittal or on a separate page attached to CONTRACTOR's resubmission transmittal, all notations or questions indicated by ENGINEER on ENGINEER's transmittal form shall be answered or acknowledged in writing. Each response shall be identified by question or notation number established by ENGINEER. If CONTRACTOR does not respond to each notation or question, resubmission will be returned without action by ENGINEER until CONTRACTOR provides a written response to all ENGINEER's notations or questions.

1.9.4 Variations or revisions from previously reviewed submittal, other than those called for by ENGINEER, shall be identified on transmittal form.

1.10 Record Drawings

1.10.1 One record copy of all Contract Documents, reference documents and all technical documents submitted in good order shall be kept and maintained at the site.

On mylar tracing media, and using drafting symbols and standards consistent with the original documents, Contract Drawings shall be annotated in red to show all changes made during the construction period. Annotated drawings are to be made available to ENGINEER for reference at all times.

1.10.2 At completion of the CONTRACT and before final payment is made, one set of clearly readable, reproducible mylar Contract Drawings reflecting all changes made during construction shall be delivered to the ENGINEER. The drawings shall each be stamped "RECORD DRAWING", and shall be marked with the contractor's stamp, the date, and the signature of the contractor's representative. Refer to individual sections for addition requirements.

1.10.3 The Record Drawings must be submitted and must be acceptable to the Engineer prior to final acceptance.

1.11 Guarantees and Warranties

1.11.1 All equipment shall be furnished complete with the manufacturer's standard trade guarantee or warranty, applicable to the Illinois Department of Transportation, from the date of final acceptance. Such guarantee shall accompany submittal shop drawings and product data.

1.11.2 Prior to final payment, the original and one copy of all bonds, warranties, guarantees and similar documents, including those customarily provided by manufacturers and suppliers which cover a period greater than the one year correction period shall be delivered to the OWNER.

1.12 Operation and Maintenance Manuals

1.12.1 Four copies of an Operation and Maintenance Manual shall be furnished to the ENGINEER for all equipment and associated control systems furnished and installed.

1.12.2 Prior to the Work Reaching 50 Percent Completion, one copy of the manual shall be submitted to the ENGINEER for approval with all specified material. The approval copies shall be submitted with the partial payment request for the specified completion. Within 30 days after the ENGINEER's approval of the two-copy submittal, the remaining 3 copies of the manual shall be furnished to the ENGINEER. Space shall be provided in the manual for additional material. Any missing material for the manual shall be submitted prior to requesting certification of substantial completion.

1.12.3 Each copy of the manual shall consist of the following and shall be prepared and arranged as follows:

(a) A section of an equipment data summary (see sample form at end of section) for each item of equipment.

(b) A section of an equipment preventive maintenance data summary (see sample form at end of section) for each item of equipment.

(c) A section of the equipment manufacturer's operating and maintenance instructions. Operating instructions include equipment start-up, normal operation, shutdown, emergency operation and troubleshooting. Maintenance instructions include equipment installation, calibration and adjustment, preventive and repair maintenance, lubrication, troubleshooting, parts list and recommended spare parts.

(d) List of electrical relay settings and control and alarm contact settings.

(e) Electrical interconnection wiring diagram for equipment furnished including all control and lighting systems.

(f) One valve schedule giving valve number, location, fluid, and fluid destination for each valve installed. All valves in same piping systems shall be grouped together in the schedule. A sample of the valve numbering system shall be obtained from the ENGINEER.

(g) All O&M Manual material shall be on 8-1/2 inch by 11 inch commercially printed or typed forms or an acceptable alternative format.

1.12.4 Each manual shall be organized into sections paralleling the equipment specifications. Each section shall be identified using heavy section dividers with reinforced holes and numbered plastic index tabs. The data shall be compiled in high-quality heavy-weight, hard cover binders with piano style metal hinges or in an alternate approved format. Large drawings and other materials which would be opened or removed for reading shall be provided with heavy clear plastic pouches within the binders. The number of binders shall be as required to hold all required material without over-filling. Various sections, as appropriate shall have suitable dividers. All volumes shall be labeled. All loose data shall be punched for binding. Composition and printing shall be arranged so that punching does not obliterate any data. The project title, and manual title, as furnished and approved by the ENGINEER shall be printed on the cover and binding edge of each manual.

1.12.5 All operating and maintenance material that comes bound by the equipment manufacturer shall be left in its original bound state. The appropriate sections of the CONTRACTOR's O&M manual shall be cross-referenced to the manufacturers' bound manuals.

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

STORMWATER PUMP STATION NO. 48

Operation and Maintenance Manual

Equipment Data Summary

Equipment Name: Specification Reference:

Manufacturer

Name:

Address:

Telephone:

Number Supplied: Location/Service:

Model No: Serial No:

Type:

Size/Speed/Capacity/Range (as applicable):

Power Requirement (Phase/Volts/Hertz):

Local Representative

Name:

Address:

Telephone:

NOTES:

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

STORMWATER PUMP STATION NO. 48

Operation and Maintenance Manual

Preventive Maintenance Summary

Equipment Name: Location: O&M Manual Reference

Manufacturer:

Address:

Telephone:

Model No: Serial No:

Maintenance Task	Lubricant/Part	D	W	M	Q	SA	A

NOTES:

*D-Daily W-Weekly M-Monthly Q-Quarterly SA-Semi-annual A-Annual

1.12.6 Binders shall be labeled Volume 1, 2, and so on, where more than one binder is required. The table of contents for the entire set, identified by volume number, shall be included in each binder.

1.13 Storage of Equipment and Materials

1.13.1 All materials and equipment shall be protected from wear and damage both before and after delivery to the job site.

1.13.2 Unless specifically permitted by the Engineer, all equipment such as pumps, fans, electrical apparatus, valve operators, SCADA equipment, and the like shall be stored indoors out of exposure to the weather. Items having electrical parts, such as motors, electronic panels, and the like, shall be kept in heated storage, at a temperature to prohibit the accumulation of condensation on the equipment. Where equipment is provided with integral space/strip heaters, (such as the motor control center), these heaters shall be energized as soon as the equipment is present at the job site and they shall remain energized from temporary circuits until final permanent energization is attained.

1.13.3 Unless otherwise specifically permitted by these specifications or as allowed by the Engineer, all materials for use on the project shall be stored indoors out of exposure to the weather. Such materials would include ductwork, doors and frames, louvers, grating, slate roofing, building hardware, windows and glass block, wire and cable, conduit, and piping. Certain materials such as building steel, exterior hatch covers, fencing, and the like which will be applied exposed to the weather, may be stored outdoors in a safe manner as approved. Note the specified requirements for the storage of building masonry in Section 4A.

1.14 Protection of the Work

1.14.1 All work shall be protected from damage by vandals, the weather, or other sources until final acceptance by the Owner. Such protection shall include temporary fencing or other barriers, if necessary, to restrict access to the work. Open pits, doors, hatches, etc. shall be covered, closed and locked. No additional compensation will be granted and no additional time will be allowed due to delays caused by failure to adequately protect the work from damage. In addition, the Contractor shall make the worksite safe at the end of each work day, leaving no attractive nuisance hazards and no open electrical boxes and the like.

1.14.2 Clean-Up and Public Safety
The work site shall be maintained in a clean condition, free of hazards to the work force and the public, all in conformance with the requirements of Article 107 of the Standard Specifications. Special care shall be taken to see that electrical systems are not left in an exposed or otherwise hazardous condition. All electrical boxes, cabinets, pole handholes, etc., which contain wiring, either energized or non-energized, shall be closed or have their cover in place and shall be locked when possible, during off-work hours.

1.15 Standards of Workmanship

1.15.1 All work shall be performed to the highest standard of each respective trade. The work shall demonstrate all due care and attention so that all specified requirements are met and that the end product is a first-rate installation.

1.15.2 The Contractor shall comply with the requirements of Sections 105 and 108 of the Standard Specifications, and any Supplements thereto shall, in addition, comply with the requirements for control of work specified herein.

1.16 Quality Control

1.16.1 Submittals

All submittals, including the following, shall be provided as specified in this Section.

Authoritative evidence in the form of Certificates of Manufacture shall be furnished to the ENGINEER to show that the materials and equipment to be used in the Work have been manufactured and tested in conformity with the Contract Documents. Copies of the results of physical tests that have been made directly on the product or on similar products of the manufacturer shall be included where necessary.

1.16.2 At all times during the progress of the Work and until the date of final completion, afford the OWNER and ENGINEER every reasonable, safe, and proper facility for inspecting the Work at the site. The observation and inspection of any work will not relieve the CONTRACTOR of any obligations to perform proper and satisfactory work as specified. Work rejected due to faulty design, inferior, or defective materials, poor workmanship, improper installation, excessive wear, or nonconformity with the requirements of the Contract Documents, shall be replaced with satisfactory work at no additional cost to the OWNER. Finished or unfinished work found not to be in strict accordance with the Contract shall be replaced as directed even though such work may have been previously approved and payment made therefore.

1.16.3 The OWNER and the OWNER's Authorized Representatives have the right to reject materials and workmanship which are defective or require correction. Rejected work and materials shall be promptly removed from the site.

1.16.4 Failure or neglect on the part of the OWNER or the OWNER's Authorized Representatives to condemn or reject bad or inferior work or materials does not imply an acceptance of such work or materials. Neither is it to be construed as barring the OWNER or the OWNER's Authorized Representatives at any subsequent time from recovering damages or a sum of money needed to build anew all portions of the Work in which inferior work or improper materials were used.

1.16.5 Should it be considered necessary or advisable by the OWNER or the OWNER's Authorized Representatives, at any time before final acceptance of the Work, to make examinations of portions of the Work already completed, by removing or tearing out such portions, all necessary facilities, labor, and material to make such an examination shall be promptly furnished. If such Work is found to be defective in any respect, all expenses of such examination and of satisfactory reconstruction shall be paid for by the CONTRACTOR. If, however, such work is found to meet the requirements of the Contract, the cost of examination and restoration of the Work will be considered a change in the Work to be paid for in accordance with applicable provisions of the Contract.

1.16.6 Proper operation of equipment during tests and instruction periods shall be the full responsibility of the CONTRACTOR. The CONTRACTOR shall make no claim for damage which may occur to equipment prior to the time when the OWNER accepts the Work.

1.16.7 If at any time prior to the expiration of any applicable warranties or guarantees, equipment is rejected by the OWNER, all sums of money received for the rejected equipment on progress certificates or otherwise on account of the Contract lump sum prices shall be repaid to the OWNER. Upon the receipt of the sum of money, OWNER will execute and deliver a bill of sale of all its rights, title, and interest in and to the rejected equipment. The equipment shall not be removed from the premises of the OWNER until the OWNER obtains, from other sources, equipment to take the place of that rejected. The OWNER hereby agrees to obtain other equipment within a reasonable time and the CONTRACTOR agrees that the OWNER may use the equipment furnished by the CONTRACTOR without rental or other charge until the other new equipment is obtained.

1.16.8 Notice shall be given in writing to the ENGINEER sufficiently in advance of the commencement of manufacture or preparation of materials especially manufactured or prepared for use in or as part of the permanent construction. When required, notice shall include a request for inspection, the date of commencement, and the expected date of completion of the manufacture or preparation of materials. Upon receipt of such notice, ENGINEER will arrange to have a representative present at such times during the manufacture or testing as may be necessary to inspect the materials, or will notify CONTRACTOR that the inspection will be made at a point other than the point of manufacture or testing, or that the inspection will be waived. These provisions shall be complied with before shipping any materials. Such inspection will not constitute a release from the responsibility for furnishing materials meeting the requirements of the Contract Documents.

1.16.9 Tests of electrical and mechanical equipment and appliances shall be conducted in accordance with recognized test codes of the ANSI, ASME, or IEEE, except as may otherwise be stated herein.

1.16.10 Personnel shall be provided to assist the ENGINEER in performing the following periodic observation and associated services.

(a) Soils: Observe and test excavations, placement and compaction of soils. Determine suitability of excavated material. Observe sub-grade soils and foundations.

(b) Concrete: Observe forms and reinforcement; observe concrete placement; witness air entrainment tests, facilitate concrete cylinder preparation and assist with other tests performed by ENGINEER.

(c) Masonry: Sample and test mortar, bricks, blocks and grout; inspect brick and block samples and sample panels; inspect placement of reinforcement and grouting.

1.16.11 When specified in Divisions 2 through 16 of the Contract Documents, an independent laboratory testing facility shall be provided to perform required testing.

The laboratory shall be qualified as having performed previous satisfactory work. Prior to use, such qualifications shall be submitted to the ENGINEER for approval.

1.16.12 Cooperate with the ENGINEER and laboratory testing representatives. At least 24 hours notice shall be given prior to when specified testing is required. Labor and materials, and necessary facilities shall be provided by the CONTRACTOR at the site as required by the ENGINEER and the testing laboratory.

1.16.13 Equipment test procedures shall be coordinated and demonstrated as specified in the Contract Documents or as otherwise required during the formal tests.

1.16.14 Test procedures and requirements for pipelines and other testing shall conform to that specified in the appropriate Specification Sections.

1.16.15 Where transcripts or certified test reports are required by the Contract Documents, the following requirements shall be met:

For all required transcripts, certified test reports, certified copies of the reports of all tests required in referenced specifications or specified in the Contract Documents, submit and obtain approval of the ENGINEER before delivery of materials or equipment. All testing shall be performed in an approved independent laboratory or the manufacturer's laboratory. Reports of shop equipment tests shall be submitted for approval within thirty days of testing. Transcripts or test reports are to be accompanied by a notarized certificate in the form of a letter from the manufacturer or supplier certifying that tested material or equipment meets the specified requirements and the same type, quality, manufacture and make as specified. The certificate shall be signed by an officer of the manufacturer or the manufacturer's plant manager.

1.16.16 At the option of the ENGINEER, or where not otherwise specified, a notarized Certificate of Compliance shall be submitted for approval. The Certificates may be in the form of a letter stating the following:

(a) Manufacturer has performed all required tests
(b) Materials to be supplied meet all test requirements
(c) Tests were performed not more than one year prior to submittal of the certificate
(d) Materials and equipment subjected to the tests are of the same quality, manufacture and make as those specified
(e) Identification of the materials

1.16.17 Initial inspection and testing of materials furnished under this Contract will be performed by the OWNER or his authorized Representatives or inspection bureaus without cost to the CONTRACTOR, unless otherwise expressly specified. If subsequent testing is necessary due to failure of the initial tests or because of rejection for noncompliance, the OWNER shall be reimbursed by the CONTRACTOR for expenditures incurred in making such tests.

1.16.18 Except as expressly provided elsewhere herein, all the costs of shop and field tests of equipment and other tests specifically called for in the Contract Documents shall be included in the Contract Price.

1.16.19 Materials and equipment submitted by the CONTRACTOR as the equivalent to those specifically named in the Contract may be tested by the OWNER for compliance. The OWNER shall be reimbursed for expenditures incurred in making such tests on materials and equipment which are rejected for noncompliance.

1.16.20 The OWNER shall be reimbursed for the costs of any job site inspection between the hours of 7:00 p.m. and 6:00 a.m. and any work on Saturdays, Sundays or Holidays.

1.16.21 The OWNER shall be reimbursed for all costs associated with Witness Tests which exceed 5 Calendar Days per kind of equipment.

1.16.22 As soon as conditions permit, all labor and materials and services to perform preliminary field tests of all equipment shall be furnished as provided under this Contract. If the preliminary field tests disclose that any equipment furnished and installed under this Contract does not meet the requirements of the Contract Documents, all changes, adjustments and replacements required shall be made prior to the acceptance tests.

1.16.23 Upon completion of the Work and prior to final payment, all equipment, piping and appliances installed under this Contract shall be subjected to specified acceptance tests to demonstrate compliance with the Contract Documents.

1.16.24 All labor, fuel, energy, water and other materials, equipment, instruments and services necessary for all acceptance tests shall be furnished by the CONTRACTOR.

1.16.25 Field tests shall be conducted in the presence of the ENGINEER. The field tests shall demonstrate that under all conditions of operation each equipment item:

(a) Has not been damaged by transportation or installation
(b) Has been properly installed
(c) Has no mechanical defects
(d) Is in proper alignment
(e) Has been properly connected
(f) Is free of overheating of any parts
(g) Is free of all objectionable vibration
(h) Is free of overloading of any parts
(i) Operates as intended

1.16.26 Work or portions of work shall be operated for a minimum of 100 hours or 14 days continuous service, whichever comes first. Test on those systems which require load produced by weather (heating or cooling) exercise shall be conducted only when weather will produce proper load.

1.16.27 If the acceptance tests reveal defects in material or equipment, or if the material or equipment in any way fails to comply with the requirements of the Contract Documents, such deficiencies shall be promptly corrected. Failure or refusal to correct the deficiencies, or if the improved materials or equipment, when tested again, fail to meet the guarantees or specified requirements, the OWNER, notwithstanding its partial payment for work and materials or equipment, may reject said materials or equipment and may order the CONTRACTOR to remove the defective work from the site at no addition to the Contract Price, and replace it with material or equipment which meets the Contract Documents.

1.16.28 If it is ascertained by testing or inspection that the material or equipment does not comply with the Contract, said material or equipment shall not be delivered, or if delivered it shall be promptly removed from the site or from the Work and replaced with acceptable material without additional cost to the OWNER. All obligations under the terms and conditions of the Contract shall be fulfilled even though the OWNER or the OWNER's Authorized Representatives fail to ascertain noncompliance or notify the CONTRACTOR of noncompliance.

1.17 Cutting and Patching

1.17.1 No structural members shall be removed, cut or otherwise modified without approval and any such work shall be done in a manner as directed by the ENGINEER.

1.17.2 Cutting of concrete slabs, walls and members shall be performed without over-cutting at corners or elsewhere.

1.17.3 Cutting and patching shall be performed in a neat and workmanlike manner, consistent with the best practices of the appropriate trade. All patching shall be done in a manner consistent with the building material being patched.

1.17.4 All cutting, fitting or patching of the Work that may be required to make the several parts thereof join shall be provided in accordance with the Contract Documents. Restoration shall be performed by competent workmen skilled in the trade.

1.17.5 All cutting and patching required to install improperly timed work or to remove samples of installed materials for testing shall be provided.

1.17.6 Except when the cutting or removal of existing construction is specified or indicated, any cutting or demolition which may affect the structural stability of the Work or existing facilities shall not be undertaken without the ENGINEER's concurrence.

1.17.7 Shoring, bracing, supports, and protective devices necessary to safeguard all work during cutting and patching operations shall be provided.

1.17.8 All materials shall be cut and removed to the extent shown or as required to complete the Work. Materials shall be removed in a careful manner with no damage to adjacent facilities. Materials which are not salvageable from the site shall be removed.

1.17.9 All work affected by demolition, cutting operations, and equipment removal shall be patched, repaired or restored with new materials or with salvaged materials acceptable to the ENGINEER to obtain a finished installation with the strength, appearance, and functional capacity required. If necessary, entire surfaces shall be patched and refinished. Affected surfaces shall match adjacent surfaces and provide uniform appearance. Unnecessary gaps, holes, openings and depressions shall be filled with suitable patching material.

1.18 Definition of Terms

1.18.1 Abbreviations

Wherever the following abbreviations are used in these Special Provisions or on the Plans, they are to be construed the same as the respective expressions represented:

AASHTO *American Association of State Highways and Transportation Officials*

ANSI *American National Standards Institute*

ASME *American Society of Mechanical Engineers*

ASTM *American Society for Testing and Materials*

AWG *American Wire Gauge*

ICEA *Insulated Power Cable Engineers Association*

IEEE *Institute of Electrical and Electronic Engineers*

IES *Illuminating Engineering Society of North America*

NEC *National Electrical Code*

NEMA *National Electrical Manufacturer's Association*

NESC *National Electrical Safety Code*

UL *Underwriters' Laboratories*

ACI *American Concrete Institute*

FM *Factory Mutual*

SSPC *Steel Structures Painting Council*

1.18.2 Standard Specifications

Where used in these Special Provisions, this term shall mean the "Standard Specifications for Road and Bridge Construction", published by the Illinois Department of Transportation dated January 1, 2007.

1.18.3 Specifications

Where used in these Special Provisions, this term shall mean the complete body of specifications, including the Standard Specifications, these Special Provisions, and referenced specifications and standards. See Article 101.42 of the Standard Specifications.

1.18.4 Supplements

Where used in these Special Provisions, this term shall mean the "Supplemental Specifications and Recurring Special Provisions" published by the Illinois Department of Transportation dated January 1, 2009.

1.18.5 Contract Documents

The complete body of agreements, specifications and drawings which define the contract work.

1.18.6 Provide

Where used in these Special Provisions, this term shall mean "furnish and install, complete, including any required connection and testing".

1.18.7 Owner

Where used in these Special Provisions, this term shall mean The State of Illinois.

1.18.8 Engineer

See Article 101.15 of the Standard Specifications.

1.19 Referenced Specifications and Standards

1.19.1 The referenced specifications and standards are incorporated, by reference, in these Special Provisions and shall apply to the work as though fully written herein:

(a) *STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION*, a publication of the Illinois Department of Transportation.

(b) *SUPPLEMENTAL SPECIFICATIONS AND RECURRING SPECIAL PROVISIONS*, a publication of the Illinois Department of Transportation.

(c) NATIONAL ELECTRICAL SAFETY CODE, a publication of American National Standards Institute.

(d) SAFETY CODE, a publication of the Illinois Department of Transportation.

(e) *AMERICAN NATIONAL STANDARD PRACTICE FOR ROADWAY LIGHTING, ANSI/IES RP-8*, published by Illuminating Engineering Society, approved by National Standards Institute.

(f) *ELECTRICAL MAINTENANCE CONTRACT*, State of Illinois. Department of Transportation, Division of Highways, District 1.

1.20 Schedule of Values

1.20.1 A Schedule of Values shall be submitted as payment basis for Pump Station General Work, Pump Station Electrical Work, and Pump Station Mechanical Work.

1.20.2 The Contractor shall submit a Schedule of Values, as specified herein, at least fifteen (15) days prior to submitting the first payment estimate and shall provide information as requested to substantiate the prices included in the Schedule of Values.

1.20.3 The Schedule of Values shall be approved by the Engineer and IDOT's District One, Bureau Electrical Operations, prior to any project payments.

1.20.4 Complete Schedule of Values

(a) The Schedule of Values shall be typewritten on 8-1/2 inch by 11 inch paper in a format approved by the Engineer.

(b) The Schedule of Values shall be used to determine the value of work completed for payment purposes. After review by the Engineer, the Contractor shall revise and resubmit the Schedule of Values as required.

(c) The Schedule of Values shall have each item further itemized by Specification Division as listed in the Specification index.

(d) For the item Pump Station General Work, Pump Station Electrical Work and Pump Station Mechanical Work, each item which has an installed value of over $10,000, a list of the costs for the major products or operations shall be indicated under each item. Round off figures to the nearest ten (10) dollars. The "value" for each item listed shall be the supplied, installed and operational start-up cost incurred to the Contractor for that item (overhead and profit included).

No items shall be listed as calendar units (i.e. per month). The sum total of all items in the Schedule shall be equal to the payment item total.

1.21 Start-Up

1.21.1 Items to be checked on start-up include, but not limited to, the following:

(a) Demonstration of back-up float controls
(b) Gas detection calibration kit shall be always stored on site
(c) Demonstration of transfer switch operation and maintenance
(d) Check potable water operation if applicable
(e) Check alarm operation SCADA and Aegis system

1.21.2 The contractor shall be prepared to demonstrate operation and maintenance procedures for all equipment installed.

1.22 Temporary Pumping Sequences

1.22.1 Install two (2) temporary 1,450 gpm pumps ..... . 2,900 gpm
1.22.2 Existing two (2) main pumps..... 5,800 gpm
Station pumping capacity..... 8,700 gpm
1.22.3 Relocate #1 existing main pump ..... …… .. 2,900 gpm
Remaining pumping capacity..... 5,800 gpm
1.22.4 Complete relocation #1 existing main pump..... 2,900 gpm
Station pumping capacity.... 8,700 gpm
1.22.5 Remove two (2) temporary 1,450 gpm pumps..... 2,900 gpm
Remaining pumping capacity ..... 5,800 gpm
1.22.6 Install new main pump ..... …… 2,900 gpm
Station pumping capacity.....….8,700 gpm
1.22.7 Relocate #2 existing main pump..... .. 2,900 gpm
Remaining pumping capacity..... 5,800 gpm
1.22.8 Complete relocation #2 existing main pump... ... …… 2,900gpm
Station pumping capacity 8,700 gpm
1.22.9 Install new low flow pump..... 250 gpm
Station pumping capacity..... 8,950 gpm

2. PRODUCTS:

Not Used

3. EXECUTION:

Not Used

END OF THIS SECTION

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 1B - MEASUREMENT AND PAYMENT

1. GENERAL:

1.1 Description

1.1.1 The work under this Contract for the rehabilitation of Pump Station 48 shall include all labor, materials, tools, equipment and incidentals and for performing all work required for the complete rehabilitation for a complete operational facility, as included in all Contract Documents and shall be as measured and paid for as described herein.

1.1.2 EARTH EXCAVATION shall be paid for at the Contract unit price per cubic yard as specified in Section 2A, Site Work.

1.1.3 STRUCTURE EXCAVATION shall be paid for at the Contract unit price per cubic yard as specified in Section 2A, Site Work.

1.1.4 AGGREGATE BASE COURSE, TYPE B 6" shall be paid for at the Contract unit price per square yard as specified in Section 2A, site Work.

1.1.5 BITUMINOUS MATERIALS (PRIME COAT) shall be paid for at the Contract Unit price per gallon as specified in Section 2A, Site Work.

1.1.6 HOT-MIX ASPHALT BINDER COURSE, IL-90.0,N50 shall be paid for at the contract unit price per ton as specified in Section 2A, Site Work.

1.1.7 HOT-MIX ASPHALT SURFACE COURSE, MIX “C”, N50 shall be paid for at the contract unit price per ton as specified in Section 2A, Site Work.

1.1.8 CONCRETE REMOVAL shall be paid for at the Contract price per cubic yard as specified in Section 2B, Demolition.

1.1.9 CONCRETE STRUCTURES shall be paid for at the Contract unit price per cubic yard as specified in Section 3A, Cast-In-Place Concrete.

1.1.10 FURNISHING AND ERECTING STRUCTURAL STEEL shall be paid for at the Contract unit price per pound as specified in Section 5A, Structural Steel.

1.1.11 CHAIN LINK FENCE, 8' (SPECIAL) shall be paid for at the Contract unit price per lineal foot as specified in Section 2A, Site Work.

1.1.12 CHAIN LINK GATES, 8’ X 12’ DOUBLE shall be paid for at the Contract unit price per each as specified in Section 2A, Site Work.

1.1.13 REINFORCEMENT BARS, EPOXY COATED shall be paid for at the Contract unit price per pound as specified in Section 3A, Cast-In-Place Concrete.

1.1.14 ENGINEER'S FIELD OFFICE, TYPE A shall be paid for at the Contract unit price per calendar month and shall be in accordance with the requirements of Section 670 of the Standard Specifications.

1.1.15 ELECTRICAL SERVICE CONNECTION shall consist of charges by the electric utility for both the temporary and permanent electrical service, if any, to be paid to the utility by the Contractor. For bidding purposes, this item shall be estimated at $20,000.00. The Contractor will be reimbursed the exact amount of the charges by the utility.

1.1.16 PUMPING STATION SCADA EQUIPMENT shall be paid for at the contract lump sum as specified in the applicable requirements of the special provisions and Division 1, General Requirements and all requirements under Division 16, Electrical..

1.1.17 PUMP STATION GENERAL WORK shall include all work which is not listed as a specific pay item but which is required for compliance with the specifications and for a complete operational facility and shall be paid for at the Contract lump sum price as specified in the Special Provisions; Division 1, General Requirements; and the applicable requirements under the following: Division 2, Site Work; Section 3B, Grout; Division 4, Masonry; Division 5, Metals (except Section 5A); Division 6, Carpentry; Division 7, Thermal and Moisture Protection; Division 8, Doors and Windows; Division 9A, Painting; and Section 10A, Specialties (Miscellaneous General Work), 10B, Fiberglass Reinforced Plastic Products and Fabrications.

1.1.18 PUMP STATION ELECTRICAL WORK shall be paid for at the Contract lump sum price as specified in the applicable requirements of the Special Provisions and Division 1, General Requirements and all requirements under Division 16, Electrical.

1.1.19 PUMP STATION MECHANICAL WORK shall be paid for at the Contract lump sum price as specified in the applicable requirements of the Special Provisions and Division 1, General Requirements and all requirements under Division 14, Conveying Systems and Division 15, Mechanical.

1.1.20 COMPLETE SPARE MAIN PUMP ASSEMBLY shall be paid for at the contract unit price each as specified in the applicable requirements Division 1, General Requirements and Division 15, Mechanical

1.1.21 COMPLETE SPARE LOW FLOW PUMP ASSEMBLY shall be paid for at the contract unit price each as specified in the applicable requirements Division 1, General Requirements and Division 15, Mechanical

1.1.22 REMOVAL AND DISPOSAL OF LEAD BASED PAINT shall be paid for at the Contract unit price per square foot as specified in Section 9B, Removal and Disposal of Lead Paint.

1.1.23 MOBILIZATION shall be paid for at the Contract lump sum price and shall be in accordance with the requirements of Supplemental Specifications and Recurring Special Provisions.

1.1.24 TRENCH BACKFILL shall be paid for at the contract unit price per cubic yard in accordance with the Standard Specifications.

2. PRODUCTS:

Not used.

3. EXECATION:

Not used.

END OF THIS SECTION

DIVISION 2 - SITE WORK

SECTION 2A - SITE WORK

1. GENERAL:

1.1 Description

1.1.1 This Section shall include all work required for the furnishing and completing all site work as indicated on the Contract Drawings and as specified herein.

1.1.2 The work included under this Section shall include, but not be limited to, the following:

(a) Site clearing
(b) Earth excavation
(c) Excavation and backfill
(d) Hot-mix asphalt pavement
(e) New fence and gate
(f) Removal of existing storm sewer
(g) New storm sewer
(h) Top soiling and seeding

1.1.3 Refer to Division 1 for additional requirements.

1.2 Related Section

1.2.1 Section 3A - Cast-In-Place Concrete

1.3 Guarantee

1.3.1 Provide guarantee under provisions of Section 1A.

1.4 Submittals

1.4.1 Submit product data under provisions of Section 1A.

1.5 Basis of Payment

1.5.1 Earth excavation shall be paid for at the contract unit price per cubic yard for EARTH EXCAVATION.

1.5.2 Aggregate base course shall be paid for at the contract unit price per square yard for AGGREGATE BASE COURSE, TYPE B 6", which price shall be considered as payment in full for this item.

1.5.3 Chain link fence will be measured for payment in lineal foot of the respective height of fence. The length paid for will be the overall length along the top of the fence from center to center of end posts, excluding the length occupied by gates.

1.5.4 This work shall be paid for at the Contract unit price per lineal foot for CHAIN LINK FENCE of the height specified on the Contract Drawings, and at the Contract unit price each for CHAIN LINK GATE, of the opening size and type specified on the Contract Drawings, and measured as specified herein, which price shall include payment for all excavation and backfilling.

1.5.5 The Contract unit price for CHAIN LINK FENCE, 8' (SPECIAL) shall also include the cost of furnishing all materials and installing the complete fence. No additional compensation will be allowed the Contractor for clearing, encasing the posts with concrete, for furnishing and installing protective electrical grounds.

1.5.6 The contract unit price for CHAIN LINK GATES, 8’x12’ DOUBLE shall also include the cost of furnishing all materials and installing the complete gate including the gate posts and fittings and accessories for the gate and gate posts as specified. No additional compensation will be allowed the Contractor for clearing or for encasing the posts with concrete.

1.5.7 Site clearing, excavation and backfill shall be included for payment under the Item, PUMP STATION, GENERAL WORK.

1.5.8 The work specified under this Section and as required for bituminous material shall be paid for at the contract unit price per gallon for BITUMINOUS MATERIAL (PRIME COAT), which price shall be considered as payment in full for this item.

1.5.9 The work specified under this Section and as required for hot-mix asphalt binder course shall be paid for at the contract unit price per ton for HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N50, which price shall be considered as payment in full for this item.

1.5.10 The work specified under this Section and as required for bituminous surface course shall be paid for at the contract unit price per ton for HOT-MIX ASPHALT SURFACE COURSE, MIX " C ", N50, which price shall be considered as payment in full for this item.

1.5.11 Removal of existing storm sewer and new storm sewer shall be included for payment under the Item, PUMP STATION GENERAL WORK.

1.5.12 All remaining site work as specified herein or as required shall be included in1 the Contract lump sum price for the Item, PUMP STATION, GENERAL WORK.

2. PRODUCTS:

2.1 Chain Link Fence Materials

2.1.1 Posts and fence with barbed wire are specified according to Section 664 of the Standard Specifications. Horizontal braces shall be all pipe type A per IDOT Standard 664001-01. Line post shall be 2.375" with 3.65 lb/ft and terminal (end, corner or pull) posts shall be 2.875" with 5.79 lb/ft steel pipe. All steel pipe shall be galvanized per ASTM F 669.

2.1.2 Concrete is Class SI conforming to the applicable portions of Sections 503 and 664 of the Standard Specifications.

2.1.3 Top and bottom rail shall be 1.66" with 2.27 lb/ft galvanized steel pipe per ASTM F 669.

2.1.4 Fabric shall be woven in 2" mesh with 0.148" diameter wire with Type II, aluminum-coated steel per Section 1006.27 of the Standard Specifications. The fabric shall be knuckled selvage on top and twisted and barbed selvage on bottom.

2.1.5 8' high fence shall consist of a 7' high chain link fence plus 1' of three strands of barb wire.

2.2 Swing Gate

2.2.1 Gate posts:

Steel pipe posts meeting requirements of ASTM F1184, Type II, and requirements for steel pipe framework specified in the Standard Specifications, 4.0 inches outside diameter, 9.11 pounds per linear foot for Group 1A pipe, or 6.56 pounds per linear foot for Group 1C pipe minimum.

2.2.2 Framing

Steel pipe frame shall meet requirements of ASTM F1184 and requirements for steel pipe framework specified in this Section. Minimum weight of pipe specified in ASTM F1184 shall be for Group 1A pipe.

2.2.3 Fabrication

Fabricate perimeter frames of gate from metal and finish to match fence frame

work. Assemble gate frames by welding or with special fittings and rivets for rigid connections, providing security against removal or breakage connections. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware and accessories. Space frame members maximum of 8 feet apart, except as otherwise required.

2.2.4 Fabric

Provide same fabric as required for adjacent fence, except as otherwise required. Install fabric with tension bars at vertical edges and at top and bottom edges. Attach tension bands to gate frame at 15 inch centers maximum.

2.2.5 Bracing

Install diagonal cross bracing consisting of 3/8 inch diameter adjustable length truss rods on gate to ensure frame rigidity without sag or twist.

2.2.6 Locking Device

Locking device shall be as shown on the drawing.

2.3 Excavation and Backfill

2.3.1 Structure excavation shall be in accordance with Section 502 of the Standard Specifications.

2.3.2 The Contractor shall use such methods and procedures as will protect surrounding property from damage and any damage to existing utilities or private property caused by the Contractor=s operations shall be repaired by the Contractor in a manner satisfactory to the Engineer and at no additional cost to the State.

2.3.3 Where it is necessary to tight sheet or brace the excavation, or to dewater the excavation, this work shall be as approved by the Engineer. Temporary sheet piling shall be as specified in Section 502 of the Standard Specifications. All sheeting or bracing shall be removed in a manner approved by the Engineer prior to backfilling.

2.3.4 Fill or backfill for structure shall be porous granular backfill as specified herein.

2.4 Hot-Mix Asphalt Pavement

2.4.1 Hot-mix asphalt pavement shall be of the thickness shown on the Drawing.

2.4.2 Hot-mix asphalt surface course shall be Mix “C “, N50.

2.4.3 Hot-mix asphalt binder source shall be IL-19.0, N50.

2.5 Storm Sewer

2.5.1 Storm sewer pipe shall be 24” diameter RCCP, Class III, Wall B. All storm sewer pipe shall be in accordance with Section 1042 of the Standard Specifications. RCCP joint shall be rubber gasket meeting the requirement of ASTM C443.

3. EXECUTION:

3.1 Site Clearing

3.1.1 Unless otherwise specifically indicated, this work shall consist

3.2 Installing New Fence

3.2.1 Chain Link fence shall be installed in accordance with Standard 664001 except that the top rail and barbed wire shall be as specified herein.

2.2.2 Fence shall be provided with three strands of barbed wire and attached tilt as shown.

3.2.3 Barbed wire: Pull wire taut and install securely to extension arms, secure to end post or terminal arms as instructed by manufacturer to prevent movement or displacement.

3.3 Storm Sewer

3.3.1 Storm sewer shall be installed and constructed in accordance with Section 550 of the Standard Specifications.

3.4 Topsoiling and Seeding

3.4.1 Work shall be in accordance with Section 221 and 260 of the Standard Specifications.

END OF THIS SECTION

DIVISION 2 - SITE WORK

SECTION 2B - DEMOLITION

1. GENERAL:

1.1 Description

1.1.1 The extent and location of the Demolition works shall be as indicated on the Drawings and as specified herein.

The work includes the requirements for the removal, wholly or in part, and satisfactory disposal of all materials except materials approved by the Engineer may be reused in the work.

1.1.2 The Demolition work is included in the Drawings for guidance only to indicate typical general construction features of the various types of construction and shall not be constructed as definitive or adequate to supplement the actual on-site inspection by the Contractor.

1.2 Job Conditions

1.2.1 The Contractor represents that it has visited the site to become familiar with the quantity and character of all materials to be demolished. The Contractor agrees that the premises were made available prior to deadline for submission of Bids for whatever inspection and tests the Contractor deemed appropriate. The Contractor assumes full responsibility for the proper disposal of all demolition materials.

1.3 Related Sections

1.3.1 Section 3A - Cast-In-Place Concrete
1.3.2 Section 5A - Structural steel

1.4 Submittal

1.4.1 Submit under provisions of Section 1A.

1.4.2 Shop drawings: Indicate demolition and removal sequence and location of salvageable items.

1.5 Basis of Payment

1.5.1 Measurement

(a) The demolition work for concrete removal shall be measured for payment by the cubic yard of concrete removed.

(b) The demolition work for general work, structural steel work, mechanical work and electrical work shall not be measured for payment.

1.5.2 Payment

(a) The work specified under this Section and as required for the removal of concrete will be paid for at the Contract unit price per cubic yard for CONCRETE REMOVAL, which price shall be considered as payment in full to complete all work under this item.

(b) The work specified under this Section and as required for the removal of structural steel shall be included in the contract lump sum price for the Item, PUMP STATION, GENERAL WORK.

(c) The work specified under this Section and as required for all general demolition work shall be included in the Contract lump sum price for the Item, PUMP STATION, GENERAL WORK.

(d) The work specified under this section and as required for all mechanical demolition work shall be included in the contract lump sum for the Item, PUMP STATION, MECHANICAL WORK.

(e) The work specified under this Section and as required for all electrical demolition work shall be included in the Contract lump sum for the Item, PUMP STATION, ELECTRICAL WORK.

2. PRODUCTS:

2.1 Materials, General

Products that are required to accomplish, or to be incorporated into, the work of this section shall be as selected by the Contractor, subject to the approval of the Engineer.

2.1.1 Salvage Items

(a) Refer to Division 15, Mechanical, and Division 16, Electrical, for information on the salvage of items under those respective Divisions.

3. EXECUTION:

3.1 Demolition

3.1.1 Demolition work to be included under the Item, PUMP STATION, GENERAL WORK shall include the removal and disposal of designated materials in areas as indicated on the Drawings and shall include, but not be limited to, the following:

(a) Masonry at existing exterior and interior walls
(b) Built-up roofing
(c) Miscellaneous metals and structural steel
(d) Louvers and dampers
(e) Miscellaneous mechanical and piping

3.1.2 Demolition work to be included under the Item CONCRETE REMOVAL shall be in accordance with the applicable requirements of Section 501 of the Standard Specifications and as specified herein.

(a) Concrete areas to be removed shall be saw cut to depth of two inches, at perimeter, unless otherwise indicated on the Drawings.

(b) Corners of saw-cut openings shall not be overcut.

(c) Concrete removal shall include reinforcing steel and other materials encountered.

(d) All materials removed under the Article shall become the property of the Contractor and shall be disposed of in a lawful manner.

(e) Clean all concrete from reinforcing steel that is to remain and protect same from damage.

3.1.3 All demolition work to be included under the Item PUMP STATION, MECHANICAL WORK shall be as indicated on the Drawings.

3.1.4 All demolition work to be included under the Item PUMP STATION, ELECTRICAL WORK shall be as indicated on the Drawings.

3.1.5 The contractor shall maintain the operations of the Pump Station as specified under Division 1, General Requirements, during all demolition operations. All demolition shall be subject to approval of the Engineer.

3.1.6 The Contractor shall protect adjacent materials, equipment, areas and related construction during all demolition operations from all dirt, dust, debris or damage of any kind.

3.1.7 The demolition operations shall be coordinated with the Contractor's proposed sequence of construction and maintenance of pumping of storm water at the Pump Station.

3.1.8 At the completion of construction, all surfaces, including interior and exterior concrete and masonry, shall be cleaned of all dirt, dust, graffiti and other marks. Surfaces designated to be painted shall be as specified under Section 9A, Painting.

3.1.9 Adjacent materials designated to remain that are damaged by the Contractor due to his operations shall be replaced at no additional cost to the State.

(a) Special operations necessary for the removal of an existing structure or obstruction shall be subject to the approval of the State.

(b) The Contractor shall provide adequate temporary support for all structures to remain that are normally supported by structures to be demolished.

3.1.10 The state will provide a list of items to be salvaged at the time of transfer of
maintenance. The salvaged items shall be removed carefully and not damaged and protected until they are picked up by the state.

3.2 Disposal

3.2.1 General: All materials, except those indicated to be salvaged upon their demolition, shall become the property of the Contractor and shall be removed and promptly disposed of in a lawful manner away from the site.

3.2.2 Cleanup: After removal of designated areas of structure, clean and grade the area. There shall be no debris, rubble, or litter left at the site from any of the demolition operations, and the site shall be clean.

END OF THIS SECTION

DIVISION 3 - CONCRETE

SECTION 3A - CAST-IN-PLACE CONCRETE

1. GENERAL:

1.1 Description

1.1.1 The work shall include requirements for all Cast-In-Place Concrete, as shown and specified herein. The work shall also include requirements for Concrete Form work for structural concrete, Concrete Reinforcement and Concrete Accessories.

1.1.2 Unless otherwise indicated, concrete material and work shall be in conformance with the requirements of the Standard Specifications for Road and Bridge Construction adopted January 1, 2007, a publication of the Illinois Department of Transportation. Refer to Division 1 for additional requirements.

1.2 Submittals

1.2.1 Submit under provisions of Section 1A and Standard Specifications.

1.3 Quality Assurance

1.3.1 Under provisions of Standard Specifications.

1.4 Basis of Payment

1.4.1 Measurement

(a) The work specified for concrete shall be measured as specified in Article 503.21 of the Standard Specifications.

1.4.2 Payment

(a) The work specified under this Section excluding concrete reinforcements shall be paid for at the contract unit price per cubic yard for CONCRETE STRUCTURES, which price shall be considered as payment in full for this Item.

(b) The work specified under this Section for concrete reinforcements shall be paid for at the contract unit price per pound for REINFORCEMENT BARS, EPOXY COATED, which price shall be considered as payment in full for this item.

2. PRODUCTS:

2.1 Concrete Form Work

2.1.1 Forms shall be of wood or metal, as required, and supplied in sufficient quantities so that work can be properly accomplished.

2.1.2 Forms shall be constructed to slopes, lines and dimensions shown, plumb, straight and sufficiently tight to prevent leakage and so braced that no distortion or settling can take place during or after placing of concrete.

2.1.3 Forms shall conform to the requirements of Section 503 "Concrete Structures" of the Standard Specifications.

2.2 Concrete Reinforcing

2.2.1 General

(a) All steel reinforcement bars shall be epoxy coated deformed bars.

(b) All steel reinforcement bars shall be deformed bars conforming to the requirements of AASHTO M-31, M-42 or M-53 Grade 60 ksi, and the applicable portions of the Standard Specifications. Epoxy coated bars shall conform to the requirement of AASHTO M284. Submit one sample of 12 inch long steel reinforcement bars and one sample each reinforcement accessories. Materials shall meet the requirements of Section 508 and Section 1006 of the Standard Specifications.

(c) Reinforcing bars shown to be welded on Drawings shall be Designation ASTM A706, Grade 60.

(d) Minimum clearances for reinforcement bars shall be as shown on the Plans. Where clearances are not shown on the Plans, the minimum clearances shall be as specified in ACI-318 (Building Code Requirements for Reinforced Concrete).

2.3 Cast-In-Place Concrete

2.3.1 General

(a) Unless otherwise indicated, all regular concrete shall be Class SI with 14 days Compressive Strength of 3,500 psi Section 1020 of the Standard Specifications.

Fly ash shall be stored at the concrete mixing plant separately from the cement. Fly ash and cement shall not be intermixed prior to being added to the concrete mix.

(b) Unless otherwise indicated, all cement shall be Portland Cement type I or II.

(c) The coarse aggregate gradations for all regular concrete (Class SI) shall be CA7 or CA 11.

(d) Concrete Proportions: Concrete proportions shall be selected to provide the required strength and durability and to provide work ability and consistency so that the concrete can be worked into forms and around reinforcement without segregation or excessive bleeding.

Establish concrete proportions including the water-cementitious material ratio on the basis of field experience or trial mixtures with the materials to be used in accordance with ACI 318.

(e) The concrete mix design slumps shall be within the following limits:

Concrete Placement (Class SI)

Normal	2 in. to 4 in.
Pumped	4 in. to 6 in.

2.3.2 Fiber Reinforcement Concrete

(a) Fiber Reinforcement Manufacturers:

1. W.R. Grace & Co.
2. Fibermesh Co.
3. Euclid Chemical Co.

(b) Dosage Rate: 1-1/2 lbs/cu yd min.

(c) Use in strict accordance with manufacturer's written recommendation and ASTM C94.

2.4 Waterstop

2.4.1 Virgin polyvinyl chloride (PVC) waterstop conforming to CRD C572, with hog rings or grommets at 12 to 18 in. oc.

2.4.2 Construction Joints: Dumbbell or serrated type, 6 in. wide by 3/8 in. thick, at center.

2.4.3 Provide prefabricated tees, crosses, and other configurations as required.

2.4.3 Gasket Type Waterstop: 1" by ¾" Waterstop-Rx by American Colloid Co. or SikaSwell S-Sealant by Sika Corp.

2.5 Mechanical Splicer

2.5.1 Develop minimum 125% of yield capacity of bars spliced in tension when tested as assembly in accordance with ASTM A370 and ASTM A615.

3. EXECUTION:

3.1 Form

3.1.1 Form Installation

(a) Form surfaces shall be smooth and free from any imperfections which would cause objectionable roughness on the finished surface of the concrete.

(b) All forms for concrete shall be tied with rods or patented ties where the concrete is to be exposed. Ties within the forms shall be constructed so as to permit their removal in accordance with the requirements of Section 503.06 of the Standard Specifications. Ties which are left in place within water containing structures shall be provided with swaged washers or other suitable devices to prevent seepage or moisture along the ties. Use lugs, cones, washers or other devices which do not leave holes or depressions greater than 7/8-inch in diameter.

(c) All necessary inserts in form work such as rods, bolts, anchorages, fillets, and other devices shall be installed as required.

(d) Forms shall not be treated with material that will adhere to or discolor the concrete.

(e) All sheeting, bracing and timbering shall be placed entirely outside of the neat lines of the structure, except that flanges or projections of steel shapes may extend into the concrete a distance not exceeding 2 inches. All sheeting shall be closely fitted to the excavation and no timber shall be left within the finished lines of the structure. The bracing shall be so arranged that no stress will be placed on any part of the sub-structure concrete until the concrete has developed sufficient strength to support safely the load thereon.

(f) For all exposed concrete edges a 3/4 inch chamfer strip shall be provided.

3.1.2 Form Removal

(a) Forms shall be removed in such manner and at such a time as to insure the complete safety of the structure. In no case shall the supporting forms or shoring be removed until the members have acquired sufficient strength to support safely their weight and load thereon. The results of suitable control tests shall be used as evidence that the concrete has attained the required strength.

(b) Removal of forms shall conform to Section 503.06 of the Standard Specifications.

3.2 Concrete Reinforcing

3.2.1 Reinforcing Installation

(a) Placing and fastening of reinforcement shall be as per Article 508 of Standard Specifications.

(b) The Contractor shall furnish to the Engineer complete bar bending details, bar lists, weights and detail drawings for the fabricating and placing of all reinforcement to be furnished under this contract. Such lists and drawings shall be prepared in accordance with the American Concrete Institute ACI 315, SP66 (Details and Detailing of Concrete Reinforcement), except as otherwise shown on the plans or ordered by the Engineer.

(c) Bar bending details, bar lists, weights and detail drawings furnished by the Contractor will be examined by the Engineer and it shall be understood by the Contractor that a responsible amount of time will be necessary for their examination before they can be approved or returned for correction. No reinforcement shall be fabricated until the bar bending details and detail drawings have been approved by the Engineer. The Contractor shall furnish to the Engineer, without extra charge therefore, copies of the approved bar bending details, bar lists and detail drawings in such number as the Engineer may require.

(d) Mechanical connections shall develop at least 125 percent of the Specified Yield Strength of the bar in tension.

3.3 Cast-In-Place Concrete

3.3.1 Placing Concrete

(a) Concrete placement and consolidation shall comply with provisions of Section 503 of the Standard Specifications.

(b) Once concreting is started it shall be carried on as a continuous operation until the placing of the section between construction joints is completed. Sections containing "cold joints" will not be accepted and shall be removed and replaced at the Contractor's expense.

(c) Concreting in freezing weather shall comply with the provisions of Section 1020 of the Standard Specifications.

(d) Old concrete surfaces that will be in contact with the new concrete shall be coated with an epoxy bonding agent, Sika Chemical Co. Sikadur Ili-Mod (Sikastix 370), or approved equal. Application shall be in strict conformity with the manufacturer's recommendations, with particular attention given to temperature requirements.

Applicable provisions of Article 503.09 (a) (2) of the Standard Specifications shall be followed. This work will not be paid for separately, but shall be incidental to the contract unit price for Class SI Concrete, and no additional compensation will be allowed.

(e) Expose surfaces of electrical room shall have smooth form finish. Form materials shall impart a smooth and uniform texture. Repair and patch imperfections, joints and tie holes. Remove all fins and other projections to smooth finish.

(f) All interior and exterior surfaces that will be exposed to view after completion of the work shall be given a normal finish in accordance with Section 503.16(a) of the Standard Specifications.

(g) All top slab surfaces exposed to the weather shall be finished to a true and even surface with floats and trowels. The final troweling shall be done with a steel trowel, leaving a smooth even surface. After the water sheen has disappeared, the surface shall be given a final finish by brushing with a whitewash brush. The brush shall be drawn across the slab with adjacent strokes slightly overlapping, producing a uniform, slightly roughened surface with parallel brush marks. All edges shall be rounded with an edging tool.

(h) Concrete floor slab of building shall have a smooth steel troweled finish and all edges of finished surfaces shall be rounded or leveled with edging tools. The Electrical Room floor slab shall be treated with an approved floor hardener and sealer.

(i) All concrete shall be cured for a minimum of 7 days in accordance with Section 1020.13, "Curing and Protection" of Portland Cement Concrete.

END OF THIS SECTION

DIVISION 3 - CONCRETE

SECTION 3B - GROUT

1. GENERAL:

1.1 Section Includes

1.1.1 Grout for equipment bases.

1.1.2 Grout for pipe and conduit penetrations.

1.1.3 Grout for anchor bolts.

1.1.4 Grout for slide gate frame.

1.2 Related Sections

1.2.1 Section 3A - Cast-In-Place Concrete.

1.2.2 Section 5C – Bolts, Anchor Bolts, Concrete Anchors, and Concrete Inserts.

1.2.3 Section 15C – Piping and Appurtenances

1.3 References

1.3.1 ASTM C109 - Compressive Strength of Hydraulic Cement Mortars (using 2" or 50 mm. Cube Specimens).

1.3.2 ASTM C150 - Portland Cement.

1.3.3 ASTM C191 - Time of Setting of Hydraulic Cement by Vicat Needle.

1.3.4 ASTM C827 - Early Volume Change of Cementitious Mixtures.

1.3.5 CRD-C-588 - Specifications for Non-Shrink Grout.

1.3.6 CRD-C-619 - Specification for Grout Fluidifier.

1.3.7 CRD-C-621 - Specification for Non-Shrink Grout.

1.4 Submittals

1.4.1 Reports: Submit reports on grout indicating conformance of component grout materials to requirements of ASTM C476 and test and evaluation reports to ASTM C1019.

1.4.2 Submit manufacturer's installation instructions under provisions of Division 1.

1.5 Tests

1.5.1 Testing of grout will be performed under provisions of Division 1.

1.6 Delivery, Storage and Handling

1.6.1 Grout materials from manufacturers shall be delivered in unopened containers.

1.6.2 Maintain packaged materials clean, dry and protected against dampness, freezing and foreign matter.

1.7 Environmental Requirements

1.7.1 Maintain materials and surrounding air temperatures to a minimum of 50^{o}F prior to, during and 48 hours after completion of the Work.

1.7.2 If manufacturer's requirements are more stringent, such requirements shall govern.

1.8 Basis of Payment

1.8.1 The work shall be paid as part of the Contract lump sum price for

PUMP STATION GENERAL WORK

which shall be payment in full for the work described herein.

2. PRODUCTS:

2.1 Materials

2.1.1 Each required material shall have one manufacturer throughout the use of that material on the Work.

2.2 Manufacturers - Non-Shrink, Non-Metallic, 100% Solid, High Strength Epoxy Grout

2.2.1 Sikadur 42, Grout-Pak by Sika Chemical Company.

2.2.2 Five Star Epoxy Grout by U.S. Grout Corporation.

2.2.3 Substitutions: Under provisions of Division 1.

2.3 Materials- Non-Shrink, Non-Metallic, Cementitious Grout

2.3.1 Pre-mixed, non-staining, cementitious grout requiring only the addition of water at the job site; conforming to the following:

(a) Non-shrink: No shrinkage (0.0%) and a maximum of 0.2% expansion in the hardened state when tested in accordance with CRD-C-621.
(b) Compressive Strength: A minimum 28-day compressive strength of 7,000 psi when tested in accordance with ASTM C109.
(c) Setting Time: A minimum initial set time of 60 minutes when tested in accordance with ASTM C191.
(d) Composition: Shall not contain metallic, particles, chlorides or expansive cement.

2.4 Manufacturers - Non-Shrink, Non-Metallic, Cementitious Grout

2.4.1 Sika Grout 212 by Sika Chemical Company.

2.4.2 Masterflow 928 by Master Builders Company.

2.4.3 Sealtight 588 grout by W. R. Meadows, Inc.

2.4.4 Substitutions: Under provisions of Division 1.

2.5 Materials - Cement-Sand Grout

2.5.1 Use 1 part cement to 3 parts sand. Keep the water cement ratio below 0.45 and achieve a minimum 28-day compressive strength of 4,000 psi.

2.5.2 Cement: ASTM C150, Type 2.

2.5.3 Sand: ASTM C33.

2.5.4 Water: Clean, fresh, potable water free from injurious amounts of vegetable matter and mineral salts.

3. EXECUTION:

3.1 Inspection

3.1.1 Examine conditions under which grout is to be installed and notify Engineer in writing of unsatisfactory conditions or deficiencies that have been corrected.

3.2 Installation

3.2.1 Place grout as shown and in accordance with manufacturer's instructions. If manufacturer's instructions conflict with the Specifications, do not proceed until Engineer provides clarification.

3.2.2 Drypacking for vertical grouting behind vertical base plates.

3.2.3 Manufacturers of proprietary products shall make available upon 72 hours' notification the services of a qualified, full-time employee to aid in assuring proper use of the product under job conditions.

3.2.4 Placing grout shall conform to temperature and weather limitations in Section 3A.

3.2.5 Equipment Bases

(a) After shimming and equipment to proper grade, securely tighten anchor bolts. Properly form around the base plates allowing sufficient room around the edges for placing the grout. Adequate depth between the bottom of the base plate and the top of concrete base must be provided to assure that the void is completely filled with grout. Use non-metallic cementitious grout unless another type of grout is recommended by equipment manufacturer.

(b) Non-shrink, non-metallic epoxy grout may be used with Engineer's specific review.

3.3 Schedule

3.3.1 Non-Shrink, Non-Metallic Cementitious Grout: anchor bolts, equipment bases, pipe supports, pipe and conduit penetration, slide gate frame, and pipe thrust support structures.

3.3.2 Cement-Sand Grout: Pipe and conduit penetrations for non-water containing structure, and repair of exposed concrete.

END OF THIS SECTION

DIVISION 4 - MASONRY SYSTEM

SECTION 4A - UNIT MASONRY

1. GENERAL:

1.1 Description

1.1.1 The scope of work under this Division shall include the furnishing and installing of all masonry units, glass blocks and appurtenant work required to complete as shown on the Drawings and as specified herein. Refer to Division 1 for additional requirements.

1.2 Related Sections

1.2.1 Section 3A - Cast-In-Place Concrete.

1.2.2 Section 7C - Joint Sealers.

1.2.3 Section 9A - Painting

1.3. Reference Standards

1.3.1 This work is subject to the requirements of the applicable portions of the following standards:

(a) ASTM C90: Hollow Load Bearing Concrete Masonry Units.
(b) ASTM C144: Aggregate for Masonry Mortar.
(c) ASTM C150: Portland Cement.
(d) ASTM C207: Hydrated Lime for Masonry Purposes.
(e) ASTM C270: Mortar for Unit Masonry.
(f) ASTM C404: Aggregates for Masonry Grout.
(g) ASTM C476: Grout for Masonry.

1.4 Submittals

1.4.1 Sample:

(a) Glass Block.

1.4.2 Material submittals shall include manufacturer's certification of compliance for the type and grade of masonry units supplied.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Store masonry units above ground on level platforms which allow air circulation under the stacked units.

1.5.2 Cover and protect against wetting prior to use.

1.5.3 Deliver decorative units packaged in manner to prevent damage.

1.6 PROJECT / SITE CONDITIONS

1.6.1 Cold Weather Protection: Temperature of masonry units shall not be less than 32°F when laid.

1.6.2 When air temperature falls below 40°F or when temperature of masonry units is below 40°F:

(a) Remove visible ice on masonry units before unit is laid.
(b) Heat mortar sand or mixing water to produce mortar temperature between 40°F and 120°F.
(c) When air temperature is between 25°F and 40°F, completely cover masonry by covering with weather resistant membrane for 24 hrs after construction.
(d) When air temperature is between 20°F and 25°F, use heat sources, install wind breaks when wind velocity exceeds 15 mph, and completely cover masonry with insulating blankets for 24 hrs after construction.
(e) When air temperature is below 20°F, provide enclosure and use heat source to maintain temperature within enclosure above 32°F for 24 hrs after construction.

1.6.3 Hot Weather Protection: When air temperature exceeds 100°F, or 90°F with wind velocity greater than 8 mph:

(a) Do not spread mortar more than 4 ft ahead of masonry.

(b) Set units within 1 minute of spreading mortar.

1.7 Basis of Payment

1.7.1 The work shall be paid as part of the Contract lump sum price for PUMP STATION GENERAL WORK which shall be payment in full for the work described herein.

2. PRODUCTS:

2.1 Concrete Block

2.1.1 Hollow normal weight concrete block units shall conform to ASTM C 90.

2.2 Glass Block

2.2.1 Manufacturer - Subject to compliance with requirements, provide glass block of one of the following, or an approved equal:

Pittsburgh Corning Corp.: Vistabrick Type, Saint-Gobain

2.2.2 The glass block shall be 3” thick solid, transparent blocks with smooth outer faces made by fusing together two solid slabs of clear, colorless glass with manufacturer's standard coating factory-applied on edge surfaces.

2.2.3 Accessories: Panel reinforcing shall be formed of two parallel wires with cross wires at regular intervals. Expansion strips shall be dense glass fiber matting 3/8" thick x 3" wide. Asphalt emulsion shall be water based.

2.3 Horizontal Joint Reinforcement and Metal Accessories

2.3.1 Wire for joint reinforcement shall be truss type, with moisture drip, hot dip galvanized after fabrication, cold-drawn steel and shall conform to ASTM A82 and ASTM A153, Class B2. As a minimum, longitudinal wires shall be 3/16" side rods with gage cross ties.

2.3.2 Manufacturer - Subject to compliance with requirements, provide horizontal joint reinforcement of one of the following, or an approved equal:

(a) A. A. Wire Products Co.
(b) "Dur-O-Wall" by Dayton Superior
(c) Blok-Lok, A Hohmann and Bernard Company

2.3.3 Horizontal Joint Reinforcement and Metal Accessories shall be as follows:

(a) The width of the horizontal reinforcing shall be 2 inches less than the actual thickness of the wall or partition in which it is to be placed. Splicing of horizontal reinforcing, including corner and partition reinforcing, shall be done by providing a 8-inch overlapping of side rods.

(b) Corners shall be reinforced with Blok-Trus Corner-Lok, standard 9-gauge (0.148") S/R by 9-gauge (0.148") C/R. Intersection between walls and partitions shall be reinforced horizontally with Blok-Trus Partition-Lok, standard 9-gauge (0.148") S/R by 9-gauge (0.148") C/R, or equal, spaced at 16-inch centers vertically, in the same course as the wall reinforcing.

(c) Solid and hollow interior or exterior masonry walls shall be reinforced horizontally with Blok-Trus AA600, (AA610) Standard 9-gauge (0.148") S/R by 9-gauge (0.148") C/R or equal, spaced at 16-inch centers vertically.

3. EXECUTION:

3.1 Concrete Masonry Units

3.1.1 All concrete masonry units shall be true, plumb and built to the thickness and bond pattern indicated. Special units shall be furnished and used where indicated and as specified. Cutting of units shall be avoided insofar as possible. Cutting at the site shall be done with a power-driven carborundum saw. Units shall not be wetted prior to use.

3.1.2 The first course of concrete masonry units shall be laid in a full bed of mortar for the full width of the unit.

Bed joints of a concrete masonry unit shall be formed by applying the mortar to the entire top surfaces of the inner and outer face shells, and the head joints shall be formed by applying the mortar for a width of about 1 inch to the ends of the adjoining units laid previously. Mortar for joints shall be smooth, not furrowed, and of such thickness that it will be forced out of the joints as the units are being placed in position.

3.1.3 Tolerances

(a) Maximum variation from unit to adjacent unit: 1/32 inch.
(b) Maximum variation from plane of wall: 1/4 inch in 10 feet, and ½ inch in 20 feet or more.
(c) Maximum variation from plumb: 1/4 inch per story non-cumulative; ½ inch in two stories or more.
(d) Maximum variation from level coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; ½ inch in 30 feet.
(e) Maximum variation of joint thickness: 1/8 inch in 3 feet.
(f) Maximum variation from cross sectional thickness of walls: 1/4 inch.

3.1.4 Cutting and Fitting

(a) Cut and fit for chases, pipes, conduit, sleeves and other components. Coordinate with other Sections of work to provide correct size, shape, and location.

(b) Obtain Engineer approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.2 Glass Block

3.2.1 Glass block including reinforcing, expansion strips, coatings, anchors and sealants shall be installed in accordance with the manufacturer's recommendations.

3.2.2 Clean glass units of substances that may impair bond with mortar or sealant. Coat sill under units with asphalt emulsion as a bond breaker, and allow to dry. Set panel anchors in mortar bed directly over coating. Provide full mortar joints. Furrowing not permitted. Remove excess mortar. Maintain uniform joint width of 3/8 inch.

3.2.3 Place panel reinforcement at every second horizontal joint in full mortar bed and at first course above and below openings within the glass unit panel. Discontinue reinforcement at expansion strips.

3.3 Clean-Up

3.3.1 All surplus material and debris shall be removed from the job site when the masonry work is completed. Any items defaced from the masonry work shall be cleaned.

3.3.2 Use bucket and brush hand cleaning method as described in BIA "Technical Note No. 20 Revised" to clean brick masonry made from clay or shale, except use detergent type masonry cleaner.

END OF THIS SECTION

DIVISION 5 - METALS

SECTION 5A - STRUCTURAL STEEL

1. GENERAL:

1.1 Section Includes

1.1.1 Monorail hoist beams.
1.1.2 Structural steel framing members and support.

1.2 Related Sections

1.2.1 Section 3A - Cast-In-Place Concrete.

1.2.2 Section 9A - Painting.

1.3 References

All reference standards shall be from the latest edition.

1.3.1 AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

1.3.2 ASTM A36 - Structural Steel.

1.3.3 ASTM A123 - Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products.

1.3.4 ASTM A325 - High Strength Bolts for Structural Steel Joints.

1.3.5 ASTM A 992 – Structural Steel Shapes

1.3.6 AWS A2.0 - Standard Welding Symbols.

1.3.7 AWS D1.1 - Structural Welding Code.

1.3.8 SSPC - Steel Structures Painting Council.

1.4 Design Requirements

1.4.1 Where final design of members and connections for any portion of the structure is not indicated, perform final design of such members and connections in accordance with AISC Specification and as Specified herein, at no additional cost.

1.4.2 Members and connections shall be designed by a structural engineer registered in the State of Illinois.

1.4.3 Unless otherwise indicated, design connections in accordance with American Institute of Steel Construction "Manual of Steel Construction, Latest Edition".

1.5 Submittals

1.5.1 Shop Drawings

(a) Indicate profiles, sizes, and locations of structural members, attachments and fasteners.
(b) Indicate welded connections with AWS A2.0 welding symbols. Indicate net weld lengths and size.
(c) Review of shop drawings in no way affects the Contractor's responsibility for carrying out the Work to Contract Drawings and specifications.
(d) Shop drawings shall be approved prior to fabrication.

1.5.2 Manufacturer's Mill Certificate: Submit under provisions of Division 1 certifying that products meet or exceed specified requirements.

1.5.3 Welders' Certificates: Submit under provisions of Division 1 Manufacturer's Certificates, certifying welders employed on the Work, verifying AWS qualifications within the previous 12 months in the position in which they will be carrying out the welding.

1.5.4 Substitutions of sections or modifications of details and the reasons for these changes shall be submitted by letter with shop drawings for review by the Engineer. Changes in related portions of the Work shall be coordinated by the Contractor.

1.6 Quality Assurance

1.6.1 Fabricate structural steel members in accordance with AISC-Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

1.7 Basis of Payment

1.7.1 The work specified under this Section and as required shall be paid for at the Contract unit price per pound (kilogram) for FURNISHING AND ERECTING STRUCTURAL STEEL, which price shall be payment in full for all labor, materials, tools, equipment and incidentals required to complete this Item.

2. PRODUCTS:

2.1 Materials

2.1.1 Structural Steel Members: ASTM A36 or A 992.

2.1.2 Bolts, Nuts, and Washers: ASTM A325.

2.1.3 Welding Materials: AWS D1.1; type required for materials being welded.

2.1.4 Materials shall meet the requirements of the Standard Specifications, Section 505.

2.2 Fabrication

2.2.1 Fabricate all members as indicated on Drawings and as outlined in AISC.

2.2.2 Perform welding in accordance with AWS D1.1.

2.2.3 Fabricating tolerances for finished parts shall comply with AISC Code of Standard Practice.

2.3 Finish

2.3.1 Prepare structural component surfaces in accordance with SSPC-SP6 - Commercial Blast Cleaning.

2.3.2 Hot-dip galvanized conforming to ASTM A123 and AHDGA Specifications.

2.3.3 Galvanizing repair paint: High zinc-dust content paint complying with MIL-P-21035.

2.4 Source Quality Control and Tests

2.4.1 Testing and analysis of components will be performed under provisions of Division 1.

3. EXECUTION:

3.1 Examination

3.1.1 Verify that field conditions are acceptable and are ready to receive work.

3.2 Erection

3.2.1 Erect structural steel in compliance with AISC Code of Standard Practice and Specification.

3.2.2 Do not field cut or alter structural members without approval of Engineer.

3.3 Field Quality Control

3.3.1 Field inspection will be performed under provisions of Division 1.

END OF THIS SECTION

DIVISION 5 - METALS

SECTION 5B - METAL FABRICATIONS

1. GENERAL:

1.1 Section Includes

1.1.1 Provide miscellaneous metal work shown on the Drawings, as specified herein, and as needed for a complete and proper installation for metal frames, floor access hatches and miscellaneous items.

1.2 Related Sections

1.2.1 Section 3A - Cast-In-Place Concrete.
1.2.2 Section 4A – Unit Masonry System.
1.2.3 Section 5C - Bolts, Anchor Bolts, Expansion Anchors and Concrete Inserts.
1.2.4 Section 9A - Painting.

1.3 References

All reference standards shall be the latest edition.

1.3.1 ASTM A36 - Structural Steel.

1.3.2 ASTM A53 - Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe.

1.3.3 ASTM A123 - Zinc (Hot-Galvanized) Coatings on Products Fabricated From Rolled, Pressed and Forged Steel Shapes, Plates, Bars, and Strip.

1.3.4 ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

1.3.5 ASTM A276, Type 316L - Stainless Steel.

1.3.6 ASTM A283 - Carbon Steel Plates, Shapes, and Bars.

1.3.7 ASTM A325 - High Strength Bolts for Structural Steel Joints.

1.3.8 ASTM A386 - Zinc-Coating (Hot-Dip) on Assembled Steel Products.

1.3.9 ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.

1.3.10 ASTM A501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

1.3.11 ASTM A992 – Structural Steel Shapes.

1.3.12 AWS A2.0 - Standard Welding Symbols.

1.3.13 AWS D1.1 - Structural Welding Code.

1.3.14 AISI - Standard for Stainless Steel.

1.3.15 SSPC - Steel Structures Painting Council.

1.3.16 ANSI A14.3: Safety requirements for fixed ladders.

1.3.17 Specifications for Aluminum Structures, The Aluminum Association.

1.4 Submittals

1.4.1 Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1.4.2 Submit Product Data.

1.4.3 Shop drawings shall be approved prior to fabrication.

1.4.4 Indicate all revisions on resubmissions.

1.5 Quality Assurance

1.5.1 Perform shop and/or field welding required in connection with the work of this Section in strict accordance with pertinent recommendations of the American Welding Society (AWS).

1.5.2 Conform to AISC and AA standards.

1.6 Field Measurements

1.6.1 Verify that field measurements are as indicated on shop drawings and in accordance with manufacturers' recommendations.

1.7 Basis of Payment

1.7.1 The work shall be paid as part of the Contract lump sum price for

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which shall be payment in full for the work described herein.

2. PRODUCTS:

2.1 Materials

2.1.1 In fabricating items which will be exposed to view, limit materials to those which are free from surface blemishes, pitting, and roughness.

2.1.2 Comply with following standards, as pertinent.

(a) Steel plates and shapes: ASTM A36 or A992.
(b) Square or rectangular tubing: ASTM A500, Grade B.
(c) Round tubing or pipe: ASTM A53, Type E or S, Grade B.
(d) Stainless Steel:
  (1) Exterior and submerged uses: AISI, Type 316.
  (2) Interior uses: AISI, Type 304 or Type 316.
(e) Aluminum shapes and plates: Alloy 6061-T6 or 6063-T6.
(f) Floor Plate: Checkered surface aluminum plate.
(g) Connection Bolts:
  (1) For steel members: ASTM A325.
  (2) For aluminum members: Stainless steel.
(h) Cast-in-place Anchor Bolts:
  (1) 1/2 in. min dia.
  (2) Nonsubmerged: ASTM A307, galvanized.
  (3) Submerged: Stainless steel.
(i) Malleable Iron: ASTM A47.
  (1). Cast Iron: ASTM A48, Class 35B.
  (2). Ductile Iron: ASTM A536, Grade 65-45-12.
  (3). Cast Aluminum: ASTM B26.

2.2 Fabrication

2.2.1 Except as otherwise shown on the Drawings or the approved Shop Drawings, use materials of size, thickness, and type required to produce reasonable strength and durability in the work of this Section.

2.2.2 Provide clips, lugs, brackets, straps, plates, bolts, nuts, washers, and similar items, as required for fabrication and erection.

2.2.3 Fabricate with accurate angles and surfaces which are true to the required lines and levels, with projecting corners clipped, grinding exposed welds smooth and flush, forming exposed connections with hairline joints, and using concealed fasteners wherever possible.

2.2.4 Weld shop connections and bolt or weld field connections.

2.2.5 Use AISC standard 2-angle web connections or single plate framing connections capable of supporting min of 50% of total uniform load capacity of member.

2.2.6 Connections shall consist of min two 3/4 in. dia bolts or welds developing min of 10,000 lbs capacity.

2.2.7 Prior to shop painting or priming, properly clean metal surfaces as required for the applied finish and for the proposed use of the item. Conform to Section 9A.

Do not coat ferrous metal surfaces embedded in concrete.
Coating of cast iron or ductile iron floor access hatches and pressure relief valves not required.

On surfaces inaccessible after assembly or erection, apply two coats of the specified primer. Change color of second coat to distinguish it from the first.

Coat aluminum surfaces in contact with concrete with bituminous coating. Under no circumstances shall aluminum contact dissimilar metal.

2.2.8 Galvanizing:

Galvanize after fabrication.

Galvanize by hot-dip process conforming to ASTM A123 and AHDGA specifications.

2.3 Finishes

2.3.1 Prepare structural component surfaces in accordance with SSPC-SP6 - Commercial Blast Cleaning.

2.3.2 Shop prime structural steel members except members to be galvanized. Do not prime surfaces that will be field welded, contact surface for friction bolts, welded studs, deformed bar anchors and steel encased in concrete.

2.3.3 Zinc used for hot-dip galvanizing coating shall conform to the Standard Specifications for Slab Zinc (Spelter) ASTM Designation B6 and shall be at least equal to the grade designated as "Prime Western". Thickness of coatings shall conform to ASTM Specifications A123, A153, and A385, as applicable for items coated.

2.3.4 Quality of galvanizing shall be rigidly controlled and it shall be understood that any defects as mentioned below shall be just grounds for rejection.

2.3.5 Galvanized steel shall have no bare spots unless small and suitable for patching, pimples showing excessive contamination, flux, ash inclusions, or blisters.

2.3.6 Where cutting existing galvanized metal Work or attaching to existing galvanized metal Work, such as by welding, the connection or bore edges shall be cold galvanized.

2.3.7 Structural and miscellaneous metal Work shall be galvanized when located on the exterior and on the interior where so indicated and/or specified.

2.3.8 Prime paint items in accordance with finish coat requirements.

2.3.9 Repair all damage to field-primed surfaces.

2.4 Metal Frames

2.4.1 Provide door, hatch, grille, louver, and other frames fabricated from structural shapes or plates.

2.4.2 Select sections for trueness of web and flange. Straighten members so finished frames are uniform, square, and true throughout length and depth of assembled units.

2.4.3 Miter or cope and join members with continuous welds.

2.4.4 Provide temporary spreader bars to prevent springing frames out of shape prior to and during erection.

2.5 Aluminum Floor Access Hatches

2.7.1 Prefabricated Standard Type:

Manufacturers:

(1) Nystrom Building Products: Bolt-In type
(2) U.S.F. Fabrication, Inc.: Retrofit type

(b) Provide access hatches and frames of material, type, and size as shown on Drawings.
(c) Door leaves shall be 1/4 in. min diamond pattern plate with reinforcing on underside to withstand live load of 300 lbs/sq ft with max deflection of 1/150 span.
(d) Frames shall be 1/4 in. min thick with strap anchors around perimeter.
(e) Equip hatches with stainless steel hinges bolted to underside and pivot on torsion bars that counterbalance leaf for easy operation.
(f) Equip hatches with hold-open arm with positive locking device with conveniently positioned release handle for easy and controlled closing.
(g) Provide 316 stainless steel snap lock mounted on underside of leaf with removable topside handle and socket recessed in cover.
(h) Hardware shall be stainless steel.
(i) Factory finish on aluminum surfaces shall be mill finish with Bituminous coating applied to surfaces in contact with concrete.
(j) Manufacturer shall warranty in writing against defects in material and workmanship for 5 yrs.

2.6 Miscellaneous Items

2.6.1 Fabricate miscellaneous framing, supports, and items of structural shapes, plates, bars, and tubing of sizes and arrangements indicated and as required.

3. EXECUTION:

3.1 Examination

3.1.1 Verify that field conditions are acceptable and are ready to receive Work.

3.1.2 Preparation

Clean and strip primed steel items to bare metal where site welding is required.

Supply items required to be cast into concrete with setting templates, to appropriate Sections.

3.2 Installation

3.2.1 Install items plumb and level, accurately fitted, free from distortion or defects.

3.2.2 Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

3.2.3 Perform field welding in accordance with AWS D1.1.

3.2.4 Obtain Engineer approval prior to site cutting or making adjustments not scheduled.

3.2.5 Perform cutting, drilling, and fitting required for installation of metal fabrications. Set the work accurately. Provide temporary bracing and anchors in formwork for items to be built into concrete. Field weld joints not shop welded because of size limitations. Grind welds smooth and touch-up shop paint coat. Do not weld, cut or abrade surfaces that have been galvanized.

3.2.6 Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete construction. Coordinate delivery of such items to project site.

3.2.7 Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.

3.2.8 Protect aluminum in contact with dissimilar material with asphalt paint to provide 2 mil dry thickness. Paint miscellaneous metal work which is to be in contact with but not fully embedded in concrete with a heavy coat of asphalt paint. Coating shall not extend onto surfaces which will be exposed.

3.2.9 Install hatches and manufactured items in accordance with manufacturer's instruction.

3.2.10 Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

3.2.11 Touch up damaged galvanizing with cold galvanizing compound as produced by Rust-Oleum Corp. or ZRC Chemical Company, Quincy, Mass.

END OF THIS SECTION

DIVISION 5 - METALS

SECTION 5C - BOLTS, ANCHOR BOLTS, CONCRETE ANCHORS, AND CONCRETE INSERTS

1. GENERAL:

1.1 Section Includes

1.1.1 Furnishing and installing all bolts, anchors and inserts, anchor bolts, expansion anchors and concrete inserts for:

(a) Piping.
(b) Hangers and brackets.
(c) Equipment.
(d) Electrical, plumbing and HVAC work.
(e) Pump base.
(f) Miscellaneous fasteners.

1.2 Related Sections

1.2.1 Section 4A – Unit Masonry.
1.2.2 Section 5B - Metal Fabrication.
1.2.3 Section 15C - Piping and Appurtenances.

1.3 References

1.3.1 Reference Standards: Comply with the applicable provisions and recommendations of the following, except as otherwise shown and specified.
1.3.2 ACI 349 - Appendix B - Code Requirements for Nuclear Safety Related Concrete Structures.
1.3.3 AISC - American Institute of Steel Construction, Structural Steel Detailing.
1.3.4 ANSI B1.1 - Screw Threads, Coarse Thread Series.
1.3.5 ANSI B18.2 - Square and Hex Bolts and Nuts.
1.3.6 ASTM A36 - Structural Steel.
1.3.7 ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
1.3.8 ASTM A193 - Alloy-Steel & Stainless Steel Bolting Materials for High-Temperature Service.
1.3.9 ASTM A194 - Carbon & Alloy Steel Nuts for Bolts for High Pressure & High Temp. Service.
1.3.10 ASTM A242 - High Strength Low-Alloy Structural Steel.
1.3.11 ASTM A307 - Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
1.3.12 ASTM A325 - Structural Bolts, Steel, Heat Treated, 120/105 KSI Minimum tensile Strength.
1.3.13 ASTM A354 - Quenched & Tempered Alloy Steel Bolts, Studs & Other Externally Threaded Fasteners.

1.3.14 ASTM A563 - Carbon and Alloy Steel Nuts.
1.3.15 ASTM A588 - High Strength Low-Alloy Structural Steel With 50 KSI Minimum Yield Point.
1.3.16 ASTM B98 - Copper Silicon Alloy Rods, Bars, and Shapes.
1.3.17 AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

1.4 Submittals

1.4.1 Samples: Submit for approval the following:

(a) Representative samples of bolts, anchors and inserts as may be requested by the Engineer. Review will be for type and finish only. Compliance with all other requirements is exclusive responsibility of Contractor.

1.4.2 Shop Drawings: Submit for approval the following:

(a) Setting drawings and templates for location and installation of anchorage devices.

(b) Copies of manufacturer's specifications, load tables, dimension diagrams and installation instructions for the devices.

1.4.3 Contractor shall submit calculations stamped by a professional engineer.

1.5 Quality Assurance

1.5.1 Bolts, anchor bolts, expansion anchors and concrete inserts shall conform to applicable Section 1006, METALS, of the Standard Specifications.

1.6 Basis of Payment

1.6.1 The work shall be paid as part of the Contract lump sum price for

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which shall be payment in full for the work described herein.

2. PRODUCTS:

2.1 Design Criteria

2.1.1 All bolts, studs and nuts shall have American National form right-hand machine cut threads which shall be in conformity with the current ANSI B1.1, "Screw Threads", Coarse Thread Series, Class 2 Fit, unless otherwise specified.

2.1.2 Bolt heads and nuts shall be semi-finished and shall be in conformity with ANSI B18.2, "Wrench-head Bolts and Nuts and Wrench Openings", Heavy Series, unless otherwise specified.

Nut dimensions shall conform to ANSI Standard B18.2.2 for heavy hex nuts.

2.1.3 Allowable tensile design stress for threaded fasteners shall not be greater than 0.33 times minimum tensile strength of threaded fastener on tensile stress area.

2.1.4 Concrete Fasteners: When the size, length and load carrying capacity of concrete fasteners is not Specified or shown on the Drawings, provide the size, length and capacity required to satisfy all of the following. Concrete fasteners include anchor bolts, expansion anchors, or concrete inserts:

(a) Working load shall be a minimum of the design load times a safety factor of four, and shall be based on a concrete compressive strength not exceeding 3000 psi.
(b) Shall satisfy all requirements and recommendations of ACI 349, Appendix B.
(c) Shall satisfy all minimum recommendations and requirements of Manufacturer.
(d) Allowances for vibration are not included in the safety factor specified above.

2.1.5 Determine design loads as follows:

(a) For equipment anchors, use the design load recommended by the manufacturer and approved by the Engineer.

(b) For pipe hangers and supports, use one half the total weight of pipe, fittings, valves, accessories and water contained in pipe, between the hanger or support in question and adjacent hangers and supports on both sides. Load shall be increased where required to allow for thrust and temperature induced forces.

2.1.6 Anchors and inserts shall be located and sized so as not to impair the integrity of the supporting structure.

2.2 Materials

2.2.1 Bolts and Anchor Bolts:

(a) Galvanized Steel Bolts and Nuts:

(1) Steel anchor bolts, studs, nuts and washers for interior installation shall be in conformity with the current ASTM Designation: A307 "Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength", Grade B, A36 or approved equal. All steel bolts, studs, nuts and washers shall be hot-dip galvanized in conformance with Class C of ASTM A153. Nuts shall conform to requirements of ASTM A563, heavy hex style.

(b) Stainless Steel Bolts and Nuts:

(1) In buried, outdoor, high humidity or submerged locations, provide stainless steel bolts, nuts and washers. Stainless steel bolts and nuts shall be in conformity with the current ASTM A193, Grade B8 (AISI 304) 75 KSI Min. Tensile Strength), Class 1 and ASTM A194, Grade 8 (AISI 304), AISI 316 or approved equal.

(2) For high strength applications, stainless steel bolts and nuts shall be in conformity with the current ASTM A193, Grade B8 (AISI 304) (Tensile Strength 100/125 KSI, Class 2 and ASTM A194, Grade 8 Strained Hardened (AISI 304) or approved equal.

(c) Bronze Bolts and Nuts:

(1) Where shown on Drawings or specified under other Sections, bronze anchor bolts, flange bolts, studs, and nuts shall be in conformity with the current ASTM Designation B98, "Copper-Silicon Alloy Rods, Bars, and Shapes." made of Alloy B12, Hard. Bolts, studs, and nuts machined from bar stock shall be made of Alloy A7, Hard.

(d) Other types, if shown on drawings or specified under other Sections.

2.3 Pipe Joints

2.3.1 Galvanized Bolts and Nuts (For EXPOSED Piping Installations):

(a) Steel anchor bolts, flange bolts, studs and nuts shall be in conformity with the current ASTM A307 "Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength", Grade B or approved equal.

(b) All steel bolts, studs and nuts, shall be hot-dip galvanized in accordance with ASTM A153.

(c) At joint harnesses and restrained harnesses connected to flange, the tie bolts and studs, flange bolts and nuts shall conform to ASTM A354 Grade BC or ASTM A193 Grade B7 115/125 KSI Min. Tensile Strength for 4" diameter and under. Lug and ring shall be ASTM A36 steel.

2.3.2 Stainless Steel Bolts and Nuts (Where Specified):

(a) Stainless steel flange bolts and nuts shall be in conformity with the current ASTM A193, Grade B8 (AISI 304) 75 KSI Min. Tensile Strength), Class 1 & ASTM A194, Grade 8 (AISI 304) or approved equal.

(b) Stainless steel bolts and nuts for harness flanges and connecting restrained harnesses to flange shall be in conformity with the current ASTM A193, Grade B8 (AISI 304) (Tensile Strength 100/125 KSI, Class 2 and ASTM A194, Grade 8 Strained Hardened (AISI 304) or approved equal.

2.3.3 Corrosion resistant steel (CRS) (For BURIED Piping Installations):

(a) CRS anchor bolts, flange bolts, studs and nuts shall be "Cor-Ten" type steel in conformity with the material characteristics listed in Sec.11-8 of AWWA C111 "Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings", and also in conformity with the ASTM: A242 "High Strength Low-Alloy Structural Steel" Type 1, A588 "High Strength Low-Alloy Structural Steel With 50 KSI Minimum Yield Point" Grade A, or approved equal.

(b) At buried mechanical joints, bolts and nuts shall be in conformity with all of AWWA C111 dimensions and requirements.

(c) Above specified bolts and nuts shall be tension tested for a minimum ultimate tensile stress of 65 ksi using testing procedures corresponding to ASTM A307 requirements, and shall be proof load tested based on 45 ksi stress to AWWA C111 standards.

(d) Bolt heads shall be marked with manufacturer, ASTM material designation/grade, and country where manufactured. Markings shall be raised or depressed.

(e) At buried joint harnesses and restrained harnesses connected to flange, the tie bolts and studs, flange bolts and nuts shall be "Cor-Ten" type steel in conformity with the current ASTM: A325, "Structural Bolts, Steel, Heat Treated, 120/105 KSI Minimum Tensile Strength", Type 3.

(f) Bolt strength shall be adequate to provide compression needed for water tightness of the gasket material used.

2.4 Concrete Anchors

2.4.1 Wedge Anchors:

(a) Manufacturers:

(1) Power-Stud by Powers Fasteners (Rawl).
(2) Kwik Bolt II by Hilti Corp.
(3) Liebig Wedge Anchor by Liebig.
(4) Ankr-Tite Wedge Anchor by Ankr-Tite Fastening Systems.
(5) Wedge-All by Simpson Strong-Tie Co., Inc.

(b) Usage: In concrete:

(1) 316 stainless steel.
(2) Do not use when submerged or subjected to dynamic loads.

2.4.2 Expansion Anchors:

(a) Manufacturers:

(1) Power-Bolt by Powers Fasteners (Rawl).
(2) HSL Heavy Duty Sleeve Anchor by Hilti Corp.
(3) Liebig Anchor by Liebig.

(b) Usage: In concrete:

(1) 316 stainless steel.
(2) Do not use when submerged, in overhead applications, or subjected to dynamic loads.

2.4.3 Undercut Anchors:

(a) Manufacturers:

(1) Maxi-Bolt by Drillco Devices Ltd.
(2) HDA Undercut Anchor by Hilti Corp.
(3) Liebig Ultraplus by Liebig.

(b) Usage: In concrete, overhead applications, and for dynamic loads:

(1) 316 stainless steel.
(2) Do not use when submerged.

2.4.4 Adhesive Anchors:

(a) Manufacturers:

(1) HIT RE 500 Epoxy Adhesive Anchor by Hilti Corp.
(2) AC100 Plus or Power-Fast + by Powers Fasteners (Rawl).
(3) Inject-Tite Two-Part Epoxy by Ankr-Tite Fastening Systems.
(4) ET, SET or ETF Epoxy Adhesive System by Simpson Strong-Tie Co., Inc.

(b) Epoxy adhesive with 316 stainless steel stud assembly.

(c) Usage:

(1) In concrete, submerged.
(2) Do not use in overhead applications.

3. EXECUTION:

3.1 Inspection

3.1.1 Examine conditions under which bolts, anchors, or inserts are to be installed, and notify Engineer in writing of unsatisfactory conditions existing.

3.1.2 Do not proceed with the Work until unsatisfactory conditions or deficiencies have been corrected in a manner acceptable to Engineer.

3.2 Installation of Expansion Anchors and Undercut Anchors

3.2.1 Drilling equipment used and installation of expansion anchors shall be in accordance with manufacturer's instructions.

3.2.2 Torque anchor as specified by manufacturer recommendation. Do not cut reinforcing bars.

3.2.3 Provide embedded items for placement in concrete form work and assure that embedded items are protected from damage and are not filled in with concrete.

3.2.4 Expansion anchors may be used for hanging or supporting pipe 2 inches diameter and smaller.

3.2.5 Expansion anchors shall not be used for larger pipe or supporting vibrating equipment unless otherwise shown or approved by the Engineer.

3.2.6 Unless otherwise shown, anchor design shall be in accordance with ACI 349, Appendix B and approved by Engineer, and in no case shall be less than:

(a) Embedment depth in concrete: 8 diameters.

(b) Anchor spacing on centers: 10 diameters.

(c) Distance to edge of concrete: 1.5 embedment.

(d) Distance to edge of concrete where anchor is loaded in direction of edge: 2.5 embedment.

3.2.7 Undercut Anchors shall be installed in accordance with manufacturer's instructions.

3.3 Cleaning

3.3.1 After embedding concrete is placed, remove protection and clean bolts and inserts.

END OF THIS SECTION

DIVISION 5 - METALS

SECTION 5D – PLANK GRATING

1 GENERAL

1.1 Section Includes

1.1.1 Provide metal plank grating as shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

1.2 Related Sections

1.2.1 Section 3A - Cast-In-Place Concrete.
1.2.2 Section 5C - Bolts, Anchor Bolts, Expansion Anchors and Concrete Inserts.

1.3 References

1.3.1 ASTM B221 – Aluminum Alloy, Extruded Bars, Rods, Wire, Shapes and Tubing.

1.3.2 NAAMM – Metal Bar Grating Manual.

1.4 Design Requirements:

1.4.1 Design Loads:

(a) 300 psf uniform live load.
(b) 1000 lbs moving concentrated live load.

1.4.2 1/4 in. max deflection under 100 psf uniform live load.

1.5 Submittals

1.5.1 Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1.5.2 Submit Product Data.

1.5.3 Shop drawings shall be approved prior to fabrication.

1.6 Quality Assurance

1.6.1 Grating shall be end product of one manufacturer to achieve standardization of appearance.

1.6.2 Conform to Metal Bar Grating Manual and NAAMM requirements.

1.7 Field Measurements

1.7.1 Verify that field measurements are as indicated on shop drawings and in accordance with manufacturers' recommendations.

1.8 Basis of Payment

1.8.1 The work shall be paid as part of the Contract lump sum price for PUMP STATION GENERAL WORK which shall be payment in full for the work described herein.

2. **PRODUCTS**

2.1 GENERAL

2.1.1 Provide shop-fabricated grating and accessories such as frames, support angles, and fasteners.

2.1.2 Grating shall be aluminum alloy 6061-T6 or 6063-T6 unpunched panels with raised longitudinal ridges for skid resistance.

2.1.3 Provide fastening devices to firmly anchor grating and treads to supports. Sections designated as removable shall not be attached to supports.

(a) Min of 4 per panel.
(b) Shall allow for repeated removal.
(c) Min 1/4 in. bolts or self tapping screws.
(d) 316 stainless steel.

2.1.4 Provide trim banding or load carrying banding on edges and cutouts welded to grating.

2.1.5 Panels shall bear on supports a min of 1-1/2 in.

2.1.6 Bolt or nest individual sections together to form larger panels.

2.1.7 Minimum width of panels shall be 16 in. except for locations requiring a single piece.

2.1.8 Max width of panels shall be 48 in.

2.1.9 Grating supports shall conform to requirements of Section 5C.

2.2 Aluminum grating

2.2.1 Manufacturers:

(a) IKG/Borden, Aluminum Plank.
(b) Ohio Grating, Aluminum Plank.

3. **EXECUTION**

3.1 Surface conditions

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

3.2 Installation

3.2.1 Install in accordance with manufacturer's written instructions.

3.2.2 Clearances:

(a) 1/4 in. max from metal sections.
(b) 1/4 in. max between sections.

END OF SECTION

DIVISION 6 - CARPENTRY

SECTION 6A - ROUGH CARPENTRY

1. GENERAL:

1.1 Section Includes

1.1.1 Wood nailers at parapet

1.1.2 Blocking and cant strip at roof system

1.1.3 Other miscellaneous wood blocking as required or as noted.

1.1.4 Shoring and temporary protection.

1.2 Related Sections

1.2.1 Section 7A - Elastomeric Membrane Roofing

1.3 References

1.3.1 ASTM A525 Standard Specification for Steel Sheet, Zinc Coated (Galvanized) by the Hot-dip Process.

1.3.2 ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3.3 Federal Specifications (FS):

(a) FF-B-575C - Bolts, Hexagon and Square.
(b) FF-N-105B - Nails, Brads, Staples, and Spikes.
(c) FF-N-836D - Nut, Square, Hexagon, Cap, Slotted, Castle.

(d) FF-S-111D - Screw, Wood.

1.4 Quality Assurance

1.4.1 Grading Rules:

(a) Lumber Grading Rules and wood species shall conform with Voluntary Product Standard PS20. Grading rules of the following associations shall also apply to materials produced under their supervision.

(1) Northeastern Lumber Manufacturers Association, Inc. (NELMA).
(2) Southern Pine Inspection Bureau (SPIB).

(3) West Coast Lumber Inspection Bureau (WCLIB).
(4) Western Wood Products Association ((WWPA).

1.4.2 Grade Marks: Identify all lumber by official grade mark.

(a) Lumber: Grade stamp to contain symbol of grading agency, mill number or name, grade of lumber, species or species grouping or combination designation, rules under which graded, where applicable and condition of seasoning at time of manufacture.

(1) S-Dry: Maximum 19 percent moisture content.
(2) MC-5 or KD: Maximum 15 percent moisture content.
(3) Dense.

1.5 Submittals

1.5.1 Submit under provisions of Division 1.

1.5.2 Rough Carpentry: Submit certification that lumber and connection material conforms to specified minimum grade.

1.6 Delivery, Storage, and Handling

1.6.1 Deliver, store, protect and handle products to site under provisions of Division 1 and in accordance with the manufacturer's instructions.

1.7 Basis of Payment

1.7.1 Payment for work specified under this Section and as required shall be included in the Contract lump sum price for the Item, PUMP STATION GENERAL WORK.

2. MATERIALS:

2.1 Blocking, nailing, etc. shall be construction grade douglas fir, hem-fir, or No. 1 common southern pine.

2.2 Fasteners for wood nailers for roofing, shall be not less than 4.76 mm (3/16-inch) diameter stainless steel, zinc coated steel, or equivalent zinc-coated wire anchors, spaced 24 inches on center.

2.3 Pressure treatment of wood shall comply with applicable requirements of AWPA C1, C2, and C9. Preservative shall be CA-B (Copper Azole Type B) minimum retention of 0.25. After treatment, kiln-dry lumber to maximum moisture content of 19%.

2.4 Blocking, nailers and other items, whether or not covered by other materials, shall be pressure treated.

2.5 Wood members in connection with roofing and flashing shall be pressure treated.

2.6 Lumber for temporary protection shall be southern yellow pine and an exterior type, Grade C, plugged fir plywood.

2.7 Anchors, connectors, and fastenings, not indicated or specified otherwise, shall be of the type, size, and spacing necessary to suit the conditions encountered and as recommended by the National Lumber Manufacturer's Association. Sizes, types, and spacing of nails, screws, or bolts for installation of manufactured building materials, shall be as recommended by the product manufacturer unless indicated or specified otherwise; bolts, nuts, washers, and all other rough hardware embedded in, or in contact with, exterior walls shall be zinc-coated, except as specified otherwise. Rough hardware shall be formed and punched before coating.

3. EXECUTION:

3.1 Members shall be closely fitted, accurately set to required lines and levels, and rigidly secured in place. Provide blocking where indicated and as necessary to secure the work.

3.2 All field-cut edges and surfaces of treated lumber shall be liberally coated with a concentrated solution of preservative.

3.3 Delivery and Storage

3.3.1 Protect lumber against dampness before and after delivery. Store under cover in a well ventilated area and where not exposed to extreme changes in temperature or humidity until used.

END OF THIS SECTION

DIVISION 7 - THERMAL MOISTURE PROTECTION

SECTION 7A - ELASTOMERIC MEMBRANE ROOFING

1. GENERAL:

1.1 Section Includes

1.1.1 Fully adhered elastomeric 60 mil sheet membrane roofing over insulation.

1.1.2 Flexible flashings and base flashings around all openings and roof edge terminations as required by all trades.

1.1.3 Membrane terminations.

1.2 Related Sections

1.2.1 Section 3A - Cast-in-Place Concrete.

1.2.2 Section 6A - Rough Carpentry.

1.2.3 Section 7B - Sheet Metal Flashing and Trim.

1.2.4 Section 7C – Joint Sealers

1.2.5 Section 7D – Board Insulation

1.3 References

1.3.1 ASTM C1289 – Faced Rigid Cellular Polyisocyanurate Insulating Board.

1.3.2 ASTM C1621 - Compressive Properties of Rigid Cellular Plastics.

1.3.3 ASTM D2842 - Water Absorption of Rigid Cellular Plastics.

1.3.1 ASTM D412 - Rubber Properties in Tension.

1.3.2 ASTM D746 - Brittleness Temperatures of plastics and Elastomers by Impact.

1.3.3 ASTM D624 - Rubber Property-Tear Resistance.

1.3.4 ASTM D822 - Practice for Operating Light-and-Water-Exposure Apparatus (Carbon-Arc Type) for Testing Paint, Varnish, Lacquer, and Related Products.

1.3.5 ASTM D1004 - Initial Tear Resistance of Plastic Film and Sheeting.

1.3.6 ASTM D2240 - Rubber Property - Durometer Hardness.

1.3.7 ASTM E96 - Water Vapor Transmission of Materials.

1.3.8 NRCA (National Roofing Contractors Association) - Roofing and Waterproofing Manual.

1.3.9 ULI - Fire Hazard Classifications.

1.4 System Description

1.4.1 Elastomeric sheet membrane roof assembly to conform to UL requirements for a Class A rated assembly, and I-90 requirements for wind uplift resistance.

1.5 Submittals

1.5.1 Submittals: Procedures for submittals as specified in Division 1.

1.5.2 Shop Drawings:

(a) Roof Plan (use 1/4" = 1'-0"): Submit general roof plan showing tapered insulation plan, which includes all valleys, ridges, slopes, saddles and crickets, roof walkway pads, and general drainage pattern based on tapered insulation.

(b) Detail Drawings (use 1-1/2" = 1'-0"): Submit shop drawings detailing base flashings, roof edge termination flashings, reglets, membrane terminations, roof drains, roof projection flashings, roof hatch flashings.

1.5.3 Samples: Submit samples for the following items:

EPDM Membrane: 8"x10", 3 pieces.
Termination bars: 2 pieces.
Rigid insulation board: 8"x10", 3 pieces.

1.5.4 Product Data:

(a) Provide product data for sheet membrane, elastic flashing, joint cover sheet, and joint and crack sealants, with temperature range for application of membrane.
(b) Rigid insulation board(s).

1.5.5 Manufacturer's Installation Instructions: Provide manufacturer's instructions for a fully adhered membrane roof system, and indicate special precautions required for seaming the membrane; include installation instructions for roofing rigid insulation board.

1.5.6 Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.5.7 Manufacturer's Field Reports: Submit under provisions of Division 1.

1.5.8 Reports: Indicate procedures followed, ambient temperatures, and wind velocity during application.

1.6 Quality Assurance

1.6.1 Perform Work in accordance with NRCA Roofing and Waterproofing Manual and manufacturer's instructions.

1.7 Qualifications

1.7.1 Manufacturer: Company specializing in manufacturing the products specified in this section with ten years documented experience.

1.7.2 Applicator: Company specializing in performing the work of this section with ten years documented experience and approved by system manufacturer.

1.8 Regulatory Requirements

1.8.1 Conform to applicable code for roof assembly fire hazard requirements.

1.8.2 ULI: Class A Fire Hazard Classification.

1.9 Delivery, Storage, and Handling

1.9.1 Deliver products in manufacturer's original containers, dry, undamaged, seals and labels intact.

1.9.2 Store products in weather protected environment, clear of ground and moisture.

1.9.3 Stand roll materials on end.

1.10 Environmental Requirements

1.10.1 Do not apply roofing membrane during inclement weather or when air temperature is below 40 degrees F and in accordance with manufacturer's instructions.

1.10.2 Do not apply roofing membrane to damp or frozen deck surface.

1.10.3 Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

1.11 Coordination

1.11.1 Coordinate the work with installing associated flashing as the work of this section proceeds.

1.12 Warranty

1.12.1 Provide 20 year "No Dollar Limit" complete system Roofing System warranty under provisions of Division 1.

(a) The Manufacturer warrants to the OWNER that, subject to the provisions of this document, the Manufacturer will, at its own expense, make or cause to be made all repairs necessary to maintain the roofing system in a watertight condition during the twenty year period. System includes:

1) Vapor barrier.
2) Insulation.
3) Membrane.
4) Flashings.
5) Fasteners and adhesives.
6) Sheet metal components.

1.12.2 Roof shall be warranted for a wind speed (maximum peak gusts) of 90 mph.

1.13 Basis of Payment

1.13.1 Payment for the work specified under this Section and as required shall be included in the Contract lump sum price for the Item, PUMP STATION GENERAL WORK.

2. PRODUCTS:

2.1 Manufacturers - Membrane Brand - Membrane System (fully adhered type)

2.1.1 Carlisle SynTec Systems: - Sure-Seal.

2.1.2 Firestone Building Products Co.: - Rubbergard EPDM.

2.1.2 Substitutions: Under provisions of Division 1.

2.2 Membrane System

2.2.1 Fully adhered 0.060 inch (60 mil) thick EPDM system.

2.3 Sheet Materials

2.3.1 Sheet: 60 mil thick EPDM membrane:

Properties	Test	Results
Tensile Test	ASTM D412	1300 psi
Elongation	ASTM D412	350%
Tear Strength	ASTM D624	175 psi
Water Absorption	ASTM D471	4%
Moisture Vapor-perms	ASTM E96	20
Low Temperature Brittleness	ASTM D746	-75 F
Resistance to Ozone	ASTM D1149	No cracks

2.3.2 Manufacturer's 5" wide (minimum), pressure sensitive, self-adhering EPDM seam cover and as recommended by Manufacturer.

2.3.3 Manufacturer shall guaranty membrane over insulation.

2.4 Base and Flexible Flashing

2.4.1 Sheet: 60 mil thick EPDM; perm rating of 0.5 maximum; tensile strength of 1200 psi elasticity of 50 percent with full recovery without set; black color; manufactured by membrane manufacturer.

2.5 Vapor Retarder Materials

2.5.1 Fire Retardant Sheet Vapor Retarder: UL requirements; plastic sheet; manufactured by membrane manufacturer, including compatible fire retardant adhesive.

2.6 Accessories

2.6.1 Sealants: As recommended by membrane manufacturer.

2.6.2 Reglet Strip Devices: 16 oz. Copper or as recommended by Manufacturer.

2.7 Manufacturers - Roofing Insulation Materials

2.7.1 Firestone Building Products Co.

2.7.2 Atlas Roofing Corporation.

2.7.3 Apache ISO Products, LLC.

2.7.4 Substitutions: Under provisions of Division 1.

2.8 Insulation Materials

2.8.1 Polyisocyanurate rigid insulation and polyisocyanurate insulation board with cellulosic fiber insulation board overlay (sandwich/composite construction); Flat and tapered board insulation, 1/4-inch/ft. taper, with the following characteristics:

Polyisocyanurate board:

(a) Board Density: 2.0 lb/cu ft.

(b) Thermal Resistance: R-value of 6 per inch.

(c) Compressive Strength: 20 psi minimum per ASTM D1621.

(d) Water Absorption: In accordance with ASTM C2842, less than 1.5 percent by volume maximum.

(e) Board Edges: Ship lapped.

(f) Board Thickness: As required to achieve an average R-value of 19.0.

Overlay boards(s):

(a) 2" high density fiberboard: R-value of 1.39 per 2" per ASTM C208.

(b) Gypsum decking overlay (if required): R-value of 1.12 per 1" per ASTM C1177.

2.9 Protection Boards:

2.9.1 All polyisocyanurate in contact with concrete roof deck and membrane roofing shall be overlaid (or composite sandwich construction) with 2" High Density fiberboard. Note: several manufacturers may require gypsum overlay when used with fully adhered.

2.10 Adhesive Materials

2.10.1 Adhesive: Type recommended by insulation manufacturer for application that provides a fully adhered system.

2.11 Components and Accessories

2.11.1 Crickets & Saddles: Slope 1/4"/ft.

2.11.2 Protective Boards: see item 2.9.

2.11.3 Underlayment: see item 2.9 & 2.10.

2.11.4 Wood Nailers: Coordinate and specify thickness of wood blocking to be equal to the thickness of all layers of insulation and protection board at all locations. Coordinate with Division 6A Rough Carpentry.

2.11.5 Termination Bar:

(a) 1/8" x 1 1/2" aluminum or stainless steel bar with 45 degree sealant pocket where space permits.

(b) 1/8" x 1" aluminum or stainless steel bar under counter flashing or other restricted areas.

2.11.6 Metal Flashings: Coordinate with Section 7B Sheet Metal Flashing and Trim.

2.11.7 Sealants: Coordinate with Section 7C Joint Sealers.

2.11.8 Top Surface Reflective Coating

(a) Coating: An acrylic based coating consisting of primer and finish coats as recommended by manufacturer for a reflective roof coating. Acrylic coating shall be in a white or light color as selected by Owner or Engineer from manufacturer’s standard available colors.

3. EXECUTION:

3.1 Examination

3.1.1 Verify that surfaces and site conditions are ready to receive work.
3.1.2 Verify deck is supported and secured.
3.1.3 Verify deck is clean and smooth, free of depressions, waves, or projections, and properly sloped to drains.
3.1.4 Verify deck surfaces are dry and free of snow or ice.
3.1.5 Beginning of installation means acceptance of the surface of the substrate.
3.1.6 Comply with manufacturer’s climatic restrictions.

3.2 Preparation

3.2.1 Fill concrete surface honeycomb and variations with latex filler.

3.2.2 Verify that all work of other trades which penetrates and modifies the roof deck or requires workmen and equipment to traverse the roof deck has been completed.

3.3 Roof Insulation Installation

3.3.1 Lay underlayment and bottom layer of insulation in accordance with manufacturer's instructions.

3.3.2 Adhere insulation with a bonding mastic or adhesive between concrete roof surface and insulation system, and between successive insulation boards in accordance with manufacturer's recommendations and instructions. Ensure compatibility of adhered insulation method(s) and bonding adhesive to the EPDM membrane system.

3.3.3 Lay insulation in parallel course with all joints staggered between courses and each course firmly adhered to deck.

3.3.4 Where more than one layer of insulation is required, stagger joints where possible in relation with the layer beneath and firmly adhere each layer to the previous layer.

3.3.5 Lay insulation boards to moderate contact without forcing joints. Cut insulation to fit neatly to perimeter blocking and protrusions through roof.

3.3.6 Miter cut all valleys.

3.3.7 Place fiberboard or other protective covering as the top surface that meets the EPDM membrane roofing system or as required by roofing manufacturer.

3.4 Membrane Application

3.4.1 Install membrane roofing in accordance with membrane manufacturer's instructions for a fully adhered membrane system using manufacturer's recommended bonding adhesive.

3.4.2 Overlap edges and ends minimum 4 inches and adhesive seal. Apply uniform bead sealant to joint edge.

3.4.3 Centered over all field seams, apply a minimum 5" wide strip of pressure sensitive, self adhering EPDM.

3.4.4 Shingle joints on sloped substrate in direction of drainage.

3.4.5 Minimize wrinkles and bubbles.

3.4.6 Seal adjoining surfaces.

3.4.7 Continue membrane up vertical surfaces minimum 8 inches unless otherwise noted.

3.4.8 Install membrane flashings. Seal watertight to membrane.

3.4.9 Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or moving.

3.4.10 Apply roof control and expansion joint materials to isolate roof into areas per manufacturer's recommendations. Seal roofing membrane sheet to joint flange; apply sealant to edge or seam.

3.4.11 Place traffic surfacing (roof walkway pads) at locations noted.

3.4.12 Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

3.5 Flashing and Accessories

3.5.1 Apply membrane base flashing to seal membrane to vertical elements.

3.5.2 Coordinate installation of roof drains, roof hatches, roof handrailing, and related flashing.

3.5.3 Seal flashing and flanges of items penetrating membrane.

3.5.4 Apply protective coating to exposed membrane surfaces and base flashing in accordance with manufacturer's instructions.

3.6 Field Quality Control

3.6.1 Field inspection will be performed under provisions of Division 1.

3.6.2 Correct identified defects or irregularities.

3.6.3 Request site attendance of roofing and insulation materials manufacturers during installation of the Work.

3.6.4 Inspection shall be performed by manufacturer of roofing system for compliance to the Work of this Section. The manufacturer shall certify the installation is complete and in accordance with the manufacturer's requirements for optimal roof life.

3.7 Cleaning

3.7.1 Remove and legally dispose of all debris from the job site.

3.7.2 In areas where finished surfaces are soiled by work of this Section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.

3.7.3 Repair or replace defaced or disfigured finishes caused by work of this Section.

3.8 Protection

3.8.1 Protect building surfaces against damage from roofing work.

3.8.2 Where traffic must continue over finished roof membrane, protect surfaces.

END OF THIS SECTION

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

SECTION 7B - SHEET METAL FLASHING AND TRIM

1. GENERAL:

1.1 Section Includes

1.1.1 Metal flashings.

1.1.2 Exposed trims, coping and fascias.

1.1.3 Scuppers, downspouts, and accessories.

1.2 Related Sections

1.2.1 Section 3A - Cast-In-Place Concrete.
1.2.2 Section 4A – Unit Masonry.
1.2.3 Section 5B – Metal Fabrications
1.2.4 Section 6A – Rough Carpentry
1.2.5 Section 7A - Elastomeric Membrane Roofing.
1.2.6 Section 7C - Joint Sealers.
1.2.7 Section 15A - General Mechanical Provisions.

1.3 References

1.3.1 AISI (American Iron and Steel Institute) - Stainless Steel Uses in Architecture.

1.3.2 ASTM A167 - Stainless and Heat-Resisting Chromium- Nickel Steel Plate.

1.3.3 ASTM B32 - Solder Metal.

1.3.4 FS O-F-506 - Flux, Soldering, Paste and Liquid.

1.3.5 FS QQ-S-571 - Solder, Tin Alloy.

1.3.6 NAAMM - Metal Finishes Handbook.

1.3.7 NRCA (National Roofing Contractors Association) - Roofing Manual.

1.3.8 SMACNA - Architectural Sheet Metal Manual.

1.3.9 ASTM A240 - Heat-resisting, Chromium & Chromium-Nickel Stainless Steel Plate, Sheet, and Strip.

1.4 Submittals

1.4.1 Submit under provisions of Division 1.

1.4.2 Shop Drawings: Provide manufacturer's for fabricators detail drawings showing:

(a) Scuppers and downspouts
(b) Coping
(c) Flashing and counterflashing
(d) All associated accessories

The drawings and manufacturer's product data shall indicate type of material(s) used, material profile, jointing pattern, jointing details, fastening methods, flashing, terminations, and installation details.

1.4.3 Samples: Submit two samples 12" (300 mm) long of each type of metal coping, downspouts, flashing, and accessories illustrating typical material, and finish.

1.5 Qualifications

1.5.1 Fabricator and Installer: Company specializing in sheet metal flashing work with 5 years minimum experience.

1.6 Delivery, Storage and Handling

1.6.1 Deliver, store, protect, and handle products to site under provisions of Division 1.

1.6.2 Stack preformed material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

1.6.3 Prevent contact with materials during storage which may cause discoloration, staining, or damage.

1.7 Basis of Payment

1.7.1 Payment for the work specified under this Section and as required shall be included in the Contract lump sum price for the Item, PUMP STATION GENERAL WORK.

2. PRODUCTS:

2.1 Manufacturers

2.1.1 Stainless Steel Flashing Trim and Coping: Through wall, base, lintel, sill, cap and coping; Brake formed to required profiles.

2.1.2 Scuppers and downspouts: Stainless Steel- brake formed to required profiles.

2.1.3 Substitutions: Under provisions of Division 1.

2.2 Sheet Materials

2.2.1 Stainless Steel: ASTM A240, type 304, 20 gauge, architectural grade alloy, finish 2B.

2.3 Accessories and Components

2.3.1 Fastener: Same material and finish as flashing metal with soft neoprene washers at exposed fasteners.
2.3.2 Underlayment: 6 mil polyethylene.
2.3.3 Slip Sheet: Rosin sized building paper.
2.3.4 Sealant: Type specified in Section 7D.
2.3.5 Solder: ASTM B32; 50/50 type.
2.3.6 Flux: FS O-F-506.
2.3.7 Scupper: Stainless Steel. Fabricate to dimensions as shown on drawings.
2.3.8 Downspout: Stainless Steel. Fabricate to 3” x 4” rectangular profile.
2.3.9 Splash Pads: Precast concrete type: minimum 3000psi at 28 days, with minimum 5 percent air entrainment.

2.4 Fabrication

2.4.1 Form sections true to shape, accurate in size, square, and free from distortion or defects. Form scupper and downspout sections to sizes as shown on drawings. Downspout shall be rectangular 3”x4” profile.

2.4.2 Fabricate cleats, hold-down clips, and starter strips of same material as sheet, minimum 50 mm (2 inches) wide, interlockable with sheet.

2.4.3 Form pieces in longest practical lengths.

2.4.4 Hem exposed edges on underside 13 mm (1/2 inch); miter and seam corners.

2.4.5 Form material with flat lock seam.

2.4.6 Solder and seal metal joints. After soldering, remove flux. Wipe and wash solder joints clean.

2.4.7 Fabricate corners from one piece with minimum 406 mm (16 inch) long legs; solder for rigidity, seal with sealant.

2.4.8 Fabricate vertical faces with bottom edge formed outward 6.3 mm (1/4 inch) and hemmed 45^{o} to form drip.

2.4.9 Fabricate flashing to allow toe to extend 50 mm (2 inches) over roofing. Return and brake edges.

3. EXECUTION:

3.1 Examination

3.1.1 Verify roof openings, pipes, or vents through roof are solidly set and nailing strips located.

3.1.2 Verify roofing termination and base flashing are in place, sealed, and secure.

3.2 Preparation

3.2.1 Install starter and edge strips, and cleats before starting installation.

3.2.2 Field measure site conditions prior to fabricating work.

3.3 Installation

3.3.1 Secure flashing in place using concealed fasteners. Use exposed fasteners only in locations approved by Engineer.
3.3.2 Lap, Cleat and seal all joints.
3.3.3 Fit flashing tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
3.3.4 Solder metal joints for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.
3.3.5 Seal metal joints watertight.
3.3.6 Secure scuppers and downspouts in place using concealed fasteners where applicable.
3.3.7 Set concrete splash pads under downspouts.

3.4 Field Quality Control

3.4.1 Field inspection will be performed under provisions of Division 1.

3.4.2 Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF THIS SECTION

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

SECTION 7C - JOINT SEALERS

1. GENERAL:

1.1 Section Includes

1.1.1 Preparing sealant substrate surfaces.

1.1.2 Sealant and backing.

1.2 Related Sections

1.2.1 Section 3A - Cast-In-Place Concrete.

1.2.2 Section 4A – Unit Masonry

1.2.3 Section 7A – Elastomeric Membrane Roofing

1.2.4 Section 7B - Sheet Metal Flashing and Trim: Sealants used in conjunction with metal flashings.

1.2.5 Section 8A - Aluminum Doors and Frames.

1.2.6 Section 10A – Specialties.

1.3 References

1.3.1 ASTM C804 – Use of Solvent-Release Type Sealants.
1.3.2 ASTM C920 - Elastomeric Joint Sealants.
1.3.3 ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.
1.3.4 FS TT-S-00227 - Sealing Compound: Elastomeric Type, Multi-Component.
1.3.5 FS TT-S-001543 - Sealing Compound, Silicone Rubber Base.
1.3.6 SWRI (Sealing, Waterproofing, and Restoration Institute) - Sealant and Caulking Guide Specification.

1.4 Submittals

1.4.1 Submit under provisions of Division 1.

1.4.2 Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.

1.4.3 Samples: Submit two samples 4 x 1/2 inches (102 mm x 13 mm) in size illustrating color for selection.

1.4.4 Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, and perimeter conditions requiring special attention.

1.4.5 Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.5 Quality Assurance

1.5.1 Perform work in accordance with SWRI requirements for materials and installation.

1.6 Qualifications

1.6.1 Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum 10 years documented experience.

1.6.2 Applicator: Company specializing in performing the work of this section with minimum 5 years documented experience.

1.7 Environmental Requirements

1.7.1 Do not install solvent curing sealants in enclosed building spaces without providing adequate ventilation.

1.7.2 Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.8 Coordination

1.8.1 Coordinate work under provisions of Division 1.

1.8.2 Coordinate the work with all sections referencing this section.

1.9 Basis of Payment

1.9.1 Payment for the work specified under this Section and as required shall be included in the Contract lump sum price for the Item, PUMP STATION GENERAL WORK.

2. PRODUCTS:

2.1 Sealants

2.1.1 Silicone Sealant: ASTM C920, Type S, Grade NS, Class 25 (100/50), Use NT, M, G, A, O; single component, moisture curing, low modulus type; colors to be selected by Engineer from manufacturer's standard color selection (see schedule below); product: Spectrem 1 manufactured by Tremco.

Color Schedule:

(a) Exterior wall joints: match mortar joint color.
(b) Sheet metal coping: match sheet metal color
(c) Exterior louvers, etc: match louver, equipment color(s)
(d) Other surfaces: match substrate color as approved by Engineer

2.2 Accessories

2.2.1 Primer: Non-staining type, recommended by sealant manufacturer to suit application.

2.2.2 Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

2.2.3 Joint Backing: ASTM D1056; round, closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width.

2.2.4 Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

2.2.5 Bituminous and Fiber Joint Filler: ASTM D1751 or FS HH-F-341.

3. EXECUTION:

3.1 Examination

3.1.1 Verify that substrate surfaces and joint openings are ready to receive work and field measurements are as shown on Drawings and recommended by the manufacturer.

3.1.2 Verify that joint backing and release tapes are compatible with sealant.

3.2 Preparation

3.2.1 Remove loose materials and foreign matter which might impair adhesion of sealant.

3.2.2 Clean and prime joints in accordance with manufacturer's instructions.

3.2.3 Perform preparation in accordance with ASTM C804 for solvent release sealants.

3.2.4 Protect elements surrounding the work of this section from damage or disfiguration.

3.3 Installation

3.3.1 Install sealant in accordance with manufacturer's instructions.
3.3.2 Measure joint dimensions and size materials to achieve required width/depth ratios.
3.3.3 Install joint backing to achieve a neck dimension no greater than 1/3 the joint width.
3.3.4 Install bond breaker where joint backing is not used.
3.3.5 Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
3.3.6 Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
3.3.7 Tool joints concave.

3.4 Cleaning and Repairing

3.4.1 Clean work under provisions of Division 1.

3.4.2 Clean adjacent soiled surfaces.

3.4.3 Repair or replace defaced or disfigured finishes caused by work of this Section.

3.5 Protection of Finished Work

3.5.1 Protect finished installation under provisions of Division 1.

3.5.2 Protect sealants until cured.

END OF THIS SECTION

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

SECTION 7D - BOARD INSULATION

1. GENERAL:

1.1 Section Includes

1.1.1 Board insulation between structures.
1.1.2 Fiberglass wall panel with 2” insulation for concrete walls.

1.2 Related Section

1.2.1 Section 3A - Cast-In-Place Concrete.

1.3 References

1.3.1 ASTM C272 - Water Absorption of Core Materials for Structural Sandwich Constructions.
1.3.2 ASTM C578 - Rigid Cellular Polystyrene Thermal Insulation.
1.3.3 ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.
1.3.4 ASTM C1621 - Compressive Properties of Rigid Cellular Plastics.
1.3.5 ASTM D1622 - Apparent Density of Rigid Cellular Plastics.
1.3.6 ASTM D2126 - Response of Rigid Cellular Plastics to Thermal and Humid Aging.
1.3.7 ASTM D2842 - Water Absorption of Rigid Cellular Plastics.
1.3.8 ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
1.3.9 ASTM E96 - Test Methods for Water Vapor Transmission of Materials.

1.4 System Description

1.4.1 Materials of this Section shall provide a continuous thermal barrier at building enclosure elements.

1.5 Submittals

1.5.1 Submit under provisions of Division 1.

1.5.2 Product Data: Provide data on product characteristics, performance criteria, and limitations.

1.5.3 Manufacturer's Installation Instructions: Indicate special environmental conditions required for installation and installation techniques.

1.5.4 Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.6 Delivery, Storage, and Protection

1.6.1 Deliver, store, protect and handle products to site under provisions of Division 1 and in accordance with the manufacturer's instructions.

1.7 Environmental Requirements

1.7.1 Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

1.8 Basis of Payment

1.8.1 Payment for the work specified under this Section and as required shall be included in the Contract lump sum price for PUMP STATION GENERAL WORK.

2. PRODUCTS:

2.1 Manufacturers - Insulation Materials

2.1.1 The Dow Chemical Company: Styrofoam.

2.1.2 Substitutions: Under provisions of Division 1.

2.2 Insulation Materials

2.2.1 Extruded Polystyrene Insulation: ASTM C578 Type IV; cellular type, conforming to the following:

(a) Thermal Resistance: R-value of 5 per inch.
(b) Compressive Strength: 25 psi minimum per ASTM D1621.
(c) Water Absorption: In accordance with ASTM C2842, less than 0.1 percent by volume maximum.
(d) Board Edges: Square.

2.3 Adhesive Materials

2.3.1 Adhesive: Type recommended by insulation manufacturer for application.

2.4 Accessories

2.4.1 A ½" or 5/8" fiber board for protection of rigid insulation surfaces.

2.4.2 Nails or Staples: Steel wire; galvanized; type and size to suit application.

2.4.3 Insulation Fasteners: Impale clip type of galvanized steel; of type to be mechanically fastened to surface to receive rigid insulation; length to suit insulation thickness; capable of securely and rigidly fastening insulation in place.

2.5 Fiberglass wall panel

2.5.1 Fiberglass reinforced plastic panel with 2" thick board insulation.

2.5.2 Board insulation shall be extruded polystyrene as specified herein.

2.5.3 Fiberglass panel shall be minimum 0.09 inch thick with embossed surface, Class A fire rating, and color as selected by Owner.

2.5.4 Manufacturer's recommendation adhesive, mechanical anchors, joint, end, and corner molding, sealant, and other accessories for insulation application.

2.5.5 Acceptable manufacturer: Glasboard by Crane Kemlite.

3. EXECUTION:

3.1 Examination

3.1.1 Verify substrate and adjacent materials and insulation boards are dry and ready to receive insulation and adhesive.

3.1.2 Verify substrate surface is flat, free of honeycomb, fins, irregularities and materials that may impede adhesive bond.

3.1.3 Verify insulation boards are unbroken, free of damage.

3.2 Installation – Extruded polystyrene board

3.2.1 Extruded polystyrene insulation to be installed where shown on the drawings, in accordance with manufacturer's instructions.

3.2.2 Place boards in method to maximize contact bedding. Stagger side and end joints with edges butted tightly.

3.2.3 Cut and fit boards tightly around penetrations and other openings as required.

3.2.4 Perimeter insulation shall be set in adhesive applied to foundation wall in accordance with manufacturer's recommendations.

3.3 Installation – Fiberglass wall panel

3.3.1 FRP wall panel with 2" insulation to be installed where shown on the drawings, in accordance with manufacturer's instructions.

3.3.2 Place panels in method to maximize contact bedding.

3.3.3 Cut and fit panels tightly around penetrations and other openings as required.

3.3.4 Insulation shall be set in adhesive applied to concrete and attach FRP panels to the insulation in accordance with manufacturer's recommendations.

3.3.5 Install molding along corners, edges, and seams as recommended by manufacturer to achieve finished system with no insulation exposed.

3.3.6 Seal joints as recommended by manufacturer.

3.3 Protection of Finished Work

3.3.1 Protect finished work under provisions of Division 1.

3.3.2 Do not permit work to be damaged prior to covering insulation.

END OF THIS SECTION

DIVISION 8 - DOORS AND WINDOWS

SECTION 8A - ALUMINUM DOORS AND FRAMES

1. GENERAL:

1.1 Section Includes

1.1.1 Aluminum flush doors and frames.

1.2 System description

1.2.1 Design and fabricate exterior assemblies to comply with requirements for system performance characteristics listed below as demonstrated by testing manufacturer's corresponding stock systems according to test methods designated.

1.2.2 Thermal Movement: Allow for expansion and contraction resulting from ambient temperature range of 120°F.

1.2.3 Wind Loading: Provide capacity to withstand uniform pressure of 20 psf inward and 20 psf outward loading tested in accordance with ASTM E330.

1.2.4 Transmission Characteristics of Assemblies: Provide exterior doors with jamb and head frames complying with requirements indicated below for transmission characteristics and test methods.

(a) Air Leakage: Air infiltration/lin ft of perimeter crack of not more than 0.50 cfm for single doors and 1.0 cfm for pairs of doors per ASTM E283 at pressure differential of 1.567 psf.
(b) Condensation Resistance: Not less than 48 crf per AAMA 1502.7.
(c) Thermal Transmittance: U-value of not more than 0.93 Btu/(hr/sq ft/°F) per AAMA 1503.1.

1.3 Related Section

1.3.1 Section 3A – Cast-In-Place Concrete.

1.3.2 Section 5B - Metal Fabrications.

1.3.3 Section 8B - Door Hardware.

1.3.4 Section 15A - General Mechanical Provisions: Louver and Damper coordination.

1.4 References

1.3.1 ANSI/ASTM B209 - Aluminum and Aluminum - Alloy Sheet and Plate.

1.3.2 ANSI/ASTM B221 - Aluminum - Alloy Extruded Bar, Rod, Wire, Shape and Tube.

1.5 Submittals

1.5.1 Submit under provisions of Division 1.

1.5.2 Shop Drawings: In addition to requirements below, provide a schedule of doors and frames using same reference numbers for details and openings as those on Drawings:

(a) Elevations of each door design.
(b) Details of doors, including vertical and horizontal edge details.
(c) Frame details for each frame type, including dimensioned profiles.
(d) Details and locations of reinforcement and preparations for hardware.
(e) Details of each different wall opening condition.
(f) Details of anchorages, accessories, joints, and connections.
(g) Details of glazing frames and stops showing glazing.

1.5.3 Manufacturer's Installation Instructions: Indicate special installation instructions.

1.5.4 Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.6 Qualifications

1.6.1 Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum ten years documented experience.

1.7 Delivery, Storage and Protection

1.7.1 Deliver, store, protect and handle products to site under provisions of Division 1.

1.7.2 Provide strippable coating to protect pre-finished aluminum surfaces.

1.8 Basis of Payment

1.8.1 Payment for the work specified under this Section and as required shall be included in the Contract lump sum price for the Item, PUMP STATION GENERAL WORK.

2. PRODUCTS:

2.1 Manufacturers

2.1.1 Cross Aluminum Products, Inc.
2.1.2 United States Metals & Manufacturing Corp.
2.1.3 Kawneer Company, Inc.
2.1.4 Special Lite, Inc.
2.1.5 Substitutions: Under provisions of Division 1.

2.2 Materials

2.2.1 Extruded Aluminum: ANSI/ASTM B221; 6063-T5 alloy.

2.2.2 Sheet Aluminum: ASTM B209; 5005 - H134 alloy.

2.2.3 Fasteners: Stainless steel.

2.3 Doors and Frames

2.3.1 Doors: 1-3/4 inches thick, full flush, tubular aluminum jamb rails, tubular grid sections with 0.090 inch thickness face sheet with vertical rib.

2.3.2 Frames: 0.125 inch minimum wall thickness, extruded aluminum. Frame tubular cross-section dimensions: head and jambs shall be nominal 2 inches deep; width shall be as indicated on drawings.

2.3.3 Insulated Panel: Construction of insulated panel (adjacent to louver and damper in door transom area) to match door construction.

2.4 Door and Insulated Panel Core

2.4.1 Core: Polyurethane foam.

2.4.2 Insulated door insulation R-value of 11.0 minimum.

2.5 Accessories

2.5.1 Rubber Silencers: Resilient rubber.

2.6 Fabrication

2.6.1 Fabricate doors and frames allowing for minimum clearances and shim spacing around perimeter of assembly, yet enabling installation.
2.6.2 Coordinate fabrication of doors and frames with louver and damper size and mounting requirements as specified in Division 15 and as indicated on drawings. Fabrication to include trim to hide exterior mounting fasteners for the louvers and dampers, as required.
2.6.3 Rigidly fit and secure joints and corners with internal reinforcement. Make joints and connections flush, hairline and weatherproof.
2.6.4 Fabricate frames and doors with hardware reinforcement. Reinforcements to be aluminum alloy 6061-T6, minimum 0.25 inch thickness.
2.6.5 Prepare components to receive anchor devices. Fabricate anchorage items.
2.6.6 Arrange fasteners, attachments, and jointing to ensure concealment from view.
2.6.7 Prepare frame for silencers. Provide three single rubber silencers for single doors and two single silencers on frame head at double doors.
2.6.8 Fabricate frames with 2 inch head member.

2.7 Finish

2.7.1 Extruded Aluminum Surfaces: Anodize to clear color.

2.7.2 Concealed Steel Items: Galvanized in accordance with ANSI/ASTM A386 to 2.0 oz/sq ft primed with iron oxide paint.

2.7.3 Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

3. EXECUTION:

3.1 Examination

3.1.1 Verify that opening dimensions and tolerances are acceptable.

3.2 Installation

3.2.1 Install doors, frames, glazing and hardware in accordance with manufacturer's instructions.

3.2.2 Coordinate installation of doors with masonry and concrete construction for anchor placement.

3.2.3 Coordinate installation of frames with louvers and dampers.

3.2.4 Use anchorage devices to securely attach frame assembly to structure.

3.2.5 Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

3.2.6 Install hardware using templates provided. Refer to Section 8B for installation requirements.

3.3 Tolerances

3.3.1 Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.4 Adjusting and Cleaning

3.4.1 Adjust work under provisions of Division 1.

3.4.2 Adjust door for smooth and balanced door movement.

3.4.3 Remove protective material from pre-finished aluminum surfaces.

3.4.4 Wash down exposed surfaces using a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

END OF THIS SECTION

DIVISION 8 – DOORS AND WINDOWS

SECTION 8B - DOOR HARDWARE

1. GENERAL:

1.1 Section Includes

1.1.1 Hardware for aluminum doors.
1.1.2 Thresholds.
1.1.3 Weatherstripping.

1.2 Related Sections

1.3.1 Section 4A Unit Masonry System.
1.3.2 Section 5B - Metal Fabrications.
1.3.3 Section 8A - Aluminum Doors and Frames.

1.4 References

1.4.1 ANSI A117.1 Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.
1.4.2 BHMA Builders' Hardware Manufacturers Association.
1.4.3 DHI Door and Hardware Institute.
1.4.4 NAAMM National Association of Architectural Metal Manufacturers.
1.4.5 UL 305 - Panic Hardware.

1.5 Submittals

1.5.1 Submit under provisions of Division 1.
1.5.2 Shop Drawings: Indicate locations and mounting heights of each type of hardware.
1.5.3 Submit manufacturer's parts lists, templates.
1.5.4 Product Data: Provide data on specified hardware.
1.5.5 Samples: Submit 1 sample of hinge, lockset, latchset, closers, thresholds, flushbolts, astragal, IDOT Deadbolt, and weatherstripping illustrating style, color, and finish.
1.5.6 Samples: May be incorporated into the work or returned to supplier.
1.5.7 Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.6 Project Record Documents

1.6.1 Submit under provisions of Division 1.
1.6.2 Record actual locations of installed cylinders and their master key code.

1.7 Operation and Maintenance Data

1.7.1 Submit under provisions of Division 1.
1.7.2 Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

1.8 Quality Assurance

1.8.1 Perform work in accordance with the following requirements:

(a) ANSI A117.1- Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.

1.9 Quality Assurance

1.9.1 Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum 5 years documented experience.
1.9.2 Hardware Supplier: Company specializing in supplying commercial door hardware with 5 years documented experience.
1.9.3 Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist in the work of this section.

1.10 Delivery, Storage, and Handling

1.10.1 Deliver, store, protect, and handle products to site under provisions of Division 1.
1.10.2 Package hardware items individually; label and identify package with door opening code to match hardware schedule.
1.10.3 Deliver keys to Owner by security shipment direct from hardware supplier.
1.10.4 Protect hardware from theft by cataloging and storing in secure area.

1.11 Coordination

1.11.1 Coordinate work with other directly affected Sections involving manufacturer or fabrication of internal reinforcement for door hardware.

1.12 Warranty

1.12.1 Provide five year warranty under provisions of Division 1.
1.12.2 Warranty: Include coverage of door closures.

1.13 Maintenance Materials

1.13.1 Provide maintenance materials under provisions of Division 1.
1.13.2 Provide special wrenches and tools applicable to each different or special hardware component.
1.13.3 Provide maintenance tools and accessories supplied by hardware component manufacturer.

1.14 Basis of Payment

1.14.1 Payment for the work specified under this Section and as required shall be included in the Contract lump sum price for the Item, PUMP STATION GENERAL WORK.

2. PRODUCTS:

2.1 Manufacturers

2.1.1 Entrance Lockset x lever action x stainless steel x US 32D x removable core x Box Strike.

1.	L9453 x 03	Schlage
2.	8847 x CRE	Yale
3.	ML2048 x LSM	Corbin Russwin

2.1.2 Exit Devices: Rim type x stainless steel x US 32D. Vertical rod type x stainless steel x US 32D. Provide compatible F08 heavy duty exit device trim for exterior doors.

1. Single doors:

a.	ED5200	Corbin Russwin
b.	8300	Adams Rite

2.1.3 Hinges x 4 1/2 x 4 1/2.

1.	BB 1191	Hager
2.	FBB 191	Stanley
3.	BB 4101	Lawrence

2.1.4 Closers x delayed action x AL size as recommended by manufacturer. Install

closers on room side, using parallel arms where necessary.

1. DC6000 Series Corbin
Russwin
2. 4010 / 4110 Smoothee Series LCN
3. 7500 Series Norton

HO indicates hold open

2.1.5 Kick Plates 10" x 2" LDW x US 32D x 16GA.

1. Brookline
2. Ives
3. Hiawatha
4. Rockwood

2.1.6 Thresholds set in sealant 5" x 1/2" Clear Anodized Aluminum Thermally Broken Saddle x frame width.

1. S282A x AL Reese
2. 252 x 3AFG x AL Pemko
3. 8425 x AL National Guard

2.1.7 Door Bottom - Mill Aluminum with thermoplastic rubber.

1. DB594AU Reese
2. 222APK Pemko
3. 15NA National Guard

2.1.8 Weatherstrip – Clear Anodized Aluminum.

1. DS 69C Reese
2. 110 NA National
Guard
3. 332 CR Pemko

2.1.9 Overhead Stop – Hold Open.

1. 70H x 26D Glynn Johnson

2.1.10 Astragals x Full Height Door - Clear Anodized Aluminum with thermoplastic rubber.

1. Doors with two active leaves:

a. 137NA (SET) National Guard
b. 303CS Pemko

2.1.11 IDOT standard outside deadbolt: Heavy duty, high security padlock locking bolt with a 3/4" throw adjustable from 3/4" to 2-3/8" shall be provided mounted on the exterior of doors. Doors shall be reinforced as necessary for installation of the outside deadbolt.

Heavy duty padlock for the doors will be provided by IDOT.

2.1.12 Substitutions: Under provisions of Division 1.

2.2 Keying

2.2.1 Supply 4 keys for each lock.

2.2.2 Keys shall match Owner's keying system.

2.2.3 Serial numbers shall be stamped or engraved on all keys.

2.3 Finishes

2.3.1 Finishes: Identified in schedule at end of section.

3. EXECUTION:

3.1 Examination

3.1.1 Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.

3.2 Installation

3.2.1 Install hardware in accordance with manufacturer's instructions and requirements of NAAMM.

3.2.2 Use templates provided by hardware item manufacturer.

3.2.3 Conform to ANSI A117.1 for positioning requirements for the handicapped.

3.3 Field Quality Control

3.3.1 Field inspection will be performed under provisions of Division 1.

3.3.2 Architectural Hardware Consultant to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

3.3.3 Provide two copies of certification to Engineer.

3.4 Protection of Finished Work

3.4.1 Protect finished work under provisions of Division 1.

3.4.2 Do not permit adjacent work to damage hardware or finish.

3.5 Hardware Schedule per Door

Door Hardware Required

D1	1 1/2 PR Butts x NRP
	1 Entrance Lockset
	1 Closer x 110 degrees x HO
	1 Exit Device
	1 Kickplate
	1 Weatherstripping
	1 Door Bottom
	1 Threshold
	1 IDOT Deadbolt

END OF THIS SECTION

DIVISION 9 - PAINTING

SECTION 9A - PAINTING

1. GENERAL:

1.1 Description

1.1.1 This item of work includes the furnishing, preparation and application of painting and related items to complete the work indicated on drawings and described in these specifications.

1.1.2 All work under this Section shall be subject to the applicable provisions of Section 100 of the Standard Specifications. Refer to Division 1 for additional requirements.

1.2 Reference Standards

1.2.1 The work shall be in conformance with the applicable standards/regulations of:

(a) Society of Protective Coatings.
(b) National Fire Protection Association (NFPA).
(c) American National Standards Institute (ANSI).
(d) Occupational Safety and Health Act (OSHA)
(e) SSPC SP10 "Near White Metal Blast Cleaning", Society of Protective Coatings.
(f) Military Specification MIL-L-81352A.
(g) Illinois Department of Transportation, Standard Specifications for Road and Bridge Construction.

1.2.2 The term "finishes" as used herein means all painting and coating systems materials, including primers, emulsions, enamels, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

1.2.3 Consult the specifications for work and materials of other trades to determine the provisions regarding their finishing. Surfaces left unfinished by the requirements of other specifications shall be painted or finished as part of this work. Work requiring finish and not specified shall be finished same as specified for similar work. Finishing specified hereinafter shall be in addition to shop and prime coats specified in other sections.

1.2.4 The work under this section shall be done by a firm with not less than 5 years of experience in commercial painting and finishing. Documentation of this experience shall be included together with the product data submitted for approval.

1.3 Quality Assurance

1.3.1 Painting shall conform to applicable Section 1008, PAINT MATERIALS and MIXED PAINTS, of the IDOT Standard Specifications.

1.3.2 The types of paint products to be used in the work shall be identified by the manufacturer's name and number.

1.3.3 The products of manufacturers other than those herein named, which are approved equal to the products specified, may be substituted, except that, all paints applied to a surface shall be products of one manufacturer. Data showing equivalent performance of each paint product to be submitted for review at least 30 calendar days before the painting is to begin, and no painting shall proceed until the substituted products have been accepted.

1.3.4 All paints and painting materials shall be delivered to the work in the original and unopened containers plainly marked with the name, brand, shelf life, and analysis of the product, and the name of the manufacturer.

1.4 Delivery and Storage of Materials

1.4.1 Deliver materials in original containers with seals unbroken and labels intact. Do not deliver or store on the site materials other than those approved for use. Empty containers shall have labels canceled.

1.4.2 Store materials outside the building. Keep storage place neat and clean and correct all damage thereto or to its surroundings.

1.4.3 Materials shall not be mixed or applied in any room having finished floor installed without providing adequate protection. Only materials used during the course of one day may be kept within the building. Remove oily rags and waste from building every night and take every precaution to avoid danger of fire.

1.5 Submittals

1.5.1 Submit product data under provisions of Section 1A.

1.6 Shop Drawings: Submit the following for approval:

1.6.1 Copies of manufacturer's technical information, including paint label analysis and application instructions, certification of coating, primer and finish coat for the material and service for each coating system proposed for use.

1.6.2 Copies of Contractor's proposed surface preparation and work area protection procedures in each area of the work.

1.6.3 List each material and cross-reference to the specific paint and finish system and application. Identify by manufacturer's catalog number and general classification.

1.6.4 Copies of manufacturer's complete color charts for each coating system.

1.7 Basis of Payment

1.7.1 The work shall be paid as part of the Contract lump sum price for PUMP STATION GENERAL WORK which shall be payment in full for the work described herein.

2. PRODUCTS:

2.1 Manufacturers

2.1.1 Tnemec Co., Inc.

2.1.2 Substitutions: Under provisions of Division 1.

2.2 Colors

2.2.1 Unless otherwise indicated, colors will be selected by the Engineer during the submitted review process.

2.2.2 Complete color charts shall be submitted of proposed paint manufacturers to the Engineer for final paint color selections.

2.2.3 Unless otherwise indicated, all surfaces without a final finish color shall be painted. In general, colors will be differentiated as follows:

(a) Ceiling.
(b) Grade floor.
(c) Lower level floors.
(d) Lower level concrete walls.
(e) Interior metal trim.
(f) Exterior metal trim (excluding louvers, stainless steel coping, and aluminum framing).
(g) Exterior piping and appurtenances (such as sluicegate stands and operators).

(h) Natural or anodized aluminum surfaces shall not be painted. Surfaces and equipment which are provided with a factory final finish shall not be painted.
(i) Stainless steel exterior coping, and other stainless steel surfaces shall not be painted unless noted otherwise.
(j) Exterior concrete walls of building.
(k) Interior concrete walls of building.
(l) Safety items, bollards, hoist beams/trolley, etc..

2. All piping shall be shop finish painted.

2.3 Color Coding

2.3.1 Piping and electrical conduit shall be color coded with colors as selected by the Engineer. Electrical conduits shall be painted the color of the wall/ceiling against which it is run. Conduits are not required to be painted if they are not running against a wall or ceiling.

2.4 Non-Slip Floor Coating

2.4.1 Concrete floors where specified shall have an abrasive coating of Series 69 Hi-Build Epoxoline II as manufactured by Tnemec Co., Inc., or equal. Bare concrete shall be primed at a dry film thickness of 2.0-3.0 mils. The first coat shall have a dry film thickness of 2.0-3.0 mils which includes silica sand to provide a non-skid surface. The second coat shall have a dry film thickness of 2.0-3.0 mils. The epoxy coating shall be applied in accordance with the manufacturer's recommendations.

3. EXECUTION:

3.1 Preparation

3.1.1 Inspect surfaces with regard to their suitability to receive a finish after preparatory work. The application of finish shall be an indication of the Contractor's acceptance of the surface.
3.1.2 Clean surfaces to be painted of loose dirt and dust before painting is started. Adjacent surfaces shall also be clean before starting painting. Do preparatory work necessary to produce a surface suitable to receive the specified finish.
3.1.3 Wash uncoated metal surfaces with mineral spirits to remove dirt and grease before applying paint materials. Blast profile shall not exceed 30% of total film thickness of coating. Preparation shall conform to primer manufacturer's requirements. Prime surfaces as soon as practical after preparation. Do not leave prepared, uncoated surfaces overnight. Touch up shop coats damaged by welding or abrasion.
3.1.4 Prior to painting, all surfaces shall be prepared and cleaned as specified and required. Surfaces shall be dry before any paint is applied. Special surface preparation work shall be as directed by the manufacturer of the paint specified to be applied to the surface. Paint shall not be applied before the prepared surfaces are approved.

3.1.5 Prior to painting steel, all welds, beads, blisters or protuberances, other than identification markings, shall be ground smooth. Pits and dents shall be filled, and other imperfections shall be removed. All rust, mill scale, oil, grease and dirt shall be removed by sandblasting in the shop in accordance with Societyof Protective Coatings Specification No. SP-10, Near White (SSPC-SP-10). Cleaned metal shall be primed the same day immediately after sandblasting to prevent rusting.

3.1.6 Prior to painting other metals, all welds, beads, blisters or protuberances, other than identification markings, shall be ground smooth and other imperfections shall be removed. All nonferrous metals, galvanized steel and stainless steel whether shop primed or field primed, shall be solvent-cleaned in accordance with SSPC-SP-1 prior to the application of the primer. Non-ferrous metal shall be treated with Oakite 747 LTS, as manufactured by Chemetel or equal before prime coat is applied.

3.1.7 Pipe covering and duct covering shall have all adhering debris removed and indentations or unsightly spots smoothed out to an even surface and shall be brushed clean.

3.1.8 Concrete surfaces shall be brushed and washed. All loose dirt, free lime, form oil, curing compounds and other foreign matter shall be removed by approved methods. Concrete surfaces requiring repair shall be patched and surfaces to receive paint shall be spackled and repaired. Concrete surfaces to be painted shall be acid-etched as recommended by the manufacturer of the coating to be applied to produce a slightly granular surface required for adherence of the paint to the concrete unless otherwise indicated. Concrete shall be thoroughly dry prior to painting.

3.2 Protection of Non-Finish Items

3.2.1 Furnish and lay drop cloths or other means of protection for finished surfaces during the work.

3.2.2 Before painting, remove hardware, accessories, plates, lighting fixtures and similar items or provide ample protection of such items. Upon completion of work in each area, replace above items. Use only skilled mechanics for removing and replacing items.

3.2.3 If finished surfaces are damaged, entirely remove the stains or replace the damaged material, making good any damage to other work in connection therewith, without additional cost to the Owner.

3.3 Application

3.3.1 The following items shall not be painted, unless otherwise specified: ducts, covering over ducts, registers, grilles, dampers and linkage, name and identification plates and tags, floor gratings, brass valves, stainless steel, wood, cast-iron piping installed underground.

(a) The following items shall be furnished with the manufacturer's standard prime and finish coats applied in the shop: pumps, motors, air compressors, wall fans, control and SCADA panels, panelboards, transformers, unit heaters, aluminum fascia, motor control centers, hoisting equipment.

(b) The following items shall be shop primed and field painted: structural steel and wrought metals, pipelines, hangers and supports, valves, valve operators and stands, guard housings, steel lintels, hollow metal doors and frames.

(c) All items not shop primed or shop finished shall be field primed and finished where exposed to view. The work shall generally include, but not be limited to, the following: interior concrete block, interior concrete walls, columns, beams and ceilings, covering over insulation on piping, electrical conduit, small piping and copper tubing, exterior PVC piping.

3.3.2 The work shall include all touch-up and remedial painting as required until the completion and acceptance of the final work.

3.3.3 Spray painting shall not be allowed.

3.4 Installation

3.4.1 Furnish equipment for the proper execution of the work. Erect and place same in such a way as not to interfere with work of other trades. Upon completion, dismantle and remove same from the job site.

3.4.2 Employ skilled mechanics to ensure good workmanship. Thoroughly mix materials immediately before application of paint. Surfaces shall be clean, dust free, dry and adequately illuminated. Each coat shall be thoroughly dry before applying succeeding coat.

3.4.3 Finished work shall be uniform and of approved color, smooth and free from runs, sags, and defective application. Edges of paint adjoining other materials or colors shall be sharp and clean, without overlapping. Before applying succeeding coats, primers and undercoats shall be completely integral and performing the function for which they are specified. Prepare and touch up scratches, abrasions, or other disfigurement and remove any foreign matter between successive coats.

3.4.4 Blast cleaned metal surfaces shall be coated immediately after cleaning, before any rusting or other deterioration or contamination of the surface occurs. Blast cleaned surfaces shall be coated not later than eight hours after cleaning under ideal conditions or sooner if conditions are not ideal.

3.4.5 Avoid degradation and contamination of blasted surfaces and avoid intercoat contamination. Clean contaminated surfaces before applying next coat. Ensure method of cleaning contaminated surface follows manufacturer's recommendations.

3.4.6 Primers and undercoats of paint and enamel shall be tinted or shaded different colors than the finish coats. Each coat of material shall be inspected and approved by the Engineer before application of the succeeding coat. Otherwise, no credit for the coat applied will be given and the work in question shall be recoated. Inform the Engineer when each coat is ready for inspection and approval.

3.4.7 Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance.

3.4.8 Painting shall not be done when the temperature is below 10 degrees C (50 degrees F) and when satisfactory results cannot be obtained due to high humidity or excessive temperatures. Paints or other finishes shall not be applied to wet or damp surfaces.

3.4.9 All painting shall be done in accordance with the paint manufacturer's recommendations.

3.4.10 All wall surfaces which will be concealed by equipment shall be painted before equipment installation.

3.5 Cleaning

3.5.1 Upon completion of painting work, clean paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

3.5.2 Rubbish, debris, empty paint cans and discarded materials shall be placed in metal containers and removed from the site.

3.6 Schedule

3.6.1 Painting Schedule

Class of Work	Primer Shop Coat	Field or Shop Finish Coats		
		1st	2nd	3rd
Nonferrous Metal and Galvanized Steel:				
Interior		A	A	A
Exterior		A	A	C
Steel and Iron:				
Interior	B	B*	A	A
Exterior	B	B*	A	C
Submerged or Constantly Wetted	B	B*	D	D
Asphaltic Coated Steel	B	E*	A	A
Exposed to Potable water	B	B*	B	F
Wrapped in insulation	B	B*		
Exterior, exposed to process wetting and dry	B	B*	D	D
Concrete:				
Interior		A	A	A
Exterior		H	H	H
Piping and Duct insulation:				
Exposed		A	A	
PVC		A	A	

*Touch-up bare metal with primer.

3.6.2 Schedule thickness is minimum as recommended by Tnemec. If other manufacturers are used, manufacturer's recommendations shall be followed, but in no case shall the thickness be less than scheduled.

Paint	Product Name	Volume Solids (%)	Dry Film Thickness (Mils)
A	Tnemec Series 69 Hi-Build Epoxoline II	69	2.0-3.0
B	Tnemec Series 140-1225 Biege Pota-Pox Plus	69	4.0-6.0
C	Tnemec Series 74 Endura-Shield	54	2.0-3.0
D	Tnemec Series 69 Hi-Build Epoxoline II	69	3.0-5.0
E	Tnemec Series 90-97 Tneme-Zinc	63	2.5-3.5
F	Tnemec Series 140-WH02 (15BL) Pota-Pox Plus	69	4.0-6.0
G	Tnemec Series 69 Hi-Build Epoxoline II	69	7.0-10.0
H	Tnemec Series 180 Acryic Emulsion	44	4.0-6.0

3.6.3 Notes

(a) Where aluminum surfaces come in contact with incompatible metals, lime, mortar, or concrete, these areas shall be given one field coat of Tnemec Series 69 Hi-Build Epoxoline II.
(b) Stainless steel, where indicated shall be protected by two coats of clear acrylic lacquer conforming to the requirements of Military Specification MIL-L-81352A. Surface preparation shall consist of removing all oil and foreign matter by wiping clean with cloth and lacquer thinner.
(c) Applicable to insulated and uninsulated pipes: Steel pipe not available with a shop coat shall be prime coated in the field immediately after installation.
(d) Piping shall be painted up to and including the flanges attached to mechanical equipment. Electrical conduit shall be painted up to and including the flexible conduit connected to equipment.
(e) All steel pipes, ductile iron fitting and flanges located at the wet well, intermediate floor and discharge floor shall be shop finish painted before shipment. Provide field touch-up paint as required.

3.6.4 General Color Scheme

General color scheme shall be as follows:

(a) Exterior Concrete Walls - light beige.
(b) Interior Steel Frame and Metal Trim – light gray.
(c) Exterior Metal Trim (except aluminum and stainless steel) – light gray.
(d) Exterior piping and appurtenances – Turbine Blue.
(e) Interior piping – Turbine blue.
(f) Electrical Conduits – light gray.
(g) Fire protection equipment – standard red.
(h) Hoist Beams/Trolley – Safety red.

Note: Contractor to submit manufacturer's color chart for Engineer's selection.

END OF THIS SECTION

DIVISION 9 - FINISHES

SECTION 9B - REMOVAL AND DISPOSAL OF LEAD BASED PAINT

1. GENERAL:

1.1 Description

1.1.1 The work specified herein includes furnishing all equipment and material to remove and dispose of all paint, which is all to be assumed to be lead based, from the walls, ceiling and floor of the interior of the pump station.

1.2 Design Requirements

1.2.1 Contractor shall be responsible for design of Lead Abatement Program, Health and Safety Plan, implementations and use.

1.3 Submittals

1.3.1 Shop Drawings: Indicate materials and equipment to be used.

1.3.2 Manufacturer's Instructions: Indicate special procedures and conditions requiring special attention.

1.3.3 Submittals Required

(a) Certification of Lead Abatement Contractor and Lead Abatement Supervisor, including list of former clients and telephone numbers.
(b) Blasting materials and additives
(c) Health and Safety Plan, specific to the site.
(d) Final Report by a Certified Hazardous Materials Manager (CHMM)
(e) Name and Qualifications of Environmental Consultant.

1.4 Certifications Required

1.4.1 Work shall be performed by a State Licensed Lead Abatement Contractor. Work shall be supervised by the Contractor's Licensed Abatement Supervisor.

1.4.2 Contractor shall submit written certification prior to work proceeding.

1.4.3 Work shall be performed by a QP1 and QP2 Certified Contractor under program by the Society for Protective Coatings (SSPC) for all protective coating applications and hazardous paint removal projects, as required.

1.5 Scheduling

1.5.1 Schedule Work to not coincide with new construction.

1.5.2 Describe removal procedures and schedule.

1.5.3 Perform noisy work in accordance with city ordinance.

1.6 Project Conditions

1.6.1 Conduct paint removal to minimize interference with adjacent and occupied building areas and plant operation.

1.6.2 Contractor shall obtain required permit from authorities at no additional costs to owner.

1.7 Submittals

1.7.1 Submit drawing showing extent of the area to be covered under this Section.

1.8 Basis of Payment

1.8.1 This work will be paid for at the contract unit price per square meter or square foot for REMOVAL AND DISPOSAL OF LEAD BASED PAINT which shall be payment in full for the work described herein.

2. PRODUCTS:

2.1 Manufacturers - Blasting Additive

2.1.1 BLASTOX by the TDJ Group

2.1.2 Substitutions: None

2.2 Blasting additives shall be BLASTOX, which is added to the non-recyclable abrasive blasting material to reduce the leachate potential of the waste product below the Federal Standard for hazardous material.

2.3 Examination

2.3.1 Contractor to verify existing site conditions.

2.4 Preparation

2.4.1 Provide, erect, and maintain temporary structures for protection of the existing facilities.

2.4.2 Provide, erect, and maintain temporary barriers to prevent spread of dust, odors, and noise to permit continued Owner occupancy.

2.4.3 Erect and maintain weatherproof closures for exterior openings.

3. EXECUTION:

3.1 General

3.1.1 Contractor shall perform all work in accordance with 29 CFR 1910, 29 CFR 1920, 29 CFR 1926 and all applicable state and Federal Laws.

3.1.2 Contractor shall cover and protect existing equipment so that no blasting material or moisture shall enter the existing facilities or equipment while removal work is proceeding. Contractor shall filter the exhaust air with an HEPA filter with a minimum of 0.3 Micron filter before discharge to the atmosphere. Contractor shall monitor continuously and continuously record the discharge air for lead concentrations for the time that Abatement begins until satisfactory final cleaning. Contractor shall submit air monitoring records to Engineer. Air monitoring shall be conducted by a qualified Environmental Consultant with all costs paid by the Contractor.

3.1.3 Contractor shall clean-up site on a daily basis so that no debris is tracked off the site by its owners or public personnel.

3.1.4 Contractor shall completely remove existing lead based paint from walls, floors and ceilings. All debris and materials shall be removed from the site. Final clean-up shall be based upon a lab analysis of the air sample from the pump station to be less than Federal Standards allow for completed Lead Abatement Program.

3.2 Final Report

3.2.1 Contractor shall submit a Final Report of the Lead Abatement program including:

(a) Names and addresses of licensed personnel performing work including license designation and number.
(b) Air monitoring records of exhaust air conducted by Environmental Consultant.
(c) Manifests of disposal of lead paint material and landfill forms.
(d) The lead leachate potential or TCLP of the lead based paint material that is disposed. Results to be verified by a NAVLAP accredited testing lab. Include accreditation of testing lab.
(e) Final Report to be signed and reviewed by a Certified Hazardous Material Manager. Report is to be complete with notes of any deficiencies and corrective action by Contractor. Report will not be complete until corrective actions are complete.
(f) Record of any correspondence or conversations with any area resident or the general public by the contractor or its personnel.
(g) Field and lab test results of final clean-up.

3.2.2 Final Report will not be completed until all corrective actions are completed.

3.3 Schedule

3.3.1 Exterior Wall : Approximately 560 ft^2

3.3.2 Grade Ceiling & Pump Floor Ceiling : Approximately 320 ft^2

3.3.3 Grade Floor & Pump Floor : Approximately 320 ft^2

3.3.3 Interior Wall : Approximately 2,200 ft^2

END OF THIS SECTION

DIVISION 10 - SPECIALITIES

SECTION 10A - SPECIALTIES

1. GENERAL:

1.1 Description

1.1.1 This item of work includes the furnishing and installation of bulletin board, fire extinguishers, first aid kit, shop desk, nameplate, trash bins and related items to complete the work shown and specified.

1.1.2 Refer to Division 1 for additional requirements.

1.2 Related Sections

1.2.1 Section 5C - Bolts, Anchor Bolts, Expansion Anchors, and Concrete Inserts.

1.2.2 Section 9A – Painting.

1.3 Submittals

1.3.1 Submit shop drawings and product data under provisions of Section 1A.

1.4 Delivery, Storage and Handling

1.4.1 Delivery, storage and handling shall be in accordance with the provisions of Section 1A.

1.5 Guarantee

1.5.1 Provide guarantee under provisions of Section 1A.

1.6 Basis of Payment

1.6.1 Specialties shall be paid for as part of the Contract lump sum price for

PUMP STATION GENERAL WORK

which shall be payment in full for work described herein.

2. PRODUCTS:

2.1 Bulletin Board

2.1.1 Furnish and install one (1) two panel bulletin board with glass doors as shown. Bulletin board panels shall be 1/4" cork mounted on hardboard. Doors shall have 1/4" glass and shall be continuously hinged with flat key tumbler locks. Overall dimensions shall be approximately 40" high, 48" long, 3" deep.

2.2 Station Identification Plate

2.2.1 Furnish and secure in position and location, one cast bronze tablet for each such required tablet. The tablet shall be made by a firm specializing in bronze tablet work and shall be of best grade of statuary bronze. Lettering shall be arranged as directed and of a style to be selected. All lettering and designs to be of embossed type, milled and polished. Background shall be pebble finish, left rough. A full-size rubbing shall be submitted for approval before casting.

2.2.2 Lettering shall read as shown on drawing.

2.3 Staff Gauges

2.3.1 Two staff gauges (one in the wet pit and one in the discharge chamber) calibrated in feet and tenths of a foot shall be provided to show the depth of the water. Staff gauge range shall be from 0’ to 11’ for wet well and 0’ to 5.5’ for discharge chamber.

2.3.2 Each gauge shall be porcelain enameled iron rod. The rods shall be professional type, 2-1/2" wide minimum, with large bold markings of a height for the full height of the wet well.

2.3.3 Each staff gauge shall be attached and supported using corrosion resistant hardware at locations to avoid conflict with level controls, etc.

2.4 Shop Desk

2.4.1 A metal shop desk shall be provided. The desk shall have a 43 inch high work surface and shall be approximately 53 inches high by 34.5 inches wide by 30 inches deep. The unit shall have a rear top shelf riser, a 3.5 inch high drawer on nylon rollers and a large storage compartment with locking door and an adjustable shelf.

The unit shall have 14 ga. corner posts and a minimum 20 ga. top and shall have a gray enamel painted finish.

2.5 First Aid Kit

2.5.1 Furnish and install two first aid kits with brackets for wall mounting as directed in the pump room and electrical room. The kit shall be Model No. 640135 as manufactured by Johnson and Johnson or equal.

2.6 Fire Extinguishers

2.6.1 Furnish and install two fire extinguishers as directed. The extinguishers shall be multipurpose Dry Chemical Type with a U.L. rating of 20A: 120B: C, 20 pound capacity in enameled steel containers. The extinguishers shall be installed with wall brackets of size required for type and capacity of extinguisher indicated.

2.7 Clock

2.7.1 Clock shall be synchronous motor type, 12" face, 120 V. 60 Hz.

2.8 Trash Can

2.8.1 Trash can shall be made of polyethylene and the capacity shall be approximately 40-50 gallon industrial type with wheels/casters.

2.9 Pump Dolly

2.9.1 Furnish one pump dolly for moving pump at floor El.732' for the low flow pump.

2.9.2 Dolly shall be shop wagon Stock No. 7045902 manufactured by Little Giant and distributed by C&H Distributors, LLC with the following design:

(a) Dolly shall be 48”x30” with 18” deck height and 3,000 lbs capacity, 12 gauge steel deck, flush edges, double grip T-bar handle, 1” axle and roller bearing wheels.
(b) Dolly shall easily be mobile while carrying heavy loads.

3. EXECUTION:

3.1 Installation

3.1.1 Install the specified specialties in accordance with manufacturer's recommendations and instructions to permit intended performance.

3.1.2 The manufacturer or supplier of the specified specialties shall furnish a qualified field engineer for whatever period of time may be necessary to assist and direct the contractor in the proper installation of the equipment furnished, to observe and check initial performance, and whose duty shall include the instruction of the plant operating personnel in the proper operating and maintenance procedures.

3.2 Painting

3.2.1 The specified specialties shall be painted in accordance with applicable AWWA standard specified and with Section 9A of these specifications.

3.3 Testing

3.3.1 The specialties shall be tested in place by the Contractor, and any defects in specialties or connections shall be corrected to the satisfaction of the Engineer.

END OF THIS SECTION

DIVISION 10 - SPECIALITIES

SECTION 10B - FIBERGLASS REINFORCED PLASTIC PRODUCTS AND FABRICATIONS

1. GENERAL:

1.1 Related Documents

1.1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this section.

1.2 Summary

1.2.1 This section includes the following FRP Products design, fabrications, and installation:

1. FRP Grating.
2. FRP Railing.
3. Grating Fasteners.
4. FRP Ladders and platform.
5. FRP Structural Shapes.

1.3 Scope of Work

1.3.1 Furnish all labor, materials, equipment and incidentals necessary to install the fiberglass reinforced plastic (FRP) products as specified herein.

1.4 Quality Assurance

1.4.1 The material covered by these specifications shall be furnished by a reputable and qualified manufacturer of proven ability who has regularly engaged in the manufacture and installation of FRP systems.

1.4.2 Substitution of any component or modification of system shall be made only when approved by the Architect or Engineer.

1.4.3 Fabricator Qualifications: Firm experienced in successfully producing FRP fabrications similar to that indicated for this project, with sufficient production capacity to produce required units without causing delay in the work.

1.4.4 In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work.

1.5 Design Criteria

1.5.1 The design of FRP products including connections shall be in accordance with governing building codes and standards as applicable.

1.5.2 Design of FRP live loads on grating shall not be less than 100 pounds per sq. ft. Grating deflection at the center of a simple span not to exceed the lesser of 0.375 inch or clear span divided by 125.

1.5.3 Structural members shall be designed to support all applied loads. Deflection in any direction shall not be more than L/180 of span for structural members. Connections shall be designed to transfer the loads.

1.6 Submittals

1.6.1 Shop drawings of all FRP structural members, handrails, gratings, plate, ladders and appurtenances shall be submitted to the Engineer for review.

1.6.2 Manufacturer's catalog data showing:

1. Dimensions, spacings, and construction of grating.
2. Design tables showing limits for span length and deflection under various uniform and concentrated loads.
3. Materials of construction.
4. Chemical resistance table

.

1.6.3 Detail shop drawings showing:

1. Dimensions.
2. Sectional assembly.
3. Location and identification mark.
4. Size and type of supporting frames required.

1.6.4 All shop drawings shall be sealed by Structural Engineer registered in the State of Illinois.

1.7 Shipping and Storage Instructions

1.7.1 All systems, sub-systems and structures shall be shop fabricated and assembled into the largest practical size suitable for transporting.

1.7.2 Items shall be covered and protected from exposure to sun or ultra violet light during storage.

1.7.3 All materials and equipment necessary for the fabrication and installation of the grating, plate, handrails, structural shapes and building panels shall be stored before, during, and after shipment in a manner to prevent cracking, twisting, bending, breaking, chipping or damage of any kind to the materials or equipment, including damage due to over exposure to the sun. Any material which, in the opinion of the Engineer, has become damaged as to be unfit for use, shall be promptly removed from the site of work, and the Contractor shall receive no compensation for the damaged material or its removal.

1.7.4 Identify and match-mark all materials, items, and fabrications for installation and field assembly.

2. PRODUCTS:

2.1 General

2.1.1 Materials used in the manufacture of the FRP products shall be new stock of the best quality and shall be free from all defects and imperfections that might affect the performance of the finished product.

2.1.2 All materials shall be of the kind and quality specified, and where the quality is not specified, it shall be the best of the respective kinds and suitable for the purpose intended.

1. Resins shall be VINYL ESTER resin for ladders and cages and other members that may be submerged in the wet well or discharge chamber and in continuous contact with sewage.

2. Resins for members for exterior or dry service shall be either polyester or vinyl ester resin.

2.1.3 After fabrication, all cut ends, holes and abrasions of FRP shapes shall be sealed with a compatible resin coating to prevent intrusion of moisture.

2.1.4 All exposed surfaces shall be smooth and true to form.

2.1.5 FRP Manufacturers:

1. Strongwell-Chatfield Division, Chatfield, MN.
2. Composite Structures International, Inc.
3. Bedford Plastics, Inc.
4. Augusta Fiberglass.
5. Ultra, Inc.
6. Or approved alternative manufacturer.

2.1.6 Grating Fastener Manufacturers:

1. GFI Grating Fasteneres, Inc.
2. Strongwell.
3. Composite Structures International, Inc.

4. Augusta Fiberglass.
5. Ultra, Inc.
6. Or approved alternative manufacturer.

2.2 Gratings

2.2.1 General

1. Grating shall be shipped from the manufacturer, palletized and banded with exposed edges protected by cardboard to prevent damage in shipment.

2. Each piece shall be clearly marked showing manufacturer's applicable drawing number.

2.2.2 All FRP items furnished under this Section shall be composed of fiberglass reinforcement and resin in qualities, quantities, properties, arrangements and dimensions as necessary to meet the design requirements and dimensions as specified in the Contract Documents.

2.2.3 Fiberglass reinforcement shall be continuous roving in sufficient quantities as needed by the application and/or physical properties required.

2.2.4 Resin shall be Vinyl Ester, Isophthalic Polyester, Polyester *or* Modified Acrylic, with chemical formulations as necessary to provide the corrosion resistance, strength and other physical properties as required.

2.2.5 All finished surfaces of FRP items and fabrications shall be smooth, resin-rich, free of voids and without dry spots, cracks, crazes or unreinforced areas. All glass fibers shall be well covered with resin to protect against their exposure due to wear or weathering.

2.2.6 All grating products shall have a tested flame spread rating of 25 or less per ASTM E-84 Tunnel Test. Gratings shall also have tested burn time of less than 30 seconds and an extent of burn rate of less than or equal to 10 millimeters per ASTM D635.

2.2.7 All mechanical grating clips shall be manufactured of Type 316SS (stainless steel).

2.2.8 Pultruded I-bar grating with bearing bars at 1 ½ in o.c. and cross bars at maximum 12 in o.c.

2.2.9 Measurements: Grating supplied shall meet the minimum dimensional requirements as shown or specified. The Contractor shall provide and/or verify measurements in field for work fabricated to fit field conditions as required by grating manufacturer to complete the work.

2.2.10 Determine correct size and locations of required holes or cutouts from field dimensions before grating fabrication. Provide additional support bars, hold-downs or framing as required for cutouts shown on plans.

2.2.11 Sealing: All shop fabricated grating cuts shall be coated with vinyl ester resin to provide maximum corrosion resistance. All field fabricated grating cuts shall be coated similarly by the contractor in accordance with the manufacturer's instructions.

2.3 Grating Fasteners

2.3.1 Grating fasteners shall be Type 316 stainless steel saddle clips or C-clips.

2.3.2 Fasteners shall allow grating panels to be secured to structural steel beam supports without field drilling, welding or otherwise damaging steel coating. Each outside panel edge and/or corner of gratings supported by structural steel I-beams or channel beams shall be secured to structural steel support with stainless steel G-clips specifically designed for securing grating shapes to steel members without drilling or damaging steel surface coating as manufactured by GFI Grating Fasteners, Inc. or equal. Hold-down clips shall be provided and spaced at a maximum of four feet apart with a minimum of four per piece of grating, or as recommended by the manufacturer.

2.4 Structural Shapes and Plate

2.4.1 Structural shapes and plate shall be made from a premium grade polyester or vinyl ester resin.

2.4.2 Structural shapes and plates shall be manufactured by the pultrusion process.

2.4.3 Structural FRP members composition shall consist of a glass fiber reinforced polyester or vinyl ester resin matrix, approximately 50% resin to glass ratio. A synthetic surface veil shall be the outermost layer covering the exterior surfaces. Glass strand rovings shall be used internally for longitudinal strength. Continuous strand glass mats shall be used internally for transverse strength.

2.4.4 Structural members shall be designed to support all applied loads. Deflections in any direction shall not be more than L/150 of span for structural members. Connections shall be designed to transfer the loads.

2.5 Fiberglass Ladders

2.5.1 Ladders shall be fiberglass reinforced plastic (FRP) constructed of siderails, rungs, and brackets.

2.5.2 Resins for ladders shall be vinyl ester resin.

2.5.3 All finished surfaces of FRP items and fabrication shall be smooth, resin-rich, free of voids, and without dry spots, due to wear or weathering. All pultruded structural shapes shall be further protected for ultraviolet (UV) light.

The side rails and rungs shall be fiberglass reinforced pultruded structural shapes pigmented throughout in OSHA safety yellow.

The side rail shall be 1-3/4" square tube or greater with a wall thickness of 1/4" or greater. The rungs shall be 1" diameter or greater pultruded structural shapes, continuously fluted or gritted to provide a non-slip surface.

Type 304 or 316 stainless steel bolts shall be used for connecting brackets and other components to ladder.

Ladders systems shall meet the load and design requirements set forth in OSHA 1910.27 (latest edition). The ladder shall also be capable of supporting a concentrated vertical load of 1,200 pounds applied at the mid-span of the rung.

2.5.4 Ladders shall be fully shop assembled. All rungs shall penetrate the wall of the tube side rails and shall be connected to the rails with both epoxy and rivets to provide both a chemical and mechanical lock, respectively.

3. EXECUTION:

3.1 Preparation

3.1.1 Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.2 Inspection and Testing

3.2.1 The Engineer shall have the right to inspect and test all materials to be furnished under these specifications prior to their shipment from the point of manufacture.

3.2.2 All labor, power, materials, equipment and appurtenances required for testing shall be furnished by the Contractor at no cost to the Department.

3.2.3 Members and components shall be as free, as commercially possible, from visual defects such as foreign inclusions, delamination, blisters, resin burns, air bubbles and pits.

3.3 Installation, General

3.3.1 Fastening to in-place construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous FRP fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts and other connectors as required.

3.3.2 Cutting, fitting and placement: Perform cutting, drilling and fitting required for installation of miscellaneous FRP fabrications. Set FRP fabrication accurately in location, alignment and elevation; with edges and surfaces level, plumb, true and free of rack; and measured from established lines and levels.

All field cut and drilled edges, holes and abrasions shall be sealed with a catalyzed resin compatible with the original resin as recommended by the manufacturer. The sealing of the edges shall prevent premature fraying at the field cut edges.

3.3.4 Provide temporary bracing or anchors in form work for items that are to be built into concrete masonry or similar construction.

3.3.5 At all unsupported cutouts, install hold downs at uncut bearing bars beyond cutout area and install support bars from hold down to hold down. Lock grating panels securely in place with hold-down fasteners as specified herein. Field cut and drill fiberglass reinforced plastic products with carbide or diamond tipped bits and blades. Seal cut or drilled surfaces in accordance with manufacturer's instructions. Follow manufacturer's instructions when cutting or drilling fiberglass products or using resin products.

3.3.6 Install items specified as indicated and in accordance with manufacturer's instructions.

END OF SECTION

DIVISION 14 - CONVEYING SYSTEMS

SECTION 14A - HOIST EQUIPMENT

1. GENERAL:

1.1 Section Includes

1.1.1 Monorail systems.
1.1.2 Electric Hoists and trolleys.
1.1.3 Operating controls.
1.1.4 Accessories.

1.2 Related Sections

1.2.1 Section 5A - Structural Steel.
1.2.2 Section 5E - Bolts, Anchor Bolts, Expansion Anchors, and Concrete Inserts.
1.2.3 Section 9A - Painting.
1.2.4 Division 16 - Electrical.

1.3 References: Equipment shall meet the requirements of the following specifications unless more stringent requirements are otherwise specified:

1.3.1 ANSI B30.2.0 - Safety Standard for Overhead and Gantry Cranes.
1.3.2 ANSI B30.11 - Safety Standard for Underhung Cranes and Monorail Systems.
1.3.3 ANSI B30.16 - Safety Standard for Overhead Hoists.
1.3.4 ANSI B30.17 - Safety Standards for Overhead and Gantry Cranes
1.3.5 ANSI MH27.1 - Specifications for Underhung Cranes and Monorail Systems.

1.3.6 HMI 100 - Standard Specifications for Electric Wire Rope Hoists.
1.3.7 HMI 200 - Standard Specifications for Hand-Operated Chain Hoist.
1.3.9 CMAA No.70 - Specifications for Electric Overhead Traveling Cranes.
1.3.11 NEC - National Electric Code
1.3.12 NEMA - National Electrical Manufacturers Association.
1.3.13 AWS D1.1 - Code for Welding in Building Construction.
1.3.14 ASME HST-4 – Electric Wire Rope Hoist

1.4 System Description

1.4.1 Motorized trolley hoist:

Location	Motorized Trolley		Electric Hoist		
	Capacity (T)	Speed (ft/min)	Capacity (T)	Speed (ft/min)	Lift Height
Pump Room	2	8±	2	8±	40 ft

1.4.2 Hook mount electric hoist:

Location	Electric Hoist		
	Capacity (T)	Speed (ft/min)	Lift Height
Pump Room	1/2	8±	40 ft

1.4.3 Although only the principal items are described herein, it is understood that all items necessary for safe and efficient operation shall be supplied, so that monorail system shall be complete in all respects and ready for operation.

1.4.4 All necessary safety devices, stops, brakes, and any additional structural supports necessary to make the system complete and ready for safe operation shall be included.

1.5 Submittals

1.5.1 Shop Drawings: Indicate as a minimum, Plans, elevations, anchor bolt size and layout, and sectional views fully dimensioned to indicate actual clearance along with other pertinent data.

1.5.2 Panel Layout and Schematic Wiring Diagrams: Provide complete wiring diagrams indicating all electrical devices, numbered terminal strips and wiring and complete description of control system.

1.5.3 Catalog data and information shall be submitted for each unit.

1.6 Quality Assurance

1.6.1 All equipment shall be from one manufacturer or supplier.

1.6.2 All materials shall be new and of first class ingredients and construction.

1.6.3 All monorail system equipment, including trolleys, hoists, switches and electrification devices, shall be installed by a manufacturer approved installer to ensure system completeness, operational integrity and safety.

1.6.4 Hoist manufacturer shall coordinate hoist system requirements with hoist beam supplier and shall verify compatibility and suitability of hoist beams where indicated on Drawings.

1.7 Operation and Maintenance Data

1.7.1 Submit under provisions of Division 1.
1.7.2 Maintenance Data: Include a parts catalog with complete list of equipment replacement parts and local distributors.
1.7.3 Provide two complete sets of replacement parts, including but not limited to, brake linings and contact kits.
1.7.4 Operation Manuals: Include description of system's method of operation and control, including motor control system and special or non-standard features provided.
1.7.5 Maintenance Manuals: Include instructions for lubrication, adjustment and care of equipment, including detailed technical descriptions of operation, adjustment, and settings of electrical circuits and mechanical equipment.
1.7.6 Provide legible schematic wiring diagrams covering electrical equipment as supplied and installed, including changes made in final work, with symbols listed corresponding to identity or markings on equipment.

1.8 Qualifications

1.8.1 Manufacturer: Company specializing in manufacturing the Products specified with minimum ten years documented experience. The suppliers of equipment under this Section shall be members of the Crane Manufacturer's Association of America, Inc.

1.8.2 Installer: Company specializing in performing the work of this section and approved by monorail equipment manufacturer.

1.9 Regulatory Requirements

1.9.1 Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc., or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.10 Field Measurements

1.10.1 Verify that field measurements are as indicated on shop drawings.

1.11 Basis of Payment

1.11.1 Monorail system, hoist, and trolley shall be paid for as part of the Contract lump sum price for PUMP STATION MECHANICAL WORK which shall be payment in full for work described herein.

2. PRODUCTS:

2.1 Manufacturers

2.1.1 ACCO/Louden/Wright.
2.1.2 Chester Hoist.
2.1.3 Substitutions: Under provisions of Section 1A.

2.2 General

2.2.1 Service Classifications: All equipment shall be designed for minimum Class C (Moderate Service) as specified in ANSI MH27.1, and operation in normal ambient temperatures (0 degrees to 40 degrees C) and normal atmospheric conditions, free from excessive dust and moisture.

2.2.2 All working parts shall be arranged for convenient inspection, lubrication, adjustment, repair, or replacement. The equipment shall be assembled, painted, tested, and adjusted in the shop as far as practicable before shipment.

2.3 Power Supply

2.3.1 All electric power supply equipment shall be suitable for 480-volt, 3-phase, 60-hertz electric service. All hoisting equipment shall be provided with suitable junction boxes for connection of field services and complete with a ground pad. Connections shall be located as shown.

2.4 Motorized Trolley

2.4.1 Trolley wheels shall be designed to operate on the bottom flange of the crane girder, wheels shall be bronze with tapered, hardened treads, designed to carry the maximum wheel load under normal conditions without undue wear, with diameter no less than is shown in Table 4.1 of Hoist Manufacturers Institute - Standard Specifications HMI-100-74 for contour wheels with treads no less than 25 mm (1-inch) wide. Wheels shall be machined to match diameters with treads to match the rolling surface of the lower flange of the hoist beam.

2.4.2 Wheel bearings shall be double row precision ball bearings, provided with fittings and seals for pressure lubrication.

(a) Bearings shall be selected to provide a minimum B10 life of 5,000 hours.

2.4.3 The electrical controls for the trolley shall be included in the push-button operation for the hoist.

2.4.4 Routine inspection of gear train shall require no disassembly of major components.

2.4.5 Trolley hoist motor shall be 460V, 3 PH, 5 hp maximum.

2.5 Electric Hoist

2.51 Electric hoist controls shall comply with N.E.C. requirements for the application being considered and shall include control fusing and contacts mechanically and electrically interlocked.

2.52 Hoist and appurtenances shall be designed to withstand all stresses imposed under safe operating conditions while handling loads within the rated capacity.

2.5.3 Furnish suitable push-button pendant control. Push-button arrangement to be supplied with strain relief protection

2.5.4 Hoists shall be equipped with overload limit device to limit loads to rated capacity.

2.5.5 Provide an upper limit switch which will automatically stop the hoist motion when the block reaches its highest position.

2.5.6 The braking system shall be capable under normal operating conditions with rated load to stop and hold the load when controls are released. Two brakes shall be provided; Mechanical load brake and electrical motor brake.

2.5.7 Controlled lowering shall be limited to 120% of rated lowering speed. In the event of complete power failure, the load shall be stopped and held.

2.5.8 All bearings shall be heavy duty, anti-friction type with a minimum B10 life of 5,000 hours.

2.5.9 Provide chain container.

2.5.10 Lift chain shall be zinc plated

2.5.11 Electric hoist motor shall be 460V, 3 PH, 0.5 hp maximum.

2.6 Electric hoist – hook suspended type

2.6.1 Provide chain container.

2.6.2 Lift chain shall be zinc plated

2.7 Electrical Equipment

2.7.1 All electrical equipment and wiring shall comply with the requirements of Division 16 of the Specifications.

2.8 Finishes

2.8.1 All monorail tracks, switches, support steel, rods and clamps shall be painted in accordance with Section 9A of these Specifications. The top surface of the bottom flange of track may not be painted if the manufacturer specifies that painting may impair wheel motion. Hoists shall be painted with the manufacturer's standard finish.

3. EXECUTION:

3.1 Examination

3.1.1 Verify location and layout of anchor bolts.

3.1.2 Verify that electrical power is available and of correct characteristics.

3.2 Installation

3.2.1 Install system and components in accordance with ANSI B30.11

3.2.2 The monorail system installer shall provide all labor and perform all work to install and make operable all mechanical and electrical equipment necessary to assure safe and reliable operation.

3.2.3 Structural members shall not be cut, drilled or otherwise altered without permission of the Engineer.

3.2.4 All tracks, support steel, rods and clamps not hot dipped galvanized shall be painted in accordance with Section 9A of these Specifications. Hoist shall be painted with the manufacturer's standard finish.

3.3 Tests by Regulatory Agencies

3.3.1 Field inspection and testing will be performed under provisions of Division 1.

3.3.2 Perform tests required by ANSI B30.11 and ANSI B30.2.0 in the presence of the Engineer and Owner. Each hoist shall be tested through a complete lift and lowering cycle and through complete trolley travel along beam to determine that the equipment will perform the function of hoisting, braking and traveling quietly and smoothly . The hoisting capacity shall be tested as near actual anticipated loads as possible with available loading facilities such as material or equipment which is readily available within area served. Defects in the equipment indicated by tests shall be promptly corrected.

3.3.3 Schedule tests with two week notice.

3.4 Cleaning

3.4.1 Remove protective coverings from protected surfaces.

3.4.2 Clean surfaces and components ready for inspection.

END OF THIS SECTION

DIVISION 15 - MECHANICAL

SECTION 15A - GENERAL MECHANICAL PROVISIONS

1. GENERAL:

1.1 Section Includes

1.1.1 The scope of work under this Division shall be all mechanical work required for the project work as shown or specified.

1.1.2 The mechanical work shall include the furnishing and installing of various items of mechanical equipment and appurtenances. Unless otherwise specifically indicated, electrical work shown on the electrical drawings shall be provided under Division 16. Any additions or modifications to the work shown on the electrical drawings required for the proper installation or operation of work under this Division shall be provided under this Division, at no additional cost to the Owner, in conformance with the requirements of Division 16. The Contractor shall be responsible for ascertaining the extent of electrical connections required for items furnished under this Division, for ascertaining the extent of electrical work shown on the electrical drawings and for coordinating the electrical work accordingly.

1.1.3 The specifications and drawings are intended to generally define the work required, but they do not include every equipment and installation detail. The work shall include all items and appurtenances required to fully complete the work, whether specifically identified or not, such that the electrical systems are complete and operational.

1.1.4 Furnishing and installing of work under this Division shall comply with Division 1 requirements relating to the furnishing and installing of work.

1.2 Code Compliance

1.2.1 Unless otherwise indicated, in the absence of more stringent requirements in the Specifications or on the Drawings, the work shall be in compliance with the requirements of applicable codes, as a minimum.

1.3 Standards

1.3.1 Wherever the following abbreviations are used in these Specifications, or on the Drawings, they are to be construed the same as the respective expressions represented:

MHSWPS	Manual for Highway Storm Water Pumping Station
AASHTO	American Association of State Highways and Transportation Officials
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWG	American Wire Gauge

AWWA American Water Works Association

IPCEA Insulated Power Cable Engineers Association

IES Illuminating Engineering Society of North America

NEC National Electrical Code

NEMA National Electrical Manufacturers Association

NESC National Electrical Safety Code

UL Underwriters' Laboratories

HIS Hydraulic Institute Standard

FM Factory Mutual

ASHRAE American Society of Heating, Refrigerating and Air Conditioning Engineers

SMACNA Sheet Metal and Air Conditioning Contractors' National Association

NFPA National Fire Protection Association

AMCA Air Movement and Control Association

1.3.2 Wherever a reference is made to a standard or standard specification, the reference shall be to the edition current at the time of bidding, including any revisions or amendments.

1.4 Verification of Contract Drawings

1.4.1 The Contractor shall familiarize himself with the details of the total construction insofar as they may affect the work under this Division, including floor elevations, physical dimensions of structures, materials of construction and the nature of work required under other Divisions. No additional compensation will be granted for failure to consider the total project work.

1.4.2 The contract drawings (Drawings) for electrical work are generally diagrammatic and do not necessarily depict all items to scale. The Drawings indicate the general locations of major elements of the work, however, field conditions or interferences, may require changes in the installation. The Contractor shall coordinate his work to avoid interferences and shall obtain approval prior to making any changes from the installation shown.

1.4.3 Prior to installation, the Engineer may make reasonable minor changes in the locations of the installation without additional cost to the State.

1.4.4 The electrical work shown on the electrical drawings (or on electrical portions of multi-trade drawings) shall be provided under Division 16. Any changes in the electrical installation required for the proper installation or operation of items provided under this Division shall be provided under this Division in full conformance with the requirements of Division 16. In other words, if a change to the electrical work is required to accommodate equipment provided under Division 15, that change shall be the responsibility of Division 15 and it must be in full compliance with the requirements of Division 16.

1.5 Coordination

1.5.1 The Contractor shall coordinate the work under this Division with the work of other trades. This shall include an orderly exchange of information and shall be accomplished such that the total work is not delayed and that interferences are avoided.

1.6 Workmanship

1.6.1 The mechanical work shall be performed in a neat and workmanlike manner in accordance with the best practices of the trade.

1.6.2 Unless otherwise indicated, all materials and equipment shall be installed in accordance with the manufacturer's recommendations.

1.7 Protection of Work

1.7.1 All mechanical work, including equipment and appurtenances, shall be protected from damage until final acceptance. Equipment shall be covered to protect against dirt, moisture, paint and the like. The work shall be protected from mechanical injury by appropriate covering or shielding.

1.7.2 Prior to final acceptance, protective measures shall be removed and equipment and items shall be cleaned as required to deliver the installation to the State in clean, undamaged condition.

1.8 Clean-up and Safety

1.8.1 The work site shall be maintained in a clean condition, free of hazards, all in conformance with the requirements of Article 107 of the Standard Specifications. Special care shall be taken to assure that systems are not left in a hazardous condition.

1.9 Materials and Equipment

1.9.1 Quality

(a) All materials, equipment and appurtenances shall be new, shall be suitable for the application and shall be the product of established, reputable manufacturers.

1.9.2 Standards

(a) The construction, sizes, ratings and capacities of items shall be in conformance with the requirements of the codes and with ASTM and ASME standards, as applicable.

1.9.3 UL and/or FM Label

(a) Unless otherwise indicated, materials and equipment shall bear the UL and/or FM label whenever such labeling is available for the type of material or equipment being furnished.

1.9.4 Other Requirements

(a) Refer to Division 1 for other requirements relating to materials and equipment.

1.10 Erecting and Jointing Interior Piping

1.10.1 Description

(a) This section includes furnishing of supports and hangers and installation of all interior piping and supports.

(b) Piping of the materials, coatings and linings shown or specified shall be installed and supported at the locations specified or where shown.

1.10.2 Delivery, Storage and Handling

(a) All products and materials shall be delivered, stored and handled as specified in Division 1.
(b) Extreme care shall be taken in loading and unloading the pipe and fittings. The work shall be done slowly using skids or suitable power equipment keeping the pipe under control at all times.
(c) Under no condition is the pipe to be dropped, bumped, dragged, pushed or moved in any way which will cause damage to the pipe, lining or coating.
(d) When handling the pipe with a crane, a suitable pipe hook or sling shall be used around the pipe. Under no condition is the sling to be allowed to pass through the pipe unless adequate measures are taken to prevent damage to the pipe ends, lining and coating.
(e) Any piping or fittings damaged in the process of delivery, storing, handling, or laying shall be replaced or repaired as approved.

1.10.3 The interior of pipelines shall be cleaned of all dirt and superfluous material of every description in an approved manner.

1.10.4 All bolts shall be primed by dipping with a bituminous coating, except the threads, which are coated immediately prior to installation of the nuts.

1.10.5 All threads shall be coated with a suitable pipe dope, Masters Metallic Compound, graphite and engine oil, or equal, before jointing.

1.10.6 Installed piping shall be free of sags or bends.

1.10.7 Piping shall be installed to allow for expansion and contraction without stressing pipe, joints or connected equipment.

1.10.8 The fire rated integrity shall be maintained where pipes pass through fire rated walls, partitions, ceilings, and floors.

1.10.9 Pipelines shall be fitted and installed in a neat and workmanlike manner in accordance with approved shop drawings.

1.10.10 Flanged joints shall be made with bolts or bolt studs with a nut on each end.

1.10.11 Welding of pipe joints shall conform with the requirements of ANSI B31.1 unless otherwise specified. All off site welding of steel pipe shall conform to the appropriate requirements.

(a) Pipe and fittings with wall thickness of 3/16-inch and larger shall have ends beveled for welding. Parts to be welded shall be securely held in place and in proper alignment during welding.
(b) The abutting pipe ends shall be separated before welding to permit complete fusion to the inside wall of the pipe without overlapping.
(c) Welding shall be continuous around the joint and completed without interruption.
(d) Welds shall be of the single vee butt type, of sound weld metal thoroughly fused into the ends of the pipe and into the bottom of the vee.
(e) Welds shall be free from cold shuts, pinholes, oxide inclusions or other defects.

1.10.12 Anchors and stands shall be furnished and installed when specified, shown, or required for holding the pipelines and equipment in position or alignment.

Where adjustable supporting devices are not required, pipelines 3 inches in diameter and smaller shall be supported on cast-iron, malleable iron, or steel hooks, hook plates, rings or ring plates.

1.10.13 Hangers and Supports

(a) Pipe hangers shall be provided at each change in pipe direction, on both sides of pipe mounted valves and equipment and on both sides of pipe loops and expansion absorbing devices.

(b) Brackets shall be used for the support of piping from vertical surfaces.

(c) Anchors shall be furnished and installed when specified, shown, or required for holding the pipelines and equipment in position or alignment.

(d) Hangers and supports shall be installed to allow controlled movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.

(e) Hangers shall be adjusted to distribute loads equally on the attachment and to achieve any indicated slope of the pipe.

1.10.14 For sleeve type couplings, equally tighten diametrically opposite bolts on the coupling to bring the gaskets up evenly all around the pipe. Final tightening shall be done with torque wrenches set for the torque recommended by the coupling manufacturer.

1.10.15 All piping shall be installed in accordance with the manufacturer's recommendations and approved Shop Drawings and as specified in Division 1.

1.10.16 After installation of the interior piping and supports, control equipment and all appurtenances, the units shall be subjected to a field running test, as specified in Division 1, under actual operating conditions. Where field welding of pipe joints shown, specified, permitted, or required meet the requirements of ASME/ANSI B31.1 -Power Piping, Chapter VI Section 137.4 Hydrostatic Testing. Testing of pipelines shall be in accordance with the requirements of Division 15A Section 12.

1.11 Leakage Tests

1.11.1 Leakage tests shall be performed for any signs of leakage in all pipelines and structures required to be watertight.

1.11.2 Leaks shall be repaired by replacing broken pipe or joint assemblies found to leak at no addition to the Contract Price.

1.12 Testing

1.12.1 All mechanical equipment and systems provided under this Division shall be adjusted and tested. The Contractor shall adjust, repair or replace faulty or improper Division 15 work or equipment discovered during testing.

1.12.2 Tests may be made progressively as portions of the work are complete.

1.12.3 Tests shall be made in the presence of the Engineer.

1.12.4 A written record of tests shall be maintained by the Contractor and, when complete, it shall be submitted for the record.

1.12.5 The Contractor shall perform all tests necessary to assure proper functioning of materials and equipment. Specific special required tests shall be as described in individual equipment specifications, however, the absence of a specific test requirement does not relieve the Contractor from responsibility to adequately test the equipment and systems for proper operation.

1.12.6 Except where otherwise specifically indicated, testing must be complete prior to final inspection. All instruments, tools, etc., required for the tests shall be provided by the Contractor. Additional testing may be requested by the Engineer during final inspection to spot-check test results or to demonstrate proper functioning of the systems. These tests shall be performed by the Contractor at no additional cost to the State.

1.13 Record Drawings

1.13.1 Alterations and additions to the mechanical installation depicted on the contract drawings made during the execution of the work shall be neatly and plainly marked in red on a set of Record Drawings kept at the contractor's field office for the project. These drawings shall be updated as the work progresses and shall be available for inspection during the course of the work.

1.13.2 Record Drawings shall be prepared and submitted in accordance with Division 1.

1.14 Data to be Filed with the Owner

1.14.1 Certain data, as specified herein, shall be furnished to the Owner when installation and testing are complete, before final acceptance.

1.14.2 The data shall be compiled in 8-1/2 x 11-inch format in high-quality heavy-weight, hard cover binders with piano-style metal hinges or in an alternate approved format. Large drawings and other materials which would be opened or removed for reading shall be provided with heavy clear plastic pouches within the binders. The number of binders shall be as required to hold all required material without over-filling. Various sections, as appropriate shall have suitable dividers. All volumes shall be labeled.

1.14.3 Four sets of the data files shall be provided.

1.14.4 As a minimum, the data files shall include:

(a) A table of contents.
(b) Approved, final shop drawings and product data for all equipment and materials incorporated in the work under this Division.
(c) Manufacturer's maintenance manuals for all equipment furnished under this Division for which maintenance is recommended by the manufacturer.

1.14.5 All data shall be neat and clearly legible. The table of contents and tabulations of set points and other recorded test data shall be typed. Sloppy, illegible, inaccurate, or incomplete data will not be accepted.

1.14.6 See Division 1 for further requirements.

1.15 Final Acceptance Inspection

1.15.1 When the work is complete, tested and fully operational, and only after the Record Drawings have been reviewed and accepted, the Contractor shall schedule a Final Acceptance Inspection with the Engineer.

1.15.2 The Final Acceptance Inspection shall be made for the complete work at the facility as a whole and shall be as further described in Section 105 of the Standard Specifications.

1.16 Guarantees

1.16.1 Guarantees shall be provided for equipment, materials and work provided under this Division as specified in Division 1.

1.17 Maintenance

1.17.1 During the course of the construction work and until final acceptance, the Contractor shall be responsible for maintenance and operational integrity of the facility as specified in Division 1.

1.18 Basis of Payment

1.18.1 Work required to comply with this Division shall be paid as specified under each individual Section, which shall be payment in full for the work described.

2. PRODUCTS:

Not Used

3. EXECUTION:

Not Used

END OF THIS SECTION

SECTION 15B - BASIC MECHANICAL MATERIALS AND METHODS

1. GENERAL:

1.1 Description

1.1.1 Basic materials and methods specified herein shall be incorporated in the work wherever applicable unless specifically indicated otherwise.

1.1.2 The basic materials and methods specified herein are intended to define a minimum standard of quality and workmanship.

1.2 Concrete

1.2.1 Concrete for equipment bases and other work under this Section shall be provided under this Section in conformance with Division 3.

1.3 Cutting and Patching

1.3.1 All cutting and patching of building materials required for work under this Section shall be provided under this Section.

1.3.2 Cutting and patching shall be provided under this Section in conformance with Division 1.

1.4 Fasteners

1.4.1 Fasteners used to mount pipe supports and other items attached to the structure shall be suitable for the weight supported and shall be compatible with the structure material, i.e. wood screws shall be used for wood, toggle bolts shall be used for hollow masonry, expansion bolts or power-set studs shall be used for solid masonry or concrete and clamps shall be used for structural steel.

1.5 Support and Anchors

1.5.1 This section includes requirements for providing all hanging and supporting devices of construction shown, specified, or required for pipelines, apparatus, HVAC system, plumbing, miscellaneous system, and equipment other than electrical equipment.

1.5.2 Submittals

(a) All submittals, including the following, shall be provided as specified in Division 1.

(b) Shop drawings shall be submitted to show the quantity, type, design and location of all supports, hangers and anchors required.

1.5.3 Supporting devices adequate to maintain the pipelines, apparatus, and equipment in proper position and alignment under all operating and testing conditions with due allowance for expansion and contraction shall be provided.

1.5.4 Supporting devices shall be designed in accordance with the best practice and shall not be unnecessarily heavy. Supporting devices shall accommodate loads imposed during leakage tests for the test pressures specified. The required strength of supporting devices shall be based on the combined weight of the piping and connected equipment, the weight of the denser of the fluids used in operations or testing and the weight of insulation where applicable.

Supports shall be installed with a working safety factor of not less than 5. Installation shall conform to requirements of Division 5 - Metals.

1.5.5 Springs shall be provided where necessary. Hangers and supports shall be of standard design where possible and shall be best suited for the service required. Proper pipe protection saddles shall be included for hangers and supports on pipes which are covered with insulation. Where required, supports shall be screw adjustable after installation unless approved otherwise.

1.5.6 All supporting devices shall be designed to minimize interference with access and movement. Eliminate the potential for injuries due to protruding supporting devices.

1.5.7 All piping supports, hanger rod size, brackets and spacing shall meet the requirements of ANSI/ASME B31.1, MSS SP-58, SP-69, SP-89 and SP-90 except as modified herein.

1.5.8 All products and materials shall be delivered, stored and handled as specified in Division 1.

1.5.9 Structural and miscellaneous steel, metal castings, ductile iron pipe and fittings, steel pipe and fittings, and supports meeting the requirements of Division 5 - Metals shall be used.

1.5.10 Overhead hangers shall be supported using threaded rods properly fastened in place by suitable screws, clamps, inserts, or bolts, or by welding. Hangers shall be subjected to tensile loading only. Where lateral or axial movement may occur, suitable linkage shall be provided to permit sway.

1.5.11 Suspended piping shall be supported by adjustable ring or clevis hangers and threaded rods from heavy duty concrete inserts or other fastening devices, except as otherwise specified or noted.

1.5.12 Brackets shall be of welded steel and designed for the following load classifications:

Load Classification	Maximum Load per Bracket
Light	750 pounds
Medium	1,500 pounds
Heavy	3,000 pounds

When medium or heavy brackets are bolted to vertical surfaces, backplates of adequate size and thickness shall be furnished and installed to distribute the load against the vertical surfaces. When the use of backplates is not practicable, the brackets shall be fastened to the vertical surfaces in such a manner that the safe bearing strength of the vertical surfaces will not be exceeded.

1.5.13 Piping shall be connected, supported and guided to permit and control pipe expansion and contraction and to accommodate building expansion, contraction and settling without damage to the piping or support system.

(a) Anchors shall be furnished and installed when specified, shown, or required for holding the pipelines and equipment in position or alignment. Anchors shall be designed for rigid fastening to the structures, either directly or through brackets.

(b) Anchors shall be cast-iron chair type anchors for piping with steel straps, except where anchors form an integral part of pipe fittings or where an anchor of special design is required.

(c) Inserts shall be galvanized concrete. Inserts shall be designed to permit the rods to be adjusted horizontally in one plane and to lock the rod nut or head automatically. Inserts shall be recessed near the upper flange to receive reinforcing rods. Inserts shall be designed so that they may be held in position during concrete placing operations. Inserts shall be designed to carry safely the maximum load that can be imposed by the rod which they engage.

1.5.14 Hanger and supports shall be installed in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1 and Section 15A.

1.5.15 When specified, hangers and supports shall be galvanized as specified in this Division.

1.5.16 Hangers, supports, anchors, and similar devices shall be painted as specified in Division 9.

1.5.17 Field welds, bolted connections and abraded areas shall be cleaned and painted as specified in Division 9.

1.6 Basis of Payment

1.6.1 The work required to comply with this Division shall be paid as specified under each individual Section, which shall be payment in full for the work described.

2. PRODUCTS:

Not Used

3. EXECUTION:

Not Used

END OF THIS SECTION

DIVISION 15 - MECHANICAL

SECTION 15C - PIPING AND APPURTENANCES

1. GENERAL:

1.1 Section Includes

1.1.1 The work specified herein includes furnishing and installing all piping, fittings, valves, and accessories, except work specified in Division 15G required for a complete and satisfactorily working installation as shown and specified.

1.2 Related Sections

1.2.1 Section 5E - Bolts, Anchor Bolts, Expansion Anchors, and Concrete Inserts
1.2.2 Section 9A - Painting
1.2.3 Section 15A - General Mechanical Provisions
1.2.4 Section 15B - Basic Mechanical Materials and Methods
1.2.5 Section 15D - Pumping Equipment

1.3 Submittals

1.3.1 Submit shop drawings and product data under provisions of Sections 1A and 15A.

1.3.2 Submit detailed drawings and data on pipe fittings, valves, slide gate, actuators and appurtenances and as specified under individual subsection.

1.3.3 Pipe and equipment manufactures' submittals as specified under individual subsection.

1.4 Delivery, Storage and Handling

1.4.1 Delivery, storage and handling shall be as specified under Section 1A.

1.5 Guarantee

1.5.1 Provide guarantee under provisions of Section 1A.

1.6 Basis of Payment

1.6.1 The piping and appurtenances work shall be paid as part of the contract lump sum price for

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which shall be payment in full for the work described herein.

2. PRODUCTS:

2.1 Water Piping

2.1.1 General

(a) All piping shall be generally arranged and aligned as shown and specified. Where special conditions are encountered in the field, the arrangement and alignment of piping shall be as directed by the ENGINEER.
(b) Piping shall be installed as directly as possible between connecting points insofar as the work of other trades permit. Where interference occurs with another trade whose work is more difficult to reroute, the Contractor shall revise the routing as required to avoid subject interferences. Piping shall be carefully installed to provide for proper alignment, slope and expansion.
(c) To allow for expansion and contraction, pipe shall be guided and supported in such manner that pipe lines shall not creep, sag or buckle. Anchors and supports shall be provided wherever necessary to prevent any misalignment of piping. Pipe support shall not be limited to support indicated on the drawings.
(d) Small tubing to gauges, controls, or other equipment, installed on any apparatus shall not be coiled nor excessive in length but shall be installed neatly, carefully, bent at all changes in direction, secured in place and properly fastened to equipment at intervals to prevent sagging.
(e) Prior to the start of any piping installation work, the Contractor shall prepare and submit for approval detailed piping installation drawings. These shall be prepared on the basis of actual equipment being furnished and actual dimensions of walls, openings and other significant elements.
(f) Piping and appurtenances shall conform to applicable Section 1006, METALS, of the Standard Specifications.

2.1.2 Ductile Iron Pipe and Fittings

(a) Ductile iron pipe shall meet the requirements of AWWA C151, Class 53 for exposed interior piping and Class 50 for buried piping.

(b) Ductile iron fittings shall have flanged joints or mechanical joints as shown or specified.

(c) Fittings shall be provided as shown and specified and shall be ductile iron meeting the requirements of AWWA C110.

(d) Pipe shall be installed in maximum lengths of 10 feet.

(e) Buried piping shall have restrained mechanical joints. Anchor bolts and nuts shall be “Cor-Ten” type steel for buried pipe installation per Section 5E.

2.1.3 Flanged Connections

(a) Flanged connections shall be made as shown and specified. All flanges shall be drilled in conformance with the 125/150 ANSI Standard template.

(b) Class 150 pound steel flanges shall be smoothed finished (flat faced) for connection to dissimilar metals such as cast iron.

(c) Flanged joints shall be made with bolts or bolt studs with a nut on each end. Bolts, stud bolts, and nuts shall meet the requirements of ASTM A 307 Grade B and ASME B16.1 and Section 5E. Bolts shall have a 1/4-inch projection beyond the nut when joint with gasket is assembled.

(d) Rubber gaskets for flanged joints shall meet the requirements of AWWA C207 as modified and supplemented herein. Gaskets shall be 1/8-inch thick. Gaskets shall be full face.

2.1.4 Wall Pipe

(a) Wall pipe shall be furnished and installed for all storm water piping passing through walls, as shown. Wall pipe material, pipe thickness and coatings shall be same as the connected piping.

(b) Wall pipe shall meet the requirements of AWWA C110.

(c) Wall pipe shall have an integrally cast intermediate collar located at the center of the wall.

2.1.5 Temporary bulkheads shall be provided at the ends of pipeline sections where adjoining pipelines have not been completed and are not ready to connect. Temporary bulkheads shall be removed when they are no longer needed.

2.1.6 Polyvinyl Chloride (PVC) Pipe and Fittings

(a) PVC pipe and fittings shall be Schedule 80 meeting the requirements of ASTM D 1784 Class 12454-B and ASTM D 1785.

(b) Joints shall be ASTM D 2855 solvent welded joints utilizing ASTM D 2564 solvent cement.

2.1.7 Stainless Steel Pipe for Ductwork

(a) ASTM A778, Grade 316
(b) Dimensions: Conform to ANSI B36.19
(c) Wall Thickness: 5-in to 36-in, Schedule 5S

2.1.8 Submittals

(a) All submittals, including the following, shall be provided as specified in Division 1 with the following stipulations.

(b) The following shop drawings shall be submitted.

1) Flanged, screwed, welding and mechanical coupling fittings and pipe, couplings, harnessing and special fittings. When special designs or fittings are required, the Work shall be shown in large detail and the special or fitting shall be completely described and dimensioned.

2) Fully Dimensioned layout of pipe, fittings, couplings, sleeves, expansion joints, supports, anchors, harnessing, valves and equipment. Pipe size, type and materials shall be labeled on drawing and a schedule shall be included.

3) Cross sections showing elevation of pipe, fittings, sleeves, couplings, supports, anchors, harnessing, valves and equipment.

4) Catalog data for pipe, couplings, harnessing and fittings.

(c) The following certifications shall be submitted:

1) Certificate of compliance for pipe, fittings, gaskets, couplings, sleeves, cleanouts, harnessing, specials, and coatings in accordance with this Division.

2) Welders' certifications.

2.1.9 Quality Assurance

(a) Certified welders, having current certificates conforming to the requirements of the ANSI code shall perform all welding on steel pipelines.

2.1.10 Painting and Coating

(a) All pipe and fittings shall be lined and coated in accordance with the piping schedule. All bolts, nuts, couplings and the like shall be coated after the joint has been made.
(b) All ductile-iron pipe and fittings to be cement-mortar lined shall have a cement-mortar lining not less than standard thickness meeting the requirements of AWWA C104, unless shown or specified otherwise.
(c) Ductile-iron pipe and fittings shall be shop coated on the outside with one coat of liquid epoxy primer Symbol B as specified in Section 9A, 4.0 mils minimum dry thickness, for use in exposed locations, such as inside buildings, where finish painting or insulating is required.

(d) Pipe for use not exposed to view shall also be coated with liquid epoxy primer Symbol B as specified in Section 9A.

(e) Immediately after facing and drilling, the back of the flanges and bolt holes shall be coated with liquid epoxy primer coating meeting the requirements of AWWA C210.

(f) The weight and class designation shall be conspicuously painted in white on the outside of each pipe, fitting, and special casting after the shop coat has hardened.

(g) Painting shall be in accordance with Section 9A and meeting the requirements of AWWA C210..

(h) Galvanizing: Provide galvanizing in accordance with ASTM A 53 where shown or specified.

(i) PVC pipe and fittings shall not be painted or coated.

(j) Sleeve-type Couplings

1) Couplings shall be shop coated with liquid epoxy primer in accordance with Section 9A and meeting the requirements of AWWA C210.

2) An additional shop coat of liquid epoxy primer shall be provided on the interior of the middle ring.

3) The exterior of sleeve-type couplings shall be finish coated after installation with the same coating specified in Division 9 for the pipeline of which it is a part.

4) Shop coats and finish coats shall be compatible.

2.2 Knife Gate Valve

2.2.1 Valve shall be of wafer face-to-face design with full diameter flanges having through pipe flange bolt holes to permit independent upstream or downstream pipe flange removal without affecting the shut-off or body shell pressure rating of the valve.

(a) Body shell pressure rating shall be 20 psig cwp.

(b) Shut-off pressure rating shall be 20 psig cwp.

2.2.2 The valve body shall be tested at 1.5 times the rated pressure and the valve gate at 1.1 the rated pressure while in the fully shut position with zero leakage permitted past the seat or to the exterior of the valve.

(a) Valve body material shall be cast 316 stainless steel.

(b) Gate shall be type 316 stainless steel.

2.2.3 Resilient seat ring material shall be type 316 stainless steel and seat material shall be natural or synthetic rubber material suitable for the application.

The packing shall be a mixture of PTFE fibers and grease compounded to permit ease of handling but with sufficient fluidity to transmit equal sealing pressure across the full length of the packing chamber.

2.2.4 The actuator support structure of the valve shall be fabricated of carbon steel. If external support of the actuator is required to insure overall valve performance, the valve manufacturer shall include suitable located support brackets with instructions for proper support and alignment. The valve yoke shall be of sufficient strength to withstand five times the maximum operating torque and thrust.

(a) The drive stem shall be of chrome steel.

(b) The stem drive nut shall be of bronze.

(c) Yoke bearings shall be cast bronze.

(d) All mechanical fasteners shall be cadmium plated.

2.2.5 The valve shall be furnished with a resilient seat which seals around the edge, not the face, of the gate and shall be mechanically retained without the use of adhesives and replaceable. The seat design shall provide drip-tight shut-off at the fully rated pressure difference in either direction.

2.2.6 The packing shall be a square braided PTFE impregnated synthetic fiber material.

2.2.7 The valve shall have scraper blades on both sides of the gate to wipe the faces of the gate clean of any media prior to contact with the packing.

2.2.8 Both faces of gate shall have a surface finish of 16 microinch to insure ease of operation and seal performance.

2.2.9 The gate shall be guided for the full length of the stroke and supported to withstand full rated shut-off pressure in either direction for the full length of valve stroke. The interior of the valve port shall be contoured to insure self cleaning of the valve. The resilient seat in the bottom port area of the valve shall be flush with the port area and shall not form a cavity in which debris can collect.

2.2.10 Valve furnished electric motor actuator shall be of rising or non-rising stem design.

2.2.11 All non-stainless steel metal surfaces shall be painted with a zinc free primer.

2.3 Motor Operated Actuator for Slide Gates

2.3.1 General: The electric valve actuator shall include a motor, operator unit gearing, limit switch gearing, limit switches, torque switches, stem nut, de-clutch lever, and auxiliary handwheel, reversing motor starter and space heaters, as a self-contained unit.

The actuator shall meet AWWA-C-540-93 specifications. A 3-pole disconnect switch shall be built in the motor starter or furnsihed with the actuator for field mounting. Unless otherwise noted the actuator shall be designed to operate the valve at the rate of 12 inches per minute.

2.3.2 Enclosures: The valve actuator motor and all electrical enclosures shall be non-explosion proof for the knife gate valve and shall be NEMA 4 for the outdoor slide gate.

2.3.3 Motor: The motor shall be 460 volts, 3 phase, 60 hertz specifically designed for valve actuator service and shall be of high starting torque, totally enclosed, non-ventilated construction non-explosion proof, Class B insulation, 85^{o}C rise, 40^{o}C ambient. Motor leads shall be brought into the control compartment or limit switch compartment for external connections.

The motor shall be of sufficient size to open or close the valve from any position and under any condition of operation the valve may be subjected to. The motor duty rating shall be sufficient for one complete cycle (open-close-open, or reverse) without exceeding its temperature rating and shall not be less than 30 minutes continuous. The motor shall be prelubricated and all bearings shall be of the anti-friction type. The motor speed shall not exceed 188.5 radian per second (1,800 rpm).

2.3.4 Electric Actuator Gearing: The actuator gearing shall be a double reduction unit with the capability of changing the output speed with a relatively fast, simple gear change. The power gearing shall consist of spur or helical gears and worm gearing. The spur or helical gearing and worm shall be of hardened alloy steel and the worm gear shall be alloy bronze. All gearing shall be accurately cut with hobbing machines. All power gearing shall be grease lubricated. Ball or roller bearings shall be used throughout. All other gears shall be made of bronze or steel.

2.3.5 Position Limit Switch: Position limit switches and associated gearing shall be an integral part of the valve actuator. Limit switch gearing shall be of the intermittent type, made of bronze or stainless steel, grease-lubricated, and enclosed in its own gear case to prevent dirt and foreign matter from entering the gear train. The limit switches shall be geared to the driving mechanism and in step at all times whether in motor or manual operation. The trip points of the switches shall be adjustable over the entire range of the valve travel. They shall not be subject to breakage or slippage due to over-travel. Limit switches shall be of the heavy duty, open contact type with a rotary wiping action.

2.3.6 Torque Switch: Each valve actuator shall be equipped with a double torque switch which is responsive to loads encountered in both the opening and closing direction. Each side of the switch shall have a graduated dial and shall be adjustable. The torque switch shall operate during the complete valve cycle without the use of auxiliary relays, linkages, latches, or other devices. The torque switch shall be designed to shut off the actuator motor in the event that abnormally high torque is realized in either direction of travel.

The torque switch is utilized as a protective device in valve applications requiring position seating. For torque seated valves, such as wedge gate and glove valves, the closing torque switch shall shut off the actuator motor when a predetermined torque is reached, corresponding to the required seating torque of the valve.

2.3.7 Manual Operation: A handwheel shall be provided for manual operation with an arrow to indicate "open" rotation. The handwheel shall not rotate during motor operation. A fused motor shall not prevent manual operation. When in manual operating position, the unit will remain in this position until the motor is energized. The actuator will automatically return to electric operation when the motor is energized. The actuator will remain in motor position until handwheel operation is desired. Movement from motor operation to handwheel operation is accomplished by a positive de-clutching lever which disengages the motor and related gearing mechanically but not electrically with no damages to clutch a gear mechanism. It shall not be possible for the unit to be simultaneously in manual and motor operation.

2.3.8 Provide stem protector for rising stem in suitable length and diameter to allow for full extension of the stem. Stem protector shall couple to the top of the actuator by means of a national pipe thread (NPT) and shall be capped and vented.

2.3.9 Hammerblow Device: The valve control shall have a built-in lost motion device that travels sufficiently enough to allow the motor to reach full speed before imparting a hammerblow to start valve in motion in either the closing or opening direction. This lost motion device also must permit motor to attain full speed before load is encountered, and load should be shared equally by two lugs cast integrally on the drive sleeve. Lost motion device is not to be provided for those valves used in inching, throttling, regulating, or modulating service.

2.3.10 Motor Starter: The motor starter shall be 3 phase AC full voltage reversing, rated 600V AC operated at 480V, 60 Hz unless otherwise noted. The starter shall include two 3 pole contactors mechanically and electrically interlocked, fused control transformer with 120V secondary, 120V, 60 Hz coils, 3 phase thermal overload relay, and auxiliary contacts. Heavy duty industrial type control station rated 10 amperes at 480 VAC, with local-off-remote selector switch, open-close-stop pushbuttons and open-closed indicating lights shall be provided on the motor starter, except where the valve actuator is inaccessible from the operating floor the control station shall be remotely mounted from the actuator. Terminal blocks shall be provided for all external wiring connections. Each terminal shall be properly marked.

2.3.11 Space Heater: Space heaters shall be provided in the motor enclosure and starter or limit switch enclosure. The heaters shall be powered as scheduled, with sufficient capacity to prevent condensation in the enclosures.

2.3.12 Power Input: The power input to the actuator shall be 480V, 3 Phase, 60 Hertz.

2.4 Slide Gate

2.4.1 General

(a) This section includes requirements for furnishing and installing the slide gate, operator and all appurtenances necessary for a complete installation.
(b) Gate operator shall be complete, including a suitable enclosure, with all appurtenances necessary for the operator to perform its intended function as specified under subsection 2.4, Motor Operated Actuator for Valves, Slide Gates and Sluice Gates, of this Section.
(c) Slide gate shall be stainless steel. Quantity of gate, guide, size, location and type shall be as shown or specified. Each gate shall be provided with the type of operator specified in the Slide Gate Schedule.
(d) Slide gate shall be designed to limit deflection under maximum loading to 1/360 of the span. Slide gate shall be designed for the seating or unseating pressures specified, measured to the center of the gate.
(e) Submittals

1) Working drawings shall be submitted, including arrangement and erection drawings of the gate, operator and control equipment; structural design data, if requested; and operating characteristics.

2) The following certifications shall be submitted:

i Manufacturer's certified performance and material specifications, as specified.

ii If requested, complete calculations shall be submitted for each size of motor operator indicating the force required to operate the gate, the operator force provided, full load and locked rotor current, and watts (horsepower).

3) Operation and maintenance manuals shall be submitted for the slide gate and gate operator.

2.4.2 Stainless Steel Slide Gate

(a) The self contained stainless steel slide gate shall be of ASTM A276, Type 304 stainless steel with a thickness of not less than 1/4 inches, reinforced with Type 304 stainless steel structural shapes, capable of withstanding the water pressure in either direction with the water level at maximum operating level. Provide tight water seal between frame and disc.

(b) The gate, guide, self contained frame shall be all fabricated of Type 304 stainless steel. Gate shall be reinforced as required to keep gate deflection within specified limits.

(c) The gate shall be designed for flush bottom closure. Bottom and side seals shall be resilient (50 ± 5 Durometer A) neoprene. The bottom seal shall be installed across the bottom of the gate or frame, mating with the side seals to keep leakage within specified limits. Provide replaceable seals, securely mounted with stainless steel retainer bars bolted to the gate with stainless steel bolts.

(d) Guides shall consist of slotted side pieces with a flush type bottom cross piece. Fabricate pieces of castings or structurals with integral anchoring ribs, shop assembled into a rigid assembly for embedment in concrete. Side slots shall be provided of the width and depth required for support and free operation of the gate without binding.

(e) Bearing surfaces shall be 3/8-inch minimum thickness, installed in a recess or keyed into the guide, designed to hold the polymer bearing surface in position against the gate.

(f) Where guides extend above concrete side walls, guides shall be supported by stainless steel structural members.

2.4.3 Slide Gate Operators And Lifting Stem

(a) Operator shall be York mounted as shown on the drawings. Operator shall be rising stem, unless otherwise specified. Stem shall be securely fastened to the gate by means of a casting, mounting block or angles secured to the gate. Acme-threaded stem shall have 16 microfinish or better. Gate stem attachment shall be provided with provisions for keying or pinning the stem to the gate attachment.

(b) Stem shall be designed for the maximum operating torque of the operator and the weight and service of the gate. The length over radius of gyration (l/r) ratio of the stem shall be limited to 200, and the stem diameter shall be limited to 1.50 inches. Stems shall be stainless steel meeting the following applicable standards.

1)	Stainless Steel	ASTM A 276, Type 304 or 304L ASTM A 582, Type 303

(c) Stem shall be provided with a stem cover of schedule 40, ASTM A53 galvanized pipe. The top of the stem cover shall be closed. The bottom end of the stem cover shall be mounted in a housing or adapter plate for easy field mounting.

(d) Provide a freezeproof cold weather and corrosion-resistant padlock with padlock chain and keys to be installed through the handwheel operator and around the stem to preventunauthourized operation of the slide gate. Padlock housing shall be a sturdy one-piece alluminum alloy casting. All other partts shall be nonferrous metal to prevent rust. Locks shall have an 11-disc locking mechanism.

Padlock chain shall be heavy-duty flat-link, zinc-plated chain.

2.4.4 Slide gate shall be painted in accordance with the requirements in Division 9 -Painting. Bright or rubbing surfaces shall not be painted, but shall be protected and left bright.

2.5 Pipe Supports and Anchors

2.5.1 Pipe supports and anchors shall be furnished and installed as shown on the Drawings or as specified in Division 15B.

2.6 Sleeve-Type Couplings

2.6.1 Couplings shall be provided with rolled steel followers, steel sleeves, rubber compound gasket and high strength boltsand nuts.

2.6.2 Use gaskets that are not affected by the fluid service of the pipeline.

2.6.3 Couplings shall have a minimum pressure rating equal to the test pressure of the pipeline.

2.6.4 Middle rings shall be provided without a pipe stop, and at least 5/16-inch thick and 5 inches wide for 4-inch through 8-inch pipe, and 3/8-inch thick and 7 inches wide for 10-inch through 30-inch pipe, with follower rings of the proper thickness.

2.6.5 Unless shown or specified otherwise, harnessing for sleeve-type couplings shall be designed, furnished and installed in accordance with the applicable portions of AWWA Manual M11, Chapter 13 - Supplementary Design Data and Details, 13.10 - Joint Harness. Harnessing shall have a design pressure equal to or greater than the test pressure of the pipeline on which it is installed.

2.6.6 All surfaces shall be shop coated with liquid epoxy primer. The inside coating of the middle ring shall be given an additional shop coat of liquid epoxy primer. Finish coat shall be as specified in Section 9A for the pipe of which it is a part.

2.7 PVC Ball Valve and Check Valve

2.7.1 PVC ball valve shall be trunnion ball design with Viton or EPDM O-rings. Ball valve shaft shall be reinforced with stainless steel rod.

2.7.2 PVC ball check valve shall be design with union connector with Viton and EPDM O-rings seals. Ball shall be supported by a system of guide ribs to give full flow with minimum turbulence and chatter.

3. EXECUTION:

3.1 Transportation and Delivery

3.1.1 Every precaution shall be taken to prevent injury to the pipe during transportation and delivery to the site. Extreme care shall be taken in loading and unloading the pipe and fittings. Such Work shall be done slowly with skids or suitable power equipment, and the pipe shall be under perfect control at all times. Under no condition shall the pipe be dropped, bumped, dragged, pushed, or moved in any way which will cause damage to the pipe or coating. When handling the pipe with a crane, a suitable pipe hook or sling around the pipe shall be used. Under no condition shall the sling be allowed to pass through the pipe unless adequate measures are taken to prevent damage to the pipe ends.

3.1.2 If any pipe or special is damaged in the process of transportation, handling or laying, such pipe or pipes shall be replaced or repaired by the Contractor at its own expense.

3.1.3 The Contractor shall furnish and install suitable blocking and stakes to prevent the pipe from rolling. The type of blocking and stakes, and the method of installation, shall be approved by the Engineer.

3.2 Piping Installation General

3.2.1 The dimensions shown on the Drawings for the location of pipelines have been established with the intent that there will be no interferences. The Contractor shall check all dimensions shown on the Contract Drawings prior to the installation of Work and shall notify the Engineer promptly of any interferences or errors discovered. If interferences are found to exist prior to or during construction, changes in the location of pipelines to avoid such interferences shall be made at no extra cost to the Owner and in a manner as reviewed by the Engineer.

3.2.2 Elevations and dimensions locating pipelines are shown on the Drawings to the centerlines of the pipe unless otherwise indicated.

3.2.3 Piping connections and dimensions to equipment are subject to changes as reviewed by the Engineer to suit the types of equipment furnished.

3.2.4 Piping suspended from ceilings shall be installed to provide maximum head room consistent with good installation.

3.2.5 The layout of the piping and fittings shall be carefully checked to determine that the related equipment can be properly assembled to produce a workable arrangement. Defective or improperly fabricated Work shall be rejected and replaced with Work which, when completely assembled, shall result in an arrangement which shall function as intended and as shown on the Drawings.

3.2.6 All pipelines shall be straight and true in alignment, grade and location indicated, designated or required, and all installation shall be made in a workmanlike manner to the satisfaction of the Engineer. The pipe and fittings shall be adequately braced and blocked or tied, hung or supported for satisfactory installation.

3.2.7 As soon as pipes are in place, all open ends shall be capped until permanent connections are made. All pipelines shall be securely supported when required either by hanging from beams with suitable pipe hangers or supported on walls by suitable wall brackets. Where it is necessary, install hangers or supports after concrete is poured or other masonry Work finished. Anchor bolts with expansion shields shall be used.

3.2.8 Where pipes pass through masonry walls, floors and partitions, the juncture shall be made as shown on Plans. Where no details are shown, the Contractor shall either rough in the piping before the concrete is poured or the masonry completed, or shall provide suitable plugs, sleeves or forms for piping. After the pipes have been installed, the openings shall be filled solid; suitable allowance being made, however, for the expansion and contraction of the piping. The cutting of concrete for pipe shall be avoided wherever possible, and in no case where such cutting is necessary shall reinforcing rods be cut or disturbed, and no such cutting shall be done without the permission of the Engineer. All openings made for pipe Work shall be neatly patched in a workmanlike manner.

3.2.9 Horizontal runs shall be given as steep a pitch with even grade toward the outlet as conditions will permit, and care shall be taken in laying out piping that there is no interference with the proper location of piping for other purposes or other equipment. No change shall be made in the general location shown for piping, or in the method of running and connecting same, except with the written approval of the Engineer. When any change is made, a record of the location of all pipes so changed shall be kept by the Contractor and a copy of such record shall be given to the Engineer showing the location of all piping.

3.3 Protection of Piping System

3.3.1 Install and maintain pipe and equipment which is clean and free from rust, dirt, scale, etc.

3.3.2 Install temporary airtight covers at all pipe and equipment openings. Special attention shall be given to vacuum and air piping and each pipe section shall be individually inspected prior to placing. No piping shall be placed when wet, nor shall any free moisture be present inside any air piping during installation.

3.4 Pipe Supports and Hangers

3.4.1 Pipe supports and hangers shall be in accordance with Section 15B.

3.5 Welding

3.5.1 All welding of piping and/or special fittings shall be done in conformity with the current ANSI B31.1, "Pressure Piping". A certification of the welder's qualifications, in conformity with the requirements of this code, shall be submitted to the Engineer.

3.5.2 Tee connections in welded piping shall be made with a factory fabricated butt welding tee or with weld-o-let of butt, socket or threaded type. When weld-o-lets are used, the branch connection shall be one-half the diameter of the main or less. Scarf welding or direct butt welding of side connections shall not be permitted. Tees fabricated from pipe shall not be permitted.

3.5.3 Long radius welding elbows shall, whenever possible, be used for changing direction of welded pipelines. Mitered joints shall be subject to approval by the Engineer.

3.6 Flanged Joints

3.6.1 All flanged joints shall be made temporarily with gaskets in place using a minimum number of bolts to support the piping. Any misalignment of the assembled piping shall be adjusted or corrected in a manner approved by the Engineer.

3.6.2 Tightening of flange bolts to "pull up" misaligned flanges will not be permitted and shall not be done. The misaligned flanges shall be machined to fit, or approved spacer pieces and gaskets shall be installed if necessary and directed by the Engineer. The temporary assembly of the flanged piping shall demonstrate that there will be no undue stresses in the piping or at the connections to the equipment. The temporary assembly shall be approved by the Engineer before the joints are tightened. Flanged joints shall then be completed and made watertight and the tension in the flange bolts, when tightened, shall not exceed 15,000 psi at the minor diameter of the bolt threads.

3.7 Sleeve Type Couplings

3.7.1 For sleeve type couplings, diametrically opposite bolts shall be equally tightened on the connection so that the gaskets will be brought up evenly all around the pipe. Final tightening shall be done with torque wrenches set for the torque recommended by the coupling manufacturer.

3.8 Testing

3.8.1 Where applicable, pipes shall be flushed clean and tested and any leaks shall be made tight.

3.9 Painting

3.9.1 Piping, fittings and appurtenances shall be painted in accordance with Section 9A - Painting.

3.10 Supports for Present Piping

3.10.1 Wherever Contractor is required to expose, suspend or reroute present piping, supports for such piping shall be provided as is required for new piping in accordance with paragraph 3.4 Pipe Supports, this Section.

3.11 Wrecking and Repair

3.11.1 The Contractor shall do its own excavation for piping as required to complete the Work. If excavation is required below present concrete slabs, the backfill materials shall be sand flushed in place or class B concrete fill as required by the Engineer. The concrete used to repair the structure shall be Class A concrete. Where reinforcing is cut, dowels shall be used for laps. Junctures between the present portions of slabs remaining and new slabs shall be uniformly saw cut.

3.11.2 All such repair procedures shall be subject to review by the Engineer.

3.12 Installation of Slide Gate

3.12.1 Slide gate shall be installed in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1.

3.12.2 Floor stand shall be accurately centered over the gate. Stand shall be solidly bolted to the floor or support structure, with through-bolts wherever possible. Approximately 3/4 inch of nonshrink cement grout shall be placed beneath stand mounted on concrete or similar construction to assure uniform support.

3.12.3 Field Tests

(a) After installation of the gate, control equipment and all appurtenances, the units shall be subjected to a field running test, as specified in Division 1, under actual operating conditions.

(b) Slide gate shall be tested for leakage, strength, and opening and closing against the maximum heads practicable to obtain under operating conditions. Any leaks around the frame or gate shall be stopped. The maximum allowable amount of seepage through any slide gate shall not exceed 0.2 gpm per foot of seating perimeter.

3.13 Installation of Pipe and Fittings

3.13.1 All pipe and fittings shall be installed in accordance with the specifications contained herein and in Division 15A and 15B and in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1.

3.14 Schedule

3.14.1 Valve Schedule

Facility/Service	Valve Type	Size Inches	Joint Type	Actuator Type	Remarks
Pump Suction	Knife Gate	6, 12	F	Handwheel	

Discharge Chamber Drain	Knife Gate	6	F	Floorstand Handwheel

Note:

(1) Abbreviations used in the schedule are as follows:

Joints

F Flanged

3.14.2 Slide Gate Schedule

Service	Size WxH (inches)	Seating Head (feet)	Unseating Head (feet)	Actuator	Remarks
Discharge Channel	24x24	10	0	E	Flush bottom
Recirculation	16x16	10	0	E	Flush bottom

Note:

(1) Abbreviation used in the schedule is follows:

Actuator

E Electric Motor (Nonmodulating)

3.14.3 Inside Piping Schedule

Service	Size (Inches)	Pipe Material[2]	Protective Coatings[4] Int.	Ext.	Joints[3]	Test Pressure (psig)[1]	Remarks
Pump Discharge	4, 12	DI	CL	P	F	100	
Pump Suction	6, 12	DI	CL	P	F	100	
Recirculation	16	DI	CL	P	M	N.A.	
Drain Pipe	4	CA	-	-	H	N.A.	
Sump Pump Discharge	2	PVC	-	-	S	N.A.	

NOTES:

(1) Measure the test pressures shown in the schedule at the centerline of the pipeline's low point. Adjust test pressures measured at other locations accordingly.

(2) DI Ductile Iron
PVC Polyvinyl Chloride
C Copper Tubing
CA Cast Iron Pipe

(3) F Flanged
S Solder
H Hub & Spigot
SW Solvent welded
M Restrained Mechanical Joint

(4) P Shop Finish Painted
CL Cement - Mortar Lined

(5) N.A. = Not Applicable

END OF THIS SECTION

DIVISION 15 - MECHANICAL

SECTION 15D - PUMPING EQUIPMENT

1. GENERAL:

1.1 Description

1.1.1 Existing pumps are Flygt dry pit submersible motor pumps and are to be relocated and upgraded as described herein.

1.1.2 This section includes requirements for furnishing and installing one new dry pit submersible motor pumping unit and one new dry pit submersible low flow pump, together with pump stand, chain and cable holder and all appurtenances necessary for a complete installation.

1.1.3 This section also includes requirements for relocation and modification two existing Flygt dry pit submersible motor pumping unit and all appurtenances necessary for a complete installation. The modification of the existing main pump shall include the conversion of electrical power input to the pump motor from 230 volts to 460 volts as shown on the Drawings and specified. Provide water tight seal after the conversion of electrical power input.

1.1.4 Pumping units include one new main pump, two existing main pump relocations and one new low flow pump as shown on the Drawings and specified.

1.1.5 Pump shall be of the vertical, centrifugal, heavy duty, non-clog, close-coupled, submersible type, with bottom suction and side discharge, each driven by submersible electric motor mounted as an integral part of the pump. The pumping unit shall be designed to pump at the capacities specified. The pumping equipment including suction elbow shall be arranged for installation in the spaces shown without appreciable revision of the piping. The pumping units shall be designed for continuous and intermittent duty.

1.1.6 Furnish one spare main pump with plug. The spare main pump assembly shall not be included in any lump sum work and will be paid for at the contract lump sum work for COMPLETE SPARE MAIN PUMP ASSEMBLY which shall be payment in full for the work specified.

1.1.7 Furnish one spare low flow pump with plug. The spare low flow pump assembly shall not be included in any lump sum work and will be paid for at the contract unit price each for COMPLETE SPARE LOW FLOW PUMP ASSEMBLY which shall be payment in full for the work specified.

1.1.8 Spare main pump assembly shall be delivered and stored at Owner's designated storage facility.

1.1.9 Spare low flow pump assembly shall be stored at floor El. 732.0 as indicated on the drawing.

1.2 Operating Conditions

1.2.1 The main pump shall be capable of a draw down to a low water level of 2.51' below the invert elevation of the 24" inlet pipe at El. 705.51 without cavitation occurring. Manufacturer's certification of the preceding shall be provided as part of the submittal data.

1.2.2 The new pumps shall operate at the capacities and heads and over the range of operating conditions specified without overloading, cavitation, and vibration. The pumps shall conform with the following requirements:

	Requirements	
Items	Main Pump (MP2)	Low Flow Pump(LFP4)
Capacity at primary rating point (design point)	2,900 gpm	250 gpm
Total head at primary rating point (design point)	30ft	33ft
Overall efficiency, wire to water, at rating point, minimum, percent	70	38
Shutoff head: Maximum	46 ft	50
Capacity at secondary rating point, minimum	4,000 gpm	500 gpm
Total head at secondary rating point, feet	24 ft	24ft
Overall efficiency, wire to water, at secondary head, minimum, percent	70	35
Diameter of sphere that will pass through pump, minimum	4-1/4 inch	3 inch
Pump suction diameter, minimum	12 inch	6 inch

Pump discharge diameter, minimum	12 inch	4 inch
Pump speed, maximum, rpm	860	1750
Motor horsepower, maximum	30 hp	7.5hp
Motor efficiency at full load, minimum, percent	88	84
Motor power factor at full load, minimum	0.8	0.82
Locked rotor kVa/hp, maximum, NEMA code letter	F	F
Maximum overall pump height including lifting eye	5'-3"	2'-2"

1.2.3 Each pump shall have a continuously rising characteristic curve from the rating point to shutoff which passes through the rating point, and which meets or exceeds the specified heads and capacities, all within the Hydraulic Institute tolerances.

1.2.4 Submersible units shall be capable of sustaining full reverse runaway speed without damage.

1.2.5 Motors shall be capable of operating pumps at any point on the curve without overloading and without using the service factor.

1.3 Related Sections

1.3.1 Section 3A - Cast-In-Place Concrete
1.3.2 Section 3B - Grout
1.3.3 Section 5A - Structural Steel
1.3.4 Section 5E - Bolts, Anchor Bolts, Expansion Anchors and Concrete Inserts
1.3.5 Section 9A - Painting
1.3.6 Section 15A - General Mechanical Provisions
1.3.7 Section 15B - Basic Mechanical Materials and Methods
1.3.8 Section 15C - Piping and Appurtenances
1.3.9 Section 16C - Major Electrical Equipment
1.3.10 Section 16D - Supervisory Control and Data Acquisition (SCADA) Equipment

1.4 Submittals

1.4.1 All submittals, including the following, shall be provided as specified in Division 1.

1.4.2 Submit a list of not less than five (5) installations where pumping equipment of the type and approximate size specified herein have been in successful operation for at least five (5) years.

1.4.3 Submit location of the nearest permanent service headquarters of the pump and motor manufacturers.

1.4.4 Submittal data shall include:

(a) Complete manufacturer's specifications and descriptive bulletins for all equipment including size, capacity, description and make of pumps.

(b) Complete description, illustrations, wiring diagrams of automatic controls and starting equipment.

(c) Complete motor data, as specified.

(d) Pump performance curves for the specified conditions including head, input kilowatts, and overall efficiency, as a function of capacity from zero to maximum capacity.

(e) Drawings of the equipment, including arrangement and erection drawings of the equipment and equipment operating characteristics in such detail as to give all dimensions necessary to accurately locate through the floors and walls all openings for pipes, anchor bolts and fittings for motors, pumps, motor and pump control center openings, and conduit between the associated equipment. This includes drawings, indents, pockets, and clearances necessary in the floors and walls for proper installation of the equipment specified.

(f) General arrangement drawing of pumping unit, suction elbow and pump stand. Include equipment weight and anchor methods and materials.

(g) Cross section drawing of pumping unit.

(h) Parts list with materials of construction identified.

(i) Motor performance characteristics.

(j) Spare parts list.

(k) Painting procedure.

(l) Six certified copies of the Shop Test results.

1.4.5 Submit copies of all manufacturers' guarantees and warranties obtained by the contractor to be transferred to the State of Illinois, Division of Highways, at the time of acceptance of this project by the State of Illinois.

1.4.6 Motor data shall include:

(a) Manufacturer
(b) Nameplate rated kilowatts (horsepower)
(c) Rated voltage
(d) Full load rpm
(e) Full load current
(f) Full load power factor
(g) NEMA design letter

(h) NEC code letter or inrush current
(i) Insulation class
(j) Service factor
(k) Recommended starting restrictions, including allowable starts per hour
(l) Recommended maximun KVAR rating of power factor

1.5 Quality Assurance

1.5.1 General

(a) Pumping equipment shall be produced by a manufacturer who regularly engages in the design, manufacture, assembly and production of submersible sewage pumping equipment of the size and type as specified for not less than five years.
(b) Motor unit wiring shall be rated for service in non- hazardous dry pit locations.
(c) All materials used in the construction of the equipment herein specified shall be new and of the highest available grade and of properties best suited to the Work required.
(d) One manufacturer shall be responsible for providing pumping equipment, including pump motor and all accessories.
(e) Unless otherwise indicated, all pumps of a specified type under this Section shall be identical, the product of the same manufacturer.
(f) To ensure that all equipment is properly coordinated and will function in accordance with the intent of these Specifications, the Contractor shall obtain all the equipment specified herein from the pump manufacturer in whom shall be vested unit responsibility for the proper function of the complete system, including pumps, motors, electrical, control equipment and accessories as shown and specified. Contractor, however, shall retain overall responsibility for equipment coordination, installation, testing and operation.

1.5.2 Contractor's Responsibility

(a) If the power demand of pumping units proposed to be provided for this Project exceeds the minimum horse power as specified and shown in the Drawings, it is the Contractor's sole responsibility, without additional cost to the Owner, to upgrade all affected electrical facilities such as, but not limited to, wiring, conduits, motor controls, switchgear, transformers and incoming facilities to be able to operate all the pumping units satisfactorily and to meet the Specifications.

1.5.3 Manufacturer's Certifications

(a) Submit manufacturer's certification that he has carefully examined all of the Contract Documents in detail, including the arrangement and conditions of proposed structures affecting the performance of the pumping equipment units, and the detailed requirements of manufacturing and subsequent installation of the pumping equipment units.

(b) Submit manufacturer's certification that there are no omissions, ambiguities or conflicts in the Contract Documents or in the pumping station piping layout that affect the pumping units, as shown on the Drawings which have not already been clarified in writing by the Owner.

(c) Submit manufacturer's certification that they have reviewed the location and discharge piping design, the discharge valve locations and types, the loads imposed on the pumping units from the connections, the pumping unit locations such as the physical separation to each other and adjacent walls, the water to be pumped, and pumping station piping layout, as shown on the Drawings, and that any incidental modifications thereto will not affect the specified pumping unit performance and efficiency to be furnished under this Contract, and they will be solely responsible for furnishing and delivering pumping equipment that will perform and meet the requirements, as specified in the Contract Documents.

(d) Submit manufacturer's certification that they have inspected the storage of the pumping equipment and find no conditions that have adversely affected the equipment.

(e) Submit manufacturer's certification that they have supervised the installation of the pumping equipment and that the pumping equipment has been properly installed.

(f) Submit manufacturer's certification that they have inspected the pumping equipment after 1000 hours of operation and certify the pumping equipment is operating satisfactorily.

1.5.4 Data to be filed with the Owner

(a) Record Drawings: The Contractor shall keep one record copy of all Specifications, Plans, Addenda, Supplementary Drawings, Working Drawings, Change Orders and Clarifications at the site in good order. Specifications, Plans, Supplementary Drawings and Working Drawings shall be annotated to show all changes made during the construction process. These shall be available to the Owner at all times and shall be delivered to the Owner upon completion of the work.

(b) Four bound copies of operating and maintenance instructions, diagrams, parts, lists, requirements and other information pertinent to the operation of the various systems and equipment shall be furnished to the Owner. Refer to Division 1.

1.5.5 Source Quality Control

(a) Shop tests shall be performed on each pumping unit including spare pump in accordance with the test code of the Hydraulic Institute, except as modified herein. The pumps shall be tested in the position that they will be installed.

(b) Tests shall be conducted at rated speed to determine the curves of head, electric input kilowatts, and overall efficiency, wire to water, as a function of capacity. A minimum of six points shall be taken, including shutoff. One point shall be as near as possible to each specified condition of head and capacity and the remaining points at capacities necessary to provide a uniform distribution of data. Capacity shall be expressed in gallons per minute and head shall be expressed in feet. Raw test data, calculated results and sufficient information for computation and plotting of the curves shall be furnished with the certified shop test curves.

(c) Certified test curves shall be furnished for approval prior to shipment. All tests shall be witnessed by the manufacturer by a Registered Professional Engineer registered in the state in which the shop tests are performed. The witnessing Registered Professional Engineer shall sign and seal each copy of the curve and test data sheets. Six copies of the curves along with the certified drive unit test data, shall be furnished for approval. Shipment of the pumping units shall not be made until the test data and curves are approved.

(d) Curves shall be drawn to such scale that values can be read accurately within 1%. The efficiency curves submitted shall constitute a guarantee within 1% on the scale, for all deliveries between 3/4 rated capacity and 1-1/4 rated capacity.

(e) In addition to the hydraulic test, the pump manufacturer shall perform the following inspections and tests on each pump before shipment from factory:

1) Impeller, motor rating and electrical connections shall first be checked for compliance with the Specifications.
2) A motor and cable insulation test for moisture content or insulation defects shall be made.
3) Prior to submergence, the pump shall be run dry to establish correct rotation and mechanical integrity.
4) The pump shall be run for 30 minutes submerged, a minimum of 6 ft. under water.
5) After operational test 1.5.5(e)4, the insulation test 1.5.5.(e)2, is to be performed again. A written report, stating the foregoing steps have been done, shall be submitted prior to shipment.
6) Each pump shall be subjected to a hydrostatic test and certification of the hydrostatic test shall be provided. The hydrostatic pressure shall, in any case, not be less than 200% the shut-off pressure of the pump as shown by the characteristic curve.

(f) The Contractor shall provide transportation and reasonable expenses to and from all factory pump testing for two (2) representatives of the State to witness such testing. State of Illinois shall designate these individuals. The Contractor shall notify the State of a scheduled test date two months prior to said date and shall arrange an exact suitable date not less than two weeks prior to the test.

(g)The pump tests shall be performed in the domestic United States. However, if this can't be done, the Contractor shall hire an approved witness and pay all necessary expenses if the test cannot be performed in the domestic United States.

1.6 Guarantee

1.6.1 Refer to Division 1.

1.7 Delivery, Storage and Handling

1.7.1 Products and materials shall be delivered, stored and handled as specified in Division 1.

1.8 Spare Parts

1.8.1 The following spare parts shall be provided for one set for new main pump and one set for low flow pump:

(a) One set of mechanical seals - upper and lower
(b) One set of cable entry grommets
(c) One set of Motor Bearings
(d) One set of Wear Rings

1.8.2 A complete set of special wrenches, spanners, eyebolts and other special tools shall be furnished sufficient to completely dismantle and reassemble each kind and size of pumping unit. Tools shall be forged steel, case hardened, full finished, and furnished with a metal tool case with a handle and provision for padlocking.

1.9 Basis of Payment

1.9.1 The pumping equipment shall be paid as part of the contract lump sum price for

PUMP STATION MECHANICAL WORK

which shall be payment in full for the work described herein unless otherwise noted.

2. PRODUCTS:

2.1 Pump Specifics

2.1.1 Design

(a) The pumps shall be dry pit submersible which is similar to the existing Flygt dry pit submersible motor non-clog wastewater pumps and shall be a self contained pump/motor unit without the need for any external cooling system.

(b) The pump/motor unit shall be designed with a suction elbow and stand to be bolted to a concrete base curb or floor as shown on the Drawings.

2.1.2 Cooling System

(a) Motors shall be cooled by the surrounding environment.

2.1.3 Casing

(a) Pump casing shall be of the centerline discharge type.

(b) Pump casing shall be ASTM A48 cast iron, with smooth surfaces devoid of blow holes or other casting irregularities.

2.1.4 Impellers

(a) Pump impellers shall be cast iron ASTM A48 and shall be statically and dynamically balanced, enclosed and non-clogging, designed with minimum clearances so as to preclude solids and stringy material from damaging the mechanical seal, on the back of the impeller.

(b) The impeller shall be secured to the shaft with a stainless steel key and lock nut in such a way that it cannot unscrew or become loosened due to rotation in either direction.

(c) Each pump shall be equipped with a stainless steel renewable impeller wear ring.

2.1.5 Oil Chamber

(a) The pumps shall be equipped with an oil chamber to function as a buffer between the pumped liquid in the casing and the motor. The oil chamber shall be arranged to accommodate thermal expansion of the oil and furnished with an oil chamber drain plug that is accessible from outside the pump unit and permits changing oil without dismantling pump components. The oil chamber shall be ASTM A48 cast iron.

2.1.6 Mechanical Seal

(a) Pumps shall have a double or tandem mechanical seals. The upper seal unit, between the oil chamber and motor housing, shall have one stationary ceramic or tungstein-carbide ring and one positively driven rotating tungstein-carbide or carbide seal ring. The lower seal unit, between the pump casing and oil chamber, shall have one stationary ring and one positively driven rotating ring. The rings shall be tungstein-carbide or ceramic. Metal parts shall be stainless steel. The spring element of the lower seal shall be protected from solids contained in the pumped liquid. Do not rely upon the pumped liquid for lubrication.

2.1.7 Motor

(a) Submersible pump motors shall be of 460-volt, 3-phase, 60-hertz squirrel cage induction type conforming to the latest applicable requirements of NEMA and NEC standards.

(b) Motors shall have suitable output torque and speed characteristic to start and operate the pump over the range of specified conditions. Nameplate horsepower rating shall not be exceeded under maximum load conditions for constant speed pumping units. The motors shall be for continuous load operation and shall be capable of sustaining continuous on-off cycling of ten starts per hour minimum without exceeding the 80 degree C temperature rise.

(c) The stator windings and stator leads shall have a minimum of NEMA Class F (155 degrees C) moisture resistant insulation. The stator coils shall be dipped and baked in Class F varnish and shall be heat-shrink fitted into the stator housing. Impregnation resin shall be applied to stator assembly in three dip and bake steps.

(d) Motors shall have an ASTM A48 cast iron stator housing. For motors that employ cooling water jackets, the water jacket passages shall preclude clogging by solids contained in the pumped liquid.

(e) The motor cables shall be multi-conductor flexible cables designed specifically for use with submersible pumps and shall be of stranded, tinned copper conductors with 600V ethylene-propylene insulation, cabled with non-hygroscopic vulcanized rubber fillers and binder tape, covered with water & oil resistant chloroprene rubber jacket, rated 90^{o} C in 40^{o} C ambient. Separate cables shall be provided for power and control. For application in wet locations multiple power cables shall be used to limit conductor current to 160A at motor full load.

(f) Motor cable entries shall have a mechanical locking ring or compression type cord grip to protect the cable jacket from being pulled out of the motor. Do not use epoxy for this purpose. Cable entries shall have watertight seals. Cable entry leads shall be isolated from the internal motor leads to prevent entry of water into the motor chamber by leakage or wicking. One cable for power and one cable for controls shall be provided. Cables shall be suitable for submersible pump application and shall conform to NEC specifications for cable sizing.

(g) The motor shall be designed for operating under completely submerged or unsubmerged conditions without damage while pumping under load.

(h) The combined service factor (combined effect of voltage, frequency and specific gravity) shall not be less than 1.15.

(i) The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet.

(j) The rated motor horsepower shall not be less than the brake horse power of the pump throughout the entire pump performance curve from shut-off through run-out.

2.1.8 Shaft

(a) Shafts shall be one piece, fully machined pump and motor shafts. Maximum shaft deflection under maximum pumping load to shall be 0.002 inches at the lower mechanical seal face.

(b) Shafts shall be carbon steel or stainless steel material and adequately designed to meet the maximum torque required at any start-up condition or operating point in the system. Carbon steel shafts shall be protected from exposure to the pumped liquid by a stainless steel sleeve, carbon steel sleeve or chrome plating.

2.1.9 Bearings

(a) The pump shaft shall rotate on permanently lubricated bearings. One assembly shall carry only radial loads and be free to float axially within the frame. The other assembly shall carry both radial and axial loads and be restrained from axial movement.

(b) Bearings shall be of sufficient size and properly spaced to transfer all radial and axial loads to the pump housing and minimize deflection

(c) Bearings shall conform with ANSI B3.15 and B3.16, Load Ratings and Fatigue Life for Ball and Roller Bearings, and have 20,000 hour minimum L_{10} bearing life at the maximum pumping load that occurs under the specified operating conditions.

2.1.10 Protection Monitoring System

(a) Each pumping unit shall be equipped with a monitoring system to protect critical machine functions during operation (including relocated Main Pumps 1 and 3 – motor protection relays for relocated pumps shall be by Flygt to match the pumps).
(b) Three thermoswitches, one per phase, shall be provided in the motor windings to protect against overheating by initiating an alarm on high temperature.
(c) A moisture sensor shall be provided to protect against damage from water contamination. The sensor shall be arranged to initiate the alarm upon sensing moisture in the oil chamber or prior to water reaching the motor windings.
(d) A monitoring device or devices designed to be compatible with the sensors and motor controls shall be provided. The monitoring devices shall be located in the motor control center. The monitoring system shall be intrinsically safe.

2.1.11 Power Cable Holder

(a) Contractor shall coordinate the installation of the cable holder with the aluminum hatch cover supplier.

(b) Provide all stainless steel cable support grip, cable pull line, snap hook and anchor as required or as shown on the drawing.

2.2 Operation and Control

2.2.1 Pump controls shall be provided in accordance with Division 16.

2.2.2 Pumps shall function in rising water and in falling water as shown on the drawings.

2.2.3 Float Level Detectors

(a) The float level detecting devices shall be located in the wet well as shown and as specified in Subsection 2.3.6, Section 16C. One float shall be supplied for each control level.

2.3 Bolts, Studs and Nuts

2.3.1 All bolts, studs and nuts shall have American National form right-hand machine cut threads which shall be in conformity with the current ANSI B1.1, "Screw Threads", Coarse Thread Series, class 2 Fit, unless otherwise specified.

2.3.2 Bolts heads and nuts shall be semi-finished and shall be in conformity with ANSI B18.2, "Wrench-Head Bolts and Nuts and Wrench Openings", Heavy Series, unless otherwise specified. All nuts shall be hexagonal in shape.

2.3.3 Stainless steel anchor bolts, flange bolts, studs and nuts shall be in conformity with the current ASTM Designation: A193, Grade B8 (AISI 304), Class 1 and ASTM A194, Grade 8 (AISI 304), AISI 316 or approved equal.

3. EXECUTION:

3.1 General

3.1.1 All equipment shall be installed in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Divisions 1 and 15A. The manufacturer shall inspect the pump installation and shall certify that the pumps have been installed properly. Information submitted for approval shall include a letter of intent to provide this certification. All wiring and piping shall be completed and all necessary adjustments to equipment shall be made to provide a complete operational pumping installation.

3.1.2 The manufacturer shall have joint responsibility with the Contractor for the proper installation of the equipment, and jointly with the Contractor shall furnish a written statement to the Owner certifying that the equipment as installed complies with the Plans and Specifications, will perform as specified, and is properly installed.

3.2 Field Quality Control

3.2.1 Representative of the Manufacturer

(a) The services of a qualified representative of the manufacturer shall be provided to instruct on proper installation of the equipment, inspect the completed installation, make any necessary adjustments, participate in the startup of the equipment, participate in the field testing of the equipment, place the equipment in trouble-free operation, and instruct operating personnel in its operation and maintenance.

3.2.2 Installed Testing

(a) After installation of the pumping units, control equipment and all appurtenances, each unit shall be subjected to a field running test under actual operating conditions. Water for these tests shall be the responsibility of the Contractor. Field tests shall be performed in the presence of and as directed by the Engineer. Tests shall demonstrate that under all conditions of operation each unit:

1) Has not been damaged during transportation or installation.
2) Has been properly installed.
3) Has no physical or mechanical defects.
4) Has been properly connected.
5) Is free of overheating of any parts.
6) Is free of overloading of any parts.

(b) The pumps shall be tested to demonstrate that the pumps and control system operate as specified. Any defects in the equipment or failure to meet the requirements of the Specifications shall be promptly corrected.

(c) The following shall be checked on start-up:

1) Current draw and voltage on all legs of each pump shall be observed and recorded to see if there is any imbalance.

2) Megger testing shall be performed and logged on all pumps.

3) Pump controls and terminations shall be checked.

3.3 Painting

3.3.1 All pumping equipment shall be painted as specified in Division 9.

3.4 Schedule

3.4.1 Refer to Drawing M4.

END OF THIS SECTION

DIVISION 15 - MECHANICAL

DIVISION 15E - VENTILATION

1. GENERAL:

1.1 Section Includes

The work specified herein includes furnishing and installing the ventilating system including fans, louvers, dampers, air inlets and outlets and all associated appurtenances and work as indicated and as specified herein.

1.2 Related Sections:

1.2.1 Section 4A - Unit Masonry
1.2.2 Section 5E - Bolts, Anchor Bolts, Expansion Anchors, and Concrete Inserts
1.2.3 Section 15A - General Mechanical Provisions
1.2.4 Section 15B - Basic Mechanical Materials and Methods
1.2.5 Section 16A - General Electrical Provisions
1.2.6 Section 16B - Basic Electrical Materials and Methods

1.3 References

All reference standards shall be from the latest edition.

1.3.1	AMCA 99	Standards Handbook.
1.3.2	AMCA 210	Laboratory Methods for Testing Fans for Rating Purposes.
1.3.3	AMCA 300	Test Code for Sound Rating Moving Air Devices.
1.3.4	AMCA 301	Method of Publishing Sound Ratings for Air Moving Devices.
1.3.5	NFPA 90A	Installation of Air Conditioning and Ventilating Systems.
1.3.6	SMACNA	HVAC Duct Construction Standards - Metal and Flexible.
1.3.7	UL 181	Underwriters Laboratories – Factory-Made Air Ducts and Connectors.

1.4 System Description

1.4.1 Ventilation system consisting of dampers, louvers and exhaust fans for the Electrical Control Room, Pump Room , Dry Well and Wet Well areas. The Electrical Control Room ventilation system will operate when temperature rises above 85º F (adjustable), while the Pump Room/Dry Well ventilation system will operate whenever the building lights are turned ON or combustion gas level rises above setting point or temperature rises in the space above setpoints 85ºF (Adjustable). Wet Well ventilation system will operate whenever the space lights are turned ON or combustion gas level rises above setpoint.

1.4.2 All fan and damper motors associated with the Electrical Control Room and the Pump/Dry Well locations shall be (corrosion resistance equipment). All fans and damper associated with Wet Well shall be rated for use in Class I, Division I area.

1.5 Submittals

1.5.1 Submit Product Data in sufficient detail to confirm compliance with requirements of this Section.

1.5.2 Submit shop drawings and product data in accordance with Section 1A and Section 15A.

1.6 Guarantee

1.6.1 Provide guarantee under provisions of Section 1A.

1.7 Delivery, Storage and Handling

1.7.1 Delivery, storage and handling shall be as specified under Section 1A.

1.8 Definitions:

1.8.1 Low Pressure (Three pressure classifications):

(a) 1/2 inch WG positive or negative static pressure and velocities less than 2,000 fpm.

(b) 1 inch WG positive or negative static pressure and velocities less than 2,500 fpm.

(c) 2 inch WG positive or negative static pressure and less than 2,500 fpm.

1.9 Basis of Payment:

1.9.1 The pump station ventilation work shall be paid at the Contract lump sum price for

PUMP STATION MECHANICAL WORK

which shall be payment in full for the work described herein.

2. PRODUCTS:

2.1 Duct Work

2.1.1 General

(a) Unless otherwise indicated all duct work shall be low pressure type(2 inch WG).

(b) Unless otherwise indicated, all duct work not located in the Wet Well shall be aluminum duct as specified herein. Flexible duct may be used where vibration isolation, such as at fan connections, is required.

(c) Duct Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavymastic.

2.1.2 Aluminum Duct

(a) Aluminum duct shall conform to ANSI/ASTM Standard B209. The duct shall be non-combustible.

(b) Aluminum used in duct work shall be alloy 3003-H14. Aluminum connectors and bar stock shall be alloy 6061-T6.

2.1.3 Flexible Duct Connections

(a) Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, as indicated.
(b) UL Listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 36 oz per sq yd, approximately 6 inches wide, crimped into metal edging strip.
(c) Provide flexible duct connections wherever ductwork connects to vibration isolated equipment.
(d) Provide adequate joint flexibility to allow for thermal axial, transverse and torsional movement, and also capable of absorbing vibrations of connected equipment.
(e) Manufacturers – Subject to compliance with requirements provide flexible connections of one of the following:

1. Ventabrics.
2. Or equal.

2.1.4 Stainless Steel Duct associated with EF-2

(a) Stainless steel duct shall conform to ANSI/ASTM Standard A167.
(b) Stainless steel duct shall be ANSI Type 316L with No. 2B finish for concealed work and No. 3 finish for exposed work.
(c) Protect finished surfaces with mill-applied adhesive protective paper, maintained through fabrication and installation.

2.1.5 Stainless Steel pipe associated with EF-3

(a) Stainless steel pipe shall conform to ASTM A778, Grade 316
(b) Stainless steel pipe dimension shall conform to ANSI B36.19

(c) Wall thickness: 5-in to 36-in: Schedule 5S
(d) All field welded joints and fittings shall be passivated.

2.1.6 Duct Supports

(a) Provide 316L stainless steel fasteners, anchors, rods, straps, trim and angles for support of stainless steel ductwork or aluminum ductwork.

2.1.7 Ductwork Fabrication and Assembly

(a) Fabricate shop or manufactured duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings.
(b) Except as otherwise indicated, fabricate elbows with centerline radius equal to 1.5 times associated duct width; fabricate mitered fittings to include turning vanes in elbows where shorter radius necessary.
(c) Limit combined angular tapers to 45 degrees for contracting tapers and 30 degrees for expanding tapers.
(d) Fabricate in 4-, 8-, 10-, or 12-ft lengths unless otherwise indicated or required to complete runs.
(e) Pre-assemble Work in shop to greatest extent possible to minimize field assembly of systems.
(f) Disassemble systems to extent necessary for shipping and handling.
(g) Match mark sections for re-assembly and coordinated installation.
(h) Fabricate of gauges and reinforcement complying with SMACNA - HVAC Duct Construction Standards.

2.1.8 Air Turning Devices

(a) Multi-blade device with blades aligned in short dimension; aluminum construction with mounting straps.

2.1.9 Duct Access Doors

(a) Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

(b) Review locations prior to fabrication.

(c) Fabricate rigid and close-fitting doors of aluminum alloy 3003-H14. Provide sealing gaskets and quick fastening locking devices.

(d) Access doors smaller than 12 inches square may be secured with sash locks.

(e) Provide two hinges and two sash locks for sizes up to 18 inches square, three hinges and two compression latches with outside and inside handles for sizes up 24 x 48 inches.

(f) Access doors with sheet metal screw fasteners are not acceptable.

(g) Manufacturers- Subject to compliance with requirements provide duct access doors of one of the following:

1. Ruskin Mfg. Co.
2. Ventfabrics, Inc.
3. Or equal.

2.2 Dampers

2.2.1 General

1. No single damper shall be larger in size than 48-IN in either dimension. Where a larger damper is required , multiple assemblies shall be provided.
2. Where multiple damper assemblies are provided, a common actuator may be used to drive a maximum of four dampers. Provide stainless steel connecting linkage as required. Where an assembly is constructed of more than four dampers, multiple actuators shall be provided.
3. Provide manual volume control dampers, gravity dampers and motorized dampers in locations shown on the Drawings.

2.2.2 Backdraft Dampers (BDD)

1. Manufacturers:

   a. Greenheck.
   b. Or equal.

2. Parallel blade, counterbalanced backdraft damper.
3. Provide in vertical or horizontal configuration as required by installation location.
4. 316 stainless steel construction with vinyl blade seals.
5. Units installed shall be set for 0.10 IN. W.C.

2.2.3 Insulated Control Dampers:

(a) Manufacturer:

1. Greenheck model ICD-45.
2. Or equal.

(b) 0.125-in aluminum channel frame insulated with polystyrene on four sides and thermally broken with dual polyurethane resin gaps.

(c) Aluminum airfoil blades internally insulated with polyurethane foam and thermally broken.
(d) Plated steel axle with dual bearings. Bearings shall have acetal inner sleeve and flanged outer bearing with no metal-to-metal or metal-to-plastic contact.
(e) External (out of the airstream) blade to blade linkage.
(f) Suitable for pressures to 8-in. w.c. and velocities to 4,000-fpm with maximum AMCA leakage rate of 8 cfm/sq. ft at 4-in w.c.

2.2.4 Motor Operated Damper:

1. Motor operated Damper (DM)

Power for the motor shall be 120 VAC, single phase. All damper motors associated with the Electrical Control Room, Pump Room and Drywell area shall be NEMA 4.

2. Actuators:

(a) Actuators shall be adequately sized for the damper size and air pressures anticipated in the system with a safety factor of two.
(b) Actuators shall have ISO9001 quality certification and be UL listed under standard 60730-1 or UL listed under standard 873.
(c) Actuators used on dampers shall be designed to directly couple and mount to a stem, shaft or ISO style-mounting pad. Actuator mounting clamps shall be a V-bolt with a toothed V-clamp creating a cold weld, positive grip effect. Single point, bolt, or single screw actuator type fastening techniques or direct-coupled actuators requiring field assembly of the universal clamp is not acceptable.
(b) Actuators shall be fully modulating/proportional, pulse width, floating/tristate, or two position as indicated in the sequence of operation and be factory or field selectable. Actuators shall have visual position indicators and shall operate in sequence with other devices if required.
(e) Provide actuators with end switches or position feedback as indicated in the sequences of operation.
(f) Actuators shall have an operating range of –22° to 122°F.
(g) Proportional actuators shall accept a 0-10 VDC or 0-20 mA input signal and provide a 2-10 VDC or 4-20 mA (with a 500 W load resistor) operating range.
(h) Actuators shall be capable of operating on 24 or 120 VAC, or 24VDC and Class 2 wiring as dictated by the application. Power consumption shall not exceed 10 VA for AC, including 120VAC actuators, and 8 watts per actuator for DC applications. Power supply requirements are Contractors option.
(i) Actuators shall have electronic overload protection or digital rotation sensing circuitry to prevent actuator damage throughout the entire rotation. End switches to deactivate the actuator at the end rotation or magnetic clutches are not acceptable.

(j) For power-failure/safety applications, an internal mechanical spring return mechanism shall be built into the actuator housing. Spring return actuators shall be capable of CW or CCW mounting orientation. Spring return models > 60 in-lbs. and non-spring return models > 90 in-lbs. will be capable of mounting on shafts up to 1.05-in diameter. Spring return actuators with more than 60 in-lb. of torque shall have a metal, manual override crank. Actuators using "on-board" chemical storage systems, capacitors, or other "on-board" non-mechanical forms of fail-safe operation are unacceptable. Upon loss of control signal, a proportional actuator shall fail open or closed as described below. Upon loss of power, a nonspring return actuator shall maintain the last position.

(k) Actuators shall be capable of being mechanically and electrically paralleled to increase torque if required. Dampers requiring greater torque or higher close off may be assembled with multiple low torque actuators. Dual mounted actuators using additional anti-rotation strap mechanical linkages, or special factory wiring to function are not acceptable. Actuators in a tandem pair must be "off the shelf," standard actuators ready for field wiring.

(l) Damper actuators shall not produce more than 62 dB (A) when furnished with a mechanical fail-safe spring. Non-spring return actuators shall conform to a maximum noise rating of 45 dB(A) with power on or in the running or driving mode.

(m) Proportional actuators shall be fully programmable. Control input, position feedback and running time shall be factory or field programmable. Diagnostic feedback shall provide indications of hunting or oscillation, mechanical overload, mechanical travel and mechanical load limit. The actuators shall also provide actuator service data, at minimum, number of hours powered and number of hours in motion.

(n) Proportional actuators shall be capable of digital communication, as built.

(o) All damper operators shall be oil submerged, geartrain type, inherently positive positioning.

(p) The actuators shall be mounted externally of ducts or air handling equipment wherever possible for ease of service and isolated from internal temperatures.

(q) Actuator enclosure:

1. Unless otherwise indicated, NEMA 4.

(r) Fail Position:

1. Outside Air Louvers/Intakes: Closed.

2.2.5 Manual Volume Dampers: (MVD)

(a) Performance

Damper manufacturer's printed application and performance data including pressure, velocity and temperature limitations shall be submitted for approval showing damper suitable for pressures to 5" w.g., velocities to 3000 fpm and temperatures to 180 degrees F. Testing and ratings to be in accordance with AMCA Standard 500.

(b) Construction

Dampers shall consist of a heavy-gage aluminum channel frame with 5" depth; triple V type blades fabricated from heavy-gage aluminum; blades shall be completely symmetrical relative to their axle point, presenting identical resistance to airflow in either direction or pressure on either side of the damper.

(c) Bearings and Linkages

1/2" diameter plated steel axles turning in synthetic (acetal) sleeve bearings; external (out of the airstream) blade-to-blade linkages.

(d) Dampers shall be integral, installed behind each grille and shall be of all stainless steel construction. Damper shall be lever-operated from face, opposed-blade type.

(e) Manufacturer – subject to compliance with requirements, provide dampers of one of the following:

1. American Warming & Ventilating Inc.
2. Arrow Louver and Damper Corp.
3. Greenheck
4. Louvers & Dampers
5. Or equal

2.2.6 Duct Hardware

(a) Manufacturers:

1. Ventfabrics, Inc.
2. Young Regulator Co.
3. Or equal.

(b) Quadrant Locks: Provide for each manual damper, quadrant lock device on one end of shaft; and end bearing plate on other end for damper lengths over 12”. Provide extended quadrant locks and end extended bearing plates for externally insulated ductwork.

2.3 Intake and Exhaust Louvers (OAL-1, OAL-2, OAL-3 & EAL-1)

2.3.1 General

Provide a fixed louver, with internal bird screen and insect screen where shown on the drawings.

2.3.2 Fabrication

Frame shall be constructed of .080" 6063T5 extruded aluminum with .072" 6063T5 extruded aluminum blades. Finish shall be clear anodized.

2.3.3 Bird Screen

Provide an externally -mounted bird screen. The screen shall be constructed of .051" x 3/4" diamond pattern expanded aluminum.

2.3.4 Insect Screen

Provide an internally-mounted insect screen. The screen shall be constructed of .0123" diameter aluminum, 18 x 14 mesh giving a free area ratio of 60%.

2.4 Grilles

2.4.1 Type

Modular grilles of the sizes indicated on the plans. Grilles shall be single-deflection type with two sets of fully adjustable 1-1/4" deep, blades space 1-1/2" on center.

2.4.2 Frame

The outlets shall consist of multiple square double-deflection grilles mounted to stainless steel mounting frame with quick-release stainless steel fasteners.

2.4.3 Fabrication

Blades and grille border shall be of heavy extruded 316L stainless steel construction with factory finish. The front set of blades shall run parallel to the short dimension of the outlet.

2.5 In-Line Centrifugal Fans - Belt Drive (EF-2)

2.5.1 General

(a) Fans used shall not decrease motor size, increase noise or increase tip speed more than 10 percent, or increase inlet air velocity by more than 20 percent, from specified criteria. Fans shall be capable of accommodating static pressure variations of plus or minus 10 percent.

(b) Base performance on sea level conditions.

(c) Statically and dynamically balance fans to eliminate vibration or noise transmission to occupied areas.

2.5.2 Performance Ratings

Conform to AMCA 210 and bear the AMCA Certified Rating Seal.

2.5.3 Sound Ratings

Conform to AMCA 301, tested to AMCA 300 and bear the AMCA Certified Sound Rating Seal.

2.5.4 Fabrication

Conform to AMCA 99.

2.5.5 Wheel and Inlet

The fan wheel shall be centrifugal backward inclined, non-overloading constructed of aluminum .

2.5.6 Housing

The fan housing shall be of the square design constructed of aluminum and shall include square duct mounting collars.

2.5.7 Finish

Factory finish before assembly with Heresite coating on fan and accessories.

2.5.8 Motors

Motors shall be heavy duty ball bearing type, carefully matched to the fan load and furnished at the specified voltage, phase and enclosure. Motors and drives shall be mounted out of the airstream. Motors shall be readily accessible for maintenance. Provide TEFC motor with aluminum cover on motor and belt.

2.5.9 Shafts and Bearings

Precision ground and stainless steel shafts shall be mounted in permanently sealed, lubricated pillow block ball bearings. Bearings shall be selected for a minimum (L50) life in excess of 200,000 hours at maximum cataloged operating speed.

2.5.10 Drive and Pulleys

Drives shall be sized for a minimum of 150% of driven horsepower. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shafts. Motor pulleys shall be adjustable for final system balancing.

2.5.11 Belt Motor Guard

Fabricate to SMACNA HVAC Duct Construction Standards - Metal and Flexible; of 12 gage, 3/4 inch diamond mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports with provision for adjustment of belt tension, lubrication and use of tachometer with guard in place.

2.5.12 Identification

Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.

2.5.13 Vibration Isolation

Fans shall be isolated from the building structure by means of neoprene vibration isolators.

2.5.14 Accessories

(a) Aluminum motor cover meeting OSHA requirements.
(b) Inlet and discharge collars
(c) Vibration isolation kit for horizontal hanging installation.
(d) Special coating as scheduled.
(e) Ceiling mounting accessories.

2.6 Sidewall Centrifugal Fans - Belt Drive (EF-1 and EF-3)

2.6.1 General

(a) Fans used shall not decrease motor size, increase noise or increase tip speed more than 10 percent, or increase inlet air velocity by more than 20 percent, from specified criteria. Fans shall be capable of accommodating static pressure variations of plus or minus 10 percent.

(b) Base performance on sea level conditions.

(c) Statically and dynamically balance fans to eliminate vibration or noise transmission to occupied areas.

2.6.2 Performance Ratings

Conform to AMCA 210 and bear the AMCA Certified Rating Seal.

2.6.3 Sound Ratings

Conform to AMCA 301, tested to AMCA 300 and bear the AMCA Certified Sound Rating Seal.

2.6.4 Fabrication

Conform to AMCA 99.

2.6.5 Wheel and Inlet

The fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances.

2.6.6 Housing

The fan housing shall be of the square design constructed of heavy gauge aluminum and shall include square duct mounting collars. Housing construction shall include remote accessible fan lubrication piping and drain. Provide aluminum bird screen and wall grille.

2.6.7 Finish

Factory finish before assembly.

2.6.8 Motors

Motors shall be heavy duty ball bearing type, carefully matched to the fan load and furnished at the specified voltage, phase and enclosure. Motors and drives shall be mounted out of the air stream. Motors shall be readily accessible for maintenance. Motor shall be rated for Class 1, Div. 1 Group D explosion proof for exhaust fan EF-3 and TEFC motor for EF-1. Provide motor in accordance with Section 16B - 2.10.

2.6.9 Shafts and Bearings

Precision ground and stainless steel shafts shall be mounted in permanently sealed, lubricated pillow block ball bearings. Bearings shall be selected for a minimum (L50) life in excess of 200,000 hours at maximum cataloged operating speed.

2.6.10 Drive

Motor shall be securely attached to the fan shaft.

2.6.11 Identification

Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.

2.6.12 Vibration Isolation

Fans shall be isolated from the building structure by means of neoprene vibration isolators.

2.7 Electric Unit Heaters (EUH-1 and EUH-2)

2.7.1 Manufacturers:

(a) Marley.
(b) Ruffneck.
(c) Or equal.

2.7.2 Type: Propeller type, washdown corrosion resistant electric unit heater.

2.7.3 Construction: Unit casing shall be constructed of stainless steel with stainless steel universal type swivel mounting bracket. Provide with stainless steel louvered air outlet and inlet grille to act as fan guard.

2.7.4 Heating Element: Element shall be constructed of type 304 stainless steel finned tubular elements with stainless steel threaded fittings forming a water-tight seal between the elements and junction box. Provide units of voltages and capacities as scheduled.

2.7.5 Fans: Fan shall be constructed of epoxy coated aluminum. Provide with motors in accordance with Division 16.

2.7.6 Controls: Provide the following control devices prewired to unit.

(a) Power contactor.
(b) Fan Delay Relay: Provide fan delay relay to keep unit fan running until all heat is dissipated from the heating elements.
(c) Automatic overtemperature cutout.
(d) Transformer for 24-volt control circuit.
(e) NEMA-4X junction box to house built-in controls and element terminals.
(f) Wall mounted NEMA 4X thermostat.

2.7.7 Accessories: Provide unit heaters with the following accessories as scheduled:

(a) Factory wired NEMA 4X disconnect switch provided in accordance with Division 16.
(b) Factory finishing.

2.8 Temperature Sensors

2.8.1 Temperature Sensors shall be of the type and have accuracy ratings as indicated and/or required for the application and shall permit accuracy rating of within 1% of the temperature range of their intended use. Sensors must be capable of being calibrated.

2.8.2 All duct sensors shall be electronic resistance type.

2.8.3 Sensors used for mixed air application shall be the averaging type of sufficient length to extend diagonally across the entire duct and have an accuracy of 1%.

2.8.4 Duct sensors shall protrude into the air stream far enough to sense any temperature differences due to stratification, etc.

2.8.5 Outside air sensors shall have a minimum range of -20 °F to 110 °F and an accuracy of within 1 °F in this temperature range. Sensors shall be provided with a water-tight fitting and adequate protection from the effects of solar radiation.

2.8.6 Space temperature sensors located in the Electrical room shall have digital space temperature and setpoint display with external setpoint adjustment and manual Occupied/Unoccupied override. Setpoint adjustment shall be software limited by OWS.

2.8.7 Space temperature sensors located in areas identified and Class 1, Division 1 or 2 shall be provided with an explosion proof enclosure with corrosion resistant elements. Sensors shall have no setpoint adjustment or display. Space temperature setpoint shall be made via the OWS.

2.8.8 Water temperature sensors shall be of the bulb type mounted within stainless steel wells filled with a heat conductive compound and in direct contact with the water within the pipe.

2.8.9 All field mounted sensors shall be labeled in accordance with the name or identification number used in the control program.

2.9 Low Temperature Protection Thermostats

2.9.1 Provide low-temperature protection thermostats of manual-reset type with sensing elements 8'-0" or 20'-0" in length.

2.9.2 Provide thermostat designed to operate in response to coldest 1'-0" length of sensing element, regardless of temperature at other parts of element.

2.9.3 Support element properly to cover entire unit width. Provide separate thermostats for each 25 sq. ft. of coil face area or fraction thereof.

2.10 Line – Voltage / Low Voltage On – Off Thermostats

2.10.1 Bi-metal actuated open contact, or bellows actuated enclosed snap-switch type.

2.10.1 UL-listed at electrical rating comparable with application.

2.10.2 Heat anticipation.

2.11 Line Voltage Thermostats With Fan Switch

2.11.1 Provide thermostats as described above with three position manual switch labeled Manual-Off-Auto. Switch shall be integral part of thermostat and be capable of mounting on 2-gang switch box.

2.12 Temperature Control Panels (TCP)

2.12.1 Provide control panels with suitable brackets for wall mounting where indicated and elsewhere as required. Locate panel as required.

2.12.2 Provide standard NEMA 1 cabinets of size required to contain temperature controllers; relays; switches; and similar devices; except limit controllers and other devices excluded in sequence of operations.

2.12.3 Mount required alarm lights, indicating devices and manual controls on face of panel.

3.0 EXECUTION:

3.1 Ductwork

3.1.1 Low pressure duct work shall be fabricated and supported in accordance with SMACNA Duct Construction Standards - Metal and Flexible and ASHRAE handbooks. The duct gages, reinforcing and sealing shall be suitable for the operating pressures of the system.

3.1.2 Double nuts and lock washers shall be used on threaded rod supports. Hanger rods shall be galvanized steel, threaded at both ends or continuously threaded.

3.1.3 During construction, temporary closures of metal or taped polyethylene shall be provided on open duct work to prevent the entry of construction dust. For a facility in continuous operation, the closures may only be required during dust-generating construction operations, as directed by the Engineer.

3.1.4 Increase duct sizes gradually, not exceeding 15 degrees divergence whenever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.

3.1.5 Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular duct elbows are used, provide turning vanes.

3.1.6 The installation shall conform to the requirements of NFPA 90A and 90B, as applicable.

3.1.7 Provide ductwork with inside dimensions equal to sizes indicated on Drawings.

3.1.8 Align ductwork accurately at connections, within 1/8" misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with ties, braces, hangers and anchors of type holding ducts true-to-shape and preventing buckling.

3.1.9 After installation, seal ductwork to seal class recommended and method prescribed in SMACNA - HVAC Duct Construction Standards.

3.1.10 Complete fabrication at Project necessary to match shop-fabricated Work and accommodate installation requirements.

3.1.11 Locate ductwork runs, except as otherwise indicated, vertically and horizontally, avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details, and notations or, if not otherwise indicated, run ductwork in shortest route not obstructing usable space or block access for servicing building or its equipment. Hold ducts close to walls, overhead construction, columns and other structural and permanent enclosure elements of building.

3.1.12 Coordinate duct installations with installation of accessories, dampers, equipment, controls, and other associated Work of ductwork system.

3.1.13 Support ductwork to comply with SMACNA - HVAC Duct Construction Standards, hangers and support section.

3.1.14 Where dissimilar metal ducts meet, provide positive electrical isolation using insulating materials, sealants and fasteners.

3.1.15 Clean ductwork internally of dust and debris as it is installed. Clean external surfaces of foreign substances causing corrosive deterioration of metal.

3.1.16 Strip protective paper from stainless ductwork surfaces, and repair finish wherever damaged.

3.1.17 Unless otherwise indicated, ducts shall be attached using rivets, bolts or sheet metal screws compatible with the duct material, i.e. aluminum screws for aluminum duct.

3.1.18 Sealant shall be non-hardening, water resistant, fire resistive and compatible with the mating materials. The sealant shall be applied as recommended by the manufacturer, either used alone or with tape or heavy mastic.

3.1.19 Contractor shall verify the location of all duct runs and wall, floor and ceiling penetrations.

3.1.20 Install access doors to open against system air pressure, with latches operable from either side, except outside only where duct is too small for person to enter. Install access doors where indicated and at each control damper.

3.1.21 Field Welded Joints

(a) Protect weld area from wind or draft while welding with gas back-up.
(b) Preheat weld area if work piece temperature is less than 60 degree.
(c) TIG welding: Use Tungsten Inert Gas (TIG) welding for welding of pipe joints. Apply shielding gas protection to underside of weld. Filler metal rods shall be AWS A5.9 type ER316.
(d) All field welded joints and fittings shall be passivated.
(e) 10% of all field welds shall be verified by an x-ray penetration test, performed by a third party.

3.2 Fans

3.2.1 Do not operate fans for any purpose until ductwork is clean, bearings lubricated, and fan has been test run under observation.

3.2.2 Install fans as indicated, with resilient mountings and flexible electrical leads.

3.2.3 Install flexible connections between fan inlet and discharge ductwork. Ensure metal bands of connections are parallel with minimum 1" flex between ductwork and fan while running.

3.2.4 Each fan shall be provided with the controls as indicated on the electrical drawings. Refer to Division 16.

3.2.5 Support fans in accordance with manufacturer's instructions. As part of submittals, include drawings showing fan support design and construction materials.

3.3 Fans and Dampers Schedules: See Sheet M5.

3.4 Field Quality Control

3.4.1 Upon completion of installation, start-up and test each electric unit heater, power and gravity ventilator to demonstrate capabilities and compliance with requirements.

3.4.2 Where possible, field correct malfunctioning units then retest to demonstrate compliance.

3.4.3 Replace units which cannot be satisfactorily corrected.

3.4.4 Test, adjust and balance environmental systems and components, as indicated, in accordance with procedures outlined in applicable standards.

3.4.5 Prepare report of test results, including instrumentation calibration reports, in format recommended by applicable standards.

3.5 Air Balancing

3.5.1 Air side system balancing shall include but not be limited to the following procedures:

(a) Test and adjust fan RPM to design requirements. For fans operating with pressure controlled VFDs, fan speed shall first be set to lowest output that allows design flow to most remote terminal served. Measured minimum required supply air pressure shall be identified to the Temperature Controls Contractor for establishing setpoint.
(b) Test and record motor full load amperage.
(c) Check all fans for correct rotation.
(d) Test and record system static pressures, suction, discharge and external at all air handling equipment.
(e) Test and adjust system for design outside air and re-circulated air quantities.
(f) Adjust and record all main supply and return air ducts and zones to proper design CFM.
(g) Test and adjust each diffuser, grille and register to within 5% of design requirements. Record data and location. Use manufacturer's rating and calculations.
(h) Adjust all grilles to minimize drafts in all areas.
(i) Test and record all air temperatures - supply, return, mixed, and outside air

3.5.2 The contractor shall include the cost of new sheaves and belts if it becomes necessary to change the drives during balancing of system.

3.5.3 Patch holes in ductwork and housings, which have been cut or drilled for test purposes, in manner recommended by original Installer.

3.5.4 Mark equipment settings, including damper control positions, fan speed control levers, and similar controls and devices, to show final settings at completion of TAB work. Provide markings with paint or other suitable permanent identification materials.

3.5.5 Balancing contractor shall coordinate damper position settings with temperature control contractor to verify airflows and positions. Include time for this verification. See HVAC controls specification for time included by temperature controls contractor to work with balancing contractor.

3.5.6 Balancing contractor to work with temperature control contractor and HVAC contractor to verify correct operation of entire HVAC system, before submitting report.

3.6 Training/Start-Up Services

3.6.1 Manufacturer to provide start-up services for fans and unit heaters.
3.6.2 Provide one half day training session for Owners' personnel. Training schedule shall be approved by Owner.
3.6.3 Provide one half day start-up/installation inspection services.

3.7 Spare Parts

3.7.1 General- Furnish to Owner, with receipt, the following spare parts for each fan

(a) Two (2) set of matched fan belts for each belt-driven fan

3.8 Cleaning

3.9.1 Clean factory-finished surfaces. Repair marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION

DIVISION 15 - MECHANICAL

SECTION 15F - MISCELLANEOUS MECHANICAL ITEMS

1. GENERAL:

1.1 Section Description

1.1.1 This Section shall include all work required for the furnishing and installing complete, the Items indicated on the Drawings, as specified herein and as follows:

(a) Sump Pump
(b) Cable Supports
(c) Stilling Wells
(d) Pavement Flood Float Alarm Box
(e) Compression Bell
(e) Refer to Division 1 for additional requirements.

1.2 Related Sections

1.2.1 Section 15A - General Mechanical Provisions
1.2.2 Section 15B - Basic Mechanical Materials and Methods
1.2.3 Section 15C - Piping and Appurtenances
1.2.4 Section 15D - Pumping Equipment
1.2.5 Section 16D - Supervisory Control and Data Acquisition (SCADA) Equipment

1.3 Submittals

1.3.1 Submit shop drawings and product data under provisions of Sections 1A and 15A.

1.4 Delivery, Storage and Handling

1.4.1 Delivery, storage and handling shall be in accordance with the provisions under Section 1A.

1.5 Guarantee

1.5.1 Provide guarantee under provisions of Section 1A.

1.6 Basis of Payment

1.6.1 Payment: The work specified under this Section and as required shall be included for payment in the Contract lump sum price for the item, PUMP STATION, MECHANICAL WORK.

2. PRODUCTS:

2.1 Sump Pump

2.1.1 Sump pump shall be completely submersible vertical centrifugal. Casing shall be cast iron and oil filled motor chamber. Impeller shall be 2 vane bronze, open non-clog, passing ½ inch solids. Bearings shall be oversized, heavy duty ball thrust bearing, oil impregnated bronze top bearing. Shaft shall be stainless steel. Provide 15 feet of flexible power cable with Crouse-Hinds Cat. No. WP832 plug.

2.1.2 Floats shall be supplied and as specified in Electrical Section.

2.1.3 Provide UL listed, NEMA 4X control Panel for the pump with following components:

a. Double door dead-front enclosure
b. Main disconnect with Hand-Off-Auto switch.
c. Diaphragm micro level switches for pump ON/OFF and high water alarm. Mercury switches not acceptable.
d. Motor contactor.
e. Numbered and wired terminal board for controls.

f. Lights to indicate pump run, control power, and motor overload.
g. Control terminal board, numbered and wired.
h. Provide with suitable receptacle to mate with plug provided on power cable. Receptacle shall be weather proof while in use type.

2.2 Cable Supports

2.2.1 The cable supports shall be constructed as indicated on the Drawings using the specified material. The cable support shall be complete and shall support all cables required for the main pumps and low flow pumps whether or not shown on the Drawings. Mesh cable grips shall be stainless steel.

2.3 Stilling Well

2.3.1 Stilling well shall be provided as indicated on the Drawings and as specified herein. Stilling well shall be provided for the Float Control Systems specified under Division 16.

2.3.2 Stilling wells for back-up float systems shall be constructed of 3/8" fiberglass consisting of 60% polyester resin and 40% glass material with stainless steel barrel slide bolt latch and stainless steel door hinges. Barrel shall stay firmly in place until the handle is lifted from the groove.

2.3.3 All hardware and metal parts shall be all stainless steel.

2.4 Pavement Flood Float Alarm Box

2.4.1 Pavement flood float alarm box shall be provided as indicated on the Drawings and as specified herein. Pavement flood float alarm box shall be provided for the Float Control System specified under Division 16.

2.4.2 Pavement flood float alarm box shall be constructed of 3/8” fiberglass consisting of 60% polyster and 40% glass material with stainless steel hasps with padlocks.

2.4.3 All hardware and metal parts shall be all stainless steel.

2.4.4 Fasteners shall be concealed or type that cannot be readily be removed when the door is locked.

2.5 Compression Bell

2.5.1 Compression bells shall be provided for water level sensing in conjunction with separately mounted pressure sensing type level transmitters. The compression bell shall be fabricated with high strength non-corrosive plastics and shaped to provide a resistance to build up of foreign material. Stainless steel tube fitting shall be provided for air tube connection. Stainless steel straps shall be provided for mounting. Quantities, locations and mounting details are shown on drawings.

2.5.2 The compression bells shall be manufactured by TESCO or equal.

3. EXECUTION:

3.1 Installation

3.1.1 Install the specified specialties in accordance with manufacturer's recommendations and instructions to permit intended performance.

3.1.2 Provide line sized PVC ball valve and check valve on discharge piping.

3.1.3 The manufacturer or supplier of the specified specialties shall furnish a qualified field engineer for whatever period of time may be necessary to assist and direct the Contractor in the proper installation of the equipment furnished, to observe and check initial performance, and whose duty shall include the instruction of the plant operating personnel in the proper operating and maintenance procedures.

3.2 Painting

3.2.1 The specified specialties shall be painted in accordance with Section 9A of these specifications.

3.3 Testing

3.3.1 The specialties shall be tested in place by the Contractor, and any defects in specialties or connections shall be corrected to the satisfaction of the Engineer.

3.4 Sump Pump Schedule

Sump Pump No.	SP1
Service:	Floor Drain
Capacity (gpm):	20
Head (ft):	35
Discharge (in):	2
Motor Size (HP):	0.5
Voltage (V):	460V,3ph, 60 Hz
Number Required:	1

END OF THIS SECTION

DIVISION 16 - ELECTRICAL

SECTION 16A - GENERAL ELECTRICAL PROVISIONS

1. GENERAL:

1.1 Description

1.1.1 The scope of work under this Section shall generally be all electrical work required for the project work as specified or as indicated on the drawings.

1.1.2 The electrical work shall include the furnishing and installing of various items of electrical equipment and, unless otherwise indicated, shall also include the electrical connection of various items such as electric pump motors, fan motors and similar items furnished under other Sections. The Contractor shall be responsible for ascertaining the extent of electrical connections required for items furnished under other Sections and for coordination the electrical work accordingly.

1.1.3 The specifications and drawings are intended to generally define the work required, but they do not include every equipment and installation detail. The work shall include all items and appurtenances required to fully complete the work, whether specifically identified or not, such that the electrical systems are complete and operational.

1.1.4 Refer to Division 1 for other requirements relating to the furnishing and installing of work which shall apply to the work under this Division.

1.2 Code Compliance

Unless otherwise indicated, in the absence of more stringent requirements in the Specifications or on the Drawings, the work shall be in compliance with the requirements of the National Electrical Code.

1.3 Standards

1.3.1 Wherever the following abbreviations are used in these Specifications or on the Drawings, they are to be construed the same as the respective expressions represented:

AASHTO	American Association of State Highways and Transportation Officials
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
AWG	American Wire Gauge
FM	Factory Mutual
ICEA	Insulated Power Cable Engineers Association
IES	Illuminating Engineering Society of North America
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Assoc.
NESC	National Electrical Safety Code

UL Underwriter's Laboratories

1.3.2 Wherever a reference is made to a standard or standard specification, the reference shall be to the edition current at the time of bidding, including any revisions or amendments.

1.4 Verification of Contract Drawings

1.4.1 The Contractor shall familiarize himself with the details of the total construction insofar as they may affect the work under this Division, including floor elevations, physical dimensions of structures, materials of construction and the nature of work required under other Divisions. No additional compensation will be granted for failure to consider the total project work.

1.4.2 The contract drawings (Drawings) for electrical work are generally diagrammatic and do not necessarily depict all items to scale. The Drawings indicate the general locations of major elements of the electrical system, outlets, fixtures, pull boxes and the like, however, field conditions or interferences, may require changes in the installation. The Contractor shall coordinate his work to avoid interferences and shall obtain the approval of the Engineer prior to making any changes from the installation shown.

1.4.3 Prior to installation, the Engineer may make reasonable minor changes in the locations of the installation without additional cost to the State.

1.5 Coordination

1.5.1 The Contractor shall coordinate the work under this Division with the work of other trades. This shall include an orderly exchange of information and shall be accomplished such that the total work is not delayed and that interferences are avoided. The Contractor shall coordinate all electrical systems into a complete operational package. The Contractor shall assign one contact person for all such co-ordination work, has an understanding and working knowledge of the electrical control systems on this project. This person shall oversee and assume proper operation of the complete electrical control system including all testing and calibration as outlined herein. The Contractor shall provide the name and phone numbers of this individual at the preconstruction inspection. This cost shall be incidental to Pump Station Electrical.

1.6 Workmanship

1.6.1 The electrical work shall be performed in a neat and workmanlike manner in accordance with the best practices of the trade.

1.6.2 Unless otherwise indicated, all materials and equipment shall be installed in accordance with the manufacturer's recommendations.

1.7 Testing

1.7.1 All electrical equipment and systems provided under this Division shall be adjusted and tested. The Contractor shall adjust, repair or replace faulty or improper Division 16 work or equipment discovered during testing.

1.7.2 In addition, all electrical items provided under other Divisions and connected and/or adjusted under this Division shall be tested and if a failure occurs due to the connecting or adjusting methods used, the failure shall be remedied under this Division by repair, replacement, or change, as determined by the Engineer, at no additional cost to the Owner.

1.7.3 Tests may be made progressively as portions of the work are complete.

1.7.4 Tests shall be made in the presence of the Engineer.

1.7.5 A written record of tests shall be maintained by the Contractor and, when complete, it shall be submitted to the Engineer for the record.

1.7.6 Independent Contractor shall perform all tests necessary to assure proper functioning of materials and equipment. As a minimum, the tests shall include the following:

(a) Before making final connections check the insulation resistance of all cables of 3-phase circuits that operate above 150 volts.

(b) Check wiring for proper phase sequencing including buses, feeder cables and transformers and assure proper connection at motors for proper rotation.

(c) Measure and record the line-to-line and line-to-neutral voltages at the line side of the service entrance, all panel buses or main terminals and at the primary and secondary terminals of all transformers furnished under this Division except for control transformers which are integral to motor starter units. Set the taps on transformers as required or as directed by the Engineer.

(d) Check and record the motor nameplate data for each 3-phase motor. Check the ratings of motor circuit protective devices and assure compatibility of the devices for the connected motors. In particular, assure that the motor starter overload elements are proper for the motor nameplate full load amperes.

(e) Set control relays, protective relays and instruments in accordance with manufacturer's recommendations. Record the set points.

(f) Check all control circuits for proper functioning of all devices and check all switches, contactors, pushbuttons, limit switches, thermostats, circuit breakers and the like for proper operation.

(g) Check all alarm circuits for proper operation and proper set points, as applicable. Record any appropriate set points.

(h) Measure and record the line currents of each phase of each 3-phase motor under load.

(i) Align and adjust lighting fixtures and assure proper operation of all controls, ballasts and lamps.

(j) All equipment must be properly calibrated for proper operation of the system.

(k) See paragraph 3.9 of this Section for further testing requirements.

1.7.7 Testing must be complete prior to final inspection. All instruments, tools, etc., required for the tests shall be provided by the Contractor. All equipment shall be properly calibrated for proper operation of the complete system. Additional testing may be requested by the Engineer during final inspection to spot-check test results or to demonstrate proper functioning of the systems. These tests shall be performed by the Contractor at no additional cost to the State.

1.7.8 The Contractor shall simulate the automatic operation of the complete pump station to assure proper operation. After assurance of proper operation, the Contractor shall demonstrate automatic operation including simulation to the Engineer's satisfaction.

1.7.9 Note that failure to test the equipment completely is not an allowance for an extension.

1.8 Data to be filed with the Owner

1.8.1 Submit shop drawings and product data under provisions of Section 1A. Certain data, as specified herein, shall be furnished to the Owner when installation and testing are complete, before final acceptance.

1.8.2 The data shall be compiled in 8-1/2 x 11 inch format in high-quality heavy-weight, hard cover binders with piano-style metal hinges or in an alternate format approved by the Engineer. Large drawings and other materials which would be opened or removed for reading shall be provided with heavy clear plastic pouches within the binders. The number of binders shall be as required to hold all required material without over-filling. Various sections, as appropriate shall have suitable dividers. All volumes shall be labeled.

1.8.3 Four sets of the data files shall be provided.

1.8.4 As a minimum, the data files shall include:

(a) A table of contents.
(b) Approved, final shop drawings and product data for all equipment and materials incorporated in the work under this Division.
(c) Manufacturer's maintenance manuals for all equipment furnished under this Division for which maintenance is recommended by the manufacturer.
(d) A tabulation of cable insulation tests.
(e) A tabulation of motor nameplate data.

(f) A tabulation of required voltage tests.
(g) A tabulation of required motor current tests.
(h) A tabulation of relay and control device set points.
(i) A tabulation of alarm set points.
(j) A Study Report providing summary of results of power systems study under paragraph 3.8 of this Section including:

1. Description, purpose, basis, and scope of study and single line diagram of power system.
2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short circuit duties and commentary regarding same.
3. Protective device time versus current color coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.
4. Fault current calculations including definition of terms and guide for interpretation of computer printout.
5. Tabulation of appropriate tap settings for relay units.
6. Arc flash calculations and tabulation of incident energy level (calories/cm^2) for each equipment location and recommended personal protective equipment (PPE).

(k) Complete testing report for the testing of electrical systems under paragraph 3.9 of this Section utilizing NETA printed forms. Submit report no later than 30 days after testing is complete. Submit proof of testing agency qualification.

1.8.5 All data shall be neat and clearly legible. The table of contents and tabulations of set points and other recorded test data shall be typed. Sloppy, illegible, inaccurate, or incomplete data will not be accepted.

1.9 Record Drawings

1.9.1 Alterations and additions to the electrical installation depicted on the contract drawings which are made during the execution of the work shall be neatly and plainly marked in red on a set of Record Drawings kept at the contractor's field office for the project. These drawings shall be updated as the work progresses and shall be available for inspection by the Engineer at all times during the course of the work.

1.9.2 When the work is complete, and before final acceptance, a set of Record Drawings shall be submitted to the Engineer for review and acceptance. The set shall include the marked field set and a set of reproducible drawings. A set of reproducible drawings will be supplied to the Contractor for use in preparing the Record Drawings. The drawings shall each be stamped "RECORD DRAWING", and shall be marked with the contractor's stamp, the date, and the signature of the contractor's supervising engineer or electrician.

1.9.3 The Record Drawings must be submitted and must be acceptable to the Engineer prior to final acceptance.

There will be no deviation from this requirement.

1.10 Guarantees

Guarantees shall be provided for equipment, materials and work provided under this Division as specified in Division 1.

1.11 Basis of Payment

1.11.1 The work shall be paid for at the Contract lump sum price for PUMP STATION ELECTRICAL WORK, which shall be payment in full for the work described herein unless otherwise noted.

1.11.2 The work for Electric Service specified under Subsection 3.4 shall be paid under the pay item ELECTRIC SERVICE CONNECTION.

1.12 Classification of Electrical Enclosures and Installations in Project Locations

Unless otherwise specified in the individual Specification Section or shown on Plans, type of electrical enclosures and installations shall be in accordance with the following:

NEMA 7(CLASS I, Division 1, GROUP D): All spaces in the pump station including Discharge Chamber Expansion and Wet Well, except otherwise indicated.

NEMA 1: Electrical Room.

NEMA 4X: Pump Room, outdoor areas, and other unspecified wet or damp area.

NEMA 12: Other area not defined.

2. PRODUCTS:

2.1 Materials and Equipment

2.1.1 Quality

All materials, equipment and appurtenances shall be new, shall be suitable for the application and shall be the product of established, reputable manufacturers.

2.1.2 Standards

The construction, sizes, ratings and capacities of items shall be in conformance with the requirements of the NEC and with NEMA standards, as applicable.

2.1.3 UL Label

Unless otherwise indicated, materials and equipment shall bear the UL label whenever such labeling is available for the type of material or equipment being furnished.

2.1.4 Service Equipment

Equipment which is used as electric service equipment shall bear a UL listing: "SUITABLE FOR USE AS SERVICE EQUIPMENT".

2.1.5 Other Requirements

Refer to Division 1 for other requirements relating to materials and equipment.

3. EXECUTION:

3.1 General

3.1.1 Provide other trades with advance information on locations and sizes of concrete pads, frames, boxes, sleeves and openings needed for the Work. Also provide information and shop drawings necessary to permit trades affected to install their Work properly and without delay.

3.1.2 Prior to submittal of shop drawings coordinate electrical equipment, particularly motor control equipment and control panels, with all applicable equipment and systems furnished under other Divisions of the Specifications. Acknowledge in submittal drawings any designated instrument tag numbers when tag numbers are assigned in drawings or specifications. Acknowledge that coordination of all applicable equipment has been performed.

3.1.3 The electrical system design, including, but not limited to, the type, size and quantity of equipment and components, layout, installation and connections as shown on Plans and/or as indicated in the Specifications, is based on electrical, electro-mechanical and/or electronic equipment supplied by selected manufacturers. If equipment furnished by the Contractor requires a different electrical system than that specified hereinafter or shown on Plans, the Contractor shall make all necessary modifications to the electrical system design, subject to the Owner's approval, to provide a complete electrical system ready for successful operation. The costs of making the modifications to the electrical system shall be entirely borne by the Contractor without extra cost to the Owner. If equipment furnished by the Contractor necessitates changes to electric, gas and/or telephone utilities' service equipment, or to the Work specified under other Sections of the Specifications, then the cost for making the changes shall also be entirely borne by the Contractor without extra cost to the Owner.

3.1.4 Locate all equipment such that they are readily accessible for operation, maintenance, repair and replacement.

Ready accessibility to removable parts of equipment and to wiring shall be provided without moving other equipment which is to be installed or which is in place. In general, such equipment is not to be blocked or concealed except where specifically permitted. Do not route conduits across or through access or maintenance space of other equipment. Where equipment is permitted to be concealed, provide approved access door. Where equipment is concealed in fire-resistance rated walls or partitions, provide access doors having same fire-resistance rating as well as partitions in which door is placed.

3.1.5 Where electrical equipment is to be installed in limited space, provide additional drawings (scale - minimum 1/4 in. = 1 ft.) as necessary to show physical and dimensional relationship between electrical equipment and adjacent equipment furnished under other Divisions of the Specifications. Acknowledge locations of adjacent structural or mechanical systems, including ductwork, piping, or equipment accesses. Acknowledge clearances established by all codes and regulations are met or exceeded.

3.1.6 The installation shall be such that its components will function together as workable systems. It shall be complete, with all accessories necessary for its operation, and shall be left with all equipment properly adjusted and in working order. The Work shall be executed in conformity with the best practices and so as to contribute to efficiency of operation, minimum maintenance, accessibility and appearance.

3.1.7 Location of electrical equipment shown on Plans are approximate and are subject to minor changes as directed by and at no extra cost to the Owner.

3.1.8 Perform equipment tests as per manufacturer's instructions except where otherwise specified

3.2 Protection of Work

3.2.1 All electrical work, including equipment, fixtures and appurtenances shall be protected from damage until final acceptance. Fixtures and equipment shall be covered to protect against dirt, moisture, paint and the like. The work shall be protected from mechanical injury by appropriate covering or shielding.

3.2.2 Prior to final acceptance, protective measures shall be removed and equipment and items shall be cleaned as required to deliver the installation to the State in clean, undamaged condition.

3.3 Clean-Up and Safety

3.3.1 The work site shall be maintained in a clean condition, free of hazards, all in conformance with the requirements of Article 107 of the Standard Specifications. Special care shall be taken to assure that electrical systems are not left in an exposed or otherwise hazardous condition.

All electrical boxes, cabinets, pole handholes, etc., which contain wiring, either energized or non-energized, shall be closed or shall have their covers in place and shall be locked when possible, during off-work hours.

3.4 Electric Service

3.4.1 Work under this Section shall include all equipment, wiring and appurtenances required for both the complete, operational temporary and permanent electric service.

3.4.2 All electric utility's charges for disconnecting the existing electric service and providing new service to the pump station shall be paid to the utility by the Contractor. The Contractor will be reimbursed the exact amount of these charges under a separate pay item, ELECTRIC SERVICE CONNECTION. For bidding purposes, this item shall be estimated at $20,000.

3.4.3 The Drawings and Specifications indicate the general nature of work required for electric service. The Contractor shall verify the service requirements, shall ascertain the installation requirements and the items of equipment, wiring, appurtenances being furnished by the utility and shall provide all other material and work required for a complete installation.

3.4.4 Power metering cabinets shall consist of transformers, and meter socket in a NEMA 3R enclosure. Coordinate the transformer rating with the electric utility.

3.4.5 All electric service work must conform to the requirements of the electric utility.

3.4.6 The Contractor shall obtain approval of the electric utility for the electric service and metering prior to installation. Copies of approved documents and drawings shall be submitted to the Engineer for the record prior to installation.

3.4.7 Existing Pump Station shall remain operational until new Pump Station is operational. Contractor is responsible for coordinating with Com Ed service disruptions such that one service is in constant operation. The following constraints shall be followed:

(a) The new Com Ed transformer, poles (if necessary), and service extension shall be installed prior to disconnection of the existing Com Ed equipment. New equipment will not yet be energized.

(b) Generator and motor control center shall be installed and tested prior to the disconnection of the existing Com Ed equipment.

(c) Conduit and conductors from new Com Ed transformers to motor control center shall be installed prior to disconnection of the existing Com Ed equipment. Contractor shall coordinate with Com Ed on conduit routing and stub up at power poles. Coordinate with Com Ed for transformer terminations.

(d) New equipment shall be energized. As new pumps are installed (and existing pumps are relocated) they shall be connected to the new electrical system. The pump station will be fed from the existing and new services for a period of time. See Section 1A paragraph 1.5 for further requirements.

(e) Contractor shall perform necessary testing of equipment at new Pump Station to verify all equipment is operational prior to the disconnection of existing Com Ed equipment.

(f) Existing service disconnection to existing Pump Station shall only occur after new Pump Station is constructed and operational.

3.5 Telephone Service

3.5.1 Work under this Section shall include all equipment, wiring and appurtenances required for complete, operational telephone service and a telephone connection for SCADA system.

3.5.2 Charges by the telephone utility shall be paid to the utility by the Contractor under the pay item, PUMP STATION ELECTRICAL WORK. The installation and coordination of charges by the telephone utility shall be referred to Jack Ryder of IDOT Business Services, telephone number (847) 705-4011.

3.5.3 The Drawings and Specifications indicate the general nature of the work required for telephone service. The Contractor shall verify the service requirements, shall ascertain the installation requirements and the items of equipment, wiring and appurtenances being furnished by the utility and shall provide all other material and work required for a complete installation.

3.5.4 All telephone service work must conform to the requirements of the telephone utility.

3.5.5 The Contractor shall obtain approval of the telephone utility for the modification of the telephone wiring. Copies of approved documents and drawings shall be submitted to the Engineer for the record prior to installation

3.6 Final Acceptance Inspection

3.6.1 When the work is complete, tested and fully operational, and only after the Record Drawings have been reviewed and accepted by the Engineer, the Contractor shall schedule a Final Acceptance Inspection with the Engineer. The Contractor is cautioned to test for the proper operation of all equipment prior to the final acceptance inspection and to make any corrections necessary to establish proper operation. THE FINAL ACCEPTANCE INSPECTION SHALL NOT BE HELD WHILE FINAL CONNECTIONS AND CHECKS ARE BEING MADE.

3.6.2 The Final Acceptance Inspection shall be made for the complete work at the facility as a whole and shall be as further described in Division 1.

3.7 Maintenance

3.7.1 During the course of the construction work and until final acceptance, the Contractor shall be responsible for maintenance and operational integrity of the facility as specified in Division 1.

3.8 Electrical Power Systems Studies

3.8.1 Section includes:

(a) Short circuit analysis, protective device evaluation study, protective device coordination study, and arc flash study on entire power distribution system.
(b) Portions of electrical distribution system from normal and alternate sources of power throughout distribution system. Normal system operating method, alternate operation, and operations which could result in maximum fault conditions and maximum incident energy shall be covered in study.
(c) Contractor shall engage services of independent engineering firm for purpose of performing electric power systems studies as specified.

3.8.2 Studies

(a) Studies include following:

1. Utility Company incoming service lines.
2. Main switching station.
3. Power transformers.
4. Generator System.
5. Motor control centers.
6. Power and lighting distribution panels.
7. Cable, wire, and conduit systems.

(b) Studies do not include equipment as shown on Drawings indicated as future.

3.8.3 Short Circuit Study

(a) Provide complete report with printout data sheets using digital computertype programs as part of study.

(b) Include utilities' short circuit contribution, resistance and reactance components of branch impedances, X/R ratios, base quantities selected, and other source impedances.

(c) Calculate short circuit momentary duty values and interrupting duty values based on assumed 3-ph bolted short circuit at switch gear base medium voltage controller, switchboard, low voltage MCC, distribution panelboard, pertinent branch circuit panel, and other significant locations through system. Include short circuit tabulation of symmetrical fault currents and X/R ratios. List with respective X/R ratio each fault location, total duty on bus, and individual contribution from each connected branch.

3.8.4 Equipment Device Evaluation Study

(a) Provide protective device evaluation study to determine adequacy of circuit breakers, molded case switches, automatic transfer switches, knife switches, controllers, surge arresters, busways, and fuses by tabulating and comparing short circuit ratings of these devices with calculated fault currents. Apply appropriate multiplying factors based on system X/R ratios and protective device rating standards. Notify ENGINEER of problem areas or inadequacies in equipment due to short circuit currents and provide suggested alternate equipment.

3.8.5 Equipment Device Coordination Study

(a) Provide protective device coordination study with necessary calculations and logic decisions required to select or check selection of power fuse ratings, protective relay characteristics and settings, ratios and characteristics of associated current transformers, and low voltage breaker trip characteristics and settings. Objective of study to obtain optimum protective and coordination performance from these devices.

(b) Include as part of coordination study, medium and low voltage classes of equipment from utility's incoming line protective device down to and including largest rated device in 480 v MCCs and panelboards. Include phase and ground overcurrent protection as well as settings of other adjustable protective devices.

(c) Draw time-current characteristics of specified protective devices in color on log-log paper or computer printout. Include with plots complete titles, representative one-line diagram and legends, associated Power Company's relays or fuse characteristics, significant motor starting characteristics, complete parameters of transformers, complete operating bands of low voltage circuit breaker trip curves and fuses. Indicate types of protective devices selected, proposed relay taps, time dial and instantaneous trip settings, transformer magnetizing in-rush and ANSI transformer withstand parameters, cable thermal overcurrent withstand limits, and significant symmetrical and asymmetrical fault currents. Provide coordination plots for phase and ground protective devices on system basis. Provide sufficient number of separate curves to indicate coordination achieved.

(d) Provide separate selection and settings of protective devices in tabulated form listing circuit identification, IEEE device number, current transformer ratios and connection, manufacturer and type, range of adjustment, and recommended settings. Tabulate recommended power fuse selection for medium voltage fuses where applied in system. Notify ENGINEER of discrepancies, problem areas or inadequacies and provide suggested alternate equipment ratings and/or settings.

3.8.6 Arc Flash Study

(a) Provide Incident Energy Study – An incident energy study shall be done in accordance with the IEEE 1584, ”IEEE Guide for Performing Arc Flash Hazard Calculations” as referenced in NFPA 70E, “Standard for Electrical Safety in the Workplace”, in order to quantify the hazard for selection of personal protective equipment (PPE).

(b) Adjust system design to optimize the results of the study as it relates to safety and reliable electrical system operation (e.g. overcurrent device settings, current limiting devices). This includes mitigation, where possible, of incident energy levels that exceed 40 calories/cm^2. Provide suggested alternate equipment and settings to minimize incident energy levels.

(c) Provide incident energy level (calories/cm^2) for each equipment location and recommended PPE.

(d) Based on the results of the incident energy study provide and install a warning label (orange <40 cal/cm^2) or danger label (red > 40 cal/cm^2) for each piece of equipment. The label must be readable in both indoor and outdoor environments and contain the following information:

1. Arc hazard boundary (feet and inches).
2. Working distance (feet and inches).
3. Arc flash incident energy at the working distance (calories/cm2).
4. PPE category and description including the glove rating.
5. Voltage rating of the equipment.
6. Limited approach distance (feet and inches).
7. Restricted approach distance (feet and inches).
8. Prohibited approach distance (feet and inches).
9. Equipment/bus name.
10. Date prepared.

(e) Provide one day of arc flash safety training, travel time excluded and at jobsite or classroom designated by OWNER, that contains the requirements referenced in OSHA 1910.269, OSHA 1910 Subpart S and NFPA 70E. Training shall include but not be limited to the following:

1. Proper use of the system analysis data.
2. Interpretation of hazard labels.
3. Selection and utilization of personal protective equipment.
4. Safe work practices and procedures.

3.8.7 Protective Device Testing, Calibration, and Adjustment

(a) Comply with Section 16A-3.9.

3.9 Testing Electrical Systems

3.9.1 Summary

(a) Prior to energizing equipment, retain services of recognized independent testing laboratory for purpose of performing inspections and tests as herein specified.
(b) Ensure electrical equipment supplied by Contractor and Owner is operational within industry and manufacturer's tolerances and installed in accordance with Specifications.

(c) Device Ratings and Settings: Verify ratings and settings of overload relays, motor circuit protectors, and overcurrent devices. Make final adjustments of devices in accordance with paragraph 3.8.

3.9.2 General

(a) Test Work and equipment installed to ensure proper and safe operation in accordance with intent of Drawings and Specifications.

1. Check interlocking and qutomatic control sequences and test operation of safety and protective devices.
2. Correct defects found by Work of this Section.
3. Cooperate with Power Company, supplier, and manufacturer representatives in order to achieve proper intended operation of equipment.

(b) Test, adjust, and record operating voltages at each system level before energizing branch circuits.

1. Transformer taps shall be adjusted to obtain as near as possible nominal system voltage.
2. Where transformer is under utility jurisdiction, obtain services of utility to correct voltage.
3. Replace devices and equipment damaged due to failure to comply with this requirement.

(c) Balance load among feeder conductors at each panelboard, switchboard or substation and reconnect loads as necessary to obtain reasonable load balance on each phase. Electrical unbalance shall not exceed 20%.

3.9.3 Motor Control Centers

(a) Visual and Mechanical Inspections:

1. Inspect for physical damage.
2. Verify equipment supplied and connected in accordance with Specifications.
3. Inspect for proper alignment, anchorage, and grounding.
4. Check tightness of accessible bolted bus joints by calibrated torque wrench method. Refer to manufacturer’s instructions for proper ft-lb levels.
5. Key interlock system shall be physically tested to ensure proper function.
6. Doors, panels, and sections shall be inspected for paint, scratches, and fit.
7. Mechanical operation of relays, switches, and other devices.

(b) Electrical Tests:

1. Insulation Resistance Test: Measure insulation resistance of each bus section phase-to-phase and phase-to-ground for 1 min. Test voltage and minimum acceptable values in accordance with Paragraph 3.9.2-C.2.

(c) Test Values:

1. Bolt torque levels shall be in accordance with manufacturer's instructions.
2. Insulation resistance test shall be performed in accordance with following:

Insulation Resistance Test Voltage	
Voltage Rating	**Test Voltage**
150 – 600 v	1,000 v
601 – 5,000 v	2,500 v
5,001 v and above	5,000 v

3. Values of insulation resistance less than rated kv +1 in megohms shall be investigated and corrected.

3.9.4 Motor Controllers

(a) Visual and Mechanical Inspections: Include following inspections and related work:

1. Motor Control Device Ratings and Settings: Verify ratings and settings as installed are appropriate for final loads and final system arrangement and parameters. Recommend final protective device ratings and settings where differences found. Use accepted revised ratings or settings to make final system adjustments.
2. Inspect for defects and physical damage and nameplate compliance with Drawings.
3. Exercise and perform operational tests of mechanical components and other operable devices in accordance with manufacturer's written instructions.
4. Check tightness of electrical connections of devices with calibrated torque wrench. Use manufacturer's recommended torque values.
5. Clean devices using manufacturer's approved methods and materials.
6. Verify proper fuse types and ratings in fusible devices.

(b) Electrical Tests:

1. Perform following in accordance with manufacturer's written instructions.

i. Insulation resistance test of motor control devices conducting parts to extent permitted by manufacturer's written instructions. Insulation resistance less than 100 megohms not acceptable.
ii. Use primary current injection to check performance characteristics of motor circuit protectors and for overload relays of controllers for motors 15 hp and larger. Trip characteristics not within manufacturer's published time-current tolerances not acceptable.
iii. Make adjustments for final settings of adjustable trip devices.
iv. Test auxiliary protective features such as loss of phase, phase unbalance, and undervoltage to verify operation.
v. Check for improper voltages at terminals in controllers having external control wiring when controller disconnect opened. Voltage over 30 v unacceptable.

2. Correct deficiencies and retest motor control devices. Verify system tests that specified requirements are met.

3.9.5 Instrument Transformers

(a) Visual and Mechanical Inspection:

1. Inspect for physical damage and compliance with Drawings.
2. Check mechanical clearances and proper operations of disconnecting and grounding devices associated with potential transformers.
3. Verify proper operation of grounding or shorting devices.

(b) Electrical tests:

1. Confirm transformer polarity electrically.
2. Verify connection at secondary CT leads by driving low current through leads and checking for this current at applicable devices.
3. Confirm transformer ratio.
4. Measure insulation resistance of transformer secondary and leads with 500 v megohm meter.
5. Measure transformer primary insulation with applicable overpotential tests.
6. Verify connection of secondary PT leads by applying low voltage to leads and checking for this voltage at applicable devices.

3.9.6 Metering and Instrumentation

(a) Visual and Mechanical Inspection:

1. Examine devices for broken parts, indication of shipping damage, and wire connection tightness.
2. Verify meter connections in accordance with single line meter and relay diagram.

(b) Electrical Tests:

1. Calibrate meters at midscale. Calibration instruments shall have precision no more than 50% of instrument being testing.
2. Calibrate watthour meters to 1/2%.
3. Verify instrument multipliers.

3.9.7 Grounding System

(a) Testing:

1. Subject completed grounding system to megger test at each location where maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells.
2. Measure ground resistance not less than 2 full days after last trace of precipitation, and without 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.
3. Perform tests by 2 point method according to Section 9.03 of IEEE 81.

(b) Maximum grounding resistance values are as follows:

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. Unfenced Substations and Pad-Mounted Equipment: 5 ohms.
5. Manhole Grounds: 10 ohms.

(c) Excessive Ground Resistance: Where resistance to ground exceeds specified values, notify ENGINEER promptly and include recommendations to reduce ground resistance and to accomplish recommended work.

(d) Report: Prepare certified test reports, of ground resistance at each test location. Include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

3.9.8 Ground Fault Systems

(a) Visual and Mechanical Inspections:

1. Inspect for physical damage and compliance with Drawings and Specifications.
2. Inspect neutral main bonding connection to ensure following.

   i. Zero sequence system grounded upstream of sensor.
   ii. Ground strap systems grounded through sensing device.
   iii. Ground connection made ahead of neutral disconnect link.

3. Inspect control power transformer to ensure adequate capacity for system.
4. Manual operate monitor panels (if present) for following:

   i. Trip test.
   ii. No trip test.
   iii. Non-automatic reset.

5. Record proper operation and test sequence.
6. Inspect zero sequence systems for symmetrical alignment of core balance transformers about current carrying conductors.
7. Verify ground fault device circuit nameplate identification by actuation observation.
8. Pickup and time delay settings shall be set in accordance with settings developed through coordination study and as approved by ENGINEER.

(b) Electrical Tests:

1. Test in accordance with manufacturer's instructions.
2. Measure system neutral insulation resistance to ensure no shunt ground paths exist, neutral-ground disconnect link removed, neutral insulation resistance measured, and link replaced.
3. Relay pickup current shall be determined by primary injection at sensor and circuit interrupting device operated.
4. Relay timing shall be tested by injecting 150% and 300% of pickup current into sensor. Total trip time shall be electrically monitored.
5. System operation shall be tested at 55% rated voltage.
6. Zone interlock system shall be tested by simultaneous sensor current injective and monitoring blocking function.

(c) Test Parameters:

1. System neutral insulation shall be minimum of 100 ohms, preferably 1 megohm or larger.
2. Relay pickup current shall be within 10% of device dial or fixed setting, and in no case greater than 1,200 amp.
3. Relay timing shall be in accordance with manufacturer's published time-current characteristic curves, but in no case longer than 1 sec.

END OF THIS SECTION

DIVISION 16 - ELECTRICAL

SECTION 16B - BASIC ELECTRICAL MATERIALS AND METHODS

1. GENERAL:

1.1 Description

1.1.1 Basic materials and methods specified herein shall be incorporated in the work wherever applicable unless specifically indicated otherwise.

1.1.2 The basic materials and methods specified herein are intended to define a minimum standard of quality and workmanship.

1.1.3 Refer to Division 1 for additional requirements.

1.2 Related Sections

1.2.1 Section 3A - Cast-In-Place Concrete.
1.2.2 Section 16A - General Electric Provisions.
1.2.3 Section 16C - Major Electric Equipment.
1.2.4 Section 16D - Supervisory Control and Data Acquisition (SCADA) Equipment.

1.3 References

Codes and Standards referred to in this Section are:

Fed. Spec.

W-F-408 - Fittings for conduit, metal (rigid thick wall and thin wall).

ASTM B-3 - Specification for soft annealed copper wire.

ASTM B-8 - Specification for concentric lay stranded copper conductors, hard medium, hard or soft.

ASTM B-33 - Specification for tinned or soft or annealed copper wire for electrical purposes.

ASTM B-189 - Specification for lead-coated and lead-alloy-coated soft copper wire for electrical purposes.

IEEE 383 - Class 1E electric cables, field splices and connections for nuclear power generating stations, standard for type test for.

ASTM D 635 - Test method for rate of burning and/or extent and time of burning of self-supporting plastics in a horizontal position.

Fed. Spec.

HH-I-595 - Insulation tape, electrical, pressure sensitive adhesive, plastic.

Fed. Spec.
WC-596 - Electrical power connectors.

NEMA WD-1-1965 - General requirements for ac switches.

ANSI C82.2 - Fluorescent lamp ballasts, methods of measurement of.

Fed. Spec W-P-115 - Panel, power distribution.

UL 50 - Cabinets and boxes.

NEMA KS1 - Enclosed and miscellaneous distribution equipment switches (600 volt maximum).

1.4 Submittals

1.4.1 Provide shop drawings and product data under provisions of Section 1A for the following items: Light Fixtures, Lamps, Ballasts, and Emergency Lighting Units, Panelboards, Disconnects and Safety Switches, Transformers, Motors, Lighting Contactors, and Cabinets and Enclosures with NEMA classification higher than NEMA 1.

1.4.2 Raceway, Conductors and Cables, Electrical Identification, Grounding, Wiring Devices, Supporting Devices, and Cabinets and Enclosures with NEMA 1 classification submittals are not required if CONTRACTOR supplies material or equipment as specified. If CONTRACTOR proposes substitutes to material or equipment submittals identified below are required.

(a) Product data.
(b) Submit in accordance with Section 1A.

1.5 Guarantee

1.5.1 Provide guarantee under provisions of Section 1A.

1.6 Basis of Payment

1.6.1 The work shall be paid at the contract lump sum price for

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which shall be payment in full for the work described herein.

2. PRODUCTS:

2.1 Raceways

2.1.1 METAL CONDUIT AND TUBING

(a) Galvanized Rigid Steel Conduit: ANSI C80.1.

(b) Flexible Metal Conduit: Zinc-coated steel.

(c) Liquidtight Flexible Metal Conduit: Flexible steel conduit with PVC jacket.

(d) Plastic- Coated Steel Conduit and Fittings: NEMA RN 1; rigid steel conduit system as specified with coated interior walls and external PVC coating, 40 mil (.1 mm) thick.

2.1.2 Nonmetallic Conduit

(a) Rigid Nonmetallic Polyvinyl Chloride (PVC) Conduit: NEMA TC 2, Schedule 40 or 80 PVC.

(b) PVC Conduit Fittings: NEMA TC 3; match to conduit type and material.

2.1.3 Fittings

(a) Fittings for steel conduit:

1) Steel or malleable iron, zinc galvanized or cadmium plated.
2) Do not use set screw or indentor type fittings.
3) Do not use aluminum or die cast fittings.
4) GRS Connectors and Couplings:

i. Threaded.
ii. Insulated throat.
iii. Gland compression type.
iv. Rain and concrete type.

5) Comply with ANSI C80.4.
6) Comply with NEMA FB 1, compatible with conduit materials.

(b) Fittings for PVC Coated galvanized rigid steel conduits:

1) Use only fittings approved for use with that material. Patch nicks and scrapes with PVC coating after installing conduit.

(c) Conduit bodies:

2) Malleable iron with galvanized finish.

(d) Fittings for flexible metal conduit:

1) Insulated throat type.
2) Threaded.
3) Grounding type.
4) Liquidtight: 1 piece sealing “O” rings with connectors when entering boxes or enclosures.

(e) PVC Conduit Fittings:

1) NEMA TC 3; match to conduit type and material.

(f) Expansion Joints:

1) Conduit expansion fittings complete with copper bonding jumper, Crouse-Hinds Type XJ.
2) Conduit expansion/deflection fittings with copper bonding jumper, Crouse-Hinds Type XD.

(g) Seals:

1) Wall entrance, OZ/Gedney Type FSK or FSC.

(h) Drain Fittings:

1) Automatic Drain Breather:

i. Explosionproof - Safe for Class 1, Group C and D.
ii. Capable of passing minimum 25 cc water/min and minimum 0.05 cu ft air/min at atmospheric pressure.

2) Condensate Drain:

i. Conduit outlet body, Type T.
ii. Threaded, galvanized plug with 3/16 in. drilled holed through plug.

(i) Hazardous Areas:

1) Explosionproof.
2) Horizontal seal fittings, Crouse-Hinds Type EYS.
3) Vertical seal fittings, Crouse-Hinds Type EYD.
4) Vertical seal fittings shall have drain type plug.

2.1.4 Raceway/Duct Sealing Compound

(a) Nonhardening, putty-like consistency workable at temperatures as low as 35°F.

(b) Compound shall not slump at temperature of 300°F and shall readily adhere to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.

2.2 Conductors and Cables

2.2.1 Building Wire and Cables

(a) UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as required to meet application and NEC requirements.

(b) Wire and cable for 600 volts and below: Soft drawn, copper wire with 600 volt insulation.

1) Conductors:

   i. Annealed, copper in accordance with ASTM B33.
   ii. Stranding: Class B in accordance with ASTM B8.

2) Insulations and Coverings:

   i. Rubber: Conform to NEMA WC 3.
   ii. Thermoplastic: Conform to NEMA WC 5.
   iii. Cross-Linked Polyethylene: Conform to NEMA WC 7.
   iv. Ethylene Propylene Rubber: Conform to NEMA WC 8.

(c) Feeders and service conductors: Single conductor Type XHHW-2.

(d) Branch Circuits:

1) Single Conductor Type THHN/THWN: Above ground and underfloor conduits.
2) Single Conductor Type XHHW-2: Duct bank conduit.
3) No. 12 AWG minimum size (unless otherwise noted) for branch circuit wiring, including motor circuits.
4) Size 120 v branch circuits for length of run on following basis.

   i. 0 to 50 ft Run From Panelboard to first outlet: No. 12 AWG minimum.
   ii. 51 to 100 ft Run: Increase one wire size, i.e., No. 12 AWG becomes No. 10 AWG.
   iii. 101 to 150 ft Run: Increase two wire sizes, i.e., No. 12 AWG becomes No. 8 AWG.
   iv. 151 ft and above: Wiring sized for 3% maximum voltage drop.

5) For other branch circuits, voltage drop for branch circuits and feeder circuit combined shall not exceed requirements of the NEC 215.

(e) Control Circuits:

1) Single conductor Type THHN/THWN: Above ground and underfloor conduits.
2) No. 12 AWG minimum size (unless otherwise noted).
3) Multi-wire cable assembly: Duct bank conduits.

(f) Non-shielded Instrumentation, Graphic Indication, and Other Control Wiring Operating at Less Than 120 v: No. 14 AWG except as otherwise indicated with same insulation as control circuits.

1) Single conductor Type THHW/THWN, above ground and underfloor conduits.
2) Multi-wire cable assembly: Duct bank conduits.

(g) Shielded instrumentation wiring, above ground and underfloor conduits:

1) PVC insulation, tinned copper (19 by 27) stranded, No. 16 AWG, twisted pair or triplet cabled with aluminum mylar shielding, stranded, tinned, No. 18 AWG copper drain wire, and overall black FR-PVC, 90°C, 600 volt jacket.
2) Multi-wire cable assembly: Duct bank conduits.

(i) Telephone wire, above ground conduits:

1) Vinyl insulation, tinned copper, solid twisted pair, cabled conductors, and silver gray vinyl jacket.

i. Up to 4 conductors per cable: 22 AWG solid wire.
ii. Over 4 conductors per cable: 24 AWG solid wire.
iii. Duct Bank: High density polyethylene jacketed multi-wire cable assemblies.

(k) Fire Alarm Circuits: Type THHN/THWN, copper conductor, in raceway.

(l) Multi-Wire Control and Instrumentation Cable Assemblies:

1) Multi-conductor, color-coded cable with number and size of conductors indicated.
2) Where spare conductors are not indicated provide 10% spare conductors. One pair minimum.
3) Control and non-shielded instrumentation.

i. Bare soft stranded No. 14 or 12 AWG copper in accordance with ASTM B3.
ii. Class B stranded in accordance with ASTM B8.
iii. Type THWN insulation also meeting requirements of NEMA WC-5 with armor-nylon in accordance with UL 83-THHN/THWN.
iv. Color coded in accordance with NEMA WC-5 Method I Table K-2.
v. Cabled with suitable fillers.
vi. Overall black FR-PVC, 90°C, 600 volt sunlight resistant jacket.

4) Shielded Instrumentation:

i. Bare soft stranded No. 16 AWG copper in accordance with ASTM B3.
ii. Class B stranded tinned copper in accordance with ASTM B8.

iii. PVC with nylon armor insulation.
iv. Twisted pairs color coded in accordance with NEMA WC-5 Method I Table K-2, and numbered.
v. Individual and overall aluminum mylar shields and seven strand tinned copper drain wires.
vi. Overall black FR-PVC 90°C 600 volt sunlight resistant jacket.

2.2.2 Connectors and Splices

(a) Underwriters Laboratories (UL) -listed factory-fabricated wiring connectors of size, ampacity rating, material, and type and class for application and for service indicated.

(b) Select to comply with Project's installation requirements and as required to meet application.

(c) Conductors No. 10 AWG and Smaller: 3M Electric Products, Skotchlok, or equal pre insulated spring connector. Comply with manufacturer's packaging requirements for number, size, and combination of conductors.

(d) Conductors No. 8 AWG and Larger: Bronze 2-bolt type connectors with spacer.

2.2.3 Terminations

(a) Power Conductors: Compression crimp type lugs.

(b) Control and Instrumentation Conductors: Compression crimp type fork tongue, insulated support type lugs on terminal strips. Do not splice.

2.3 Electrical Identification

2.3.1 Raceway and Conductor Labels

(a) Manufacturer’s equipment removed in Item 1 above. Standard Products: Where more than one type is listed for specified application, selection is Installer's option, but provide a single type for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, or as specified elsewhere.

(b) Conform to ANSI A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway or cable size.

1) Color: Black legend on orange field.
2) Legend: Indicates voltage.

(c) Adhesive Labels: Preprinted, flexible, self adhesive vinyl. Legend is over-laminated with clear, wear and chemical resistant coating.

(d) Pre-tensioned, Wraparound Plastic Sleeves: Flexible, preprinted, color coded, acrylic bands sized to suit diameter of line it identifies and arranged to stay in place by pre-tensioned gripping action when placed in position.

(e) Colored Adhesive Tape: Self adhesive vinyl tape not less than 3 mils thick by 1 to 2 in. wide (0.08 mm thick by 25 to 51 mm wide).

(f) Underground Line Warning Tape: Permanent, bright colored, continuous printed, vinyl tape with following features:

1) Size: Not less than 6 in. wide by 4 mils thick (152 mm wide by 0.102 mm thick).
2) Compounded for permanent direct burial service.
3) Embedded continuous metallic strip or core.
4) Printed Legend: Indicates type of underground line.

(g) Aluminum, Wraparound Marker Bands: Bands cut from 0.014 in. (0.4 mm) thick aluminum sheet, 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) Plasticized Card Stock Tags: Vinyl cloth with preprinted and field printed legends. Orange background, except as otherwise indicated, with eyelet for fastener.

(i) Aluminum Faced Card Stock Tags: Wear resistant, 18 point minimum card stock faced on both sides with embossable aluminum sheet, 0.002 in. (0.05 mm) thick, laminated with moisture resistant acrylic adhesive, and punched for fastener. Preprinted legends suit each application.

(j) Brass or Aluminum Tags: Metal tags with stamped legend, punched for fastener. Dimensions: 2 by 2 in. (51 by 51 mm) by 0.05 in. (1.3 mm).

2.3.2 Engraved Nameplates and Signs

(a) Manufacturer's Standard Products: Where more than one type is listed for specified application, selection is Installer's option, but provide single type for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, or as specified elsewhere.

(b) Engraved stock, melamine plastic laminate, 1/16 in. (1.6 mm) minimum thick for signs up to 20 sq in. (129 sq cm), 1/8 in. (3.2 mm) thick for larger sizes.

1) Engraved Legend: Black letters on white face.
2) Punched for mechanical fasteners.

(c) Baked Enamel Signs for Interior Use: Preprinted aluminum signs, punched for fasteners, with colors, legend, and size as indicated or as otherwise required for application. 1/4 in. (6.4 mm) grommets in corners for mounting.

(d) Exterior, Metal Backed, Butyrate Signs: Wear resistant, non-fading, preprinted, cellulose acetate butyrate signs with 0.0396 in. (1 mm), galvanized steel backing, with colors, legend, and size appropriate to application. 1/4 in. (6.4 mm) grommets in corners for mounting.

(e) Fasteners for Plastic Laminated and Metal Signs: Self tapping stainless steel screws or No. 10/32 stainless steel machine screws with nuts, flat washers and lock washers.

2.3.3 Miscellaneous Identification Products

(a) Cable Ties: Fungus-inert, self extinguishing, 1 piece, self locking, Type 6/6 nylon cable ties with following features:

1) Minimum Width: 3/16 in. (5 mm).
2) Tensile Strength: 50 lb (22.3 kg) minimum.
3) Temperature Range: Minus 40 to 185°F (Minus 4 to 85°C).
4) Color: As indicated where used for color coding.

(b) Paint: Alkyd-urethane enamel. Primer as recommended by enamel manufacturer.

2.4 Grounding

2.4.1 Grounding and Bonding Products

(a) Governing Requirements: Where types, sizes, ratings, and quantities are in excess of NEC requirements, more stringent requirements and greater size, rating, and quantity indications govern.

2.4.2 Wire and Cable Grounding Connectors

(a) Conform to NEX Table 8, except as otherwise indicated, for conductor properties, including stranding.

1) Material: Copper.

(b) Equipment Grounding Conductors: Insulated with green color insulation.

(c) Grounding-Electrode Conductors: Stranded cable.

(d) Underground Conductors: Bare, tinned, stranded, except as otherwise indicated.

(e) Bare Copper Conductors:

1) Solid Conductors: ASTM B3.
2) Assembly of Stranded Conductors: ASTM B8.
3) Tinned Conductors: ASTM B33.

2.4.3 Miscellaneous Conductors

(a) Grounding Bus: Bare, annealed-copper bars of rectangular cross section.

(b) Braided Bonding Jumpers: Copper tape, braided No. 3/0 AWG bare copper wire, terminated with copper ferrules.

(c) Bonding Straps: Soft copper, 0.05 in. (1 mm) thick and 2 in. (50 mm) wide, except as indicated.

2.4.4 Connector Products

(a) Pressure Connectors: High-conductivity-plated units.

(b) Bolted Clamps: Heavy-duty type.

(c) Exothermic-Welded Connections: Provided in kit form and selected per manufacturer's written instructions for specific types, sizes, and combinations of conductors and connected items.

2.4.5 Grounding Electrodes and Test Wells

(a) Grounding Rods: Copper-clad steel.

1) Size: 3/4 in. by 120 in. (19 by 3000 mm).

(b) Plate Electrodes: Copper, square or rectangular shape. Minimum 0.10 in (3 mm) thick, size as indicated.

(c) Test Wells: Fabricate from 15 in. (400 mm) long, square-cut sections of 8 in. (200 mm) diameter, Schedule 80, PVC pipe or as detailed on Drawings.

2.5 Wiring Devices

2.5.1 Manufacturers

(a) Wiring Devices:

1) Bryant Electric, Inc.
2) GE Company; GE Wiring Devices.
3) Hubbell, Inc.; Wiring Devices Div.
4) Killark Electric Manufacturing Co.
5) Pass & Seymour/Legrand; Wiring Devices Div.
6) Pyle-National, Inc.; an Amphenol Co.

(b) Wiring Devices for Hazardous (Classified) Locations:

1) Crouse-Hinds Electrical Co.; Distribution Equipment Div.
2) Killark Electric Manufacturing Co.
3) Pyle-National, Inc.; an Amphenol Co.

2.5.2 Receptacles

(a) Straight Blade and Locking Receptacles: Heavy Duty specification grade.

(b) GFCI Receptacles: Termination type, with integral NEMA WD 6, Configuration 5-20R duplex receptacle. Design units for installation in 2-3/4 in. (70 mm) deep outlet box without an adapter.

(c) Isolated Ground Receptacles: Equipment grounding contacts connected only to green grounding screw terminal of device with inherent electrical isolation from mounting strap.

1) Devices: Listed and labeled as isolated ground receptacles.
2) Isolation Method: Integral to receptacle construction and not dependent on removable parts.

(d) Industrial Heavy Duty Receptacles: Comply with IEC 309-1.

(e) Hazardous (Classified) Location Receptacles: Comply with NEMA FB 11.

1) Appleton Cat. No. EFS B175-2023M, Crouse-Hinds Cat. No. ENR 21201 with NEMA 5-20R.
2) Plugs: Match receptables. Furnish 1 plug for each receptacle installed.

(f) Color: White unless otherwise indicated or required by Code.

2.5.3 Pendant Cord/Connector Devices

(a) Matching, locking type, plug and receptacle body connector, NEMA WD 6, Configurations L5-20P and L5-20R, Heavy Duty grade.

1) Body: Nylon with screw open cable gripping jaws and provision for attaching external cable grip.
2) External Cable Grip: Woven wire mesh type made of high strength galvanized steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.5.4 Cord and Plug Sets

(a) Match voltage and current ratings and number of conductors to requirements of equipment being connected.

1) Cord: Rubber insulated, stranded copper conductors, with type SOW-A jacket. Green insulated grounding conductor, and equipment rating ampacity plus minimum of 30%.
2) Plug: Nylon body and integral cable clamping jaws. Match cord and receptacle type for connection.

2.5.5 Switches

(a) Snap Switches: Heavy duty: quiet type.

(b) Snap Switches in Hazardous (Classified) Locations:

1) Appleton EFS series, Crouse-Hinds EDS series.
2) Comply with UL Standard 894.

(c) Color: White unless otherwise indicated or required by Code.

2.5.6 Wall Plates

(a) Single and combination types match corresponding wiring devices.

1) Plate Securing Screws: Metal with head color to match plate finish.
2) Finished Spaces: 0.04 in. (1 mm) thick, Type 302, satin finished stainless steel.
3) Unfinished Spaces: Galvanized steel.
4) Exterior and wet locations: Weatherproof plates and covers.

2.6 Lighting Fixtures

2.6.1 Fixtures and Fixture Components

(a) Metal Parts: Free from burrs, sharp corners, and edges.

(b) Sheet Metal Components: Steel, except as indicated. Form and support to prevent warping and sagging.

(c) Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position.

(d) Reflecting Surfaces: Minimum reflectance as follows, except as otherwise indicated:

1) White Surfaces: 85%.
2) Specular Surfaces: 83%.
3) Diffusing Specular Surfaces: 75%.
4) Laminated Silver Metallized Film: 90%.

(e) Lenses, Diffusers, Covers, and Globes: 100% virgin acrylic plastic or water white, annealed crystal glass, except as otherwise indicated.

(f) Fixture Support Components: Comply with Section 16B paragraph 2.11.

1) Single-Stem Hangers: 1/2 in. (12 mm) steel tubing with swivel ball fitting and ceiling canopy. Finish same as fixture.
2) Twin-Stem Hangers: Two, 1/2 in. (12 mm) steel tubes with single canopy arranged to mount a single fixture. Finish same as fixture.
3) Rod Hangers: 3/16 in. (5 mm) minimum diameter, zinc-plated, threaded steel rod.
4) Hook Hanger: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

(g) Fluorescent Fixtures: Conform to UL 1570.

(h) Fluorescent Ballasts: Electronic integrate circuit, solid-state, full-light-output, energy-efficient type compatible with lamps and lamp combinations to which connected.

1) Certification by Electrical Testing Laboratory (ETL).
2) Labeling by Certified Ballast Manufacturers Association (CBM).
3) Type: Class P, high power factor, except as otherwise indicated.
4) Sound Rating: "A" rating, except as otherwise indicated.
5) Voltage: Match connected circuits.
6) Lamp Flicker: Less than 5%.
7) Minimum Power Factor: 90%.
8) Total Harmonic Distortion (THD) of Ballast Current: Less than 20%.
9) Conform to FCC Regulations Part 15, Subpart J for electromagnetic interference.
10) Conform to IEEE C62.41, Category A, for resistance to voltage surges for normal and common modes.
11) Multilamp Ballasts: Use 2, 3, or 4 lamp ballasts for multilamp fixtures where possible.
12) Lamp-ballast connection method does not reduce normal life of lamps.

(i) High-Intensity-Discharge (HID) Fixtures: Conform to UL 1572.

(j) HID Ballasts: Conform to UL 1029 and ANSI C82.4. Include following features, except as otherwise indicated.

1) Metal Halide Ballasts:

i. Pulse start ballast.

2) Operating voltage: Match system voltage.

(k) Auxiliary, Instant-On, Quartz System: Automatically switches quartz lamp when fixture is initially energized and when momentary power outages occur. Turns quartz lamp off automatically when HID lamp reaches approximately 60% light output.

(l) Incandescent Fixtures: Conform to UL 1571.

(m) Exit Signs: Conform to UL 924 and following:

1) Sign Colors: Conform to local code.
2) Minimum height of Letters: Conform to local code.
3) Arrows: Include as indicated.

(n) Emergency Lighting Units: Conform to UL 924.

1) Battery: Sealed, maintenance-free, lead-acid type with minimum 10 yr nominal life and special warranty.
2) Charger: Minimum 2-rate, fully automatic, solid-state type, with sealed transfer relay.
3) Operation: Relay automatically turns lamp on when supply circuit voltage drops to 80% of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. Relay disconnects lamps and battery and automatically recharges and floats on trickle charger when normal voltage is restored.
4) Wire Guard: Where indicated, provide heavy-chrome-plated wire guard arranged to protect lamp heads or fixtures.
5) Time-Delay Relay: Provide time-delay relay in emergency lighting unit control circuit arranged to hold unit ON for fixed interval after restoration of power after outage. Provide adequate time delay to permit HID lamps to restrike and develop adequate output.

2.6.2 Lamps

(a) Comply with ANSI C78 series that is applicable to each type of lamp.

(b) Fluorescent Color Temperature and Minimum Color-Rendering Index (CRI): 3500 K and 85 CRI, except as otherwise indicated.

(c) Noncompact Fluorescent Lamp Life: Rated average is 20,000 hrs at 3 hrs per start when used on rapid start circuits.

(d) Metal Halide Color Temperature and Minimum Color-Rendering Index (CRI): 3600 K and 70 CRI, except as otherwise indicated.

2.6.3 Finishes

(a) Manufacturer's standard, except as otherwise indicated, applied over corrosion-resistant treatment or primer, free of streaks, runs, holidays, stains, blisters, and similar defects.

2.7 Panelboards

2.7.1 Manufacturer's

(a) Cutler-Hammer.
(b) Square-D Co.

2.7.2 Panelboard Fabrication

(a) Enclosures: Flush- or surface-mounted cabinets as indicated. NEMA PB 1, Type 1, unless otherwise indicated to meet environmental conditions at installed location.

(b) Front: Secured to box with concealed trim clamps, unless otherwise indicated. Front for surface-mounted panelboards shall be same dimensions as box. Fronts for flush panelboards shall overlap box, unless otherwise indicated.

(c) Directory Frame: Metal, mounted inside each panelboard door.

(d) Bus: Hard drawn copper of 98% conductivity.

(e) Main and Neutral Lugs: Compression type.

(f) Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors. Bonded to box.

(g) Service Equipment Approval: Listed for use as service equipment for panelboards with main service disconnect.

(h) Future Devices: Equip with mounting brackets, bus connections, and necessary appurtenances, for overcurrent protective device ampere ratings indicated for future installation of devices.

(i) Special Features: Include following features for panelboards as indicated:

1) Isolated Equipment Ground Bus: Adequate for branch-circuit equipment ground conductors; insulated from box.

(j) Extra Gutter Space: Dimensions and arrangement as indicated.

1) Subfeed: Overcurrent protective device or lug provision as indicated.

(k) Feed-through Lugs: Sized to accommodate feeders indicated.

2.7.3 Lighting and Appliance Branch Circuit Panelboards

(a) Branch Overcurrent Protection Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
(b) Doors: In panelboard front, with concealed hinges. Secure with flush catch and tumbler lock, keyed alike.

2.7.4 Distribution Panelboards

(a) Branch-Circuit Breakers: Where overcurrent protective devices are indicated to be circuit breakers, use bolt-on circuit breakers, except circuit breakers 225-A frame size and greater may be plug-in type where individual positive-locking device requires mechanical release for removal.

2.7.5 Overcurrent Protective Devices

(a) Molded-Case Circuit Breakers: NEMA AB 1, handle lockable.

1) Characteristics: Frame size, trip rating, number of poles, and auxiliary devices as indicated and interrupting capacity rating to meet available fault current.
2) Application Listing: Appropriate for application, including Type SWD for switching fluorescent lighting loads, Type HACR for heating, air-conditioning, and refrigerating equipment and Class B GFCI for pipeline and vessel fixed electrical heating equipment unless otherwise indicated.
3) Circuit Breakers, 200A and Larger: Trip units interchangeable within frame size.
4) Circuit Breakers, 400A and Larger: Field-adjustable short-time and continuous current settings.
5) Current-Limiting Trips: Where indicated, let-through ratings less than NEMA FU 1, Class RK-5.
6) Current Limiters: Where indicated, integral fuse listed for circuit breaker.
7) Lugs: Mechanical lugs and power-distribution connectors for number, size, and material of conductors indicated.
8) Shunt Trip: Where indicated.

2.8 Disconnects, Fuses, and Circuit Breakers

2.8.1 Manfacturer's

(a) Motor and Circuit Disconnects:

1) Square D Co.
2) Cutler-Hammer.

(b) Molded-Case Circuit Breakers:

1) Square D Co.

2) Cutler-Hammer.

2.8.2 Enclosed Circuit Breakers

(a) Enclosed Molded-Case Circuit Breaker: NEMA AB 1, handle lockable with 2 padlocks.

(b) Characteristics:

1) Frame size, trip rating, number of poles, and auxiliary devices as indicated.
2) Interrupting capacity rating to meet available fault current, 10,000 symmetrical rms amps minimum.
3) Appropriate application listing when used for switching fluorescent lighting loads or heating, air conditioning, and refrigeration equipment.

(c) Interchangeable Trips: Circuit breakers, 200 amps and larger, with trip units interchangeable within frame size.

(d) Field-Adjustable Trips: Circuit breakers, 400 amps and larger, with adjustable short time and continuous current settings.

(e) Current-Limiting Trips: Where indicated, let-through ratings less than NEMA FU 1, Class RK-5.

(f) Current Limiters: let-through ratings less than NEMA FU 1, Class RK-5.

(g) Molded-Case Switch: Where indicated, molded-case circuit breaker without trip units.

(h) Lugs: Mechanical lugs and power-distribution connectors for number, size, and material of conductors indicated.

(i) Shunt Trip: Where indicated, 120 volts, 60 Hz.

(j) Accessories: As indicated on drawings.

2.8.3 Safety Switches

(a) NEMA heavy duty Type HD.
(b) Dual cover interlock.
(c) Visible blades.
(d) Provisions for control circuit interlock.
(e) Pin type hinges.
(f) Tin plated current carrying parts.
(g) Quick make and break operator mechanism.
(h) Handle attached to box, not cover.
(i) Handle position indication, ON in up position and OFF in down position.

(j) Padlock provisions for up to 3 padlocks in OFF position.
(k) UL listed lugs for type and size of wire specified.
(l) Spring reinforced fuse clips for Class R fuses.
(m) Provisions for insulated or groundable neutral.
(n) UL listed short circuit rating 200,000 RMS amp with Class R fuses.

2.8.4 Three Phase Manual Motor Switch

(a) Quick make and break operator mechanism.

(b) Padlock provisions in OFF position.

(c) NEMA type.

2.8.5 Enclosures

(a) Enclosure: NEMA AB 1, Type 1, unless specified or required otherwise to meet environmental conditions of installed location.

1) Outdoor or Other Wet or Damp Indoor Locations: NEMA Type 4X stainless steel.
2) Hazardous Areas Indicated on Drawings: NEMA Type 7C.

2.9 Transformers

2.9.1 Manufacturers

(a) Cutler-Hammer.

(b) Square D Co.

2.9.2 Transformers, General

(a) Factory-assembled and -tested, air-cooled units of types specified, designed for 60 Hz service.

(b) Cores: Grain-oriented, nonaging silicon steel.

(c) Coils: Continuous copper windings without splices, except for taps.

(d) Internal Coil Connections: Brazed or pressure type.

(e) Enclosure: Class complies with NEMA 250 for environment in which installed.

2.9.3 General-Purpose Distribution and Power Transformers

(a) Comply with NEMA ST 20 and list and label as complying with UL 1561.

(b) Efficiency: Efficiency equal to or greater than that stated in NEMA TP 1, for that type and rating of transformer.

(c) Cores: 1 leg per phase.

(d) Windings: One coil per phase in primary and secondary.

(e) Enclosure: Indoor, ventilated.

(f) Insulation Class: 220°C class 115°C maximum rise above 40°C for transformers 15 kVA or smaller; 220°C class 80°C maximum rise above 40°C for transformers larger than 15 kVA.

(g) Taps: 220°C class 115°C maximum rise above 40°C for transformers 15 kVA or smaller; 220°C class 80°C maximum rise above 40°C for transformers larger than 15 kVA.

1) Taps, 3 through 15 kVA: Two 5% taps below rated high voltage.
2) Taps, 15 through 500 kVA: Six 2.5% taps, 2 above and 4 below rated high voltage.

(h) K-Factor Rating: 220°C class 115°C maximum rise above 40°C for transformers 15 kVA or smaller; 220°C class 80°C maximum rise above 40°C for transformers larger than 15 kVA.

1) Transformer design prevents overheating when carrying full load with harmonic content corresponding to designated K-factor.
2) Nameplate states designated K-factor of transformer.

2.9.4 Finishes

(a) Indoor Units: Separate; marked "Shield" for grounding connection.

(b) Outdoor Units: Comply with ANSI C57.12.28.

2.9.5 Source Quality Control

(a) Factory Tests: Design and routine tests comply with referenced standards.

2.10 Electric Motors

2.10.1 Manufacturers

(a) Siemens.
(b) General Electric.
(c) U.S. Motors.
(d) Toshiba.

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2.10.2 General

(a) Requirements below apply to motors covered by this Section except as otherwise indicated.

(b) Motors 1/2 hp and larger: Polyphase.

(c) Motors Smaller Than 1/2 hp: Single-Phase.

(d) Frequency Rating: 60 Hz.

(e) Voltage Rating: Determined by voltage of circuit to which motor is connected for following motor voltage ratings (utilization voltages):

1) 120 V Circuit: 115 V - motor rating.
2) 208 V Circuit: 200 V - motor rating.
3) 240 V Circuit: 230 V - motor rating.
4) 480 V Circuit: 460 V - motor rating.

(f) Service factors indicated for motors are minimum values and apply at frequency and utilization voltage at which motor is connected. Provide motors which will not operate in service factor range when supply voltage is within 10% of motor voltage rating.

(g) Capacity: Sufficient to start and operate connected loads at designated speeds in indicated environment, and with indicated operating sequence, without exceeding nameplate ratings. Provide motors rated for continuous duty at 100% of rated capacity.

(h) Temperature Rise: Based on 40°C ambient except as otherwise indicated.

(i) Enclosure: Totally Enclosed Fan Cooled (TEFC) unless otherwise indicated in other sections and as required by NEC.

1) Explosion proof motors approved for specific hazard classifications covered by NEC.
2) Weather proof motors designed for outdoors and in wet areas.

(j) Copper Windings.

2.10.3 Polyphase Motors

(a) Squirrel-cage induction-type conforming to following requirements except as otherwise indicated.

(b) NEMA Design Letter Designation: "B"

(c) Bearings: Double-shielded, prelubricated ball bearings suitable for radial and thrust loading for application.

(d) Motor Efficiencies:

1) General purpose motors (not inverter duty/vector duty or explosion proof): NEMA Premium Energy Efficient Motors with nominal efficiency equal to or greater than that stated in NEMA MG 1 for NEMA Premium Energy Efficient Motors for that type and rating of motor.
2) Explosion proof motors: NEMA Energy Efficient/High Efficiency Motors with nominal efficiency equal to or greater than that stated in NEMA MG 1 for NEMA Energy Efficient/High Efficiency Motors for that type and rating of motor.

(e) Multi-Speed Motors: Separate windings for each speed.

(f) Internal thermal Overload Protection For Motors: For motors so indicated, protection automatically opens control circuit arranged for external connection. Protection operates when winding temperature exceeds safe value calibrated to temperature rating of motor insulation.

(g) Motors for Reduced Inrush Starting: Coordinate with indicated reduced inrush controller type and with characteristics of driven equipment load. Provide required wiring leads in motor terminal box to suit control method.

(h) Torque:

1) Breakdown torque shall be 200% or more of maximum torque load placed on motor shaft.
2) Provide torque shall be 200% or more of maximum torque load placed on motor shaft.
3) Supply special motors where load requirements exceed standard design.

(i) Open Drip Proof (ODP).

1) Energy Efficient.
2) Protected Openings.
3) Class B Insulation.
4) 1.15 Service Factor.
5) Cast iron construction.

(j) Totally Enclosed Fan Cooled (TEFC) and Totally Enclosed Non-Ventilated (TENV).

1) Energy Efficient.
2) 1.15 Service Factor, Class “F” Insulation.
3) Cast iron construction; frame, conduit box, end shields, fan cover, inner caps for 182T frames and larger.
4) Positive lubrication system.
5) Removeable eyebolt.
6) Suitable for indoor and outdoor installations.

7) Diagonally split, neoprene gasketed, rotatable oversized conduit box with NPT threaded lead hole.
8) Conduit box mounted, UL approved clamp type grounding lug.
9) Permanently numbered non-wicking loads.
10) Rust inhibitive non-washing lubricant.
11) Stainless steel nameplate with:

i. NEMA nominal efficiency.
ii. AFBMA bearing numbers.
iii. Lubrication instructions.

(k) Explosion Proof.

1) Same features as TEFC.
2) Approved for NEC hazardous classified location as noted in equipment specification or as indicated on Drawings.
3) Automatic explosion proof breather drains.

(l) Submersible pump and mixer motors.

1) As explosion proof breather drains.
2) 1.10 service factor, unless otherwise indicated in equipment specification sections.

2.10.4 Single-Phase Motors

(a) One of the following types as selected to suit starting torque and other requirements of specific motor application:

1) Permanent Split Capacitor.
2) Split-Phase Start, Capacitor-Run.
3) Capacitor-Start, Capacitor-Run.

(b) Shaded-Pole Motors: Use only for motors smaller than 1/20 hp.

(c) Internal Thermal Overload Protection for Motors: For motors so indicated, protection automatically opens power supply circuit to the motor, or control circuit arranged for external connection. Protection operates when winding temperature exceeds safe value calibrated to temperature rating of motor insulation. Provide device that automatically resets when motor temperature returns to normal range except as otherwise indicated.

(d) Bearings, belt connected motors and other motors with high radial forces on motor shaft shall be ball bearing type. Sealed, prelubricated sleeve bearings may be used for other single phase motors.

2.10.5 Source Quality Control

(a) Testing:

1) Perform belt connected motors and other motors with high radial forces on motor shaft shall be ball bearing type. Sealed, pre-lubricated sleeve bearings may be used for other single phase motors.
2) Test shall be standard NEMA routine production test in accordance with NEMA MG 1.

2.11 Supporting Devices

2.11.1 Materials

(a) Aluminum or Stainless Steel.

2.11.2 Coatings

(a) Products for use outdoors.

(b) Use PVC coating where indicated on Drawings.

2.11.3 Manufactured Supporting Devices

(a) Raceway Supports: Clevis hangers, riser clamps, conduit straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps.

(b) Fasteners: Types, materials, and construction features as follows:

1) Expansion Anchors: Carbon steel wedge or sleeve type.
2) Toggle Bolts: All steel springhead type.
3) Powder-Driven Threaded Studs: Heat-treated steel, designed specifically for intended service.
4) Nuts, Washers, and Bolts: Stainless steel.

(c) Conduit Sealing Bushings: Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.

(d) Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Provide plugs with number and size of conductor gripping holes as required to suit individual risers.

(e) U-Channel Systems: Channels, with 9/16-in. dia holes, at minimum of 8 in. on center, in top surface. Provide fittings and accessories that mate and match with U-channel and are of same manufacture.

2.11.4 Fabricated Supporting Devices

(a) Shop- or field-fabricate supports or manufacture supports assembled from U-channel components.

(b) Brackets: Fabricated of angles, channels, and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.

(c) Pipe Sleeves: Provide pipe sleeves of one of following:

1) Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from following gage metal for sleeve diameter noted:

i. 3 in. and smaller: 20 ga.
ii. 4 in. to 6 in.: 16 ga.
iii. Over 6 in.: 14 ga.

2) Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe.
3) Plastic Pipe: Fabricate from Schedule 40 galvanized steel pipe.

2.11.5 Fire Resistant Joint Sealers

(a) Manufacturers:

1) “Dow Corning Fire Stop Foam,” Dow Corning Corp.
2) “Pensil 851,” General Electric Co.
3) Or Equal.

(b) Two-part, foamed-in-place, silicone sealant formulated for use in through-penetration fire-stopping around cables, conduit, pipes, and duct penetrations through fire-rated walls and floors.

(c) Sealants and accessories shall have fire-resistance ratings indicated, as established by testing identical assemblies in accordance with ASTM E 814, by Underwriters' Laboratories, Inc., or other testing and inspection agency acceptable to authorities having jurisdiction.

2.12 Cabinets, Boxes, and Fittings

2.12.1 General

(a) Electrical Cabinets, Boxes, and Fittings: Of indicated types, sizes, and NEMA enclosure classes. Where not indicated, provide units of types, sizes, and classes appropriate for use and location. Provide items complete with covers and accessories required for intended use. Provide gaskets for units in damp or wet locations.

2.12.2 Miscellaneous Materials and Finishes

(a) Fasteners for General Use: Corrosion resistant screws and hardware including cadmium and zinc plated items.

(b) Fasteners for Damp or Wet Locations: Stainless steel screws and hardware.

(c) Fittings for Boxes, Cabinets, and Enclosures: Conform to UL 514B. Malleable iron or zinc plated steel for conduit hubs, bushings and box connectors.

(d) Finishes:

1) Exterior Finish: Galvanized or Gray baked enamel for items exposed in finished locations except as otherwise indicated.
2) Interior Finish: Where indicated, white baked enamel.

2.12.3 Metal Outlet, Device, and Small Wiring Box

(a) General:

1) Conform to UL 514A and UL 514B.
2) Boxes shall be of type, shape, size, and depth to suit each location and application.

(b) Steel Boxes: Conform to NEMA OS 1. Boxes shall be sheet steel with stamped knockouts, threaded screw holes and accessories suitable for each location including mounting brackets and straps, cable clamps, exterior rings and fixture studs.

(c) Galvanized Cast-Iron Boxes: Iron alloy, waterproof, with threaded raceway entries and features and accessories suitable for each location, including mounting ears, threaded screw holes for devices and closure plugs.

2.12.4 Pull and Junction Boxes

(a) General: Comply with UL 50 for boxes over 100 cu in. volume. Boxes shall have screwed or bolted on covers of material same as box and shall be of size and shape to suit application.

(b) Galvanized Steel Boxes: Flat rolled, code gauge, sheet steel with welded seams. Where necessary to provide rigid assembly, construct with internal structural steel bracing. Hot-dip galvanized after fabrication. Cover shall be gasketed.

(c) Stainless-Steel Boxes: Fabricate of stainless steel conforming to Type 304 of ASTM A167. Where necessary to provide rigid assembly, construct with internal structural stainless steel bracing. Cover shall be gasketed.

(d) Galvanized Cast-Iron Boxes: Molded of cast iron alloy with gasketed cover and integral threaded conduit entrances.

(e) Boxes Approved for Classified Locations: Cast metal or cast nonmetallic boxes conforming to UL 886 listed and labeled for use in specific location classification, and with specific hazardous material encountered. Conduit entrances shall be integral threaded type.

2.12.5 Terminal Strips

(a) Manufacturers:

1) Square D Co.
2) Buchanan.
3) Or Equal.

(b) Channel mount snap-on type.

(c) Individual gangable with nylon bases.

(d) Solderless box lug type rated at 600 v to accommodate No. 22 to 8 AWG wire or as otherwise indicated.

(e) Provide 50% spare terminals.

2.13 Lighting Contactors

2.13.1 Manufacturer: Square-D Model 8903LXG20V02CR6 or equal.
2.13.2 Description: NEMA ICS 2, magnetic lighting contactor, 100% rated.
2.13.3 Configuration: Mechanically held.
2.13.4 Coil Voltage: 120 volts, 60 Hertz.
2.13.5 Poles: Two.
2.13.6 Contact Rating: 30 amperes.
2.13.7 Enclosure: ANSI/NEMA ICS 6, Type 1.
2.13.8 Accessories:

(a) Selector Switch: ON/OFF/AUTOMATIC
(b) Pushbuttons and Selector Switches: NEMA ICS 2, general duty type.

2.13.9 Astronomical Timer: Intermatic Model ET8015C or Equal.

3. EXECUTION:

3.1 Raceways

3.1.1 Examination

(a) Examine surfaces to receive raceways, wireways, and fittings for compliance with installation tolerances and other conditions affecting performance of raceway system.

(b) Coordinate layout and installation of raceway and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

3.1.2 Wiring Methods

(a) Outdoors, Damp or Wet Locations: Use following wiring methods unless otherwise noted on Drawings:

1) Outdoor Exposed: PVC-Coated galvanized rigid steel.
2) Damp or Wet Locations (including Pump Room): PVC-Coated galvanized rigid steel.
3) Concealed: Galvanized rigid steel.
4) Underground Power and Control, Single Run: Rigid nonmetallic (PVC) conduit.

i. Concrete encased except for area lighting branch circuits or as otherwise noted on Drawings.

5) Underground Power and Control, Grouped: Rigid nonmetallic (PVC) conduit.

i. Concrete encased except for area lighting branch circuits or as otherwise noted on Drawings.

6) Underground Shielded Instrumentation Cables and Shielded Instrumentation Cables run in concrete slabs, Single Run or Grouped: Galvanized rigid steel.

7) Connection to Vibrating Equipment (including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment): Liquidtight flexible metal conduit.

(b) Indoor Dry Locations: Use following wiring methods unless otherwise noted.

1) Connection to Vibrating Equipment (including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment): Flexible metal conduit.
2) Exposed: Galvanized rigid steel conduit.

(c) Hazardous classified locations: Use the following wiring methods unless otherwise noted on drawings.

1) Exposed and concealed: Galvanized rigid steel conduit.

(d) Use 3/4 in. minimum size unless otherwise noted except conduit runs to room light switches may be 1/2 in.

(e) Unless specifically indicated otherwise on Drawings or in Specifications, use galvanized rigid steel conduit for general wiring.

(f) Encase galvanized rigid steel conduits installed underground or underfloor in at least 3 in. of concrete.

PVC conduit may be used without encasing in concrete for underfloor conduit or where specifically indicated on Drawings.

1) Underground conduit shall be minimum of 1 in., buried at depth of not less than 24 in. below grade.
2) Provide conduits or ducts terminating below grade with means to prevent entry of dirt and moisture.
3) When using concrete encased PVC conduit provide PVC coated galvanized rigid steel elbows.

(g) Raceways Embedded in Slabs: Install in middle third of slab thickness where practical, and leave at least 1 in. (25 mm) concrete cover.

1) Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
2) Space raceways laterally to prevent voids in concrete.
3) Run conduit larger than 1 in. trade size parallel to or at right angles to main reinforcement and spaced on center of at least 3 times conduit trade dia. with minimum 2 in. concrete covering. Conduits over 1 in. may not be installed in slab without approval of ENGINEER.
4) When at right angles to reinforcement, place conduit close to slab support.
5) Conduits embedded in concrete frame shall comply with applicable provisions of ACI 318.

3.1.3 Installation

(a) Conceal raceways by enclosing within finished walls, ceilings, and floors, unless otherwise indicated.

(b) Provide watertight conduit system where installed in wet places, underground or where buried in masonry or concrete.

1) Use threaded hubs when entering top of enclosures.
2) Use sealing type locknuts when entering sides or bottom of enclosures.

(c) Install two spare 1 in. conduits from top of each flush mounted panelboard to area above ceiling for future use. On flush mounted panelboards located on first and higher level floors, provide two spare 1 in. conduits from bottom of panelboard to ceiling area of floor below for future use.

(d) Keep raceways at least 6 in. (150 mm) away from parallel runs of flues and steam or hot water pipes. Install horizontal raceway runs above water and steam piping.

(e) Install raceways level and square and at proper elevations. Provide adequate headroom.

(f) Complete raceway installation before starting conductor installation.

(g) Support raceway as specified in Section 16B-2.11.

(h) Use temporary closures to prevent foreign matter from entering raceway.

(i) Run concealed raceways with minimum of bends in shortest practical distance considering type of building construction and obstructions, except as otherwise indicated.

(j) Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow surface contours as much as practical.

1) Mount exposed horizontal runs as high above floor as possible, and in no case lower than 7 ft above floors, walkways, or platforms in passage areas.
2) Run parallel or banked raceways together, on common supports where practical.
3) Make bends in parallel or banked runs from same center line to make bends parallel. Use factory elbows only where they can be installed parallel; otherwise, provide field bends for parallel raceways.

(k) Join raceways with fittings designed and approved for purpose and make joints tight.

1) Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
2) Use insulating bushings to protect conductors.

(l) Terminations: Where raceways are terminated with locknuts and bushings, align raceway to enter squarely, and install the locknuts with dished part against the box. Use two locknuts, one inside and one outside the box. Use insulating bushings. Provide insulated grounding bushings to terminate ground wire.

(m) Where terminations in threaded hubs, screw raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to box, and tighten chase nipple so no threads are exposed.

(n) Install pull wires in empty raceways. Use monofilament plastic line having not less than 200 lb (90 kg) tensile strength. Leave not less than 12 in. (300 mm) of slack at each end of pull wire.

(o) Telephone and Signal System Raceways 2 in. Trade Size and Smaller:

In addition to above requirements, install in maximum lengths of 150 ft (45 m) and with maximum of two 90° bends or equivalent. Install pull or junction boxes where necessary to comply with these requirements.

(p) PVC Externally Coated Galvanized Rigid Steel Conduit: Use only fittings approved for use with that material. Patch nicks and scrapes in PVC coating after installing conduit.

3.1.4 Conduit Stub-Ups

(a) Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above finished slab.

(b) Transition under floor conduit to PVC coated galvanized rigid steel conduit before rising above floor. Under floor conduit elbows shall be PVC coated galvanized rigid steel conduit. Extend the PVC coated galvanized rigid steel conduit portion of the stub-up minimum 12 inch above floor or slab.

3.1.5 Conduit Bends

(a) Make bends and offsets so inside diameter is not reduced. Unless otherwise indicated, keep legs of bend in same plane and straight legs of offsets parallel.

(b) Provide NEMA standard conduit bends, except for conduits containing medium voltage cable, fiber optic cable, or conductors requiring large radius bends.

3.1.6 Flexible Connections

(a) Use maximum of 6 ft (1830 mm) of flexible conduit for recessed and semi-recessed lighting fixtures.

(b) Terminate conduits at motor terminal boxes, motor operated valve stations or pipe-mounted instruments and other equipment subject to vibration with maximum of 3 ft (915 mm) liquidtight flexible metal conduit unless otherwise indicated.

(c) Use liquidtight flexible conduit in wet or damp locations.

(c) Use approved flexible connections in hazardous locations.

(d) Install separate ground conductor inside flexible conduit connections.

3.1.7 Fittings

(a) Install raceway sealing fittings according to manufacturer's written instructions.

Locate fittings at suitable, approved, accessible locations and fill them with UL-listed sealing compound. Install raceway sealing fittings at following points and elsewhere as indicated:

1) Where conduits enter or leave hazardous locations.
2) Where conduits pass from warm locations to cold locations, such as boundaries of refrigerated spaces and air-conditioned spaces.
3) Where otherwise required by NEC.

(b) Use raceway fittings compatible with raceway and suitable for use and location. For GRS, use threaded galvanized rigid steel conduit fittings, except as otherwise indicated.

(c) Install automatic breather drain fittings according to manufacturers written instructions. Locate fittings to drain conduit system and prevent condensate from entering device enclosures. Install automatic breather drain fittings at following points and elsewhere as indicated.

1) Where vertical seals are installed.
2) Low points in conduit system.
3) Below filed instrumentation at junction boxes of flexible and rigid conduit.
4) Where otherwise required by NEC.

(d) Install wall entrance seal as dictated by application where conduits pass through foundation walls below grade.

(e) Install conduit expansion fittings complete with bonding jumper in following locations.

1) Conduit runs crossing structural expansion joints.
2) Conduit runs attached to 2 separate structures.
3) Conduit runs where movement perpendicular to axis of conduit may be encountered.

(f) Where conduit passes from inside of building to outdoors, it shall be firmly packed at fitting nearest wall line with Johns-Manville Duxseal to depth of at least 1 in. after wires and cables are pulled in; or, if conduit enters directly into equipment, it shall be fitted with seal and drain fitting to prevent water entering equipment.

3.1.8 Grounding

(a) Ground in accordance with Section 16B-2.4.

(b) Provide grounding connectors for raceway, boxes, and components as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors.

Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL 486A.

3.1.9 Protection

(a) Provide final protection and maintain conditions, in manner acceptable to manufacturer and Installer, to ensure that coatings, finishes, and cabinets are without damage or deterioration at Substantial Completion.

1) Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2) Repair damage to PVC or paint finishes with matching touch-up coating recommended by manufacturer.

3.1.10 Cleaning

(a) Upon completion of installation of system, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

3.2 Electrical Identification

3.2.1 Installation

(a) Install As indicated where used for color coding.

(b) Install labels where indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.

(c) Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and or designations used for electrical identification with corresponding designations used in Contract Documents or required by codes and standards. Use consistent designations throughout Project.

(d) Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work.

(e) Self Adhesive Identification Products: Clean surfaces of dust, loose material, and oily films before applying.

(f) Install painted identification as follows:

1) Clean surfaces of dust, loose material, and oily films before painting.
2) Prime Surfaces: For galvanized metal, use single component, acrylic vehicle coating formulated for galvanized surfaces.

For concrete masonry units, use heavy duty, acrylic resin block filler. For concrete surfaces, use clear, alkali resistant, alkyd binder type sealer.

3) Apply one intermediate and one finish coat of silicone alkyd enamel.
4) Apply primer and finish materials according to manufacturer's instructions.

(g) Indentify Raceways and Exposed Cables of Certain Systems with Color Banding: Band exposed and accessible raceways of systems listed below for identification.

1) Fire Alarm Systems: Red.
2) Fire Suppression Supervisory and Control System: Red and yellow.
3) Combined Fire Alarm and Security System: Red and blue.
4) Security Fire Alarm and Security System: Red and blue.
5) Mechanical and Electrical Supervisory System: Green and blue.
6) Telecommunications System: Green and yellow.

(h) Install Circuit Identification Labels on Boxes: Label externally as follows:

1) Exposed Boxes: Pressure sensitive, self adhesive plastic label on cover.
2) Concealed Boxes: Plasticized card stock tags.
3) Labeling Legend: Permanent, water proof listing of panel and circuit number or equivalent.

(i) Indentify Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communications lines, install continuous underground plastic line marker located directly above line at 6 to 8 in. (150 to 200 mm) below finished grade. Where multiple lines installed in common trench or concrete envelope provide multiple underground line warning tapes, one for each 16 inches of width of lines. If lines do not exceed an overall width of 16 in. (400 mm), use single line marker.

1) Install line marker for underground wiring, both direct buried and in raceway.

(j) Color Code Conductors: Secondary service, feeder, and branch circuit conductors throughout secondary electrical system.

1) Field applied, color coding methods may be used in lieu of factory coded wire for sizes larger than No. 10 AWG.

i. Colored, pressure sensitive plastic tape in half lapped turns for distance of 6 in. (150 mm) from terminal points and in boxes where splices or taps are made.

Apply last 2 turns of tape with no tension to prevent possible unwinding. Use 1 in. (25 mm) wide tape in colors as specified. Adjust tape bands to avoid obscuring cable identification markings.

ii. Colored cable ties applied in groups of 3 ties of specified color to each wire at each terminal or splice point starting 3 in. (76 mm) from terminal and spaced 3 in. (76 mm) apart. Apply with special tool or pliers, tighten to snug fit, and cut off excess length.

2) 208/120-V Systems: As follows:

i. Phase A: Black.
ii. Phase B: Red.
iii. Phase C: Blue.
iv. Neutral: White.
v. Ground: Green.

3) 480/277-V Systems: As follows:

i. Phase A: Brown.
ii. Phase B: Orange.
iii. Phase C: Yellow.
iv. Neutral: White with non-green stripe.
v. Ground: Green.

(k) Power Circuit Identification: Use metal tags or aluminum wraparound marker bands for cables, feeders, and power circuits in vaults, pull boxes, junction boxes, and switchboard rooms.

1) Legend: 1/4 in. (6.4 mm) steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.
2) Fasten tags with nylon cable ties; fasten bands using integral ears.

(l) Apply identification to conductors as follows:

1) Conductors to Be Extended in Future: Indicate source and circuit numbers.
2) Multiple Power or Lighting Circuits in Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color coding for voltage and phase indication of secondary circuit.
3) Multiple Control and Communications Circuits in Same Enclosure: Identify each conductor by its system and circuit designation. Use consistent system of tags, color coding, or cable marking tape.

(m) Apply warning, caution, and instruction signs and stencils as follows:

1) Install warning, caution, and instruction signs where indicated or required to ensure safe operation and maintenance of electrical systems and of 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 butyrate signs with metal backing for outdoor items.
2) Emergency Operating Signs: Install engraved laminate signs with white legend on red background with minimum 3/8 in. (9 mm) high lettering for emergency instructions on power transfer, load shedding, and or emergency operations.

(n) Install identification as follows:

1) Apply equipment identification labels of engraved plastic laminate on each major unit of equipment, including central or master unit of each system. This includes communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Except as otherwise indicated, provide single line of text with 1/2 in. (13 mm) high lettering on 1-1/2 in. (38 mm) high label; where 2 lines of text are required, use lettering 2 in. (51 mm) high. Use black lettering on white field. Apply labels for each unit of following categories of equipment.

i. Panelboards, electrical cabinets, and enclosures.
ii. Access doors and panels for concealed electrical items.
iii. Electrical switchgear.
iv. Motor control centers.
v. Push button stations.
vi. Power transfer equipment.
vii. Transformers.
viii. Power generating units.
ix. Telephone switching equipment.
x. Fire alarm master station or control panel.
xi. Security monitoring or control panel.

2) Apply designation labels of engraved plastic laminate for disconnect switches, breakers, push buttons, pilot lights, motor control centers, and similar items for power distribution and control components above, except panelboards and alarm/signal components where labeling is specified elsewhere. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker.

3.3 Conductors and Cables

3.3.1 Installation

(a) Install wires and cables as indicated, according to manufacturer's written instructions and NECA "Standard of Installation".

(b) Run wire and cable in conduit unless otherwise indicated on Drawings. Pull conductors into raceway simultaneously where more than 1 is being installed in same raceway.

1) Use pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation.
2) Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
3) Do not draw conductor into conduits until building is enclosed, watertight, and work causing cable damage has been completed.

(c) Install cable supports for vertical feeders in accordance with NEC. Provide split wedge type which firmly clamps each individual cable and tightens due to cable weight.

(d) For panelboards, cabinets, switches, and equipment assemblies, neatly form, train, and tie cables in individual circuits.

(e) Seal cable and wire entering building from underground between wire and conduit, where cable exits conduit, with non-hardening approved compound.

(f) Install wire and cables in separate raceway systems as follows:

1) Exit lights.
2) Shielded Instrumentation
3) Telephone cables.
4) Fire Alarm System.
5) As required by NEC.

(g) Where control or instrumentation cables are run in underground conduit and ducts provide multi-wire cable assemblies.

(h) Where power cables and instrument/signal cables enter and pass through same or distribution box, steel barrier or separate raceways shall continue through box to avoid magnetic interaction between power cables and instrumentation conductors.

(i) Do not run instrumentation cables into control cabinets or MCC unless cables are terminated in cabinet or MCC.

(j) Wiring at Outlets: Install with at least 12 in. (300 mm) of slack conductor at each outlet.

(k) Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL 486A.

(l) Drawings do designate number of conductors in conduit. CONTRACTOR is responsible for verifying number of conductors in conduit prior to installation. Location of branch circuits and switch legs indicated on Drawings may be routed differently as dictated by construction and these Specifications.

3.3.2 Terminations and Splices

(a) Terminate control, instrumentation, and communication cables on terminal strips in separate terminal cabinets located near conduit entrances of buildings or as shown on Drawings.

(b) Power Cable Splices (no splices in cables unless approved by Engineer):

1) Provide continuous lengths of cable without splices in motor circuits and feeders unless otherwise noted. Splices may be installed in motor circuits and feeders with prior approval by ENGINEER.
2) Install splices and taps that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.
3) Use splice and tap connectors that are compatible with conductor material.
4) Where pre-insulated spring connectors are used for equipment connections, tape connector to wire to prevent loosening under vibration.
5) Each tap, joint or splice in conductors No. 8 AWG and larger shall be taped with two half-lap layers of vinyl plastic electrical tape and finish wrap of color coding tape where required by code.
6) Cable splices shall be made only in distribution boxes and junction boxes.

(c) Power Cable Terminations:

1) Termination of wires with full compression type lugs installed with appropriate hand or hydraulic tool. Use proper dies to achieve the desired compression.
2) For screw type terminal blocks, terminations for stranded conductors shall be made with T & B lock-on fork connector with insulated sleeves.

3) Motor lead conductor terminations shall be made with a T & B or approved equal, full compression lug, full ring type, bolted, and taped as required. For connecting motor lead to service wiring fasten full ring lugs together with cadmium plated steel cap screws, and cover with a minimum of 2 layers 1/2 lap, 3M Scotch No. 33 tape; option: T & B "Motor Stub Splice Insulator".

3.3.3 Control Circuits

(a) Control circuit wiring from same area for the same system returning to same panel, (e.g., LCP, DPC, etc.,) may be combined provided signal and voltage types are not mixed.

(b) Following types of wiring shall not be combined with other types:

1) 4-20 ma dc analog; Type 2 shielded cable.
2) 24 vdc discrete (e.g., field or LCP powered dry contacts).

3.3.4 Branch Circuits

(a) Motor branch circuits and branch circuits for 3 phase circuits shall not be combined.

(b) Branch circuits for single phase equipment devices from same LP or PP may be combined provided that such combining does not result in having to derate ampacity of conductors.

3.3.5 Feeders

(a) Extend feeders at full capacity from origin to termination.

(b) Each conduit raceway shall contain only those conductors constituting single feeder circuit.

(c) Where multiple raceways are used for single feeder, each raceway shall contain conductor of each phase and neutral if used.

(d) Where feeder conductors run in parallel, conductors shall be of same length, material, circular-mil area, insulation type, and terminated in same manner.

(e) Where parallel feeder conductors run in separate raceways, raceways shall have same physical characteristics.

(f) Confine feeders to insulated portions of building unless otherwise shown.

(g) On network systems, neutral shall be run with phase wires. Unbalanced neutral current shall not exceed normal or derated conductor capacity.

3.3.6 Motor and Equipment Wiring

(a) Provide motor circuits in accordance with diagrams and schedules on Drawings and code requirements, from source of supply to associated motor starter and starter to motor terminal box, including necessary and required intermediate connections.

(b) Do not include associated control conductors in same conduit with power conductors.

(c) Provide branch circuits to conform with NEC requirements and nameplate ratings. CONTRACTOR responsible for verification of ratings of motors and installing proper branch circuits.

3.3.7 Color Coding

(a) Conductors for Lighting and Power wiring:

Phase	208/120 v	480/277 v
A	Black	Brown
B	Red	Orange
C	Blue	Yellow
Travelers	Pink	Purple
Neutral	White	White with non-green stripe
Ground	Green	Green

(b) Colored pressure-sensitive plastic tape.

1) Apply in half overlapping turns for minimum of three inches at terminal points, and in junction boxes, pull boxes, and troughs.
2) 3/4 in. wide with colors as specified.
3) Apply last two laps of tape with no tension to prevent possible unwinding.
4) Where cabling markings are covered by tape, apply tags to cable starting size and insulation type.

(c) Color code for insulated power system wiring shall be in accordance with NEC.

(d) Color code for intrinsically safe systems shall be light blue.

3.3.8 Control, Communication and Signal System Identification

(a) Install permanent wire marker at termination.

(b) Identifying numbers and letters on wire markers shall correspond to those on terminal blocks or wiring diagrams used for installing systems.

(c) Plastic sleeve or self adhesive vinyl cloth.

3.3.9 Feeder Identification

(a) Pullboxes and junction boxes, install metal tags on circuit cables and wires to clearly designate circuit identification and voltage.

(b) Comply with Section 16B-2.3.

3.3.10 Field Quality Control

(a) Visual and Mechanical Inspection:

1) Inspect cables for physical damage and proper connection in accordance with single-line diagram.
2) Test cable mechanical connections to manufacturer's recommended values using calibrated torque wrench.
3) Check cable color coding with specifications and NEC standards.

(b) Electrical Tests:

1) Perform insulation-resistance test on each conductor with respect to ground and adjacent conductors. Applied potential shall be 1000 volts dc for 1 min.
2) Perform continuity test to insure proper cable connection.

(c) Test Values:

1) Evaluation results by comparison with cables of same length and type. Investigate any value less than 50 megohms.

3.4 Grounding

3.4.1 Application

(a) Equipment Grounding Conductors: Comply with NEC Article 250 for types, sizes, and quantities of equipment grounding conductors, except where specific types, larger sizes, or more conductors than required by NEC are indicated.

1) Install equipment grounding conductor with circuit conductors for items below in addition to those required by Code:

i. Feeders and branch circuits.
ii. Lighting circuits.
iii. Receptacle circuits.
iv. Singe-phase motor or appliance branch circuits.
v. Three-phase motor or appliance branch circuits.

2) Busway Supply Circuits: Install separate equipment grounding conductors from grounding bus in switchgear or distribution panel to equipment grounding-bar terminal on busway.

3) Isolated Grounding-Receptacle Circuits: Install separate insulated equipment grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding-conductor terminal of applicable derived system or service, except as otherwise indicated.

4) Isolated Equipment Enclosure Circuits: For designated equipment supplied by branch circuit or feeder, isolate equipment enclosure from supply raceway with nonmetallic raceway fitting listed for purpose. Install fitting where raceway enters enclosure, and install separate equipment grounding conductor. Isolate equipment grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding-conductor terminal of applicable derived system or service, except as otherwise indicated.

(b) Signal and Communications Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding-electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1) Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on 1/4 by 2 by 12 in. (6 by 50 by 300 mm) grounding bus.

2) Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

(c) Separately Derived Systems: Where NEC requires grounding, ground according to NEC Paragraph 250-26.

(d) Common Ground Bonding with Lightning Protection System: Bond electric power system ground directly to lightning protection system grounding conductor at closest point to electric service grounding electrode. Use bonding conductor sized same as system grounding conductor and install in conduit.

(e) Piping Systems and Other Equipment: Comply with NEC Article 250 for bonding requirements.

3.4.2 Installation

(a) Ground electrical systems and equipment according to NEC requirements, except where Drawings or Specifications exceed NEC requirements.

(b) Grounding Rods: Locate minimum of 1 rod length from each other and at least same distance from any other grounding electrode.

1) Drive until tops are 2 in. (50 mm) below finished floor or final grade, except as otherwise indicated.
2) Interconnect with grounding-electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make these connections without damaging copper coating or exposing steel.

(c) Grounding Conductors: Route along shortest and straightest paths possible, except as otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

(d) Underground Grounding Conductors: Use bare tinned copper wire. Bury at least 24 in. (600 mm) below grade.

(e) Metal Water Service Pipe: Provide insulated copper grounding conductors, sized as indicated, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding-clamp connectors. Where dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Do not install grounding jumper across dielectric fittings. Bond grounding-conductor conduit to conductor at each end.

(f) Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding-clamp connectors.

(g) Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.

(h) Test Wells: One for each driven grounding electrode system, except as otherwise indicated. Set top of well flush with finished grade or floor. Fill with 1 in. 25 mm) maximum-size crushed stone or gravel.

3.4.3 Connections

(a) Make connections so possibility of galvanic action or electrolysis 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 assure high conductivity and to make contact points closer in 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: Use for connections to structural steel and for underground connections, except those at test wells. 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-Wire 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: Where metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at both entrances and exits with grounding bushings and bare grounding conductors, except as otherwise indicated.

(e) Connections at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connections between conductors and grounding rods.

(f) Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturers' published torque-tightening values. Where these requirements are not available, use those specified in UL 486A and UL 486B.

(g) Commpression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by manufacturer of connectors. Provide embossing die code or other standard method to make visible indication that connector has been adequately compressed on grounding conductor.

(h) Moisture Protection: Where insulated grounding conductors are connected to grounding rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.4.4 Underground Distribution System Grounding

(a) Ground pad-mounted equipment and noncurrent-carrying metal items associated with substation by connecting them to underground cable and grounding electrodes.

3.4.5 Field Quality Control

(a) Test in accordance with 16A-3.9.

(b) Testing Agency: Provide services of qualified independent testing agency to perform specified acceptance testing.

(c) Testing: Upon completion of installation of ground-fault protection system and after electrical circuits have been energized, demonstrate capability and compliance with requirements.

1) Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters.

(d) Correct malfunctioning units at site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

3.4.6 Restoration

(a) Restore surface features, including vegetation, at areas disturbed by work of this Section.

1) Re-establish original grades, except as otherwise indicated.
2) Where sod has been removed, replace it as soon as possible after backfilling is completed.
3) Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition.
4) Include topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching.
5) Maintain restored surfaces.
6) Restore disturbed paving.

3.5 Wiring Devices

3.5.1 Installation

(a) Mounting height as follows unless otherwise shown on Drawings:

1) Switches: 48 in. above floor.
2) AC Receptacles and Telephone Outlets: 15 in. above floor or 6 in. above counters, counter back-splashes, and baseboard radiators in finished areas; 48 in. above floor in unfinished areas.

(b) Install devices and assemblies plumb and secure.

(c) Install wall plates when painting is complete.

(d) Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

(e) Protect devices and assemblies during painting.

3.5.2 Identification

(a) Comply with Section 16B-2.3.

1) Switches: Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on wall plate.
2) Receptacles: Identify panelboard and circuit number from which served. Use machine printed, pressure sensitive, abrasion resistant label tape on face of plate and durable wire markers or tags within outlet boxes.

3.5.3 Connections

(a) Connect wiring device grounding terminal to branch circuit equipment grounding conductor.

(b) Isolated Ground Receptacles: Connect to isolated ground conductor routed to designated isolated equipment ground terminal of electrical system.

(c) Tighten electrical connectors and terminals according to manufacturers published torque-tightening values. If manufacturers torque values are not indicated, use those specified in UL 486A.

3.5.4 Field Quality Control

(a) Test wiring devices for proper polarity and ground continuity. Operate each device at least six times.

(b) Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

(c) Replace damaged or defective components.

3.5.5 Cleaning

(a) Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

3.6 Lighting Fixtures

3.6.1 Installation

(a) Set units plumb, square, and level with ceiling and walls, and secure according to manufacturer's written instructions and approved Shop Drawings. Support fixtures according to Section 16B-2.11.

(b) Supports for Recessed and Semi-recessed Grid-Type Fluorescent Fixtures: Support Units from suspended ceiling support system. Install ceiling support system rods or wires at minimum of 4 rods or wires for each fixture, located not more than 6 in. (150 mm) from fixture corners.

1) Install support clips for recessed fixtures, securely fastened to ceiling grid members, at or near each fixture corner.

(c) Supports for Suspended Fixtures: Brace pendants and rods over 48 in. (1200 mm) long to limit swinging. Support stem-mounted, single-unit, suspended fluorescent fixtures with twin-stem hangers. For continuous rows, use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of chassis, including one at each end.

(d) Lamping: Where specific lamp designations are not indicated, lamp units according to manufacturer's instructions.

3.6.2 Connections

(a) Ground lighting units. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A.

3.6.3 Field Quality Control

(a) Inspect each installed fixture for damage. Replaced damaged fixtures and components.

1) Verify normal operation of each fixture after fixtures have been installed and circuits have been energized with normal power source.
2) Give advance notice of dates and times for field tests.
3) Provide instruments to make and record test results.
4) Interrupt electrical energy to demonstrate proper operation of emergency lighting installation. Include following information in tests of emergency lighting equipment:

i. Duration of supply.
ii. Low battery voltage shutdown.
iii. Normal transfer to battery source and retransfer to normal.
iv. Low supply voltage transfer.
v. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.

vi. Report results of tests.

(b) Replace fixtures that show evidence or corrosion during Project warranty period.

3.6.4 Adjusting and Cleaning

(a) Clean fixtures after installation. Use methods and materials recommended by manufacturer.

(b) Adjust aimable fixtures to provide required light intensities.

3.7 Panelboards

3.7.1 Installation

(a) Install panelboards and accessory items according to NEMA PB 1.1.

(b) Mounting Heights: Top of trim 74 in. (1880 mm) above finished floor, unless otherwise indicated.

(c) Mounting: Plumb and rigid without distortion box. Mount flush panelboards uniformly flush with wall finish.

(d) Circuit Directory: Type directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing.

(e) Install filler plates in unused spaces.

(f) Provision for Future Circuits at Flush Panelboads: Stub four 1 in. (27 mm) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in future. Stub four 1 in. (27 mm) empty conduits into raised floor space or below slab not on grade.

(g) Wiring in Panelboard Gutters: Arrange conductors into groups, and bundle and wrap with wire ties after completing load balancing.

3.7.2 Identification

(a) Identify field-installed wiring and components and provide warning signs as specified in Section 16B-2.3.

(b) Panelboard Nameplates: Label each panelboard with engraved laminated-plastic or metal nameplates mounted with corrosion-resistant screws.

3.7.3 Grounding

(a) Make equipment grounding connections for panelboards.

(b) Provide ground continuity to main electrical ground bus.

3.7.4 Connections

(a) Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A.

3.7.5 Field Quality Control

(a) Make insulation-resistance tests of each panelboard bus, component, and connecting supply, feeder, and control circuits.

(b) Make continuity tests of each circuit.

(c) Visual and Mechanical Inspection.

1) Check circuit breaker for proper mounting and compare nameplate data to drawings and specifications.
2) Operate circuit breaker to ensure smooth operations.
3) Inspect case for cracks or other defects.

(d) Balancing Loads: After Substantial Completion, conduct load-balancing measurements and make circuit changes as follows:

1) Perform measurements during period of normal working load as advised by OWNER.
2) Perform load-balancing circuit changes outside normal occupancy/working schedule of facility. Make special arrangements with OWNER to avoid disrupting critical 24 hr services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3) Recheck loads after circuit changes during normal load period. Record all load readings before and after changes and submit test records.
4) Tolerance: Difference exceeding 20% between phase loads, within panelboard, is not acceptable. Rebalance and recheck as required to meet this minimum requirement.

3.7.6 Adjusting

(a) Set field-adjustable pick-up and time-sensitivity ranges in accordance with Section 16A-3.8.

3.7.7 Cleaning

(a) On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

3.8 Disconnects, Fuses and Circuit Breakers

3.8.1 Examination

(a) Examine utilization equipment nameplates and installation instructions to verify proper fuse locations, sizes, and characteristics.
(b) Do not proceed with installation until unsatisfactory conditions have been corrected.

3.8.2 Installation

(a) Install enclosed switches and circuit breakers in locations as indicated, according to manufacturer's written instructions.

(b) Install fuses in fusible devices as indicated. Arrange fuses so fuse ratings are readable without removing fuse.

(c) Install enclosed switches and circuit breakers level and plumb.

(d) Install wiring between enclosed switches and circuit breakers and control/indication devices.

(e) Connect enclosed switches and circuit breakers and components to wiring system and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts according to equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL Standard 486A.

3.8.3 Identification

(a) Install typewritten labels on inside door of each fused switch to indicate fuse replacement information.

3.8.4 Coordination Study

(a) Where coordination study recommends changes in types, classes, features or ratings of equipment or devices specified in Section 16A-3.8 from those indicated, make written request for instructions. Obtain instructions from ENGINEER before ordering equipment or devices recommended to be changed.

3.8.5 Field Quality Control

(a) Manufacturer’s Field Services:

1) Supplier’s or manufacturer’s representative for equipment specified herein shall be present at job site of classroom designated by Owner for minimum man days indicated, travel time excluded, for assistance during plant construction, plant startup, and training of Owner’s personnel for plant operation. Include minimum of:

i. 1/2 man day for Installation Services.
ii. 1/2 man day for Instructional Services.

(b) Test in accordance with Section 16A-3.9.

(c) Testing: After installing enclosed switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

2) Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.5 for enclosed switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
3) Correct malfunctioning units at site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units, and retest.

3.8.6 Adjusting

(a) Set field-adjustable pick-up and time-sensitivity ranges in accordance with Section 16A-3.8.

3.8.7 Cleaning

(a) Upon completion of installation, inspect OCPDs. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

3.9 Transformers

3.9.1 Installation

(a) Comply with safety requirements of IEEE C2.

(b) Arrange equipment to provide adequate spacing for access and for circulation of cooling air.

(c) Identify transformers and install warning signs according to Section 16B-2.3.

(d) Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.9.2 Grounding

(a) Comply with NFPA 70 requirements separately derived systems for connecting to grounding electrodes and for bonding to metallic piping near transformer.

(b) Comply with Section 16B-2.4.

3.9.3 Field Quality Control

(a) Testing: Perform field quality-control testing:

1) Test Objectives: To ensure transformer is operational within industry and manufacturer's tolerances, is installed according to Contract Documents, and is suitable for energizing.
2) Report: Submit written report of observations and tests. Report defective materials and installation.
3) Tests: Include following minimum inspections and tests according to manufacturer's written instructions. Comply with IEEE C57.12.91 for test methods and data correction factors.

i. Inspect accessible components for cleanliness, mechanical and electrical integrity, and damage or deterioration. Verify that temporary shipping bracing has been removed. Include internal inspection through access panels and covers.
ii. Inspect bolted electrical connections for tightness according to manufacturer's published torque values or, if not available, those specified in UL 486A.
iii. Insulation Resistance: Perform megohmmeter tests of primary and secondary winding to winding and winding to ground.

Minimum Test Voltage: 1000 V, dc.
Minimum Insulation Resistance: 500 megaohms.
Duration of Each Test: 10 min.
Temperature Correction: Correct results for test temperature deviation from 20^{o}C standard.

4) Test Failures: Compare test results with specified performance or manufacturer's data. Correct deficiencies identified by tests and retest. Verify that transformers meet specified requirements.
5) Supplier or manufacturer shall direct services to specific system and equipment operation, maintenance, field tests, and troubleshooting.
6) In addition to the services specified above, provide manufacturer’s services as required to successfully complete systems demonstration.

3.9.4 Cleaning

(a) On completion of installation, inspect components. Remove paint splatters and other spots, dirt, and debris. Repair scratches and mars on finish to match original finish. Clean components internally using methods and materials recommended by manufacturer.

3.9.5 Adjusting

(a) After installing and cleaning, touch up scratches and mars on finish to match original finish.

(b) Adjust transformer taps and connections to provide optimum voltage conditions at utilization equipment throughout normal operating cycle of facility. Record primary and secondary voltages and tap settings or connections and submit with test results.

3.10 Electric Motors

3.10.1 Installation

(a) Field install motors in accordance with manufacturer's instructions and following:

1) Direct Connected Motors: Mount securely in accurate alignment.
2) Belt Drive Motors: Use adjustable motor mounting bases. Align pulleys and install belts. Use belts furnished by manufacturer and tension belts in accordance with manufacturer recommendations.

3.10.2 Commissioning

(a) Check operating motors, both factory and field-installed, for unusual conditions during normal operation. Coordinate with commissioning of equipment for which motor is part.

(b) Report unusual conditions.

(c) Correct deficiencies of field-installed units.

3.10.3 Alignment

(a) Installer of motor is responsible for alignment.

(b) Check alignment of motors prior to startup.

(c) Motors over 50 hp: operating motors, both factory and field-installed, for unusual conditions during normal operation. Coordinate with commissioning of equipment for which motor is part.

3.10.4 Field Quality Control

(a) Inspect wire and connections for physical damage and proper connection.

(b) Conduct insulation resistance (megger) test on each motor 25 hp and larger before energizing. Conduct test with 500 or 1,000 vdc megger. Test each phase separately and follow procedures listed below.

1) Disconnect voltage sources, lightning arrestors, capacitors, and other potential low insulation sources from motor before connecting megger to motor.
2) When testing phase, connect phases not under test to ground.
3) Apply test voltage, phase to ground on each phase being tested. Record resistance reading at 30 sec and at 1 min after test voltage is applied. Divide 1 min reading by 30 sec reading to obtain dielectric absorption ratio (DAR). DAR shall be 1.25 or greater for phase to pass test.
4) If phases have DAR of 1.25 or greater, attach tag to motor and mark tag "Insulation Resistance Test OK" and sign.
5) If phases have DAR of less than 1.25, attach tag to motor and mark tag “Insulation Resistance Test Failed” and sign. Provide new motor and retest. Notify ENGINEER of failure and actions taken to correct.
6) Connect equipment removed in Item 1 above.

(c) Before energizing motor, record motor's nameplate current on record drawing line diagrams. Size motor starter overload heaters with starter manufacturer's recommendation for given motor nameplate current, service factor, and power factor correcting capacitors, is provided.

(d) Check rotation of motor before connecting to driven equipment; before couplings are bolted or belts installed. Before motor is started to check rotation, determine that motor is lubricated. When rotation is correct, mark insulation resistance test tag "Rotation OK". Sign or initial test tag by person who checked motor rotation.

(e) Supplier or manufacturer shall direct services to system and equipment operation, maintenance, troubleshooting, and equipment and system-related areas other than wastewater treatment process.

(f) In addition to the services specified above, provide manufacturer’s services as required to successfully complete systems demonstration.

3.11 Supporting Devices

3.11.1 Installation

(a) Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.

(b) Coordinate with structural system and with other electrical installation.

(c) Raceway Supports: Comply with NEC and following requirements:

1) Conform to manufacturer's recommendations for selection and installation of supports.

2) Strength of each support shall be adequate to carry present and future load multiplied by safety factor of at least four. Where this determination results in safety allowance of less than 200 lbs, provide additional strength until there is minimum of 200 lbs safety allowance in strength of each support.
3) Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
4) Support parallel runs of horizontal raceways together on trapeze-type hangers.
5) Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 1 in. and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use 1/4 in. dia or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.
6) In vertical runs, arrange support so load produced by weight of raceway and enclosed conductors is carried entirely by conduit supports with no weight load on raceway terminals.

(d) Vertical Conductor Supports: Install simultaneously with installation of conductors.

(e) Miscellaneous Supports: Support miscellaneous electrical components as required to produce same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices.

(f) Sleeves: Install in concrete slabs and walls and other fire-rated floors and walls for raceways and cable installations. For sleeves through fire rated-wall or floor construction, apply UL listed firestopping sealant in gaps between sleeves and enclosed conduits and cables.

(g) Conduit Seals: Install seals for conduit penetrations of slabs below grade and exterior walls below grade and where indicated. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal.

(h) Conduit extending through roof shall pass through ceiling box at roof line.

1) Provide 14 ga minimum copper box complete with watertight soldered seams and flanged to serve as pitch pocket for each conduit.
2) Install conduit and pitch pocket in advance of roofing work.

(i) Fastening: Unless otherwise indicated, fasten electrical items and their supporting hardware securely to building structure, including but not limited to conduits, raceways, cables, cable trays, busways, cabinets, panelboards, transformers, boxes, disconnect switches, and control components in accordance with following:

1) Fasten by means of wood screws or screw-type nails on wood, toggle bolts on hollow masonry units, concrete inserts or expansion bolts on concrete or solid masonry, and machine screws, welded threaded studs, or spring-tension clamps on steel. Threaded studs driven by powder charge and provided with lock washers and nuts may be used instead of expansion bolts and machine or wood screws. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws.
2) Holes cut in concrete shall not cut main reinforcing bars. Fill holes that are not used.
3) Load applied to any fastener shall not exceed 25% of proof test load. Use vibration- and shock- resistant fasteners for attachments to concrete slabs.

3.12 Cabinets, Boxes and Fittings

3.12.1 Installation, General

(a) Locations: Install items where indicated and where required to suit code requirements and installation conditions.
(b) Cap unused knockout holes where blanks have been removed and plug unused conduit hubs.
(c) Support and fasten items in accordance with Section 16B-2.11.
(d) Sizes shall be adequate to meet NEC volume requirements, but in no case smaller than sizes indicated
(e) Remove sharp edges where they may come in contact with wiring or personnel.

3.12.2 Applications

(a) Hinged Door Enclosures: Sheet steel, baked enamel finish, NEMA type 12 enclosure except as indicated.

(b) Hinged Door Enclosures in Corrosive Locations: NEMA type 4X stainless steel metal enclosure, or as indicated on Drawings.

(c) Outlet Boxes and Fittings: Install outlet and device boxes and associated covers and fittings of materials and NEMA types for each location in conformance with following requirements unless otherwise noted:

1) Interior Dry Locations: Install outlet and device boxes and associated covers and fittings of materials and NEMA types for each location in conformance with following requirements unless otherwise noted:

2) Locations Exposed to Weather or Dampness: Galvanized, cast metal, NEMA Type 3R.
3) Wet Locations: Stainless Steel, NEMA type 4X enclosures.
4) Corrosive Locations: Stainless Steel, NEMA type 4X enclosures.

(d) Pull and Junction Boxes:

1) Interior Dry Locations: Sheet steel, NEMA type 1 for flush mounting and feraloy Type FS or FD cast boxes with threaded conduit hubs for surface mounting.
2) Wet Locations: Stainless Steel, NEMA type 4X enclosures.
3) Corrosive Locations: Stainless Steel, NEMA type 4X enclosures.
4) Hazardous (Classified) Locations: NEMA type listed and labeled for location and class of hazard indicated.

3.12.3 Installation of Outlet Boxes

(a) Outlets at Windows and Doors: Locate close to window or door trim.

(b) Column and Pilaster Locations: Locate outlet boxes for switches and receptacles on columns or pilasters so centers of columns are clear for future installation of partitions.

(c) Locations in Special Finish Materials: For outlet boxes for receptacles and switches mounted in desks or furniture cabinets or in glazed tile, concrete block, marble, brick, stone or wood walls, use rectangular shaped boxes with square corners and straight sides. Install boxes without plaster rings. Saw cut recesses for outlet boxes in exposed masonry walls.

(d) Gasketed Boxes: At following locations use cast metal, threaded hub type boxes with gasketed weatherproof covers:

1) Exterior Locations.
2) Where surface mounted on unfinished walls, columns or pilasters. (Cover gaskets may be omitted in dry locations).
3) Where exposed to moisture laden atmosphere.
4) Where indicated.

(e) Mounting: Mount outlet boxes for switches with long axis vertical or as indicated. Mount boxes for receptacles vertically. Gang boxes shall be mounted with long axis horizontal. Locate box covers or device plates so they will not span different types of building finishes either vertically or horizontally. Locate boxes for switches near doors on side opposite hinges and close to door trim, even though electrical floor plans may show them on hinge side.

(f) Ceiling Outlets: For fixtures, where wiring is concealed, use outlet boxes 4 in. sq by 1-1/2 in. deep, minimum with raised plaster or tile cover. Provide 3/8 in. fixture stud.

(g) Cover Plates for Surface Boxes: Use plates sized to box front without overlap.

(h) Protect outlet boxes to prevent entrance of plaster, and debris. Thoroughly clean foreign material from boxes before conductors are installed.

(i) Concrete Boxes: Use extra deep boxes to permit side conduit entrance without interfering with reinforcing, but do not use such boxes with over 6 in. depth.

(j) Secure boxes rigidly to substrate upon which being mounted or solidly embed boxes in concrete or masonry. Do not support from conduit, mechanical ductwork or piping.

(k) Set boxes in concealed conduit runs, flush with wall surfaces, with or without covers as required.

(l) Do not install boxes back to back or through wall. Offset outlet boxes on opposite sides of wall minimum 12 in.

(m) Set outlet boxes parallel to construction, securely mounted and adjusted to set true and flush with finished surface.

(n) Do not burn holes, use knockout punches or saw.

(o) Use handy boxes only where specifically indicated.

(p) Provide outlet box divider barriers between 277/480 v and 120/208 v devices as required and per NEC.

(q) Where emergency switches occur adjacent to normal light switches, install in separate boxes in accordance with NEC and device plate color coding separation.

3.12.4 Outlet Box Locations

(a) Locate flush mounted wall boxes in corner of nearest brick or block to keep cutting to minimum.

(b) Location of outlets and equipment as shown on Drawings is approximate and exact location to be verified and shall be determined by:

1) Construction or code requirement.
2) Conflict with equipment or other trades.
3) Equipment manufacturer's drawings.

(c) Minor modification in location of outlets and equipment considered incidental up to distance of 10 ft with no additional compensation, provided necessary instructions given prior to roughing in of outlet.

(d) Mounting heights for devices and equipment to be measured from finished floor to centerline of device and unless otherwise noted on Drawings as follows.

1) Switches: 48 in. above floor.
2) Ac Receptacles and Telephone Outlets: 15 in. above floor or 6 in. above counters, counter backsplashes, and baseboard radiators in finished areas; 48 in. above floor in unfinished areas.
3) Wall Bracket Lighting Fixtures: 8 in. above mirrors or or 6 ft 6 in. above floor.
4) Pushbuttons: 48 in. above floor.
5) Disconnect Switches: 60 in. above floor

3.12.5 Installation of Junction Boxes

(a) Box Selection: For boxes in main feeder conduit runs, use sizes not smaller than 8 in. sq by 4 in. deep. Do not exceed 6 entering and 6 leaving raceways in single box. Quantities of conductors (including equipment grounding conductors) in pull or junction box shall not exceed following:

Size of Largest Conductors in Box	Maximum No. of Conductors in Box
No. 4/0 AWG	30
250 MCM	20
500 MCM	15
Over 500 MCM	10

1) Cable Supports: Install clamps, grids, or devices to which cables may be secured. Arrange cables so they may be readily identified. Support cable at least every 30 in. inside boxes.

2) Mount pull boxes in inaccessible ceilings with covers flush with finished ceiling.

3) Size: Provide pull and junction boxes for telephone, signal, instrumentation, control, and other systems at least 50% larger than would be required by the NEC for boxes smaller than 24 in. by 24 in., or as indicated. Locate boxes strategically and provide shapes to permit easy pulling of future wires or cables of types normal for such systems.

3.12.6 Grounding

(a) Electrically ground metallic cabinets, boxes, and enclosures. Where wiring to item includes grounding conductor, provide grounding terminal in interior of cabinet, box or enclosure.

3.12.7 Cleaning and Finish Repair

(a) Upon completion of installation, inspect components. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, abrasions and weld marks.

(b) Galvanized Finish: Repair damage using zinc-rich paint recommended by manufacturer.

(c) Painted Finish: Repair damage using matching corrosion inhibiting touch-up coating.

3.13 Excavation and Backfill

3.13.1 Excavation and backfill for work under this Division shall be provided under this Division in conformance with Division 2.

3.14 Concrete

3.14.1 Concrete for equipment pads, conduit encasement, handholes, manholes and other work under this Division shall be provided under this Division in conformance with Division 3.

3.15 Cutting and Patching

3.15.1 All cutting and patching of building materials required for work under this Division shall be provided under this Division.

3.15.2 No structural members shall be removed, cut or otherwise modified without approval of the Engineer and any such work shall be done in a manner as directed by the Engineer.

3.15.3 Cutting and patching shall be performed in a neat and workmanlike manner, consistent with the best practices of the appropriate trade. All patching shall be done in a manner consistent with the building material being patched.

3.15.4 Holes made in concrete shall be made using a suitable core drill. The use of a star drill or air hammer will not be permitted.

3.15.5 In new construction, sleeves, chases, inserts and the like required for work under this Division shall be provided under this Division and the furnishing and placement of these items shall be fully coordinated with the other trades involved so as not to delay the new construction.

END OF THIS SECTION

DIVISION 16 - ELECTRICAL

SECTION 16C - MAJOR ELECTRICAL EQUIPMENT

1. GENERAL:

1.1 Description

1.1.1 Major electrical equipment shall be the items of equipment specified herein.

1.1.2 The manufacturer of each specified item shall provide not less than four (4) hard-cover operation and maintenance manuals for the respective equipment item furnished. The manuals shall contain final, approved shop drawings and product data sheets (including any field additions or modifications), as well as recommended installation, testing, operation and maintenance procedures.

1.1.3 The manufacturer shall provide one set of any special tools, as applicable, required for the maintenance of the equipment, housed in a metal tool box.

1.1.4 Equipment furnished under this section shall be complete with anchor bolts and associated hardware required to anchor equipment to concrete. Anchor bolts and all hardware shall be galvanized steel.

1.1.5 For each specified item, a representative of the manufacturer shall check the installation and submit, to the Engineer, three (3) certified, signed statements, addressed to the owner, that the equipment has been properly installed and is in good working order.

1.2 Related Sections

1.2.1 Section 3A - Cast-In-Place Concrete.
1.2.2 Section 16A - General Electrical Provisions.
1.2.3 Section 16B - Basic Electrical Materials and Methods.
1.2.4 Section 16D - Supervisory Control and Data Acquisition (SCADA) Equipment.

1.3 References

1.3.1 Codes and Standards referred to in this Section are:

(a) NEMA ICS-1 General Standards for Industrial Control and Systems.

(b) UL 845 Motor Control Centers.

(c) ISA Standards and Recommended Practices for Instrumentation and Control.

(e) NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum.)

1.4 Submittals

1.4.1 Provide shop drawings and product data under provisions of Section 1A.

1.4.2 Submittals of shop drawings and product data shall be particularly detailed and complete. Submittals shall be complete with the manufacturer's guarantee. Piecemeal submittals will be returned without review.

1.4.3 Submittal information shall include schematic diagrams, point-to-point internal wiring diagrams, point-to-point field wiring diagrams, and other necessary diagrams and installation requirements for the motor starters, motor control center, automatic transfer switch, intrusion alarm system, fire alarm panel, SCADA system, and other components and systems that are interfaced to these systems.

1.5 Guarantee

1.5.1 All electrical equipment shall be guaranteed from all defects of material and workmanship for the manufacturer's standard length of guarantee or for 1 year from the date of final acceptance, which is longer.

1.6 Delivery, Storage and Handling

1.6.1 Delivery, storage and handling shall be in accordance with the provisions of Section 1A.

1.6.2 Motor control center and switchgear sections shall be delivered in shipping splits that can be moved past obstructions in delivery path.

1.7 Basis of Payment

1.7.1 The major electrical equipment work shall be paid for at the contract lump sum price for

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which shall be payment in full for the work described herein.

2. PRODUCTS:

2.1 Motor Control Centers

2.1.1 Manufacturers

(a) Square D Co.
(b) Cutler-Hammer/Westinghouse.
(c) Allen-Bradley.

2.1.2 Coordination Study

(a) Where coordination study specified in Section 16A-3.8 recommends changes in types, classes, features or ratings of equipment or devices from those indicated, make written request for instruction. Obtain instructions from ENGINEER before ordering equipment or devices recommended to be changed.

2.1.3 Motor Control Centers

(a) Wiring: NEMA ICS 3, Class I, Type B.

(b) Enclosures: Surface-mounted cabinets as indicated. NEMA 250, Type 1 gasketed, unless otherwise indicated to meet environmental conditions at installed location.

1) Compartments: Modular; individual doors have concealed hinges and quick-captive screw fasteners. Interlocks on combination controller units require disconnect means in off position before door can be opened or closed, except by consciously operating permissive release device.

2) Interchange ability: Compartments are constructed to remove units without opening adjacent doors, disconnecting adjacent compartments, or disturbing operation of other units in control center. Units requiring same size compartment are interchangeable, and compartments are constructed to permit ready rearrangement of units, such as replacing 3 single units with unit requiring 3 spaces, without cutting or welding.

3) Wiring Spaces: Each vertical section of structure with horizontal and vertical wiring has spaces for wiring to each unit compartment in each section, with supports holding wiring in place.

(c) Short-Circuit Current Rating for Each Section: Equal to or greater than indicated available fault current in symmetrical amperes at motor-control center location.

2.1.4 Buses

(a) Material: Tin plated copper.

(b) Ampacity Ratings:

1) As indicated on horizontal buses.

2) 300 amp min for vertical main buses or larger as required for installed units.

(c) Neutral Buses: Full size in service entrance section only.

(d) Equipment Ground Bus: Non-insulated, horizontal copper bus 2 by 1/4 in. (50 by 6 mm), min.

(e) Horizontal Bus Arrangement: Main phase, neutral and ground buses extended with same capacity entire length of motor-control center, with provision for future extension at both ends by bolt holes and captive bus splice sections. Main horizontal bus shall not be less than 600 amperes.

(f) Short-Circuit Withstand Rating: Same as short-circuit current rating of section, not less than 65,000 RMS symmetrical amperes.

2.1.5 Functional Description

(a) Description: Modular arrangement of motor controllers, control devices, overcurrent protective devices, transformers, panelboards, instruments, indicating panels, blank panels, and other items mounted in compartments of motor-control center as indicated.

(b) Motor-Controller Units: Combination controller units of types and with features, ratings, and circuit assignments indicated.

1) Units with full-voltage, across-the-line, magnetic controllers up to and including Size 3 are installed on drawout mountings with connectors that automatically line up and connect with vertical-section buses while being racked into their normal, energized positions.

2) Units have short-circuit current ratings equal to or greater than short-circuit current rating of motor-control center section.

3) Units in motor-control centers with Type B wiring are equipped with pull-apart terminal strips or drawout terminal boards for external control connections.

(c) Overcurrent Protective Devices: Types of devices with features, ratings, and circuit assignments indicated. Individual feeder-tap units through 225-A rating shall be installed on drawout mountings with connectors that automatically line up and connect with vertical-section buses while being racked into their normal, energized positions.

(d) Spaces and Blank Units: Compartments fully bused and equipped with guide rails or equivalent, ready for insertion of drawout units.

(e) Spare Units: Type, size, and ratings as indicated, and installed in compartments indicated “spare”.

2.1.6 Magnetic Motor Controllers

(a) Description: NEMA ICS 2, Class A, full voltage, non-reversing, across-the-line, unless otherwise indicated.

(b) Control Circuit: 120V; obtained from integral control power transformer, unless otherwise indicated. Include control power transformer with adequate capacity to operate connected pilot, indicating and control devices, plus 100% spare capacity.

(c) Combinational Controller: Factory-assembled combination controller and disconnect switch with or without overcurrent protection as indicated.

1) Circuit-Breaker Disconnect: NEMA AB 1, motor-circuit protector with field-adjustable short-circuit trip coordinated with motor locked-rotor amperes.

(d) Overload Relay:

1) Electronic solid state type with inverse-time-current characteristic, phase loss and phase unbalance protection.

(e) Time Delay Restart Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connection.

1) Provide in starter enclosure where indicated on drawings.
2) Delay initial motor start.
3) Delay motor restart due to starter dropout caused by undervoltage or starter coil circuit interruption for maintained control circuits.
4) Adjustable on delay from 0.15 to 30.0 sec set at 10.0 sec.
5) Connect control relay in motor starter coil circuit.
6) Coordinate control relay section with motor starter to cause motor starter to drop out at voltage slightly higher than dropout voltage of starter and have dropout time slightly faster than motor starter to ensure if motor starter drops out, relay will drop out.

2.1.7 Feeder Overcurrent Protection

(a) Molded-Case Circuit Breaker: NEMA AB 1, handle lockable.

1) Characteristics: Frame size, trip rating, number of poles, and auxiliary devices as indicated and interrupting capacity rating to meet available fault current.
2) Application Listing: Appropriate for application, including Type HACR for heating, air-conditioning, and refrigeration equipment.
3) Circuit Breakers, 200A and Larger: Trip units interchangeable within frame size.
4) Current-Limiting Trips: Where indicated, let-through ratings less than NEMA FU 1, Class RK-5.
5) Lugs: Mechanical lugs and power-distribution connectors for number, size, and material of conductors indicated.
6) Shunt Trip: Where indicated or required for ground fault protection trip.
7) Incoming line circuit breakers shall be 100% rated, with microprocessor based adjustable LSI trip. No ground fault trip shall be provided.

2.1.8 Automatic Transfer Switches

(a) Automatic transfer switches incorporated in motor control centers shall be as specified elsewhere herein.

2.1.9 Micro Processor Based Metering Units

(a) Each incoming line shall have a microprocessor based electronic metering unit with digital readout and key pad. Metering unit shall monitor phase amperes, phase-to-phase voltages, and phase-to-neutral voltages with one percent accuracy. Metering system shall also monitor and indicate megawatts, megavars, power factor, megawatt demand and frequency. In addition, overvoltage/undervoltage, phase loss/ unbalance/reversal protective functions shall also be available and user programmable. Furnish two NO/NC alarms and two NO/NC trip contacts. Fused potential transformers shall be included. Current transformers shall be as shown. Metering units shall be equipped with data communications modules capable of communication with the SCADA panel using Modbus protocol. Coordinate with SCADA panel supplier through the Contractor to determine Modbus protocol type. Metering units shall be door mounted.

2.1.10 Accessories

(a) Factory install in controller enclosure, unless otherwise indicated.

1) Main and Low Flow Pumps: "Pump Run", "Pump Call", "Manual Operation", and "Off" Pilot Lights, push-to-test: NEMA ICS 2, heavy-duty type.
2) Exhaust Fans: "On" and "Off" Pilot Lights, push-to-test: NEMA ICS 2, heavy-duty type.
3) Manual overload reset button on all motor starter buckets.
4) Provide adequate space in motor starter bucket for installation of vendor furnished motor protection relay for Main and Low Flow Pumps.

(b) Furnish the following devices when indicated on Drawings.

1) Push-Button Stations and Selector Switches: NEMA ICS 2, heavy-duty type.
2) Stop and Lockout Push-Button Station: Momentary-break push-button station with factory-applied hasp arranged so padlock can be used to lock push button in depressed position with control circuit open.
3) Control Relays: Auxiliary and adjustable time-delay relays.
4) Elapsed Time Meters: Heavy duty with digital readout in hours.
5) Start counter: Miniature electric, 120 VAC, 6-digit, pushbutton reset, panel mounted, Durant-Eaton Corp. Cat. No. 6-Y-41322-406-ME-Q or equal.
6) Ammeter: Instrument-grade multi-position control switch having pistol-grip handle. Selector switch shall be 4-position and include an off position.
7) A separate ground fault relay and ground current sensor shall be provided for each incoming line. The relay shall actuate an alarm light and close a dry contact for remote monitoring. The relay shall not be used to trip the incoming breaker.

2.2 Fire Alarm System

2.2.1 Provide a complete fire alarm system for the station including an emergency power supply consisting of a battery (minimum 10 year nominal life expectancy and sized to operate complete alarm system for period of 24 hours), charger (solid-state, fully automatic, variable-charging-rate type that will completely charge fully discharged batteries in 4 hours or less), automatic transfer switch (transfers load to battery without loss of signals or status indications when normal power fails), and wall mounted control panel. The system shall be supervised and shall generate two isolated SPDT contact outputs for remote connection. One of these outputs shall be wired to the SCADA system and the other to the Pump Station Control Panel.

2.2.2 The system shall be complete with three zones - the electrical room, the pump room, and the lower level pump room. Smoke detectors with heat elements shall be provided as indicated on the Contract Drawings and shall be of the ionization type. Electronic horn/strobes as manufactured by System Sensors or Edwards shall be provided as shown Plans. All appliances shall meet the NFPA requirements. Heat detector units shall have be combination fixed-temperature and rate-of-rise with mounting plate arranged for outlet box mounting; 135^{o} F (57^{o} C) fixed temperature setting, except as indicated.

2.2.3 The system shall have provisions for receiving a non-latching normally open non-function contact (Combustible gas monitor horn relay). The contact closure shall activate the horn/strobes only, the other fire alarm system functions shall not be affected.

2.2.4 Submittal information shall include all necessary internal and external wiring diagrams and installation requirements. Complete system connection diagrams of all initiating devices, notification appliance and end of line resistors shall be included.

2.2.5 The system shall be the product of a single manufacturer having local available service. The system shall be UL listed and Factory Mutual approved.

2.2.6 Horns: Electric-vibrating-polarized type, operating on 24 V dc, with provision for housing operating mechanism behind grille. Horns produce sound-pressure level of 90 dB, measures at 10 ft (3 m) from source.

2.2.7 Visual Alarm Devices: Xenon strobe lights with clear or nominal white polycarbonate lens. Mount lenses on aluminum faceplate. Word “FIRE” is engraved in minimum 1 in. (25 mm) high letters on lens.

(a) Devices have candela reading as stated in NFPA 72.

2.3 AEGIS/Intrusion Alarm System

2.3.1 An AEGIS/Intrusion Alarm System shall be provided as generally shown on the drawings and specified herein for the purposes of detecting unauthorized entry into the pump station along with communicating various indicated alarms. An Intrusion alarm condition shall be sent to the SCADA panel and the pump station control panel. All required input alarms shall be communicated via telephone output to the designated destination.

2.3.2 The system shall consist of a new NEMA 12 wall mounted panel with lockable hinged door, 120V - 12V transformer, DC power supply with battery and battery charger, digital dialer, a transmit LED, a 6 volt control relay, alarm buzzer, magnetic reed switches at the entry doors, a key operated alarm override switch at the main entry door with LED and other appurtenances in the Intrusion Alarm Panel as indicated or required.

2.3.3 The magnetic reed switches shall consist of two elements, the magnet which mounts to the interior face of the door and the magnetically operated reed switch which mounts to the door frame. The switch contacts shall be closed when the door is open and open when the door is closed.

2.3.4 The override switch shall be weatherproof, shall be suitable for recessed mounting in a masonry wall and shall be secured against unauthorized removal. The switch shall have two contacts; one contact for shutting the door switches, and one contact for connection to the SCADA panel. The switch shall be operated by a special key. The key shall be removable in both positions. The key shall match the Owner's existing keying system. The override switch shall have an LED to indicate open or closed position. The override switch shall have a tamper pushbutton incorporated into the design, which shall be held open by the cover plate and spring closed if the cover plate is removed.

2.3.5 A submittal for the Intrusion Alarm Panel showing the layout of the intrusion alarm system devices and complete point to point wiring diagram shall be provided.

2.3.6 The panel shall operate on 120V, 60 Hz input.

2.4 Automatic Transfer Switches

2.4.1 Automatic transfer switches shall be air break, double throw interrupter type, electrically operated and mechanically held in both the normal and emergency positions. The switch operators shall be single solenoid or single motor operated and shall be momentarily energized by the sources to which the load is transferred. Switches shall be capable of transfer in either direction on 70% of rated voltage.

2.4.2 Transfer time in either direction shall not exceed 5 seconds.

2.4.3 Unless otherwise indicated, the switch shall be rated for 480 volts. The current rating shall be as indicated, as a minimum. Main contacts and main current carrying parts shall be insulated for 600 volts.

The rating of the switch shall be a 24-hour continuous rating in a non-ventilated enclosure for all classes of loads including resistance inductive, tungsten lamp and ballast loads. Temperature rise shall conform to NEMA standards.

2.4.4 Main contacts shall be mechanically held in position by the operating linkage without the use of hooks, latches, magnets or springs and the contacts shall be of a silver-tungsten alloy.

2.4.5 Separate arcing contacts, with magnetic blowouts shall be provided. Interlocked molded case circuit breakers or interlocked contactors will not be acceptable.

2.4.6 The number of poles shall be as indicated. Four pole switches shall be equipped with four fully-rated poles, all operating on a common shaft and the short circuit rating of the fourth pole shall be identical to the rating of the main poles.

2.4.7 Not less than two auxiliary contacts, one closed on normal and one closed on emergency, rated not less than 10 amperes at 120 volts, shall be mounted on and actuated by the same shaft as the main contacts. Additional relay contacts, timers, control relays and associated wiring required for the functions indicated shall be front accessible. All wiring shall be tagged with self-sticking or tubular wire markers.

2.4.8 Except for the normal functioning of a programmed neutral position, failure of any component shall not result in a neutral position where both normal and emergency contacts remain open. Also, the failure of any component shall not result in a condition where both normal and emergency contacts are closed, or attempt to close at the same time.

(a) Switch operator has programmed neutral position arranged to provide midpoint between 2 working switch positions with an intention, controlled, timed pause during transfer at midpoint.
(b) Midpoint pause is adjustable from 0.5 to 30 sec minimum, and factory set at 2.0 secs, except as indicated.
(c) Time delay occurs for both transfer directions.

2.4.9 Unless otherwise indicated, transfer switches shall be without integral and overcurrent or short circuit protection.

2.4.10 Switch components shall be easily maintainable from the front without removal of the switch from its enclosure and without disconnecting the main power cable. Adequate safety baffles and barriers shall be provided and all components shall be clearly identified.

2.4.11 Manual Operator

(a) Each transfer switch shall be equipped with a manual operator. The manual operator shall operate the switch in the same transfer time as normal electric operator transfer. Interlocking shall be provided to prevent electric operation of the switch when the manual operator is used. The manual operator shall be arranged to provide adequate shielding and protection from live electrical parts for operating personnel.

2.4.12 Withstand Rating, Tests and Certifications

(a) Transfer switches for 480 volt circuits shall have a withstand rating of not less than 50,000 RMS symmetrical amperes at 20% power factor for a duration of 3 cycles at 480 volts without contact separation or damage.

(b) In addition, they shall have a UL Standard 1008 listed withstand and closing rating, at 480 volts, when coordinated with molded case circuit breakers, of not less than 85,000 RMS symmetrical amperes.

(c) Product data submitted for approval shall include copies of a report form an independent testing laboratory which documents that identical switches have met the requirements of UL Standard 1008 for the specified ratings. In addition, the data shall include certified copies of test documentation of the 3-cycle withstand requirements specified herein.

(d) Also, the manufacturer shall document and certify that the switch has sufficient arc interrupting capabilities for 50 cycles of operation when operating between a normal and emergency source for the following load:

1) 600% of rated current at 0.4 power factor.

2) 20% of rated current at 0.4 power factor.

2.4.13 Basic Operation

(a) Operation shall be controlled by voltage sensing relays in each phase of both the normal and emergency sources.

(b) Upon a decrease in voltage on one or more phases of the normal source, start signal shall be sent to generator, the load shall be transferred to the emergency source, after an emergency transfer time delay as specified. Upon restoration of voltage to all phases of the normal, the load shall be re-transferred to the normal source, after a normal retransfer time delay as specified, and the generator shall run unloaded (engine cool down time delay). If the emergency source fails at any time while connected to the load, the switch shall immediately retransfer to the normal source upon restoration of voltage to the normal source on all phases. Pick-up voltage adjustable from 85% to 100% nominal, and drop-out voltage adjustable from 75% to 98% pick-up value. Factory set for pick-up at 90% and drop-out at 85%.

2.4.14 Control Features

Each transfer switch shall include, as a minimum, the following features of control:

(a) Emergency Transfer Time Delay

This time delay relay shall delay the transfer to the emergency source for a time to allow for momentary outages. This time delay shall be adjustable with a range of roughly 0 to 5 minutes.

(b) Test Switch

A test switch shall be mounted on the enclosure door to simulate failure of the normal power source.

(c) Indicating Lights

The switch shall have indicating lights mounted on the enclosure to indicate which position, normal or emergency, the switch is on.

(d) Normal Source Selector

The transfer switch shall be mounted on the enclosure door to allow either source to be selected as the normal source.

(e) Programmed Neutral Position

The switch operation shall have a programmed, adjustable time neutral position to prevent mechanical damage to motors which are running at the time of transfer. See paragraph 2.4.8 above.

(f) Override Switch

The transfer switch shall have an override switch, mounted on the enclosure door to hold transferred switch in the emergency position regardless of the status of the normal source.

(g) Auxiliary Contacts

An auxiliary contact for each of the following functions:

1) A contact closed when source 1 connected (Normal Position).
2) A contact closed when source 2 connected (Emergency Position).
3) A contact closed when transferred to emergency.
4) A contact closed on utility source 1 undervoltage.
5) A contact closed on generator source 2 undervoltage.
6) Engine start contact.

(h) Normal Retransfer Time Delay

This time delay relay shall delay the retransfer to normal and it shall be adjustable from 0 to 30 minutes; factory set at 10 minutes.

(i) Engine Cool Down Time Delay

This time delay relay shall run the generator unloaded, to allow the engine to cool, after retransfer to the Utility power supply and it shall be adjustable from 0 to 5 minutes; factory set at 5 minutes.

(j) Transfer switch shall be provided with Modbus communication capability.

(k) Engine-Generator Exerciser

Solid-State programmable time switch starts engine-generator set and transfers load to it from normal source for preset time, then retransfers and shuts down engine after preset cool-down period. Initiate exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory-set periods are 7 days and 20 minutes, respectively. Exerciser features include the following:

1) Exerciser transfer selector switch, which permits selection between exercise with and without load.
2) Pushbutton programming controls with digital display of settings.
3) Integral battery operation of time switch when normal control power is not available.

2.4.15 Enclosure

(a) Where indicated, transfer switches shall be installed within motor control centers. Such switches shall be installed at the motor control center manufacturer's factory and shall be an integral part of the motor control center equipment. The depth of the enclosure shall be the same as that of the motor control center and shall not exceed 20 inches.

(b) Where transfer switches in separate enclosures are indicated, those enclosures shall be NEMA 12 unless otherwise indicated.

2.4.16 Instructional Data/Material

(a) Not less than 4 full sets of hardbound installation and maintenance manuals, complete with any appropriate descriptive literature and any special tools required to service transfer switches shall be provided. Where more than one size is provided, the material shall address each size and shall be clearly delineated. The material so furnished shall include complete wiring diagrams.

(b) Plastic-laminated step-by-step operating and test procedures, complete with schematic wiring diagrams shall be permanently attached to automatic transfer switch enclosures.

2.5 Pavement Flood Sensor

2.5.1 The pavement flood sensor shall be in accordance with Section 16D.

2.5.2 The float shall be mounted in a float alarm box specified under DIVISION 15 – MECHANICAL.

3. EXECUTION:

3.1 Examination

3.1.1 Verify location and layout of 480V Switchgear, Motor Control Centers, Aegis/Intrusion alarm equipment, and Fire alarm equipment.

3.1.2 Verify that electrical power is available and of correct characteristics.

3.2 Preparation

3.2.1 Install concrete bases after dimensions of equipment are confirmed by equipment manufacturers.

3.3 Installation

3.3.1 Install system and components in accordance with manufacturer's specifications.

3.3.2 The installer shall provide all labor and perform all work to install and make operable all mechanical and electrical equipment necessary to assure safe and reliable operation.

3.4 Field Quality Control

3.4.1 Representative of the Manufacturer

(a) The services of a qualified representative of the manufacturer shall be provided to instruct on proper installation of the equipment, inspect the completed installation, make any necessary adjustments, participate in the startup of the equipment, participate in the field testing of the equipment, place the equipment in trouble-free operation, and instruct operating personnel in its operation and maintenance. This service shall include all equipment provided in this Section for this project including Motor Control Center, 480v Switchgear, Intrusion Alarm Panel, and Fire Alarm Panel. Include:

i. 1 mandays for Installation Services for Motor Control Center.
ii. 1 manday for Instructional Services for Motor Control Center.
iii. 1 manday for Installation Services for Intrusion Alarm Panel and Fire Alarm Panel.
iv. 1 manday for Instructional Services for Intrusion Alarm Panel and Fire Alarm Panel.

(b) The start-up services for the following equipment shall be coordinated with IDOT and IDOT shall be notified at least one week in advance:

Motor Control Center.
Intrusion Alarm Panel.
Fire Alarm Panel.

3.5 Adjustments

3.5.1 Motor Control Centers

(a) Set field-adjustable pick-up time-sensitivity ranges in accordance with Section 16A-3.8.

END OF THIS SECTION

DIVISION 16 - ELECTRICAL

SECTION 16D - SUPERVISORY, CONTROL AND DATA ACQUISITION (SCADA) EQUIPMENT

1. GENERAL:

1.1 Description

1.1.1 The existing SCADA panel shall be removed and turned over to IDOT. A new free standing SCADA panel with necessary hardware and software shall be provided and implemented to meet the monitoring and control requirement of the rehabilitated pumping station equipment.

1.1.2 The existing SCADA radio equipment, antenna and antenna cable shall be retained. The required cables between the SCADA Panel and the SCADA radio panel shall be provided by the Contractor.

1.1.3 A SCADA (Supervisory Control and Data Acquisition) system shall be provided to function as the "Master Control Station" for the Pump Station facility. The SCADA system shall consist of, but not be limited to; programmable controller, data communication equipment, LED (light emitting diode) digital displays as noted, process instrumentation and control devices, uninterruptible power systems (UPS), and other devices as required and/or as indicated on Plans.

1.1.4 All materials, equipment, labor, programming, configuration and installation services, and incidentals required to achieve a fully integrated and operational system shall be furnished and installed complete by a qualified system integrator with a minimum of 10-years experience. The system integrator shall design and coordinate the instrumentation and control system for proper operation with related equipment and materials.

1.1.5 Auxiliary and accessory devices necessary for system operation or performance, such as transducers or relays to interface with equipment provided under this Contract shall be included whether shown on the drawings or not.

1.1.6 The system integrator shall provide all programming and configuration of equipment and software including development of graphic displays. Displays shall be coordinated with existing Department standards.

1.1.7 The system integrator shall install the control system and shall perform all on-site testing, start-up, and training of IDOT’s staff.

1.1.8 All necessary coordination required for interfacing the proposed pump station facility with the proposed SCADA system shall be provided by the system integrator.

1.2 Submittals

1.2.1 Submit product data, shop drawings, project documentation, O & M Data and record documents in accordance with the provisions of Section 1A. and the following.

1.2.2 Product Data

(a) Bill of Material: List all the materials and equipment to be furnished. Tag number, manufacturer's complete catalog number, service, location, and cross-reference numbers of instruction sheet, specification data sheet and wiring diagram shall be included under each item.

(b) Specification Data and Drawings: Furnish instrument specification data sheet as per ISA standard instrument specification form, if applicable, wiring and/or connection diagram, outline dimensions, installation diagram and manufacturer's catalog for each instrument. A common set of drawings with setting and/or scale individually listed may be furnished for instruments with identical specification except setting and/or scale.

(c) Panel Drawings: Furnish panel drawings for each instrument/control panel. List bill of materials, show panel or cabinet structure, outline dimension, general arrangement, devices, cutouts and mounting details of instruments and control devices, terminal blocks, wire ways and piping.

1.2.3 System Diagrams

(a) Instrument Loop Diagram: Show all analog and digital loops for all instrument sensors, secondary instruments, I/O functions, alarms, control and displays using ISA standard symbols per ISA Standard S5.4.
(b) SCADA System Block Diagram: Show system hardware configuration and identify model numbers of each system component.
(c) Schematic diagrams, point-to-point internal wiring diagrams, point-to-point field wiring diagrams, and other necessary diagrams and installation requirements for the SCADA system and other components and systems that are interfaced to these systems.
(d) Interconnecting Wiring and/or Piping Diagrams: Show schematically the wiring and piping runs for each instrumentation and control system. The diagram shall show and identify, with location noted, all instruments, piping and appurtenances furnished under this section and related electrical equipment furnished under other Sections. All terminal blocks and pipe taps shall be identified.

1.2.4 Software Documentation

Submit system software, application software, I/O point data base listing, programming ladder diagrams, graphic pages and report forms in prints.

Software, application programs, ladder diagrams and control logics shall also be submitted on a 740MB CD-R.

1.2.5 Instruction Manuals

Submit instruction manuals covering installation, operation, calibration, maintenance, diagnostic and repair for all hardware and software.

1.2.6 Record Documents

Accurately record actual calibration setting and scales of instruments.

1.3 Work for Hire

1.3.1 Any and all configuration, programming, setup or other software functions (SOFTWARE) performed on all intelligent devices provided as part of this Project is to be considered “Work for Hire” under the 1976 Copyright Act as amended (title 17 of the United States Code). The SOFTWARE shall be owned by IDOT and shall be turned over to IDOT fully documented as the work is completed.

1.3.2 IDOT intends only to obtain the SOFTWARE for its own use.

1.3.3 IDOT will not prevent the SOFTWARE supplier from reuse of the SOFTWARE concepts and ideas for other projects. Any reuse of the SOFTWARE concepts and ideas generated under this Project is solely the responsibility of the SOFTWARE supplier. The SOFTWARE supplier shall defend, indemnify and hold harmless IDOT from all claims, damages and expenses (including reasonable litigation costs), arising out of any use, misuse or misapplication of SOFTWARE concepts and ideas.

1.4 Operational and Performance Requirements

1.4.1 The SCADA system includes a Panelview as the main Human Machine Interface (HMI) device, a master PLC for pumping system control, a Remote Termianl Unit (RTU) as alarm panel, a RTU as the automatic transfer Controller for electric services and generator control in the low voltage switch gear, reactive air bubbler level sensing system (LT-100 – LT-101) as the primary wet well level measurement devices and a multi-float/relay level monitoring system as the backup pump control system.

1.4.2 The PLC shall check the validity of LT-100 and LT-101 level signals using float levels as reference, and select a valid signal for pump control (LT-100 as default). If level signal is invalid, then the point level inputs signals from the multi-float system shall be used for pump control.

1.4.3 The SCADA System shall be designed for full automatic control of the pump station, and shall also be designed to allow manual operation. In the event of loss of signal(s) from water level sensing device(s), the SCADA system shall be capable of accepting data by manual entry of observed water levels via keypad/board or touch screen (or other acceptable means) from operating personnel at the pump station.

1.4.4 Pumping operation of the facility shall respond to water levels sensed in accordance with the pumping operation tables shown on the Drawings. The Programmable Logic Controller (PLC) and associated personal computer with SCADA software herein specified shall be capable of automatically controlling pumping operations.

1.4.5 The PLC shall also be programmed to operate as a 3-pump alternator for the main pumps and as a low flow pump controller such that the proper pumps operate in accordance with the wet well level.. The alternator shall sequence the pumps cyclic mode, alternation shall occur when all pumps are off in a pumping cycle. When the generator is providing power to the 480V switchgear the PLC shall sequence the starting of pumps in proper time intervals to reduce the starting and running load of the generator.

1.4.6 In the event of power failure of the electric utility source or the standby generator testing, and the generator is on line the PLC shall be programmed in such a way that only the low flow pump and one main pump on the generator bus can be started with the next pump only being started after the generator is stabilized.

1.5 Related Sections

1.5.1 Section 16A - General Electrical Provisions.
1.5.2 Section 16B - Basic Electrical Materials and Methods.
1.5.3 Section 16C - Major Electrical Equipment.
1.5.4 Section 16E – Packaged Engine Generator Systems.

1.6 Reference

1.6.1 ISA Standards and Recommended Practices for Instrumentation and Control.

1.7 Guarantee

1.7.1 Provide guarantee from all defects of material and workmanship for the manufacturer's standard length of guarantee or for 1 year from the date final acceptance, whichever is longer.

1.8 Deliver, Storage and Handling

1.8.1 Delivery, storage and handling shall be in accordance with the provisions of Section 1A.

1.9 Basis of Payment

1.9.1 Supervisory, Control and Data Acquisition (SCADA) equipment will be paid for under the contract lump sum price for PUMP STATION SCADA EQUIPMENT.

1.10 SCADA System I/O List

1.10.1 SCADA Panel PLC Hardwired I/O Points

DESCRIPTION	DI	DO	AI	AO	NOTE
Pump Station Wet Well Level, LT-100			1		
Pump Station Wet Well Level, LT-101			1		
Pump Station Discharge Level, LT-102			1		
Main Pump1-Current (3 phases – amps)			3		
Main Pump2-Current (3 phases – amps)			3		
Main Pump3-Current (3 phases – amps)			3		
Low Flow Pump-Current (3 phases – amps)			3		
Generator Fuel Tank Level			1		
Main Pump 1 Thru 3 Starter Contactor Called	3				
Main Pump 1 Thru 3 HOA not in AUTO	3				
Main Pump 1 Thru 3 Breaker Tripped	3				
Main Pump 1 Thru 3 Overload	3				
Main Pump 1 Thru 3 Motor Hi Temp/Moisture	3				
Main Pump 1 Thru 3 Run		3			
Low Flow Pump 1 Starter Contactor Called	1				
Low Flow Pump 1 HOA not in AUTO	1				
Low Flow Pump 1 Breaker Tripped	1				
Low Flow Pump 1 Overload	1				
Low Flow Pump 1 Motor Hi Temp/ Moisture	1				
Low Flow Pump 1 Run		1			
Call Main Lead Pump		1			
Call Main Lag Pump		1			
Call Standby Pump		1			
Call Low Flow Pump		1			
Main Pump Fail to Stop	1				
High Water Alarm Float	1				
Start Standby Level-Float	1				
Start Lag Level-Float	1				
Start Lead Pump Level-Float	1				
Stop Main Pump, Start LF Level Float	1				
Maun Pump Fail to Stop Level	1				
Stop LF Pump Level-Float	1				
Low Water Alarm Float	1				
MP Maunal Seq Selector Switch Position	12				
Primary Bubbler Failure		1			
Secondary Bubbler Failure		1			
Discharge Chamber Bubbler Failure		1			
Discharge Chamber Flooded		1			
SCADA Panel Power Failure		1			
Central Pump Test		1			

SCADA Panel Alarm		1			
Float Failure		1			
Primary Compr Call		1			
Primary Sol. Valve Call		1			
Secondary Compr Call		1			
Secondary Sol. Valve Call		1			
Discharge Chamber Compr Call		1			
Discharge Chamber Sol. Valve Call		1			
Compr Inflow Valve Call		1			
Solenoid Inflow Valve Call		1			
Generator Fuel Tank Leak	1				
Generator E-Stop	1				
Generator Common Alarm	1				
Generator Not in Auto	1				
Generator Fuel Tank Low	1				
Generator Running	1				
Generator Loaded	1				
Utility Power Available	1				
Switch Gear In Test Mode	1				
Exhaust Fan -1 Running	1				
Exhaust Fan -2 Running	1				
Exhaust Fan -3 Running	1				
Combustible Gas Warning	1				
Combustible Gas Alarm	1				
Combustible Gas Detector Trouble	1				
Fire Alarm	1				
Pump Station Intrusion Alarm	1	1			
Pump Station Entry Key Switch Not Armed	1				
120 VAC Power Fail	1				
UPS alarm	1				
24VDC Power Supply Alarm	1				
Pump Room High Temperature	1				
Control Building High Temperature	1				
Alarm Acknowledge	1				
Intrusion Alarm	1				
Key Switch	1				
Spare	5	3	2		
TOTAL	52	28	18		

1.10.2 Master PLC I/O Points via Modbus

(a) From 480V MCC:

1) From Utility Line 1, & Generator Breaker Trip Unit: Breaker status (Closed), 3 phase line voltage, 3 phase current, KW and power factor, and trip settings.

2) From Tie Breaker 1 Trip Unit: Breaker status (Closed) & trip settings.

3) From each Feeder Breaker Trip Unit: Breaker status (Closed), 3 phase current, KW and power factor, and trip settings.

(b) From Engine Generator Controller:

Metering: Elapsed Run Time, Engine RPM, DC Voltage, 3 phase current, voltage, KW and KVA; P.F., KWHr, Alarms: Hi/Lo coolant temp., Low oil pressure, Low DC volts, System not in automatic, Hi/Lo fuel level, Over crank, Over speed, Battery charger malfunction, Generator on load, Circuit breaker tripped.

1.11 System Description

1.11.1 The following points are not intended to be a comprehensive list of the system's features, only summarize the major functions of the system. The SCADA system specified herein shall perform the following generalized functions:

(a) Perform real-time process control, including proportional integral derivative control action, sequencing, process calculations, etc.
(b) Collect and store accurate, reliable operating information for present and future uses.
(c) Assist plant operating personnel by noting and communicating off-normal operating conditions and equipment failures.
(d) Accumulate and store equipment running times for use in preventative maintenance.
(e) Provide color graphic displays and summary reports for use by the plant operating and supervisory personnel.
(f) Provide trending for all analog values.
(g) Provide control system diagnostics.

1.11.2 The system is based on the SCADA system block diagram shown on Plans. The system shall include:

(a) Redundant programmable logic controllers (PLCs) with local input/output (I/O), graphical interface panels, network communications and other capabilities as specified herein and shown on the SCADA system block diagram.

(b) Computer operating system, Human Machine Interface(HMI) control/graphic software, PLC programming software, and other application software as specified herein.

(c) The computer shall be linked to the PLC over an Ethernet (IEEE 802.3) based local area network (LAN).

1.11.3 All process control functions including PID, calculations, sequencing, set points, timing, etc., shall be done in the PLCs. The graphic screens, program development, set point modification, data archiving, etc., shall be done by the computers.

1.11.4 The system shall allow the operator to manually control (by keyboard entry and mouse type pointing device) the status of pumps, valves, etc. (i.e., on-off, open-close, set point value, etc.) when viewing the appropriate graphic screen on HMI.

1.11.5 Convert the current HMI package to RSView latest version as the SCADA HMI software.

2. PRODUCTS:

Field Devices:

Equipment listed in the table below shall conform to the instrumentation standards described in the paragraphs following the table:

a. Control Stations (Type x).
b. Analysis Instrumentation (A Series).
c. Level Instrumentation (L Series).
d. Miscellaneous Instrumentation (M Series).
e. Pressure Instrumentation (P Series).
f. Programmable Controllers and Computer Equipment (Y Series).

Tag	Device Type	Location/Description	Additional Information
CS-MP-1	Type A	Main Pump No.1 Control Station	
CS-MP-2	Type A	Main Pump No.2 Control Station	
CS-MP-3	Type A	Main Pump No.3 Control Station	
CS-LFP-1	Type A	Low Flow Pump No.1 Control Station	
LT-100	L10	Primary Wet Well Level Element	Bubbler System
LT-101	L10	Secondary Wet Well Level Element	Bubbler System
LT-102	L10	Discharge Chamber Level Element	Bubbler System
FS-HWA	L8	High Water Alarm	
FS-MP-1	L8	Start Lead Pump Float	
FS-MP-2	L8	Start Lag 1 Pump Float	
FS-MP-3	L8	Start Lag 2 Pump Float	
FS-LFP-1	L8	Start Lead Low Flow Pump Float	
FS-MP-1B	L8	Stop Main Pumps Start Low Flow Pump Float	
FS-MP-2B	L8	Stop Low Flow Pump Float	
FS-LWA	L8	Low Water Alarm	
AE-1	A25	Combustible Gas Sensor Pump Room Main Level	
AE-2	A25	Combustible Gas Sensor Pump Room Platform	
AE-3	A25	Combustible Gas Sensor Wet Well	

AH-1	M30	Alarm Horn Electrical Room	
AH-2	M30	Alarm Horn Pump Room Upper Level	
AH-3	M30	Alarm Horn Pump Room Platform	
AH-4	M30	Alarm Horn Pump Lower Level	
AL-1	M31	Alarm Strobe Electrical Room	
AL-2	M31	Alarm Strobe Pump Room Upper Level	
AL-3	M31	Alarm Strobe Pump Room Platform	
AL-4	M31	Alarm Strobe Pump Room Lower Level	
AB-1	M31	Alarm Beacon Pump Room Entrance Exterior	
DS-1	M50	Door Switch Pump Room Entrance	
DS-2	M50	Door Switch Wet Well Access Hatch	
DS-3	M50	Door Switch Electrical Room Entrance	
ASH-1	M51	Electrical Room Smoke Detector	

2.1 048-PLC-1 SCADA Panel at Electrical Control Room

2.1.1 A SCADA panel shall house a programmable logic controller (PLC) which shall be programmed for automatic control and monitoring of the operations of all control and monitoring functions at the Pump Station. The PLC shall control the starting and stopping the low flow pump and three main pumps to prevent highway flooding.

2.1.2 The SCADA panel shall be NEMA 12 floor mounted, front accessible only, metal enclosed type, arranged for cable and/or conduit entry from the top, bottom or sides, as required. Panel design shall allow easy access to all internal wiring and appurtenances. Ventilation fan, air filter, thermostatically controlled space heater, light kit and 120V receptacle shall be provided. The panel shall have a full piano hinge door(s) and a 3-point latch with a locking handle. The handle shall have a cylinder type lock keyed to match IDOT's system.

2.1.3 The enclosure shall be finished inside and out. Exterior color shall match that for the motor control center, and the interior color shall be white or as otherwise approved by the Engineer.

2.2 (Y50) Programmable Logic Controllers

2.2.1 An Allan-Bradley programmable logic controller (PLC) system shall be furnished and shall be programmed to operate all functions herein specified. All analog and discrete inputs and outputs shall be provided as necessary. The logic program shall be of a universal type architecture and shall not be of a proprietary language. In addition, the programmable controller shall be capable of being operated from the District 8 Dispatcher’s Alarm Panel via the radio as the primary method of communication or leased telephone lines as the redundant method of communication. The programmable controller equipment supplier shall be responsible for coordinating and providing a complete and properly functioning software package for the control and operation of the equipment as specified herein.

2.2.2 The system integrator shall furnish the station operational program. A CD ROM copy and printout of the PLC control program shall be furnished to DEPARTMENT at the time of start-up. Disk and printed copy of the operating program shall be maintained on the file with the system integrator.

2.2.3 048-PLC-1: The PLC shall be a redundant system consisting of two(2) redundant ControlLogix processors with 1.5 Mbytes of memory, two(2) ControlLogix System Redundancy Modules, two(2) Control Net communication interfaces, two(2) Ethernet modules, two(2) redundant hot-swappable power supplies, Remote I/O system with redundant power supplies, Communication gateways, Modbus Interface card(s), Graphic Interface Panel (GIP), necessary cable assembly, and necessary specialty modules to form a complete system. The PLC shall be Allen-Bradley ControlLogix Redundant System with sufficient memory and I/O capacity to handle monitor and control functions of present system plus 20% spare memory and 10% spare I/O. The PLC shall be mounted in the control building SCADA Panel and shall be programmed for monitoring and control functions. The GIP shall be NEMA 4 front of panel mounted Allen-Bradley PanelView Plus 1250 12.1" TFT active matrix color display with keypad for operator interface, on the SCADA panel door. The main processor module shall be capable of accepting additional I/O plug-in modules for expansion. Analog and digital terminal interface modules (Allen-Bradley 1492-IFM and 1492-AIFM), pre-wired cables with removable terminals and connectors.

2.2.4 The PLC system design is based on a specific manufacturer's, other manufacturer's system will be acceptable only if they are proven to be the same as the specified in functionality and reliability.

2.2.4 Communication and I/O Modules

(F) CONTROL NET MODULES

i. Allen Bradley – 1756-CNB

ii. Capable of Control Net communication using ICP to combine functionality of I/O network and Peer to Peer Network, providing high speed functionality of for functions.

iii. Capable of providing deterministic, repeatable transfers of all mission critical control data in addition to supporting transfers of non-time-critical data. The device shall also allow for I/O updates and controller-to-controller interlocking to always take precedence over program uploads, downloads and messaging

iv. Data Communication Rates shall be 5 Mbytes/Sec

(b) Modbus communications shall be implemented with the use of ProSoft® MVI56 series modules, rack mounted, into ControlLogix Remote I/O 17 slot chassis

(c) 24VDC Digital Input:

i. 24 VDC as required by application.
ii. 1756-IB
iii. 16 points per module.
iv. 1756-TBNH Removable Terminal Blocks.
v. LED indication of on/off status of each point.

(d) 24VDC or 120VAC Relay Output:

i. 5-125VDC, 5-240VAC individually isolated relay contact outputs.
ii. 1756-OW16I
iii. 16 points per module.
iv. 1756-TBCH Removable Terminal Blocks.
v. LED indication of on/off status of each point.

(e) Analog Input:

i. 8 points per module.
ii. 1756-IF8
iii. 1756-TBCH Removable Terminal Blocks.
iv. Accept 4-20 mAdc or 1-5 vdc inputs as required by application.

2.3 PLC Program Development Software System

2.3.1 The System Integrator shall provide as part of the System a software package to allow off-line or on-line ladder logic program development, annotation and monitoring on an IBM or compatible personal computer operating under the computer operating system specified herein.

2.3.2 The software shall be utilized for development of the ladder logic programs and transfer to the PLC. Provide all PLC configuration required to implement the control strategies specified in this Section and shown on E19 SCADA System Diagrams.

2.3.3 The software package shall be completely menu driven and shall be distributed on standard CD's.

2.3.4 All required hardware (including cables, cable adapters, etc.) to allow the PLC's connection to a Standard RS-232-C or USB personal computer port shall be furnished.

2.3.5 The software package shall include a software license agreement allowing IDOT the rights to utilize the software as required for any current or future modification, documentation, or development of the PLC's furnished for this project.

2.3.6 The software shall provide as a minimum the following functions:

(a) Annotation of all ladder elements with at least 3 lines of 6 characters each.

(b) Annotation of all ladder rungs with at least 240 characters.

(c) Provide visual "power flow" monitoring of circuit elements (when connected to the PLC).

(d) Provide annotated ladder diagram printout on a standard IBM compatible dot matrix printer for documentation purposes.

(e) On-line help facility.

(f) Download or upload ladder program from the PLC to the PC.

(g) Provide a ladder element and I/O cross reference table.

(h) Provide all monitoring, forcing, programming error detection, searching, configuration, etc., functions as required to allow an operator/ programmer to completely program a PLC.

2.3.7 Programming software shall be Allen-Bradley RSLogix 5000 for Windows NT. Software shall be suitable for simultaneous operation with the computer based control system software specified herein. Provide means for development software operation without affecting on-line operation of the computer control system.

2.4 Graphical Interface Panels (GIP)

2.4.1 Provide graphical interface panels incorporated into each PLC as shown on the drawings. Graphical interface panels shall be configured to allow operator access to status and control of local processes being monitored by the PLC. Provide all software, hardware, cables, and appurtenances for a fully configured system.

2.4.2 Provide industrial grade NEMA 4 sealed panel with keypad. Keypad shall include a minimum of 15 user definable panel buttons and 5 user definable control buttons. Provide 12.1-inch, 800 x 600 pixel, VGA, color TFT display.

2.4.3 Provide PLC communications interface drivers to allow direct access of the graphical interface panel to the PLC and network. During configuration, the System Integrator shall assign specific addressing and input/output access to allow monitoring of the specific local process. Provide a minimum of two configurable serial communication ports.

2.4.4 Provide Windows based configuration software with the graphical interface panels. Configuration software shall utilize fill-in-the-blank style structure and support a minimum of 30 control display pages per panel. Control pages shall be stored in non-volatile EEPROM memory.

2.4.5 Provide screen templates for screen configuration including discrete indicator, analog numeric readout, message text display, graphical analog bar, register table, alarm windows, and control button. Panel software shall allow mixing of custom graphics and templates on any page configuration. Provide variable sizing of templates with no limitation on the number of elements on any alarm page.

2.4.6 Provide custom graphic capability for a schematic, graphical representation of the process. Resolution of graphics shall be to the screen pixel level. Custom graphics shall have the ability to be animated including proportional and status color based strategies. Provide a library of pre-developed symbols based on ISA graphical standards.

2.4.7 Provide alarm monitoring capabilities with audio output. Alarm buffer shall store a minimum of 100 alarms for scrolling, review, and acknowledgment by the operator using an alarm summary page. Provide alarm acknowledge and audio output silence logic. Alarm audio output shall be adjustable up to 2 watts maximum.

2.4.8 Provide capacity for a minimum of 500 text messages.

2.4.9 Provide all configuration, transfer, and graphics software as required.

2.4.10 Unit shall operate from 24V DC power source. Operating temperature range shall be 0-50^{o}C with 20-80% humidity range, non-condensing. Provide a single Form C alarm fault contact rated a minimum of 1A at 120 VAC. Contact shall be wired into a discrete input of the PLC serving the GIP.

2.4.11 Graphical interface panel shall be Allen-Bradley Panel View Plus.

2.5 GIP Software Configuration

2.5.1 General: The GIP graphical presentation shall present graphic logic for the PanelView monitor. Specific details of the graphical presentation at the GIP are not necessarily shown on the Drawings or described in the Control Descriptions. When GIP requirements are not specifically shown, provide GIP panel graphics that match that of the HMI logic for the points as detailed on the Drawings or in the Control Descriptions.

2.5.2 Provide RSViewME software on original diskettes, software publishers license and manual)s)

2.5.3 The GIP shall provide the following general purpose screens:

(a) Two system status screens that summarize the present operational status of the pump station and sluice gate structure.
(b) Main menu and navigation screens for the GIP screens presented in a general to specific hierarchy.
(c) System alarm screen that presents a list of critical system wide alarms. Alarms shall be for operator information only. Operator acknowledgment of all system alarms shall not be possible at the GIP level, only at the HMI level.
(d) Local alarm screen that presents a list of local process alarms. Alarms shall be for operator information only. Operator acknowledgment of all system alarms shall not be possible at the GIP level, only at the HMI level.
(e) GIP Help screen(s) that summarize operator interface formats, use of function keys, navigational standards, etc.

2.5.4 GIP Interface shall match to the greatest extent possible the formats used at the HMI level including status colors, alarm presentation, text fonts, screen formats, etc. The operator interface at the GIP shall match that used for the HMI whenever possible.

2.6 Modular Data Switches

2.6.1 Manufacturers:

(a) Phoenix Contact FL Switch MM HS.
(b) Or equal.

2.6.2 Features:

(a) Modular Ethernet switch, expandable to 24 ports (fiber or twited pair). Provide “head station” and one “expansion module”. Locate equipment in enclosure to allow addition of one additional “expansion module” in the future, including sufficient length of DIN rail.
(b) Store and forward switch in compliance with IEEE 802.3, 2 priority classes in accordance with IEEE 802.1D, TCP/IP protocol.
(c) Fiber modules (100 BASE FX):
  i. 2-ports per module, provide total of 4 fiber ports.
  ii. 100-Mbps.
  iii. Multimode SC.

(d) Twisted-Pair modules (10/100 BASE T):

  i. 2-ports per module, provide total of 6 twisted pair ports.
  ii. Provide one module with switch configuration memory to allow replacement of switch hardware without the need to reconfigure switch settings.
  iii. Autosensing 10-/100-Mbps.
  iv. RJ45 connection.

(e) Self-learnind address tables.
(f) Integrated web server function.
(g) Integrated Management Agent, SNMP protocol.
(h) 24 VDC power supply, internal.
(i) Shock test in accordance with IEC 60068-2-27.
(j) Operation: 25 g, 11 ms duration, semi-sinusiodal shock impulse.
(k) Ambient temperature (operation) – 0 °C to 55 °C.
(l) Humidity: 10% to 95% non-condensing.

2.7 Data Outlet - Industrial

2.7.1 Data Outlets shall support Universal applications in a multivendor environment, accepting modular RJ-45 plugs, and shall be provided with the following features:

(a) Bulkhead connector suitable for through-front of control panel installation.
(b) Gasketed, screw-on closure cap with chain.
(c) Data Jacks – 8 position/ 8 conductor, RJ-45, modular, insulation displacement type for 24 AWG copper cable.
(d) Duplex jack outlet in process building electrical rooms. One process Control Network (PCN) jack, one telephone jack.
(e) NEMA 4 rated.
(f) Quantity of jacks as specified.

2.8 Uninterruptible Power Supply (UPS) System

2.8.1 Uninterruptible Power Supplies (UPS) System shall be provided for the SCADA and instrumentation systems as shown on the Drawings and specified herein.

The UPS shall sustain operation during short-term power failures, and shall provide power for an orderly shutdown to prevent the loss of data during power failure and shall provide isolation between the control system and the plant power system.

2.8.2 The UPS shall be a single phase, true on-line, solid DEPARTMENT unit with microprocessor controlled static inverter, hot pluggable batteries, battery charger, LED display and keypad, and manual isolated make before break maintenance bypass switch.

2.8.3 Under normal operating conditions, the critical load shall be continuously supplied by the UPS inverter. The battery charger shall maintain a float-charge on the battery. When AC line power fails, or goes out of tolerance, the inverter shall obtain power from the batteries and supply AC power to the loads without interruption.

(a) The UPS system shall be sized to sustain 1.5 times the connected full load for a minimum period of 30 minutes in an operating environment of 32°F to 104°F. Final UPS sizing is the responsibility of System Integrator.
(b) The UPS system shall be lightning and surge tested per ANSI/IEEE C62.41 and shall be capable of reducing an input spike to less than 3 volts on the output for a 2000 to 1 spike attenuation. The UPS system shall have 120 dB common mode and 60 dB Transverse mode noise attenuation.
(c) The UPS system shall provide a true separately derived power source as defined in the NEC article 250.30 with output neutral bonded to ground. There shall be no direct connection between input and output and less than 2 pf of effective input to output capacitance.
(d) The UPS system output shall be regulated to 120/208 VAC $\pm$ 3%, single phase three wire, 60 HZ $\pm$ 0.5 HZ over the full dynamic range from no load to full load and low line VAC to high line VAC and low battery voltage to high battery voltage.
(e) The UPS system shall provide computer grade sine wave power with 5 percent or less total harmonic distortion.
(f) The UPS system capacity shall be rated in volt amperes (VA) while loaded with typical computer grade switch mode power supplies having a power factor of 0.6 to 0.7 and crest factor of 2.7 to 3.5.
(g) The UPS system shall have an efficiency of at least 92% when operated from AC line.
(h) The UPS system shall have built-in self-diagnostic monitoring capable of monitoring as a minimum AC volts in/out, AC current in/out, battery voltage, VA load, watts, power factor percent of full load, time of day, system hours, inverter hours and projected run time available. Unit shall have relay contacts that close on UPS alarm condition and normal (utility) power failure.
(i) The UPS system shall have a dual track redundant configuration that utilizes either line or inverter output for power and shall be designed to meet or exceed a MTBF of 100,000 hours.
(j) The system input voltage shall be 120/208 VAC, 60 Hz, single phase, 3 wire. Provide external break before make disconnect switch to allow transition to like power for testing or removal of the UPS.

(k) The system batteries shall be supplied with a battery cabinet of the same design and finish as the UPS. The batteries shall be sealed, no maintenance type rated to provide minimum continuous operation of connected equipment as specified herein.
(l) The System Integrator shall provide sizing data on the UPS listing all loads and calculations required for sizing the UPS system.

2.9 Combustible Gas Detector (A25)

2.9.1 Manufacturers:

(a) MSA Ultima Series.
(b) General Monitors “Smart Sensor” Series.
(c) Or Equal.

2.9.2 System Requirements:

(a) Catalytic Bead sensor/transmitter for Combustible Gas detection.
(b) Provide single sensor wall mounted enclosures for sensor/transmitter. Sensor/transmitter enclosures shall be rated for Class I, Division 1, Group D environment.
(c) Provide permanently installed remote test gas applicator and tubing for all combustible gas detectors.
(d) Provide wall-mounted enclosures for associated monitoring unit. Monitoring unit enclosure shall be rated NEMA 4x.
(e) Sensor Power: Loop Powered, 24 Vdc.

(f) 4-20 mAdc into 600 ohms for each sensor input channel.
(g) Provide 1 portable calibration unit for each type of sensor. The kit shall be complete, including a light weight carrying case, dispensing valve, regulator assembly and hose, test coils and necessary cylinder for type of calibrating gas. The test kit shall be stored in an approved cabinet adjacent to and match the air monitor panel.
(h) Monitoring Unit Power: 120 Vac.
(i) Isolated, High/Low Fault alarm relay contacts for each sensor type with individual High/Low Fault alarm setpoints.
(j) Provide relay contacts for local alarm light/horn and for transmission to remote monitoring device.
(k) Fault alarm relay contacts shall be latched until manually reset. Provide reset pushbutton integral to Monitoring Unit.
(l) Local reset pushbutton. Provide reset pushbutton integral to Monitoring Unit.
(m) Response Time:

i. 90% LEL, 10 sec.

(n) Provide Panel mounted remote monitoring device for all sensors

2.10 Direct Acting Float Switches (L8)

2.10.1 Manufacturers:

(a) Contegra.
(b) Anchor Scientific Roto-Float Types S.

2.10.2 Float Features:

(a) Float: 316 Stainless Steel.
(b) Provide sufficient length of PVC jacketed cable.
(c) For Class 1, Divisions 1 or 2 hazardous (classified) locations, provide intrinsically safe relays in corresponding control panel.
(d) Mounting Hardware: 316 Stainless Steel on vertical mounting pipe or Stainless Steel cable with anchor.
(e) Switch: Non-Mercury tilt type.

2.11 Level Sensing System – Bubbler (L10)

2.11.1 Provide compressed air bubbler systems for monitoring of pump station levels. Bubbler systems shall be provided for each compression bell location as shown on drawings.

2.11.2 Each bubbler system shall be provided with, at a minimum, an air compressor, pressure transmitter, pressure control valve, indicating flow regulator and purge valve.

2.12 Exterior Mounted Alarm Horns (M30)

2.12.1 Manufacturers:

(a) Federal Signal Vibratone

2.12.2 Alarm Horn Features.

(r) NEMA 4: Suitable for use in wet location or outdoors, gasketed, where specified.
(s) NEMA 7: Suitable for Class I, Division 1, Group D Hazardous (Classified) Area, where specified.
(f) Wall or surface mounted, provide mounting lugs.
(g) Body to include outlet box.
(h) 3/4 in. conduit hubs.
(i) Annunciator unit to project 100 dB tone at 10 ft.
(j) Provide horn with projector cone.
(k) Gray enamel finish.

2.13 Exterior Mounted Alarm Lights (M31)

2.13.1 Manufacturers:

(a) Appleton Electric Company.
(b) Crouse Hinds.
(c) Federal Signal.

2.13.2 Alarm Light Features:

(a) 120 vac.
(b) NEMA 4: Suitable for use in wet location or outdoors, gasketed, where specified.
(c) NEMA 7: Suitable for Class I, Division 1, Group D Hazardous (Classified) Area, where specified.
(d) Surface-mounted, provide mounting lugs. Body to include mounting lugs.
(e) Aluminum mounting hood.
(f) Red glass globe with guard.
(g) 3/4 in. conduit hubs.

2.14 Process Indicators, Electronic (M37)

2.14.1 Manufacturers:

(a) Precision Digital.
(b) Red Lion, IMP.
(c) Moore Industries.

2.14.2 Indicator Features:

(a) 4-20mAdc Input.
(b) 4 ½ digit LED indicator.
(c) Loop powered.
(d) Enclosures:

i. NEMA 4X: Impact-resistant polycarbonate body, clear gasketed polycarbonate cover. ½" conduit hole in bottom of case.
ii. NEMA 7 XP: FM approved cast aluminum body, screw-type cast aluminum cover with view port. Two ¾" conduit holes.

(e) Provide 2" pipe mounting kit as detailed.

2.15 Proximity Switches in Intrusion (M50)

2.15.1 Manufacturers:

(a) ADT.
(b) Sentrol.

2.15.2 Intrusion Switch Features.

(a) Proximity switch for monitoring of building or control panel door position.
(b) Solid State Hall Effect sensor with magnetic actuating bar.
(c) Switch shall be commercial grade. Inductive, tubular or barrel type switches shall not be acceptable.
(d) Provide dry contacts suitable for connection to PLC input. Use switch manufacturer's recommended switching relay/amplifier as necessary to affect proper interface.

Relay/amplifier shall be installed in PLC panel.

2.16 Smoke Detectors – Building Status (M51)

2.16.1 Manufacturers:

(a) Simplex.
(b) Or Equal

2.16.2 Smoke Detector Features:

(a) Photo-electric type smoke detector.
(b) Dry contacts suitable for connection to PLC input.
(c) 24Vdc power.

2.17 Field and Control Panel Devices and Control Station Components

2.17.1 Pushbuttons

(a) Manufacturers:

i. Allen Bradley 800T.
ii. Square D Class 9001, Type K.
iii. Cutler-Hammer 10250T.

(b) Construction:

i. Heavy duty.
ii. Watertight.
iii. Oil-tight.
iv. Flush panel mounting.
v. Size to mount in 30.5-mm diameter.
vi. Match NEMA rating of associated Control Station (see below).

(c) Pushbuttons Features:

i. Flush head unless specified elsewhere.
ii. Contact Blocks:

- Double break silver contacts.
- Ac Ratings: 7,200 va make, 720 va break.
- Single pole, double throw or double pole, single throw.
- Up to six tandem blocks.

iii. Momentary contact unless specified elsewhere.
iv. Non-illuminated.
v. Legend plates, as required, for type of operation or as specified elsewhere.

(d) Emergency Stop Pushbuttons Features:

i. Jumbo red mushroom head.
ii. Contact Blocks:

- Double break silver contacts.
- Ac Ratings: 7,200 va make, 720 va break.
- Single pole, single throw.
- Up to six tandem blocks as specified.

iii. Push/pull.
iv. Maintained contact.
v. Non-illuminated.
vi. Legend plates:

- Extra large.
- Red.
- “ESTOP”.

2.17.2 Selector Switches:

(a) Selector Switch Features:

i. Maintained position unless specified elsewhere.
ii. Contact Blocks:

- Double break silver contacts.
- Ac Ratings: 7,200 va make, 720 va break.
- Contact configuration as specified.
- Up to six tandem blocks.

iii. Operators:

- Number of positions as specified elsewhere.
- Standard knob type unless specified elsewhere.

iv. Legend plates as required for type of operation or specified elsewhere.

2.17.3 Pilot Lights:

(a) Pilot Light Features

i. Transformer type.
ii. Bayonet, 6 to 8 v bulb.
iii. Colored lens as specified elsewhere.
iv. Interchangeable lenses.
v. Transformer rated for 120 v, 60 Hz.
vi. Push to test.
vii. Legend plates as specified elsewhere.

2.17.4 Potentiometers:

(a) Potentiometer Features:

i. Three-terminal potentiometer.
ii. Resistance: 10 kOhm.
iii. Power Rating: 2 watt, 50V ac/dc.
iv. Resolution: 1 percent.
v. Linearity: +/- 5 percent.

2.17.5 Control Relays

(a) Manufacturers:

i. Potter and Brumfield.
ii. Struthers Dunn.

(b) Operating Data:

i. Pickup Time: 13 ms maximum.
ii. Dropout Time: 10 ms maximum.
iii. Operating Temperature: -45°F to 150°F.

(c) ac Coil:

i. 120 or 240 vac.
ii. Continuous rated.
iii. 3.5 va inrush maximum.
iv. 1.2 va sealed, maximum.
v. 50 to 60 Hz.
vi. Light to indicate energization.
vii. Minimum Dropout Voltage: 10% of coil rated voltage.

(d) dc Coil:

i. 24 or 120 Vdc.
ii. Continuous rated.
iii. Light to indicate energization.
iv. Minimum Coil Resistance:

- 24 Vdc: 450 Ω.
- 120 Vdc: 9,000 Ω.

(e) Contacts:

i. Gold flashed fine silver, gold diffused for 1 amp or less resistive load.
ii. Silver cadmium oxide.
iii. 4 form C.
iv. 120 vac.
v. 10 amp make, 1.5 amp break, (inductive).

(f) Rated at 10 million operations.
(g) 11 pin, square socket.

(h) DIN rail mountable.
(i) Enclosed and protected by polycarbonate cover.
(j) Provide relay-retaining clips.

2.17.6 Timers

(a) 24-hour Clock Timer (Repeat Cycle):

i. Manufacturers:

- Tork Time Controls.
- Intermatic.
- Or equal.

ii. Mounting: Surface.
iii. Display: 24-hour LCD.
iv. Contacts: 1 SPDT rated 20 A.
v. Set Points: 288 per 24-hour.
vi. Skip Feature: 1 to 7 day adjustable.
vii. Minimum On-Off Time: 5 min.
viii. Time cycle programmable by keypad.
ix. Power: 120 vac, 60 Hz.

(b) Elapsed Time Meters:

i. Manufacturers:

- Engler.
- Eagle Signal.
- Or equal.

ii. Mounting: Surface.
iii. Digits: 5, non-reset.
iv. Power: 120 vac, 60 Hz.

(c) Interval/Duration Timer (Rear of Panel):

i. Manufacturers:

- Potter and Brumfield, CN series.
- Eagle Signal DM 100 series.
- Or equal.

ii. Mounting: Plug-in with dust tight cover.
iii. Type: Integrated circuit.
iv. Range: 0.5 sec to 99 min. Field selectable.
v. Contacts: 2 DPDT contacts rated 10 amp, 120 vac.
vi. Power: 120 vac, 60 Hz.

(d) Interval/Duration Timer (Front of Panel):

i. Manufacturers:

- Eagle Signal, CX300 series.
- Or equal.

ii. Type: Microprocessor.
iii. Timing Range: Five ranges from 200 sec to 200-hr field selectable.
iv. Contacts: 10 amp, 120 vac.
v. Controls: Membrane switches for operator input.

2.17.7 Terminal Blocks

(a) Manufacturers:

i. Phoenix Contact.
ii. Weidmuller.
iii. Or equal.

(b) 300 v rating for 120 v circuits and below, 600 v rating for 480 v circuits.
(c) Clamping screw type.
(d) Isolating end caps for each terminal.
(e) Identification on both terminals.
(f) Clip-mounted on DIN rail.
(g) Accept AWG 12 to 22.
(h) Feed-Through Terminals:

i. 20 Amp rating.

(i) Switched Terminals:

i. Knife disconnect with test sockets.
ii. 10 Amp rating.

(j) Fused Terminals:

i. Hinged fuse removal/disconnect.
ii. 10 Amp rating.
iii. Include blown fuse indication.

2.17.8 Electronic Current Isolator

(a) Manufacturers:

i. Phoenix Contact Model MCR Series.

(b) Electronic Current Isolator Features:

i. Solid state instrument to electrically isolate one instrument loop from another instrument loop. Converter to accept 4-20 mAdc input signal and provide equal but isolated and power-boosted output.
ii. Mounting: DIN Rail.
iii. Temperature compensated, calibration-free.
iv. Signals: Input: 4-20 mAdc into 50 ohms. Output: 4-20 mAdc into output load up to 500 ohms.
v. Isolation: Common mode up to 700 vac between input and output.
vi. Accuracy: 0.5% of span.
vii. Provide power supply specific to isolator.

2.17.9 Motor Current Transmitter

(a) Manufacturers:

i. Moore Industries.
ii. Or equal.

(b) Current transmitter for monitoring motor current.

(c) 4-20 mAdc output signal suitable for connection to PLC input.

(d) 120 vac operation, allow 4 mAdc output with pump motor shut off.

(e) Behind of panel mount.

(f) Include current transformer of proper turns ratio coordinating motor full load amperage (plus 25%) to current transmitter.

2.17.10 Control Stations:

(a) Description of enclosures used to house field pilot devices.

i. NEMA ratings:

- NEMA 7 in Class 1, Division 1 or 2 Hazardous (Classified) Locations.
- NEMA 4X 316 stainless steel in indoor wet/corrosive locations or outdoors.
- NEMA 12 in other areas.

ii. Nameplates:

- Engraved laminated plastic.
- Letters 3/16 in. high.
- Black letters on white background.
- Identify per equipment controlled, using names found on Drawings.

(b) Control Stations – Definitions, Type A

A. PRIMARY/STANDBY/LOW FLOW PUMP: One 3-position selector switch with 3 contact blocks (XOO/OXO/OOX) for Hand/Off/Auto. One NO momentary contact pushbutton for start. One NC momentary contact pushbutton for stop. One NO momentary contact pushbutton for jog. One 120 VAC pilot light for running. One 120 VAC pilot light for Pump Call.

2.18 Panel Fabrication

2.18.1 General

(a) The panels shall match the general construction of the motor control center and shall be of the same height.
(b) The panels shall conform to all applicable standards of NEMA and ANSI and shall consist of formed steel panels containing equipment and devices as indicated.
(c) The panels shall be equipped with space heater(s) as specified for motor control centers.
(d) A separate SCADA panel shall also be furnished by this contract for pumping system monitoring and control. SCADA panel shall be installed under this contract.
(e) Payment for the Control Panel and SCADA panel shall be in accordance with Division 1 Section 1A.

2.18.2 Enclosure

(a) The Control Panel enclosure shall be NEMA 12, of a height and depth to match the motor control center and of a width sufficient for the equipment to be housed.
(b) The panels shall have a full piano hinge door and a 3-point latch with a locking handle. The handle shall have a cylinder type lock keyed to match the Owner's system.
(c) The door for the Control Panel shall have a hinged gasketed door with clear polycarbonate window to cover the flush mounted combustible gas monitor.
(d) The enclosures shall be finished inside and out. The finish shall be as specified for the motor control center. Exterior color shall match that for the motor control center, and the interior color shall be white or as otherwise approved by the Engineer.
(e) The SCADA Panel enclosure shall be NEMA 12 shall be of a height, width and depth as indicated on the drawings and shall be finished as described above.

2.18.3 Devices and appurtenances

(a) Unless otherwise indicated, pushbuttons, selector switches, indicating lights, relays, and other devices shall be provided as part of the SCADA and Control panels and shall be as specified for motor control centers. Devices similar to those in the motor control center panel shall be of the same manufacturer.

(b) Where indicated, certain devices shall be furnished under other Sections of the Specifications for installation under this Section. The panel manufacturer shall coordinate the arrangement and wiring of these devices for a complete finished assembly. Such devices shall be factory installed by the panel manufacturer.
(c) The alarm panel shall be as specified under "Alarm Annunciators".
(d) The float control system circuit shall be as specified under “Float Control System”. The float relays shall be intrinsically safe.
(e) The Combustible Gas Detectors shall be as specified under “Combustible Gas Detection System”.
(f) Nameplates shall be as specified in Section 16B. Relays and other devices located inside the panel shall be identified with nameplates.
(f) The control panel shall be complete with float type water level control systems integrated as indicated on the drawings and as specified.

2.18.4 Wiring

(a) Wiring shall be brought to terminal strips near the bottom of enclosures and 10 percent spare terminals shall be provided in each. The identification of terminals shall conform to the schematic diagrams and shall consist of adhesive labels as manufactured by Brady, Thomas, or equal.
(b) Design control panels to keep 480-vac power, 120-vac power and discrete signals, and analog and other low voltage signals separated.

i. Do not run 480-vac power, 120-vac power and discrete signals, or analog or other low voltage signals in the same conduit or wire-duct.
ii. Where 480-vac power, 120-vac power and discrete signals, or analog or other low voltage signals must cross, they shall do so at right angles.

2.19 Float Control System

2.19.1 The float control system shall include floats, interconnecting integral cable of a length required, and control logic for the functions indicated.
2.19.2 Floats shall provided as specified in this Section
2.19.3 The system shall be intrinsically safe for installation in the wet well.
2.19.4 The system shall be complete with control logic to provide the contacts for controls and alarm functions indicated.
2.19.5 The system shall be complete with all required mounting hardware and accessories.
2.19.6 The float system shall be complete with mounting arrangement with a stilling well of adequate size, or by other means approved by the Engineer, to forestall the attachment of large sections of ice to the floats during cold weather which could then disturb the system mounting. The mounting arrangement shall permit easy removal of the floats and easy realignment when replaced. Submit details for approval by the Engineer prior to installation.

2.20 Alarm Annunciators

2.20.1 Unless otherwise indicated, alarm annunciators shall be of the plug-in relay type and shall be configured of single-alarm modules in an arrangement as indicated on the Drawings or as otherwise directed by the Engineer.

2.20.2 Each module shall be engraved as indicated on the Drawings or as otherwise directed by the Engineer.

2.20.3 The relay annunciator modules shall be individually removable from the front of the unit. Input and output terminals shall be accessible from the rear of the unit.

2.20.4 Relays shall be hermetically sealed and shall be securely held in place by retaining clips or other means approved by the Engineer. Relays shall have silver/silver alloy contacts rated not less than 2 amperes at 120 volts. Each alarm module shall produce at least one isolated double throw auxiliary contact for remote connection.

2.20.5 The annunciator shall operate in a "Sequence A" flashing mode as follows:

(a) The control logic selectable to incorporate lock-in or non-lock-in alarm activation. Lock-in selection shall maintain alarm status until the alarm has been acknowledged by depressing the acknowledge pushbutton at the annunciator. Non-lock-in selection shall permit alarm status to return to the normal off condition as soon as the alarm input is cleared.

(b)

Condition	Nameplate Status
Normal	Off
Alarm	Flashing
Acknowledge	Steady On
Normal (clear)	Off
Lamp Test	Steady On

2.20.6 Each alarm window shall be illuminated with not less than two long-life lamps which shall be easily accessible for replacement.

2.20.7 Each annunciator shall be complete with an integral flasher unit. Alarm logic, such as for the flasher, shall be solid state. The flasher shall not occupy a designated alarm module, i.e., if twelve alarm positions are shown, all shall be useable for alarms.

2.20.8 Unless otherwise indicated, annunciators shall have provisions for an audible alarm and silence upon alarm "acknowledge" condition for possible future addition of an audible alarm.

2.20.9 Each unit shall be complete with "ACKNOWLEDGE" and "LAMP TEST" pushbutton functions, with heavy duty oil-tight pushbuttons mounted adjacent to the alarm windows.

2.20.10 Each annunciator shall be equipped with a power monitor relay to monitor the power supply to the unit, complete with a DPDT contact rated not less than 2 amperes at 120 volts for remote connection.

2.20.11 Unless otherwise indicated, annunciators shall operate from a 120 volt, 60 Hz supply.

2.20.12 Unless otherwise indicated, annunciators shall be flush panel mounted.

2.20.13 Blank alarm module units shall be fully equipped for alarms, complete with relays and logic.

2.20.14 After power failure all alarm output contacts shall remain in the original positions just before the power failure.

2.20.15 For uniformity among stations, alarm annunciators shall be Ronan Model X3-1010, Panalarm Series 10, De-Lins Model 11, or approved equal.

2.21 Combustible Gas Detection System (Gasoline)

2.21.1 The combustible gas detection system shall be a central gas monitoring system capable of continuously monitoring ambient air for gasoline at locations as shown on the drawings, using remote gas sensor/transmitters designed to measure the concentrations of gasoline.

2.21.2 The combustible gas detection system shall be provided as specified in this Section

2.21.3 The gas detection system shall measure and display gas concentration. The system shall provide identifiable audible and visual alarms when preset limits are exceeded. Relays for different alarm setpoint levels shall be provided for alarms and ventilation controls.

2.21.4 The system shall consist of three (3) dual-channel monitor/readout units, one(1) relay programmer module, one(1) power supply unit, four(4) alarm relays, a horn relay, a buzzer and five(5) remotely mounted gas sensor/transmitter units. An independent monitoring channel shall be provided with each sensor/transmitter having a full scale range as specified. The sensor units shall be capable of being located remote from the monitor/readout unit by up to 5000 feet. Sensor unit shall receive power from and send signals corresponding to gas values to the monitor/readout unit. Each sensor unit shall be mounted in an enclosures suitable for NEC Class I, Division 1, Group C & D hazardous locations. The sensor units shall have provisions for mounting to a wall or similar structure.

2.21.5 The combustible gas monitor/readout unit shall be of the panel mounted type suitable for flush mounting in the door of Control Panel CP21 as shown. All wiring connections shall be marked with functional designations such that connections can be made without the use of diagrams or tables. All connections must be easily accessible from the front. An external sealed switch shall be provided to allow for alarm reset and audible alarm silencing without opening the enclosure. All unused channel spaces shall be neatly blanked off.

2.21.6 Alarms and relays at the monitoring/readout unit shall be set for the following levels of gas concentration:

(a) Gasoline "WARNING" alarm - 20% LEL
(b) Gasoline "ALARM" - 50% LEL

2.21.7 In response to a WARNING or ALARM signal from the gas detection system, due to a high concentration of gasoline in the monitored space, an explosion-proof horn in the Pump Room shall be energized.

The ventilation system for the monitored space shall be activated. The horn shall be provided.

2.21.8 Spare parts shall be provided for the air monitoring equipment as follows:

2.21.9 One set of fuses, one sensor head assembly and one sensor.

2.21.10 The services of a qualified representative of the manufacturer shall be provided to inspect the installation, make any adjustments, test the equipment, field calibrate the air monitoring equipment upon completion of the installation; after 24 hours of operation and again after one week; and instruct the operating personnel in the operation, calibration and maintenance of the equipment.

2.21.11 The combustible gas detection system shall include a locally mounted gas monitor unit, controller, calibration tube box, calibration kit and a remote gas sensor capable of continuously monitoring ambient air for gasoline concentration inside the wet well as shown on the drawings and remote calibration.

2.21.12 The combustible gas sensor shall be of the diffusion type, catalytic bead sensing element mounted in a Class I, Division 1, Group B, C & D explosion proof stainless steel enclosure for monitoring the presence of petroleum in the ambient air. Sensor unit shall receive power from and send signals corresponding to gas values to the monitor unit. The sensor shall be remotely mounted from the monitor. A calibration sample tube shall be connected to the sensor. 50 feet of sensor cable and sample tubing shall be connected to the sensor. The sensing element shall have 1-year minimum operating life

2.21.13 The calibration tube box shall be a 6”x4”x4” stainless steel continuous hinge type 4X enclosure with a stainless steel or brass female quick connector for ¼” tubing and a protector plug or cap mounted on one side of the box.

2.21.14 15A non-intrusive hand held wireless remote infrared controller unit shall be provided for sensor calibration, clocking setting, Min/Max gas value and date of last calibration display. Installation, set-up, calibration and start-up of the sensor unit shall not require opening of the sensor/transmitter enclosure.

3 EXECUTION:

3.1 Inspection

3.1.1 Verify that field conditions are acceptable and are ready to receive work.

3.2 Installation

3.2.1 Install devices and equipment in accordance with manufacturer's instructions.

3.2.2 The modification, demolition and installation of the SCADA equipment shall be scheduled to minimize interruption of automatic operation and monitoring of the pumping system. The contractor shall submit a detailed schedule for IDOT’s approval.

3.3 System Testing

3.3.1 System Testing and Start-up including the following, shall be provided as specified under provisions of Section 1A.

3.3.2 System Shop Tests

(a) The Contractor shall be able to simulate the present SCADA system within his shop. Shop testing shall include, but not necessarily be limited to, the following:
(b) Manually fill-in required additions to data base.
(c) Manual forcing of outputs.
(d) Operation of the control programs.
(e) Recall of simulated data points on the LCD displays and printers.
(f) Recall of all reports with partial fill-in data and manual fill-in data at time of testing.
(g) Routing testing of logger, alarm printer and LCD displays based upon manual input data.
(h) Change of alarm and limit setpoints, etc., and observation of results.
(i) Any additional testing which may be found to be necessary at the time the above is observed.
(j) All necessary contact and analog inputs must be provided to permit satisfactory testing of the above. If analog instrument switch over from one test to another is required, it shall be done in a most expeditious predetermined manner so as to permit nearly continuous testing during final shop acceptance.
(k) Prior to such acceptance tests, the Contractor shall submit the detailed procedures of the proposed shop tests and a time schedule within which such tests can be run, both subject to acceptance and approval by the Engineer. The Contractor will be expected to do all necessary pretrial testing and debugging to ascertain that the system is in running order. After the Contractor has confirmed that the proper responses can be achieved, the date for final shop test may be established.
(l) During shop testing, the Contractor shall generate hard copy prints of all reports and graphics, indexes and point I.D.'s on both printer and LCD monitor for submittal, review and correction. A certified letter that the listed shop tests have been performed shall be submitted. IDOT reserves the right to be present when shop tests are run.

3.3.3 System Field Tests

(a) The pre-acceptance test procedures, as outlined in the preceding paragraphs, shall apply. Acceptance testing shall include the following:
(b) Acknowledge receipt of all analog and contact inputs, their reliability value and range.
(c) Transmission of contact and analog signals to perform their intended tasks.
(d) Any additional testing which may be found necessary at the time the above is observed.

3.3.4 Final Acceptance

(a) Satisfactory operation of the work by IDOT shall be interpreted to mean that the work is sufficiently advanced to form a reliable system for system operation; the I/O control loops, software, control programs and peripheral equipment are operating properly; the necessary debugging programs have been performed; data output is reliable and control loops are operational. Equipment which was found to be ineffective or inoperable has been returned or replaced, and checking and calibrating of systems has been completed.

(b) Final acceptance test will be run for 40 days within which cumulative major component down time, consisting of the computer systems and the PLC's, does not exceed 8 hours. Repeat test if 8 hour limit is exceeded.

(c) Written acceptance by IDOT shall be the starting date of the guarantee period.

4. TRAINING:

4.1 Operator Training

4.1.1 Operator training shall be provided at IDOT's facility concurrently with system installation on a prearranged formalized basis and shall include the necessary training aids in conjunction with actual work on the equipment supplied. Work shall include complete review of all operating and training manuals and physical application.

4.1.2 Training shall include operation of the SCADA system, set up the changes of control logic and set points, initiation of diagnostic routine, set up and revisions of graphic and report format, system shutdown and restart, etc. It shall also include care, maintenance and tuning of the monitor and screens.

4.1.3 Upon completion of this program, the operators shall be capable of operating the processor equipment, peripherals and I/O equipment to monitor and control the process, system shutdown and restart, diagnose system failure and to initiate routine switch over procedures and component replacement.

4.1.4 This training shall consist of a minimum of two (2) 3 day (8 hours per day) classes for 2 persons in each class. Training manuals shall be provided.

4.2 Programmer Training

4.2.1 The Contractor shall make arrangement for two persons from IDOT District 1 to attend software manufacturers' regular programming classes held by the manufacturers or their representatives. The class shall not be less than 1 week for SCADA HMI software (RSView) and 1 week for PLC programming (Allen-Bradley PLC). The training course fee shall be paid for by the Contractor. The manufacturer shall have regular training facilities within 40 miles of Main Pumping Station.

4.3 Maintenance Training

4.3.1 The Contractor shall provide two 1-day on-site maintenance training classes for 2 persons in each class. The maintenance training may be combined with the OPERATOR TRAINING.

5. GUARANTEE AND ADDITIONAL SERVICES:

5.1 All hardware and software furnished under this contract including but not limited to the Microprocessors, accessory peripherals, discrete devices, analog instruments and control devices shall be covered under a 0ne(1) year warranty from the date of acceptance against all manufacturer defects and contractor workmanship.

6. VISITING JOB SITES:

6.1 Prospective bidders are urged to visit the job sites in order to familiarize themselves with the extent and the conditions under which the work must be completed. It is the intent that all work requiring additions, revisions, relocation and/or removals of equipment and facilities be fully included in the original bidding; later claims for extra work will not be approved, occasioned by the failure to comply with this request.

END OF THIS SECTION

DIVISION 16 - ELECTRICAL

SECTION 16E - PACKAGED ENGINE GENERATOR SYSTEMS

1. GENERAL:

1.1 Description

1.1.1 Major electrical equipment shall be the items of equipment specified herein.

1.1.2 The manufacturer of each specified item shall provide not less than four (4) hard-cover operation and maintenance manuals for the respective equipment item furnished. The manuals shall contain final, approved shop drawings and product data sheets (including any field additions or modifications), as well as recommended installation, testing, operation and maintenance procedures.

1.1.3 The manufacturer shall provide one set of any special tools, as applicable, required for the maintenance of the equipment, housed in a metal tool box.

1.1.4 Equipment furnished under this section shall be complete with anchor bolts and associated hardware required to anchor equipment to concrete. Anchor bolts and all hardware shall be galvanized steel.

1.1.5 For each specified item, a representative of the manufacturer shall check the installation and submit, to the Engineer, three (3) certified, signed statements, addressed to the owner, that the equipment has been properly installed and is in good working order.

1.1.6 Section Includes:

(a) Engine generator set.
(b) Cooling system.
(c) Fuel system.
(d) Starting system.
(e) Weatherproof housing.

1.2 Related Sections

1.2.1 Section 3A - Cast-In-Place Concrete.
1.2.2 Section 16A - General Electrical Provisions.
1.2.3 Section 16B - Basic Electrical Materials and Methods.
1.2.4 Section 16D - Supervisory Control and Data Acquisition (SCADA) Equipment.

1.3 References

1.3.1 Codes and Standards referred to in this Section are:

(a) The generator set installation and on-site testing shall conform to the requirements of the following codes and standards, as applicable. The generator set shall include necessary features to meet the requirements of these standards:

1) IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.

2) NFPA37 – Standard for Installation and Use of Stationary Combustion Engines and Gas Turbines.

3) NFPA70 – National Electrical Code.

4) NFPA110 – Emergency and Standby Power Systems.

(b) The generator set and supplied accessories shall meet the requirements of the following standards:

1) NEMA MG1-1998 part 32.

2) UL142 – Sub-base Tanks.

3) UL1236 – Battery Chargers.

4) UL2200 - Stationary Engine Generator assemblies.

(c) The control system for the generator set shall comply with the following requirements:

1) CSA C22.2, No. 14 – M91 Industrial Control Equipment.

2) EN50082-2, Electromagnetic Compatibility – Generic Immunity Requirements, Part 2: Industrial.
3) EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.
4) FCC Part 15, Subpart B.
5) IEC8528 part 4. Control Systems for Generator Sets.
6) IEC Std 801.2, 801.3, and 801.5 for susceptibility, conducted, and radiated electromagnetic emissions.
7) UL508. Safety Standard for Industrial control Equipment.
8) UL1236 –Battery Chargers.

(d) The generator set manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

1.4 Submittals

1.4.1 Provide shop drawings and product data under provisions of Section 1A.

(a) Show connections, mounting, and support provisions and access and working space requirements.
(b) Wiring Diagrams for Systems: Show power and control connections and distinguish between factory-installed and field-installed wiring.

1.4.2 Product Data:

(a) Include data of features, components, ratings, and performance. Include dimensioned outline plan and elevation drawings of engine generator set and other system components.

1.4.3 Test Results:

(a) Certified Summary of Prototype Unit Test Report: Submit certified copies of actual prototype unit test report if requested by ENGINEER.
(b) Certified Test Reports of Components and Accessories: Submit for devices that are equivalent, but not identical, to those tested on prototype unit if requested by ENGINEER.
(c) Exhaust Emissions Test Report: Include proof of compliance with applicable requirements.
(d) Certification of Torsional Vibration Compatibility: Conform to NEMA 110.
(e) Factory Project-Specific Equipment Test Reports: For units to be shipped for this Project showing evidence of compliance with specified requirements.
(f) Field Test Report.

1.4.3 Operation and Maintenance Data:

(a) Detailed Operating Instructions: Describe operation under both normal and abnormal conditions.

(b) Lists: Tools, test equipment, spare parts, and replacement items recommended to be stored at site for ready access. Include part and drawing numbers, current unit prices, and source of supply.

1.5 Guarantee

1.5.1 All electrical equipment shall be guaranteed from all defects of material and workmanship for the manufacturer's standard length of guarantee or for 1 year from the date of final acceptance, which is longer.

1.6 Delivery, Storage and Handling

1.6.1 Delivery, storage and handling shall be in accordance with the provisions of Section 1A.

1.7 Basis of Payment

1.7.1 The major electrical equipment work shall be paid for at the contract lump sum price for

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which shall be payment in full for the work described herein.

1.8 Definitions

1.8.1 Emergency or Standby Rating: Power output rating equal to power that generator set delivers continuously under normally varying load factors for duration of power outage with capability of 24 continuous operating hours.

1.8.2 Operational Bandwidth: Total variation from lowest to highest value of parameter over range of conditions indicated, expressed as percentage of nominal value of parameter.

1.8.3 Power Output Rating: Gross electrical power output to generator set minus total power requirements of electric motor-driven accessories normally constituting part of engine assembly.

1.8.4 Steady-State Voltage Modulation: Uniform cyclical variation of voltage within operational bandwidth, expressed in Hz or cycles per second.

1.9 System Description

1.9.1 Design Requirements:

(a) System Includes: Standby-rated, automatically started diesel engine coupled to ac generator unit. Engine and generator are factory-mounted and factory-aligned on structural steel skid. Subsystems and auxiliary components and equipment are as indicated.

(b) Environmental Conditions: Engine generator system withstands following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1) Ambient Temperature: -15°C to +40°C.
2) Altitude: Sea level to 1,000 ft (300m).

1.9.2 Performance Requirements:

(a) Functional Description: Switching "On-Off" switch on generator control to "On" position starts generator set. "Off" position of same switch initiates shutdown of unit. When unit is running, specified system or equipment failures or derangements automatically shut down unit and initiate alarms. Operation of remote emergency stop switch also shuts down unit.

(b) System Performance:

1) Steady-State Voltage Operational Bandwidth: 1% of rated output voltage from no load to full load.
2) Steady-State Voltage Modulation: Less than 0.25 Hz.
3) Transient Voltage Performance: Not more than 10% variation for 50% step-load increase or decrease. Voltage recovers to remain within steady-state operating band within 2 sec.
4) Steady-State Frequency Operational Bandwidth: 0.5% of rated frequency from no load to full load.
5) Steady-State Frequency Stability: When system is operating at constant load within rated load, there are no random speed variations outside steady-state operational band and no regular or cyclical hunting or surging of speed.
6) Transient Frequency Performance: Less than 3 Hz variation for 50% step-load increase or decrease. Frequency recovers to remain within steady-state operating band within 3 sec.
7) Output Waveform: At no load, harmonic content measures line-to-line or line-to-neutral does not exceed 5% total and 3% for single harmonics. Telephone influence factor determined according to NEMA MG1 does not exceed 50.
8) Sustained Short-Circuit Current: For 3-ph bolted short circuit at system output terminals, system will supply minimum of 300% of rated full-load current for not less than 10 sec and then clear fault automatically, without damage to any generator system component.
9) Temperature Rise of Generator: Within acceptable limits for insulation systems used according to NEMA MG1 when operating continuously at standby rating conditions. Temperature rise not to exceed 105°C over 40°C ambient.
10) Nonlinear Load Performance: System performance is not degraded from that specified in this Article by continuous operation, with load current having minimum total harmonic content of 15% rms, and minimum single harmonic content of 10% rms.

11) Starting Time: Maximum total time period for cold start, with ambient temperature at low end of specified range, is 10 sec. Time period includes output voltage and frequency settlement within specified steady-state bands.

1.10 Quality Assurance

1.10.1 Manufacturer Qualifications: Firms experienced in manufacturing equipment of types and capabilities indicated that have record of successful in-service performance.

(a) Emergency Service: System manufacturer maintains service center capable of providing training, parts, and emergency maintenance and repairs at Project site within 4 hrs maximum response time.

1.10.2 Comply with NFPA 70.

1.10.3 Engine Exhaust Emissions and Fuel System: Comply with applicable Federal, State, and local government requirements.

1.10.4 Permits: Provide required air permitting and fuel system permitting required in accordance with applicable Federal, State, and local government requirements.

1.10.5 Single-Source Responsibility: Obtain engine generator system components from single manufacturer with responsibility for entire system. Unit shall be representative product built from components that have proven compatibility and reliability and are coordinated to operate as unit as evidenced by records of prototype testing.

2. PRODUCTS:

2.1 Manufacturers

2.1.1 Engine Generator Sets:

(a) Cummins Power Generation (Contact: Tim O'Connell 708.482.2882).
(b) Kohler Co (Contact: Guy Gammons 847.956.2165).
(c) Caterpillar (Contact: Tony Yang: 630.516.4471)

2.1.2 Engine Generator System:

(a) System is coordinated assembly of compatible components.
(b) Ratings: 3-ph, 4-wire 277/480v, 60 Hz, 100 kW, 125 KVA.
(c) Motor starting KVA of 563 minimum required to start and operate following load steps without exceeding 20% maximum voltage dip and with return to steady state in less than 2 sec.

1) Step No.1 30 HP Main Pump.
2) Step No.1 25 KVA lighting transformer.
3) Step No.1 2 HP Exhaust Fan.
4) Step No.1 7.5 KW Unit Heater.
5) Step No.1 5 HP Hoist.
6) Step No.1 1/2 HP Sump Pump.

7) Step No.2 30 HP Main Pump.
8) Step No.2 5 KW Unit Heater.

(d) Safety Standard: Comply with ASME B15.1
(e) Nameplates: Equip each major system component with conspicuous nameplate of component manufacturer. Nameplate identifies manufacturer of origin and address, and model and serial number of item.

2.1.3 Engine Generator Set:

(a) Power Output Rating: Nominal ratings as indicated, with capacity as evidenced by records of prototype testing.

(b) Skid: Welded steel base securely mounted with anchored mounting bolts. Adequate strength and rigidity to maintain alignment of mounted components without dependence on concrete foundation. Free from sharp edges and corners. Lifting attachments arranged to facilitate lifting with slings without damaging components.

(c) Vibration Isolation: In accordance with manufacturers recommendations: Integral vibration isolators may be provided. When integral isolators are not provided, provide 95% efficient spring type vibration isolators. Mount isolators between steel base and concrete pad.

(d) Rigging Diagram: Inscribed on metal plate permanently attached to skid. Diagram indicated location and lifting capacity of each lifting attachment and location of center of gravity.

2.1.4 Engine:

(a) Comply with NFPA 37.

(b) Fuel: Diesel fuel oil grade DF-2.

(c) Maximum Speeds:

1) Engine: 1,800 rpm.
2) Piston speed 4-cycles engines: 2,250 ft/min.

(d) Lubrication Systems: Pressurized by positive displacement pump driven from engine crankshaft. Mount following items on engine or skid:

1) Filter and Strainer: Rated to remove 90% of particles 5 microns and smaller while passing full flow.
2) Oil Cooler: Maintains lubricating oil at manufacturer's recommended optimum temperature.

3) Thermostatic Control Valve: Controls flow in system to maintain optimum oil temperature. Unit is capable of full flow and is designed to be fail-safe.
4) Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps or siphons or special tools or appliances.

(e) Engine Fuel System: Comply with NFPA 30.

1) Integral Injection Pumps: Driven by engine crankshaft. Pumps are adjustable for timing and cylinder pressure balancing.
2) Main Fuel Pump: Mounted on engine. Pump ensures adequate primary fuel flow under starting and load conditions.
3) Parallel Fuel Oil Filters: Ahead of injection pumps. Changeover valves allow independent use of either filter.
4) Relief/Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.
5) Flexible fuel line connections for supply and return lines.
6) Shut-off fuel solenoid valve field mounted at tank.

(f) Jacket Coolant Heater: Electric immersion type, factory-installed in jacket coolant system. Unit is rated and thermostatically controlled to maintain an engine temperature of 25^{o}C at low end of specified ambient temperature range.

1) Voltage: 120.
2) Watts: 1,500.
3) Quantity: 1.

(g) Speed Governor: Adjustable isochronous type, with speed sensing.

2.1.5 Engine Cooling System:

(a) Closed-loop, liquid-cooled, with radiator factory-mounted on engine generator set skid and integral engine-driven coolant pumping.
(b) Radiator Core Tubes: Nonferrous metal construction other than aluminum.
(c) Size of Radiator: Adequate to contain expansion of total system coolant from start to 100% load condition.
(d) Coolant: Solution of 50% ethylene glycol and 50% water.
(e) Temperature Control: Self-contained thermostatic control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer. Features include:

1) Thermostatic Elements: Interchangeable and nonadjustable.
2) Actuator Design: Normally-open valves to return to open position when actuator fails.

(f) Coolant Hose: Flexible assembly with nonporous rubber inside surface and aging, ultraviolet, and abrasion-resistant fabric outer covering:

1) Rating: 50 psi (345 kPa) maximum working pressure with 180°F (82°C) coolant, and noncollapsible under vacuum.
2) End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

2.1.6 Fuel Supply System:

(a) Dual Wall Subbase Tank: Factory-fabricated assembly or NRTL-listed fuel tank with integral, float-controlled transfer pump and features described below.

1) Tank Capacity: Adequate to supply fuel to engine for uninterrupted period of 24 hrs operation at 100% of rated power output of engine generator system without being refilled.

(b) Generator Access: Generator manufacturer's access catwalks and stairs accessory for generators mounted on sub-base fuel tanks. Provide aluminum catwalk and stair on each side on generator for access to generator mounted on top of sub-base fuel tank. Catwalk and stair configurations shall be coordinated with generator and sub-base fuel tank size and height.

(c) Manual over-fill protection.

(d) Internally baffled to prevent immediate resupply of heated return fuel.

(e) Lockable 2 in. fill cap.

(f) Fuel level gauge.

1) Provide 4-20mA output for remote indication of fuel tank level.

(g) Electrical stub-in area with detachable end panel.

(h) Multiple top entry customer-select ports.

(i) Tank to foundation ground clearance for visual secondary leak detection.

(j) Load bearing vertical "C" channel at generator set mounting points.

(k) Vertically accessible primary vent.

(l) Venting to UL142 in both primary and secondary containments.

(m) Weatherproof secondary containment.

(n) Mounted directly to generator set skid.

(o) 8 ga aluminized steel top.

(p) 12 ga aluminized steel sides and bottom.

(q) 4 in. “C” channel side and bottom load bearing structure.

(r) Symmetrical to 100 kW generator set footprint.

(s) Baked enamel finish.

(t) Listed to UL142 under Label No. 48-24-2 “Secondary Containment Generator Base Tank.”

(u) Low fuel level alarm.

(v) Leak detection alarm.

(w) Initial Fill: Diesel fuel oil grade DF-2. Contractor shall refill tank after generator testing to provide full tank.

2.1.7 Engine Exhaust System:

(a) Muffler: Industrial-type, sized as recommended by engine manufacturer. Measured sound level in 20-75 Hz frequency band, according to “DEMA Test Code for Measurement of Sound from Heavy-Duty Reciprocating Engines” at distance of 25 ft from exhaust discharge, is 87 dB or less.

(b) Connections from Engine to Exhaust System: Furnish flexible section on corrugated stainless steel pipe with generator set.

(c) Insulation for mufflers.

(d) Supports for Muffler and Exhaust Piping: Vibrations isolating-type.

2.1.8 Starting System:

(a) Description: 12 v electric with negative ground and including following items:

1) Components: size so they will not be damaged during full engine-cranking cycle with specified maximum ambient temperature.
2) Cranking Motor: Heavy-duty unit that automatically engaged and releases from engine flywheel without binding.
3) Cranking Cycle: 60 sec.

4) Battery complies with SAE J537 and has adequate capacity within ambient temperature range specified in Part 1 to provide specified cranking cycle series at least twice without recharging.

5) Battery Cable: Size as recommended by generator set manufacturer for cable length required for connection to battery. Include required interconnecting conductors and connection accessories.

6) Battery Compartment: Factory-fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controller heater is arranged to maintain battery above 10°C regardless of external ambient temperature within range specified in Part 1. Include accessories required to support and fasten batteries in place.

7) Battery-Charging Alternator: Factory-mounted on engine with solid-state voltage-regulation and 35 amp minimum continuous rating.

8) Battery Charger: Current limiting, automatic equalizing and float charging-type designed for operation from 120 v 60 Hz supply source. Unit complies with UL 508 and includes following features:

   i. Operation: Equalizing charging rate of 10 amps is intitiaed automatically after battery has lost charge until adjustable equalizing voltage is achieved at battery terminals. Until then automatically switches to lower float-charging mode, and continues operating in that mode until battery is discharged again.

   ii. Automatic Temperature Compensation: Adjusts float and equalizes voltages for variations in ambient temperature from -40°C to +60°C to prevent overcharging at high temperatures and undercharging at low temperatures.

   iii. Automatic Voltage Regulation: Maintains output voltage constant regardless of input voltage variations up to +10%.

   iv. Ammeter and Voltmeter: Flush mounted in door. Meters indicate charging rates.

   v. Safety Functions: Include sensing of abnormally low battery voltage arranged to close contacts providing “low battery voltage” indication on control and monitoring panel. Also include sensing of high battery voltage and loss of ac input or dc output of battery charger. Either of these conditions closes contacts that provide “battery charger malfunction” indication at system control and monitoring panel.

   vi. Enclosure and Mounting: NEMA Class 1 wall-mounted cabinet.

2.1.9 Control and Monitoring:

(a) Operating and safety indications, protective devices, basic system controls, and engine gages are grouped on common control and monitoring panel mounted on generator set. Mounting method isolates control panel from generator set vibration.

1) Generator Circuit Breaker: Molded case type conforming to Section 16B-2.8. Trip rating based on generator full load current.
2) Shunt Trip Device: For generator breaker, connected to trip breaker when generator set is shut down by protective devices.
3) Current and Potential Transformers: Instrument accuracy class.

(b) Indicating and Protective Devices, and Controls: Include those required by NFPA 110 for Level 2 system plus following:

1) Ac Voltmeter.
2) Ac Ammeter.
3) Ac Frequency Meter.
4) Dc Voltmeter (Alternator Battery Charging).
5) Engine Coolant Temperature Gage.
6) Engine-Lubricating Oil Pressure Gage.
7) Running Time Meter.
8) Ammeter/Voltmeter Phase Selector Switch or Switches.
9) Generator Voltage-Adjusting Rheostat.
10) Frequency Adjusting Rheostat.

(c) Supporting Items: Include sensors, transducers, terminals, relays, and other devices, and wiring required to support specified items. Locate sensors and other supporting items on engine, generator, or elsewhere as indicated. Where not indicated, locate to suit manufacturer's standard.

(d) Common Remote Audible Alarms: Conform to NFPA 110 requirements for Level 1 systems. Include necessary contacts and terminals in control and monitoring panel. Locate audible device and silencing means where indicated.

1) High Engine Temperature Shutdown.
2) Low-Lube Oil Pressure Shutdown.
3) Overspeed Shutdown.
4) Remote Emergency Stop Shutdown.
5) High Engine Temperature Pre-alarm.
6) Low-Lube Oil Pressure Pre-alarm.
7) Low Fuel Tank Level.

(e) Connection to Data Link: Status indication for transmission of generator status and alarms by data link to remote data terminals.

Generator control panel shall be provided with Modbus communication capability. Data system connections to terminals are covered in another Section.

1) Separate terminal block factory-wired to Form C dry contacts for each alarm.

2.1.10 Generator, Exciter, and Voltage Regulator:

(a) Comply with NEMA MG 1 and specified performance requirements.
(b) Drive: Generator shaft is directly coupled to engine shaft. Exciter is rotated integrally with generator rotor.
(c) Electrical Insulation: Class H or Class F.
(d) Stator Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.
(e) Construction prevents mechanical, electrical, and thermal damage due to vibration, overspeed up to 125% of rating, and heat during operation at 100% of rated speed.
(f) Excitation uses no-slip or collector rings, or brushes, and is arranged to sustain generator output under short circuit conditions as specified.
(g) Enclosure: Dripproof.
(h) Instrument Transformers: Mounted within generator enclosure.
(i) Voltage Regulator: Solid-state-type, separate from exciter, providing performance as specified:

1) Adjusting rheostat on control and monitoring panel provided +5% adjustment of output voltage operating band.

(j) Surge Protection: Conform to UL 1449. Mount suppressors in generator enclosure and connect to load terminals.
(k) Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

2.1.11 Outdoor Generator Set Enclosure:

(a) Description: Weatherproof steel housing. Multiple panels are lockable and provide adequate access to components requiring maintenance. Panels are removable by one person without tools. Enclosure shall be sized to allow access to transformer and auxiliary power panel, “skin-tight” enclosure is not acceptable.

(b) Fixed Louvers: At air inlet and discharge. Louvers prevent entry of rain and snow.

(c) Automatic Dampers: At air inlet and discharge. Dampers are closed to reduce engine and battery heat loss in cold weather when unit is not operating.

(d) Air Flow Through Housing: Adequate to maintain temperature rise of system components within required limits.

(e) Muffler/Silencer mounted inside of enclosure.

(f) Incandescent light fixtures with wire guards shall be provided inside enclosure. Fixtures shall be factory wired to a light switch and auxiliary power panel. Coordinate light switch position with access panels and locate near generator control panel.

(g) Two duplex receptacles shall be provided inside enclosure and factory wired to auxiliary power panel. One receptacle shall be located next to light switch with the second located on the opposite side of the enclosure near an access panel.

(h) A step down transformer and an auxiliary power panel shall be provided to supply power to the engine generator set's auxiliary devices such as battery charger, jacket water heaters, lighting, maintenance receptacles, etc. The auxiliary power panel shall be 120/208 3-phase, with main breakers and sufficient branch breakers plus 2 spares. A 480V 3-phase power feeder will be provided for the transformer, feeder size shall be coordinated with feeder breaker in power panel in pump station. Devices within enclosure and provided with generator set shall be factory wired to auxiliary power panel.

2.1.12 Finishes:

(a) Outdoor Enclosures: Polyurethane enamel over corrosion-resistant pretreatment and manufacturer's compatible standard primer.

2.1.13 Source Quality Control:

(a) Factory Tests: Include prototype testing and Project-specific equipment tests (equipment manufactured specifically for this Project).

(b) Prototype Testing: Performed on separate engine generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

1) Tests: Conform to those required by Level 1 energy converters in paragraphs 3.2.1, 3.2.1.1, and 3.2.1.2 of NFPA 110.
2) Components and Accessories: Items furnished with installed unit that are not identical to those on tested prototype have been acceptable tested to demonstrate compatibility and reliability.

(c) Project-Specific Factory Equipment Tests: Test engine generator set and other system components and accessories prior to shipment. Test items individually and assembled and connected as complete system at factory in manner equivalent to that required at Project site. Record and report test data. Conform to SAE 8528 and following:

1) Test Equipment: Use instruments calibrated within previous 12 mos and with accuracy directly traceable to National Institute of Standards and Technology (NIST).
2) Hydrostatic Test: Perform on radiator, heat exchanger, and engine water jacket.
3) Generator Tests: Conform to IEEE 115.
4) Complete System Continuous Operation Test: Includes nonstop operation for minimum standard factory test, including at least 1 hr at 50% and 75%, and 2 hrs at 100% of full load. If unit stops during standard factory test, repeat complete test. Record following minimum data at start and end of each load run, at 15 min intervals between those times and at 15 min intervals during balance of test:

i. Fuel consumption.
ii. Exhaust temperature.
iii. Jacket water temperature.
iv. Lubricating oil temperature and pressure.
v. Generator load current and voltage, each phase.
vi. Generator system gross and net output kW.

5) Complete System Performance Tests: Include following to demonstrate conformance to specified performance requirements:

i. Single-step load pickup.
ii. Transient and steady-state governing.
iii. Transient and steady-state voltage performance.
iv. Safety shutdown devices.

6) Observation of Factory Test: Provide 2 wk advance notice of tests and opportunity for observation of test by OWNER and ENGINEER.
7) Report rest results within 10 days of completion of tests.

2.1.14 Special Tools and Spare Parts to be Furnished:

(a) One set of all special tools that are required for the normal operation and maintenance of the engine generator unit.
(b) Two complete spare replacement sets of all filter elements required for the generator unit.
(c) Three complete replacement sets of each type and size of fuses.

(d) Two complete replacement sets of each type of indicating lamps.

3. EXECUTION:

3.1 Examination

3.1.1 Verify location and layout of Engine Generator Set.

3.1.2 Verify that electrical power is available and of correct characteristics.

3.2 Preparation

3.2.1 Install concrete bases after dimensions of equipment are confirmed by equipment manufacturers.

3.3 Installation

3.3.1 Anchor generator set and other system components on concrete bases as indicated. Provide anchorage and vibration isolation according to manufacturer's recommendations.

3.3.2 Maintain minimum working space around components according to manufacturer's approved submittals and NEC.

3.4 Cleaning

3.4.1 Upon completion of installation, inspect system components. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean components internally using methods and materials recommended by manufacturer.

3.5 Field Quality Control

3.5.1 Manufacturer's Field Services:

(a) The services of a qualified representative of the manufacturer shall be provided to instruct on proper installation of the equipment, inspect the completed installation, make any necessary adjustments, participate in the startup of the equipment, participate in the field testing of the equipment, place the equipment in trouble-free operation, and instruct operating personnel in its operation and maintenance. Include minimum:

i. 1 manday for Installation Services.
ii. 1/2 manday for Instructional Services.
iii. 1/2 manday for Post Startup Services.

(b) Supplier or manufacturer shall direct services to system and equipment operation, maintenance, troubleshooting, and equipment and system related areas.
(c) In addition to the services specified above, provide manufacturer's services as required to successfully complete systems demonstration.

(d) The start-up services for the following equipment shall be coordinated with IDOT and IDOT shall be notified at least one week in advance:

Engine Generator System.

3.5.2 Tests: Provide services of qualified testing agency to perform tests listed below according to manufacturer's recommendations upon completion of installation of system. Use instruments bearing records of calibration within last 12 mos, traceable to NIST standards, and adequate for making positive observation of test results. Include following tests:

(a) Battery Tests: Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions. Test for contact integrity of connectors.
(b) Battery Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
(c) System Integrity Tests: Verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.
(d) Simulation of malfunctions to verify proper operation of local andremote protective, alarm, and monitoring devices.
(e) Load Test: Use variable load bank capable of simulating kVA, kW, and power factor of load for which unit is rated. Run unit at 25, 50, and 75% of rated capacity for 30 min each, and at 100% for 1 hrs. Record voltage, frequency, load current, battery-charging current, power output, oil pressure, and coolant temperature during test.
(f) Exhaust System Back-Pressure Test: Use manometer with scale exceeding 40 in. of water. Connect to exhaust line close to engine exhaust manifold. Verify that back pressure at full-rated load is within manufacturer's published allowable limits for engine.
(g) Exhaust Emissions Test: Conform to applicable government test criteria.

3.5.3 Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

END OF THIS SECTION

ALKALI-SILICA REACTION FOR CAST-IN-PLACE CONCRETE (BDE)
Effective: August 1, 2007 Revised: January 1, 2009

Description. This special provision is intended to reduce the risk of a deleterious alkali-silica reaction in concrete exposed to humid or wet conditions. The special provision is not intended or adequate for concrete exposed to potassium acetate, potassium formate, sodium acetate or sodium formate. The special provision shall not apply to the dry environment (humidity less than 60 percent) found inside buildings for residential or commercial occupancy. The special provision shall also not apply to precast products or precast prestressed products.

Aggregate Expansion Values. Each coarse and fine aggregate will be tested by the Department for alkali reaction according to ASTM C 1260.

The test will be performed with Type I or II cement having a total equivalent alkali content (Na_2O + $0.658K_2O$) of 0.90 percent or greater. The Engineer will determine the assigned expansion value for each aggregate, and these values will be made available on the Department's Alkali-Silica Potential Reactivity Rating List. The Engineer may differentiate aggregate based on ledge, production method, gradation number, or other factors. An expansion value of 0.05 percent will be assigned to limestone or dolomite coarse aggregates and 0.03 percent to limestone or dolomite fine aggregates (manufactured stone sand); however the Department reserves the right to perform the ASTM C 1260 test.

Aggregate Groups. Each combination of aggregates used in a mixture will be assigned to an aggregate group. The point at which the coarse aggregate and fine aggregate expansion values intersect in the following table will determine the group.

AGGREGATE GROUPS			
Coarse Aggregate or Coarse Aggregate Blend ASTM C 1260 Expansion	Fine Aggregate or Fine Aggregate Blend ASTM C 1260 Expansion		
	≤ 0.16%	> 0.16% - 0.27%	> 0.27%
≤ 0.16%	Group I	Group II	Group III
> 0.16% - 0.27%	Group II	Group II	Group III
> 0.27%	Group III	Group III	Group IV

Mixture Options. Based upon the aggregate group, the following mixture options shall be used; however, the Department may prohibit a mixture option if field performance shows a deleterious alkali-silica reaction or Department testing indicates the mixture may experience a deleterious alkali-silica reaction.

Group I - Mixture options are not applicable. Use any cement or finely divided mineral.
Group II - Mixture options 1, 2, 3, 4, or 5 shall be used.
Group III - Mixture options 1, 2 and 3 combined, 4, or 5 shall be used.
Group IV - Mixture options 1, 2 and 4 combined, or 5 shall be used.

For Class PP-3 concrete the mixture options are not applicable, and any cement may be used with the specified finely divided minerals.

a) Mixture Option 1. The coarse or fine aggregates shall be blended to place the material in a group that will allow the selected cement or finely divided mineral to be used.

   When a coarse or fine aggregate is blended, the weighted expansion value shall be calculated separately for the coarse and fine aggregate as follows:

   Weighted Expansion Value = (a/100 x A) + (b/100 x B) + (c/100 x C) + …

   Where: a, b, c... = percentage of aggregate in the blend;
   A, B, C…= expansion value for that aggregate.

b) Mixture Option 2. A finely divided mineral shall be used as described in 1), 2), 3), or 4) that follow. The replacement ratio is defined as "finely divided mineral:portland cement".

1) Class F Fly Ash. For Class PV, BS, MS, DS, SC, and SI concrete and cement aggregate mixture II (CAM II), Class F fly ash shall replace 15 percent of the portland cement at a minimum replacement ratio of 1.5:1.

2) Class C Fly Ash. For Class PV, MS, SC, and SI Concrete, Class C fly ash with 18 percent to less than 26.5 percent calcium oxide content, and less than 2.0 percent loss on ignition, shall replace 20 percent of the portland cement at a minimum replacement ratio of 1:1; or at a minimum replacement ratio of 1.25:1 if the loss on ignition is 2.0 percent or greater. Class C fly ash with less than 18 percent calcium oxide content shall replace 20 percent of the portland cement at a minimum replacement ratio of 1.25:1.

   For Class PP-1, RR, BS, and DS concrete and CAM II, Class C fly ash with less than 26.5 percent calcium oxide content shall replace 15 percent of the portland cement at a minimum replacement ratio of 1.5:1.

3) Ground Granulated Blast-Furnace Slag. For Class PV, BS, MS, SI, DS, and SC concrete, ground granulated blast-furnace slag shall replace 25 percent of the portland cement at a minimum replacement ratio of 1:1.

   For Class PP-1 and RR concrete, ground granulated blast-furnace slag shall replace 15 percent of the portland cement at a minimum replacement ratio of 1.5:1.

   For Class PP-2, ground granulated blast-furnace slag shall replace 25 to 30 percent of the portland cement at a minimum replacement ratio of 1:1.

4) Microsilica or High Reactivity Metakaolin. Microsilica solids or high reactivity metakaolin shall be added to the mixture at a minimum 25 lb/cu yd (15 kg/cu m) or 27 lb/cu yd (16 kg/cu m) respectively.

c) Mixture Option 3. The cement used shall have a maximum total equivalent alkali content ($Na_2O + 0.658K_2O$) of 0.60 percent. When aggregate in Group II is involved, any finely divided mineral may be used with a portland cement.

d) Mixture Option 4. The cement used shall have a maximum total equivalent alkali content ($Na_2O + 0.658K_2O$) of 0.45 percent. When aggregate in Group II or III is involved, any finely divided mineral may be used with a portland cement.

e) Mixture Option 5. The proposed cement or finely divided mineral may be used if the ASTM C 1567 expansion value is ≤ 0.16 percent when performed on the aggregate in the concrete mixture with the highest ASTM C 1260 test result. The ASTM C 1567 test will be valid for two years, unless the Engineer determines the materials have changed significantly. For latex concrete, the ASTM C 1567 test shall be performed without the latex. The 0.20 percent autoclave expansion limit in ASTM C 1567 shall not apply.

   If during the two year time period the Contractor needs to replace the cement, and the replacement cement has an equal or lower total equivalent alkali content ($Na_2O + 0.658K_2O$), a new ASTM C 1567 test will not be required.

Testing. If an individual aggregate has an ASTM C 1260 expansion value > 0.16 percent, an ASTM C 1293 test may be performed by the Contractor to evaluate the Department's ASTM C 1260 test result. The ASTM C 1293 test shall be performed with Type I or II cement having a total equivalent alkali content (Na_2O + 0.658K_2O) of 0.80 percent or greater. The interior vertical wall of the ASTM C 1293 recommended container (pail) shall be half covered with a wick of absorbent material consisting of blotting paper. If the testing laboratory desires to use an alternate container or wick of absorbent material, ASTM C 1293 test results with an alkali-reactive aggregate of known expansion characteristics shall be provided to the Engineer for review and approval. If the expansion is less than 0.040 percent after one year, the aggregate will be assigned an ASTM C 1260 expansion value of 0.08 percent that will be valid for two years, unless the Engineer determines the aggregate has changed significantly.

The Engineer reserves the right to verify a Contractor's ASTM C 1293 or 1567 test result. The Engineer will not accept the result if the precision and bias for the test methods are not met.

The laboratory performing the ASTM C 1567 test shall either be accredited by the AASHTO Materials Reference Laboratory (AMRL) for ASTM C 227 under Portland Cement Concrete or Aggregate; or shall be inspected for Hydraulic Cement - Physical Tests by the Cement and Concrete Reference Laboratory (CCRL) and shall be approved by the Department. The laboratory performing the ASTM C 1293 test shall be inspected for Portland Cement Concrete by CCRL and shall be approved by the Department.

APPROVAL OF PROPOSED BORROW AREAS, USE AREAS, AND/OR WASTE AREAS (BDE)

Effective: November 1, 2008 Revised: November 1, 2010

Replace the first paragraph of Article 107.22 of the Standard Specifications with the following:

"All proposed borrow areas, including commercial borrow areas; use areas, including, but not limited to temporary access roads, detours, runarounds, plant sites, and staging and storage areas; and/or waste areas are to be designated by the Contractor to the Engineer and approved prior to their use. Such areas outside the State of Illinois shall be evaluated, at no additional cost to the Department, according to the requirements of the state in which the area lies; and approval by the authority within that state having jurisdiction for such areas shall be forwarded to the Engineer. Such areas within Illinois shall be evaluated as described herein.

A location map delineating the proposed borrow area, use area, and/or waste area shall be submitted to the Engineer for approval along with an agreement from the property owner granting the Department permission to enter the property and conduct cultural and biological resource reconnaissance surveys of the site for archaeological resources, threatened or endangered species or their designated essential habitat, wetlands, prairies, and savannahs. The type of location map submitted shall be a topographic map, a plat map, or a 7.5 minute quadrangle map. Submittals shall include the intended use of the site and provide sufficient detail for the Engineer to determine the extent of impacts to the site. The Engineer will initiate cultural and biological resource reconnaissance surveys of the site, as necessary, at no cost to the Contractor. The Engineer will advise the Contractor of the expected time required to complete all surveys. If the proposed area is within 150 ft (45 m) of the highway right-of-way, a topographic map of the proposed site will be required as specified in Article 204.02."

CEMENT (BDE)
Effective: January 1, 2007 Revised: April 1, 2011

Revise Section 1001 of the Standard Specifications to read:

"**SECTION 1001. CEMENT**

1001.01 Cement Types. Cement shall be according to the following.

(a) Portland Cement. Acceptance of portland cement shall be according to the current Bureau of Materials and Physical Research's Policy Memorandum, "Portland or Blended Cement Acceptance Procedure for Qualified and Non-Qualified Plants".

Portland cement shall be according to AASHTO M 85, and shall meet the standard physical and chemical requirements. The Contractor has the option to use any type of portland cement listed in AASHTO M 85 unless a specific cement is specified for a construction item. Inorganic processing additions shall be limited to granulated blast-furnace slag according to the chemical requirements of AASHTO M 302, Class C or F fly ash according to the chemical requirements of AASHTO M 295, and cement kiln dust.

(b) Portland-Pozzolan Cement. Acceptance of portland-pozzolan cement shall be according to the current Bureau of Materials and Physical Research's Policy Memorandum, "Portland or Blended Cement Acceptance Procedure for Qualified and Non-Qualified Plants".

Portland-pozzolan cement shall be according to AASHTO M 240 and shall meet the standard physical and chemical requirements. The Contractor has the option to use portland-pozzolan cement unless a specific cement is specified for a construction item. Inorganic processing additions shall be limited to granulated blast-furnace slag according to the chemical requirements of AASHTO M 302, Class C or F fly ash according to the chemical requirements of AASHTO M 295, and cement kiln dust. The pozzolan constituent for Type IP using Class F fly ash shall be a maximum of 25 percent of the weight (mass) of the portland-pozzolan cement. The pozzolan constituent for Type IP using Class C fly ash shall be a maximum of 30 percent of the weight (mass) of the portland-pozzolan cement. The pozzolan constituent for Type IP using microsilica or high-reactivity metakaolin shall be a maximum of ten percent. The pozzolan constituent for Type IP using other materials shall have the approval of the Engineer.

Portland-pozzolan cement may be used in concrete mixtures when the air temperature is below 40 ºF (4 ºC), but the Engineer may request a trial batch of the concrete mixture to show the mix design strength requirement will be met.

(c) Portland Blast-Furnace Slag Cement. Acceptance of portland blast-furnace slag cement shall be according to the current Bureau of Materials and Physical Research's Policy Memorandum, "Portland or Blended Cement Acceptance Procedure for Qualified and Non-Qualified Plants".

Portland blast-furnace slag cement shall be according to AASHTO M 240 and shall meet the standard physical and chemical requirements. The Contractor has the option to use portland blast-furnace slag cement unless a specific cement is specified for a construction item.

Inorganic processing additions shall be limited to granulated blast-furnace slag according to the chemical requirements of AASHTO M 302, Class C or F fly ash according to the chemical requirements of AASHTO M 295, and cement kiln dust. The blast-furnace slag constituent for Type IS shall be a maximum of 35 percent of the weight (mass) of the portland blast-furnace slag cement.

Portland blast-furnace slag cement may be used in concrete mixtures when the air temperature is below 40 ºF (4 ºC), but the Engineer may request a trial batch of the concrete mixture to show the mix design strength requirement will be met.

(d) Rapid Hardening Cement. Rapid hardening cement shall be used according to Article 1020.04 or when approved by the Engineer. The cement shall be on the Department's current "Approved List of Packaged, Dry, Rapid Hardening Cementitious Materials for Concrete Repairs", and shall be according to the following.

(1) The cement shall have a maximum final set of 25 minutes, according to Illinois Modified AASHTO T 131.
(2) The cement shall have a minimum compressive strength of 2000 psi (13,800 kPa) at 3.0 hours, 3200 psi (22,100 kPa) at 6.0 hours, and 4000 psi (27,600 kPa) at 24.0 hours, according to Illinois Modified AASHTO T 106.
(3) The cement shall have a maximum drying shrinkage of 0.050 percent at seven days, according to Illinois Modified ASTM C 596.
(4) The cement shall have a maximum expansion of 0.020 percent at 14 days, according to Illinois Modified ASTM C 1038.
(5) The cement shall have a minimum 80 percent relative dynamic modulus of elasticity; and shall not have a weight (mass) gain in excess of 0.15 percent or a weight (mass) loss in excess of 1.0 percent, after 100 cycles, according to Illinois Modified AASHTO T 161, Procedure B.

(e) Calcium Aluminate Cement. Calcium aluminate cement shall be used according to Article 1020.04 or when approved by the Engineer. The cement shall meet the standard physical requirements for Type I cement according to AASHTO M 85, except the time of setting shall not apply. The chemical requirements shall be determined according to AASHTO T 105 and shall be as follows: minimum 38 percent aluminum oxide (Al_2O_3), maximum 42 percent calcium oxide (CaO), maximum 1 percent magnesium oxide (MgO), maximum 0.4 percent sulfur trioxide (SO_3), maximum 1 percent loss on ignition, and maximum 3.5 percent insoluble residue.

1001.02 Uniformity of Color. Cement contained in single loads or in shipments of several loads to the same project shall not have visible differences in color.

1001.03 Mixing Brands and Types. Different brands or different types of cement from the same manufacturing plant, or the same brand or type from different plants shall not be mixed or used alternately in the same item of construction unless approved by the Engineer.

1001.04 Storage. Cement shall be stored and protected against damage, such as dampness which may cause partial set or hardened lumps. Different brands or different types of cement from the same manufacturing plant, or the same brand or type from different plants shall be kept separate."

CERTIFICATION OF METAL FABRICATOR (BDE)
Effective: July 1, 2010

Revise Article 106.08 of the Standard Specifications to read:

"**106.08 Certification of Metal Fabricator.** All fabricators performing work on metal components of structures shall be certified under the appropriate category of the AISC Quality Certification Program as follows.

(a) Fabricators of the main load carrying steel components of welded plate girder, box girder, truss, and arch structures shall be certified under Category MBr (Major Steel Bridges).

(b) Fabricators of the main load carrying steel components of rolled beam structures, either simple span or continuous, and overhead sign structures shall be certified under Category SBr (Simple Steel Bridges).

Fabricators of steel or other non-ferrous metal components of structures not certified under (a) or (b) above shall be certified under the program for Bridge and Highway Metal Component Manufacturers."

CONCRETE ADMIXTURES (BDE)
Effective: January 1, 2003 Revised: April 1, 2009

Replace the first paragraph of Article 1020.05(b) of the Standard Specifications to read:

"(b) Admixtures. The use of admixtures to increase the workability or to accelerate the hardening of the concrete will be permitted when approved by the Engineer. Admixture dosages shall result in the mixture meeting the specified plastic and hardened properties. The Department will maintain an Approved List of Corrosion Inhibitors. Corrosion inhibitor dosage rates shall be according to Article 1020.05(b)(12). The Department will also maintain an Approved List of Concrete Admixtures, and an admixture technical representative shall be consulted when determining an admixture dosage from this list. The dosage shall be within the range indicated on the approved list unless the influence by other admixtures, jobsite conditions (such as a very short haul time), or other circumstances warrant a dosage outside the range. The Engineer shall be notified when a dosage is proposed outside the range. To determine an admixture dosage, air temperature, concrete temperature, cement source and quantity, finely divided mineral sources(s) and quantity, influence of other admixtures, haul time, placement conditions, and other factors as appropriate shall be considered. The Engineer may request the Contractor to have a batch of concrete mixed in the lab or field to verify the admixture dosage is correct. An admixture dosage or combination of admixture dosages shall not delay the initial set of concrete by more than one hour. When a retarding admixture is required or appropriate for a bridge deck or bridge deck overlay pour, the initial set time shall be delayed until the deflections due to the concrete dead load are no longer a concern for inducing cracks in the completed work. However, a retarding admixture shall not be used to further extend the pour time and justify the alteration of a bridge deck pour sequence.

When determining water in admixtures for water/cement ratio, the Contractor shall calculate 70 percent of the admixture dosage as water, except a value of 50 percent shall be used for a latex admixture used in bridge deck latex concrete overlays."

Revise Section 1021 of the Standard Specifications to read:

"**SECTION 1021. CONCRETE ADMIXTURES**

1021.01 **General.** Admixtures shall be furnished in liquid form ready for use. The admixtures shall be delivered in the manufacturer's original containers, bulk tank trucks or such containers or tanks as are acceptable to the Engineer. Delivery shall be accompanied by a ticket which clearly identifies the manufacturer and trade name of the material. Containers shall be readily identifiable as to manufacturer and trade name of the material they contain.

Corrosion inhibitors will be maintained on the Department's Approved List of Corrosion Inhibitors. All other concrete admixture products will be maintained on the Department's Approved List of Concrete Admixtures. For the admixture submittal, a report prepared by an independent laboratory accredited by the AASHTO Materials Reference Laboratory (AMRL) for Portland Cement Concrete shall be provided. The report shall show the results of physical tests conducted no more than five years prior to the time of submittal, according to applicable specifications. However, for corrosion inhibitors the ASTM G 109 test information specified in ASTM C 1582 is not required to be from and independent lab. All other information in ASTM C 1582 shall be from and independent lab.

Tests shall be conducted using materials and methods specified on a "test" concrete and a "reference" concrete, together with a certification that no changes have been made in the formulation of the material since the performance of the tests. Per the manufacturer's option, the cement content for all required tests shall either be according to applicable specifications or 5.65 cwt/cu yd (335 kg/cu m). Compressive strength test results for six months and one year will not be required.

Prior to the approval of an admixture, the Engineer reserves the right to request a sample for testing. The test and reference concrete mixtures tested by the Engineer will contain a cement content of 5.65 cwt/cu yd (335 kg/cu m). For freeze-thaw testing, the Department will perform the test according to AASHTO T 161, Procedure B. The flexural strength test will be performed according to AASHTO T 177. If the Engineer decides to test the admixture, the manufacturer shall submit AASHTO T 197 water content and set time test results on the standard cement used by the Department. The test and reference concrete mixture shall contain a cement content of 5.65 cwt/cu yd (335 kg/cu m). The manufacturer may select their lab or an independent lab to perform this testing. The laboratory is not required to be accredited by AASHTO.

The manufacturer shall include in the submittal the following admixture information: the manufacturing range for specific gravity, the midpoint and manufacturing range for residue by oven drying, and the manufacturing range for pH. The submittal shall also include an infrared spectrophotometer trace no more than five years old.

For air-entraining admixtures according to Article 1021.02, the specific gravity allowable manufacturing range shall be established by the manufacturer and the test method shall be according to ASTM C 494. For residue by oven drying and pH, the allowable manufacturing range and test methods shall be according to ASTM C 260.

For admixtures according to Articles 1021.03, 1021.04, 1021.05, 1021.06, and 1021.07, the pH allowable manufacturing range shall be established by the manufacturer and the test method shall be according to ASTM E 70. For specific gravity and residue by oven drying, the allowable manufacturing range and test methods shall be according to ASTM C 494.

When test results are more than seven years old, the manufacturer shall re-submit the infrared spectrophotometer trace and the report prepared by an independent laboratory accredited by AASHTO.

All admixtures, except chloride-based accelerators, shall contain a maximum of 0.3 percent chloride by weight (mass).

Random field samples may be taken by the Department to verify an admixture meets specification. A split sample will be provided to the manufacturer if requested. Admixtures that do not meet specification requirements or an allowable manufacturing range established by the manufacturer shall be replaced with new material.

1021.02 Air-Entraining Admixtures. Air-entraining admixtures shall be according to AASHTO M 154.

1021.03 Retarding and Water-Reducing Admixtures. The admixture shall be according to the following.

(a) The retarding admixture shall be according to AASHTO M 194, Type B (retarding) or Type D (water-reducing and retarding).

(b) The water-reducing admixture shall be according to AASHTO M 194, Type A.

(c) The high range water-reducing admixture shall be according to AASHTO M 194, Type F (high range water-reducing) or Type G (high range water-reducing and retarding).

1021.04 Accelerating Admixtures. The admixture shall be according to AASHTO M 194, Type C (accelerating) or Type E (water reducing and accelerating).

1021.05 Self-Consolidating Admixtures. The self-consolidating admixture system shall consist of either a high range water-reducing admixture only or a high range water-reducing admixture combined with a separate viscosity modifying admixture. The one or two component admixture system shall be capable of producing a concrete mixture that can flow around reinforcement and consolidate under its own weight without additional effort and without segregation.

The high range water-reducing admixture shall be according to AASHTO M 194, Type F.

The viscosity modifying admixture shall be according to ASTM C 494, Type S (specific performance).

1021.06 Rheology-Controlling Admixture. The rheology-controlling admixture shall be capable of producing a concrete mixture with a lower yield stress that will consolidate easier for slipform applications used by the Contractor. The rheology-controlling admixture shall be according to ASTM C 494, Type S (specific performance).

1021.07 Corrosion Inhibitor. The corrosion inhibitor shall be according to one of the following.

(a) Calcium Nitrite. The corrosion inhibitor shall contain a minimum 30 percent calcium nitrite by weight (mass) of solution, and shall comply with the requirements of AASHTO M 194, Type C (accelerating).

(b) Other Materials. The corrosion inhibitor shall be according to ASTM C 1582."

CONSTRUCTION AIR QUALITY – DIESEL RETROFIT (BDE)
Effective: June 1, 2010

The reduction of emissions of particulate matter (PM) for off-road equipment shall be accomplished by installing retrofit emission control devices. The term "equipment" refers to diesel fuel powered devices rated at 50 hp and above, to be used on the jobsite in excess of seven calendar days over the course of the construction period on the jobsite (including rental equipment).

Contractor and subcontractor diesel powered off-road equipment assigned to the contract shall be retrofitted using the phased in approach shown below. Equipment that is of a model year older than the year given for that equipment's respective horsepower range shall be retrofitted:

Effective Dates	Horsepower Range	Model Year
June 1, 2010 1/	600-749	2002
	750 and up	2006
June 1, 2011 2/	100-299	2003
	300-599	2001
	600-749	2002
	750 and up	2006
June 1, 2012 2/	50-99	2004
	100-299	2003
	300-599	2001
	600-749	2002
	750 and up	2006

1/ Effective dates apply to Contractor diesel powered off-road equipment assigned to the contract.
2/ Effective dates apply to Contractor and subcontractor diesel powered off-road equipment assigned to the contract.

The retrofit emission control devices shall achieve a minimum PM emission reduction of 50 percent and shall be:

a) Included on the U.S. Environmental Protection Agency (USEPA) *Verified Retrofit Technology List* (http://www.epa.gov/otaq/retrofit/verif-list.htm), or verified by the California Air Resources Board (CARB) (http://www.arb.ca.gov/diesel/verde/verdev.htm); or

b) Retrofitted with a non-verified diesel retrofit emission control device if verified retrofit emission control devices are not available for equipment proposed to be used on the project, and if the Contractor has obtained a performance certification from the retrofit device manufacturer that the emission control device provides a minimum PM emission reduction of 50 percent.

Note: Large cranes (Crawler mounted cranes) which are responsible for critical lift operations are exempt from installing retrofit emission control devices if such devices adversely affect equipment operation.

Diesel powered off-road equipment with engine ratings of 50 hp and above, which are unable to be retrofitted with verified emission control devices or if performance certifications are not available which will achieve a minimum 50 percent PM reduction, may be granted a waiver by the Department if documentation is provided showing good faith efforts were made by the Contractor to retrofit the equipment.

Construction shall not proceed until the Contractor submits a certified list of the diesel powered off-road equipment that will be used, and as necessary, retrofitted with emission control devices. The list(s) shall include (1) the equipment number, type, make, Contractor/rental company name; and (2) the emission control devices make, model, USEPA or CARB verification number, or performance certification from the retrofit device manufacturer. Equipment reported as fitted with emissions control devices shall be made available to the Engineer for visual inspection of the device installation, prior to being used on the jobsite.

The Contractor shall submit an updated list of retrofitted off-road construction equipment as retrofitted equipment changes or comes on to the jobsite. The addition or deletion of any diesel powered equipment shall be included on the updated list.

If any diesel powered off-road equipment is found to be in non-compliance with any portion of this special provision, the Engineer will issue the Contractor a diesel retrofit deficiency deduction.

Any costs associated with retrofitting any diesel powered off-road equipment with emission control devices shall be considered as included in the contract unit prices bid for the various items of work involved and no additional compensation will be allowed. The Contractor's compliance with this notice and any associated regulations shall not be grounds for a claim.

Diesel Retrofit Deficiency Deduction

When the Engineer determines that a diesel retrofit deficiency exists, a daily monetary deduction will be imposed for each calendar day or fraction thereof the deficiency continues to exist. The calendar day(s) will begin when the time period for correction is exceeded and end with the Engineer's written acceptance of the correction. The daily monetary deduction will be $1,000.00 for each deficiency identified.

The deficiency will be based on lack of diesel retrofit emissions control.

If a Contractor accumulates three diesel retrofit deficiency deductions for the same piece of equipment in a contract period, the Contractor will be shutdown until the deficiency is corrected.

Such a shutdown will not be grounds for any extension of the contract time, waiver of penalties, or be grounds for any claim.

CONSTRUCTION AIR QUALITY - DIESEL VEHICLE EMISSIONS CONTROL (BDE)
Effective: April 1, 2009 Revised: July 1, 2009

Diesel Vehicle Emissions Control. The reduction of construction air emissions shall be accomplished by using cleaner burning diesel fuel. The term “equipment” refers to any and all diesel fuel powered devices rated at 50 hp and above, to be used on the project site in excess of seven calendar days over the course of the construction period on the project site (including any “rental” equipment).

All equipment on the jobsite, with engine ratings of 50 hp and above, shall be required to: use Ultra Low Sulfur Diesel fuel (ULSD) exclusively (15 ppm sulfur content or less).

Diesel powered equipment in non-compliance will not be allowed to be used on the project site, and is also subject to a notice of non-compliance as outlined below.

The Contractor shall submit copies of monthly summary reports and include certified copies of the ULSD diesel fuel delivery slips for diesel fuel delivered to the jobsite for the reporting time period, noting the quantity of diesel fuel used.

If any diesel powered equipment is found to be in non-compliance with any portion of this specification, the Engineer will issue the Contractor a notice of non-compliance and identify an appropriate period of time, as outlined below under environmental deficiency deduction, in which to bring the equipment into compliance or remove it from the project site.

Any costs associated with bringing any diesel powered equipment into compliance with these diesel vehicle emissions controls shall be considered as included in the contract unit prices bid for the various items of work involved and no additional compensation will be allowed. The Contractor's compliance with this notice and any associated regulations shall also not be grounds for a claim.

Environmental Deficiency Deduction. When the Engineer is notified, or determines that an environmental control deficiency exists, he/she will notify the Contractor in writing, and direct the Contractor to correct the deficiency within a specified time period. The specified time-period, which begins upon Contractor notification, will be from 1/2 hour to 24 hours long, based on the urgency of the situation and the nature of the deficiency. The Engineer shall be the sole judge regarding the time period.

The deficiency will be based on lack of repair, maintenance and diesel vehicle emissions control.

If the Contractor fails to correct the deficiency within the specified time frame, a daily monetary deduction will be imposed for each calendar day or fraction thereof the deficiency continues to exist. The calendar day(s) will begin when the time period for correction is exceeded and end with the Engineer's written acceptance of the correction. The daily monetary deduction will be $1,000.00 for each deficiency identified.

If a Contractor or subcontractor accumulates three environmental deficiency deductions in a contract period, the Contractor will be shutdown until the deficiency is corrected. Such a shutdown will not be grounds for any extension of contract time, waiver of penalties, or be grounds for any claim.

CONSTRUCTION AIR QUALITY - IDLING RESTRICTIONS (BDE)
Effective: April 1, 2009

Idling Restrictions. The Contractor shall establish truck-staging areas for all diesel powered vehicles that are waiting to load or unload material at the jobsite. Staging areas shall be located where the diesel emissions from the equipment will have a minimum impact on adjacent sensitive receptors. The Department will review the selection of staging areas, whether within or outside the existing highway right-of-way, to avoid locations near sensitive areas or populations to the extent possible. Sensitive receptors include, but are not limited to, hospitals, schools, residences, motels, hotels, daycare facilities, elderly housing and convalescent facilities. Diesel powered engines shall also be located as far away as possible from fresh air intakes, air conditioners, and windows. The Engineer will approve staging areas before implementation.

Diesel powered vehicle operators may not cause or allow the motor vehicle, when it is not in motion, to idle for more than a total of 10 minutes within any 60 minute period, except under any of the following circumstances:

1) The motor vehicle has a gross vehicle weight rating of less than 8000 lb (3630 kg).
2) The motor vehicle idles while forced to remain motionless because of on-highway traffic, an official traffic control device or signal, or at the direction of a law enforcement official.
3) The motor vehicle idles when operating defrosters, heaters, air conditioners, or other equipment solely to prevent a safety or health emergency.
4) A police, fire, ambulance, public safety, other emergency or law enforcement motor vehicle, or any motor vehicle used in an emergency capacity, idles while in an emergency or training mode and not for the convenience of the vehicle operator.
5) The primary propulsion engine idles for maintenance, servicing, repairing, or diagnostic purposes if idling is necessary for such activity.
6) A motor vehicle idles as part of a government inspection to verify that all equipment is in good working order, provided idling is required as part of the inspection.
7) When idling of the motor vehicle is required to operate auxiliary equipment to accomplish the intended use of the vehicle (such as loading, unloading, mixing, or processing cargo; controlling cargo temperature; construction operations, lumbering operations; oil or gas well servicing; or farming operations), provided that this exemption does not apply when the vehicle is idling solely for cabin comfort or to operate non-essential equipment such as air conditioning, heating, microwave ovens, or televisions.
8) When the motor vehicle idles due to mechanical difficulties over which the operator has no control.
9) The outdoor temperature is less than 32 °F (0 °C) or greater than 80 °F (26 °C).

When the outdoor temperature is greater than or equal to 32 °F (0 °C) or less than or equal to 80 °F (26 °C), a person who operates a motor vehicle operating on diesel fuel shall not cause or allow the motor vehicle to idle for a period greater than 30 minutes in any 60 minute period while waiting to weigh, load, or unload cargo or freight, unless the vehicle is in a line of vehicles that regularly and periodically moves forward.

The above requirements do not prohibit the operation of an auxiliary power unit or generator set as an alternative to idling the main engine of a motor vehicle operating on diesel fuel.

Environmental Deficiency Deduction. When the Engineer is notified, or determines that an environmental control deficiency exists based on non-compliance with the idling restrictions, he/she will notify the Contractor, and direct the Contractor to correct the deficiency.

If the Contractor fails to correct the deficiency a monetary deduction will be imposed. The monetary deduction will be $1,000.00 for each deficiency identified.

DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION (BDE)
Effective: September 1, 2000 Revised: January 1, 2011

FEDERAL OBLIGATION. The Department of Transportation, as a recipient of federal financial assistance, is required to take all necessary and reasonable steps to ensure nondiscrimination in the award and administration of contracts. Consequently, the federal regulatory provisions of 49 CFR part 26 apply to this contract concerning the utilization of disadvantaged business enterprises. For the purposes of this Special Provision, a disadvantaged business enterprise (DBE) means a business certified by the Department in accordance with the requirements of 49 CFR part 26 and listed in the Illinois Unified Certification Program (IL UCP) DBE Directory.

STATE OBLIGATION. This Special Provision will also be used by the Department to satisfy the requirements of the Business Enterprise for Minorities, Females, and Persons with Disabilities Act, 30 ILCS 575. When this Special Provision is used to satisfy state law requirements on 100 percent state-funded contracts, the federal government has no involvement in such contracts (not a federal-aid contract) and no responsibility to oversee the implementation of this Special Provision by the Department on those contracts. DBE participation on 100 percent state-funded contracts will not be credited toward fulfilling the Department's annual overall DBE goal required by the US Department of Transportation to comply with the federal DBE program requirements.

CONTRACTOR ASSURANCE. The Contractor makes the following assurance and agrees to include the assurance in each subcontract that the Contractor signs with a subcontractor:

> The Contractor, subrecipient, or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of contracts funded in whole or in part with federal or state funds. Failure by the Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate.

OVERALL GOAL SET FOR THE DEPARTMENT. As a requirement of compliance with 49 CFR part 26, the Department has set an overall goal for DBE participation in its federally assisted contracts.

That goal applies to all federal-aid funds the Department will expend in its federally assisted contracts for the subject reporting fiscal year. The Department is required to make a good faith effort to achieve the overall goal. The dollar amount paid to all approved DBE companies performing work called for in this contract is eligible to be credited toward fulfillment of the Department's overall goal.

CONTRACT GOAL TO BE ACHIEVED BY THE CONTRACTOR. This contract includes a specific DBE utilization goal established by the Department. The goal has been included because the Department has determined that the work of this contract has subcontracting opportunities that may be suitable for performance by DBE companies. This determination is based on an assessment of the type of work, the location of the work, and the availability of DBE companies to do a part of the work. The assessment indicates that, in the absence of unlawful discrimination, and in an arena of fair and open competition, DBE companies can be expected to perform **0.00%** of the work. This percentage is set as the DBE participation goal for this contract. Consequently, in addition to the other award criteria established for this contract, the Department will only award this contract to a bidder who makes a good faith effort to meet this goal of DBE participation in the performance of the work. A bidder makes a good faith effort for award consideration if either of the following is done in accordance with the procedures set forth in this Special Provision:

(a) The bidder documents that enough DBE participation has been obtained to meet the goal; or
(b) The bidder documents that a good faith effort has been made to meet the goal, even though the effort did not succeed in obtaining enough DBE participation to meet the goal.

DBE LOCATOR REFERENCES. Bidders may consult the IL UCP DBE Directory as a reference source for DBE-certified companies. In addition, the Department maintains a letting and item specific DBE locator information system whereby DBE companies can register their interest in providing quotes on particular bid items advertised for letting. Information concerning DBE companies willing to quote work for particular contracts may be obtained by contacting the Department's Bureau of Small Business Enterprises at telephone number (217)785-4611, or by visiting the Department's web site at www.dot.il.gov.

BIDDING PROCEDURES. Compliance with this Special Provision is a material bidding requirement. The failure of the bidder to comply will render the bid not responsive.

(a) The bidder shall submit a Disadvantaged Business Utilization Plan on Department forms SBE 2025 and 2026 with the bid.

(b) The Utilization Plan shall indicate that the bidder either has obtained sufficient DBE participation commitments to meet the contract goal or has not obtained enough DBE participation commitments in spite of a good faith effort to meet the goal. The Utilization Plan shall further provide the name, telephone number, and telefax number of a responsible official of the bidder designated for purposes of notification of plan approval or disapproval under the procedures of this Special Provision.

(c) The Utilization Plan shall include a DBE Participation Commitment Statement, Department form SBE 2025, for each DBE proposed for the performance of work to achieve the contract goal.

For bidding purposes, submission of the completed SBE 2025 forms, signed by the DBEs and faxed to the bidder will be acceptable as long as the original is available and provided upon request. All elements of information indicated on the said form shall be provided, including but not limited to the following:

(1) The names and addresses of DBE firms that will participate in the contract;
(2) A description, including pay item numbers, of the work each DBE will perform;
(3) The dollar amount of the participation of each DBE firm participating. The dollar amount of participation for identified work shall specifically state the quantity, unit price, and total subcontract price for the work to be completed by the DBE. If partial pay items are to be performed by the DBE, indicate the portion of each item, a unit price where appropriate and the subcontract price amount;
(4) DBE Participation Commitment Statements, form SBE 2025, signed by the bidder and each participating DBE firm documenting the commitment to use the DBE subcontractors whose participation is submitted to meet the contract goal;
(5) If the bidder is a joint venture comprised of DBE companies and non-DBE companies, the plan must also include a clear identification of the portion of the work to be performed by the DBE partner(s); and,
(6) If the contract goal is not met, evidence of good faith efforts.

GOOD FAITH EFFORT PROCEDURES. The contract will not be awarded until the Utilization Plan submitted by the apparent successful bidder is approved. All information submitted by the bidder must be complete, accurate and adequately document that enough DBE participation has been obtained or document the good faith efforts of the bidder, in the event enough DBE participation has not been obtained, before the Department will commit to the performance of the contract by the bidder. The Utilization Plan will be approved by the Department if the Utilization Plan documents sufficient commercially useful DBE work performance to meet the contract goal or the bidder submits sufficient documentation of a good faith effort to meet the contract goal pursuant to 49 CFR part 26, Appendix A. The Utilization Plan will not be approved by the Department if the Utilization Plan does not document sufficient DBE participation to meet the contract goal unless the apparent successful bidder documented in the Utilization Plan that it made a good faith effort to meet the goal. This means that the bidder must show that all necessary and reasonable steps were taken to achieve the contract goal. Necessary and reasonable steps are those which, by their scope, intensity and appropriateness to the objective, could reasonably be expected to obtain sufficient DBE participation, even if they were not successful. The Department will consider the quality, quantity, and intensity of the kinds of efforts that the bidder has made. Mere *pro forma* efforts, in other words, efforts done as a matter of form, are not good faith efforts; rather, the bidder is expected to have taken genuine efforts that would be reasonably expected of a bidder actively and aggressively trying to obtain DBE participation sufficient to meet the contract goal.

(a) The following is a list of types of action that the Department will consider as part of the evaluation of the bidder's good faith efforts to obtain participation. These listed factors are not intended to be a mandatory checklist and are not intended to be exhaustive. Other factors or efforts brought to the attention of the Department may be relevant in appropriate cases, and will be considered by the Department.

(1) Soliciting through all reasonable and available means (e.g. attendance at pre-bid meetings, advertising and/or written notices) the interest of all certified DBE companies that have the capability to perform the work of the contract.

The bidder must solicit this interest within sufficient time to allow the DBE companies to respond to the solicitation. The bidder must determine with certainty if the DBE companies are interested by taking appropriate steps to follow up initial solicitations.

(2) Selecting portions of the work to be performed by DBE companies in order to increase the likelihood that the DBE goals will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate DBE participation, even when the prime Contractor might otherwise prefer to perform these work items with its own forces.

(3) Providing interested DBE companies with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.

(4) a. Negotiating in good faith with interested DBE companies. It is the bidder's responsibility to make a portion of the work available to DBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DBE subcontractors and suppliers, so as to facilitate DBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of DBE companies that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for DBE companies to perform the work.

b. A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including DBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using DBE companies is not in itself sufficient reason for a bidder's failure to meet the contract DBE goal, as long as such costs are reasonable. Also, the ability or desire of a bidder to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Bidders are not, however, required to accept higher quotes from DBE companies if the price difference is excessive or unreasonable.

(5) Not rejecting DBE companies as being unqualified without sound reasons based on a thorough investigation of their capabilities. The bidder's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. non-union employee status) are not legitimate causes for the rejection or non-solicitation of bids in the bidder's efforts to meet the project goal.

(6) Making efforts to assist interested DBE companies in obtaining bonding, lines of credit, or insurance as required by the recipient or Contractor.

(7) Making efforts to assist interested DBE companies in obtaining necessary equipment, supplies, materials, or related assistance or services.

(8) Effectively using the services of available minority/women community organizations; minority/women contractors' groups; local, state, and federal minority/women business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of DBE companies.

(b) If the Department determines that the apparent successful bidder has made a good faith effort to secure the work commitment of DBE companies to meet the contract goal, the Department will award the contract provided that it is otherwise eligible for award. If the Department determines that the bidder has failed to meet the requirements of this Special Provision or that a good faith effort has not been made, the Department will notify the responsible company official designated in the Utilization Plan that the bid is not responsive. The notification shall include a statement of reasons for the determination.

(c) The bidder may request administrative reconsideration of a determination adverse to the bidder within the five working days after receipt of the notification date of the determination by delivering the request to the Department of Transportation, Bureau of Small Business Enterprises, Contract Compliance Section, 2300 South Dirksen Parkway, Room 319, Springfield, Illinois 62764 (Telefax: (217)785-1524). Deposit of the request in the United States mail on or before the fifth business day shall not be deemed delivery. The determination shall become final if a request is not made and delivered. A request may provide additional written documentation and/or argument concerning the issues raised in the determination statement of reasons, provided the documentation and arguments address efforts made prior to submitting the bid. The request will be forwarded to the Department's Reconsideration Officer. The Reconsideration Officer will extend an opportunity to the bidder to meet in person in order to consider all issues of documentation and whether the bidder made a good faith effort to meet the goal. After the review by the Reconsideration Officer, the bidder will be sent a written decision within ten working days after receipt of the request for reconsideration, explaining the basis for finding that the bidder did or did not meet the goal or make adequate good faith efforts to do so. A final decision by the Reconsideration Officer that a good faith effort was made shall approve the Utilization Plan submitted by the bidder and shall clear the contract for award. A final decision that a good faith effort was not made shall render the bid not responsive.

CALCULATING DBE PARTICIPATION. The Utilization Plan values represent work anticipated to be performed and paid for upon satisfactory completion. The Department is only able to count toward the achievement of the overall goal and the contract goal the value of payments made for the work actually performed by DBE companies. In addition, a DBE must perform a commercially useful function on the contract to be counted. A commercially useful function is generally performed when the DBE is responsible for the work and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. The Department and Contractor are governed by the provisions of 49 CFR part 26.55(c) on questions of commercially useful functions as it affects the work. Specific counting guidelines are provided in 49 CFR part 26.55, the provisions of which govern over the summary contained herein.

(a) DBE as the Contractor: 100 percent goal credit for that portion of the work performed by the DBE's own forces, including the cost of materials and supplies. Work that a DBE subcontracts to a non-DBE does not count toward the DBE goals.

(b) DBE as a joint venture Contractor: 100 percent goal credit for that portion of the total dollar value of the contract equal to the distinct, clearly defined portion of the work performed by the DBE's own forces.

(c) DBE as a subcontractor: 100 percent goal credit for the work of the subcontract performed by the DBE's own forces, including the cost of materials and supplies, excluding the purchase of materials and supplies or the lease of equipment by the DBE subcontractor from the prime Contractor or its affiliates. Work that a DBE subcontractor in turn subcontracts to a non-DBE does not count toward the DBE goal.

(d) DBE as a trucker: 100 percent goal credit for trucking participation provided the DBE is responsible for the management and supervision of the entire trucking operation for which it is responsible. At least one truck owned, operated, licensed, and insured by the DBE must be used on the contact. Credit will be given for the following:

(1) The DBE may lease trucks from another DBE firm, including an owner-operator who is certified as a DBE. The DBE who leases trucks from another DBE receives credit for the total value of the transportation services the lessee DBE provides on the contract.

(2) The DBE may also lease trucks from a non-DBE firm, including from an owner-operator. The DBE who leases trucks from a non-DBE is entitled to credit only for the fee or commission it receives as a result of the lease arrangement.

(e) DBE as a material supplier:

(1) 60 percent goal credit for the cost of the materials or supplies purchased from a DBE regular dealer.
(2) 100 percent goal credit for the cost of materials or supplies obtained from a DBE manufacturer.
(3) 100 percent credit for the value of reasonable fees and commissions for the procurement of materials and supplies if not a regular dealer or manufacturer.

CONTRACT COMPLIANCE. Compliance with this Special Provision is an essential part of the contract. The Department is prohibited by federal regulations from crediting the participation of a DBE included in the Utilization Plan toward either the contract goal or the Department's overall goal until the amount to be applied toward the goals has been paid to the DBE. The following administrative procedures and remedies govern the compliance by the Contractor with the contractual obligations established by the Utilization Plan. After approval of the Utilization Plan and award of the contract, the Utilization Plan and individual DBE Participation Statements become part of the contract. If the Contractor did not succeed in obtaining enough DBE participation to achieve the advertised contract goal, and the Utilization Plan was approved and contract awarded based upon a determination of good faith, the total dollar value of DBE work calculated in the approved Utilization Plan as a percentage of the awarded contract value shall become the amended contract goal.

(a) No amendment to the Utilization Plan may be made without prior written approval from the Department's Bureau of Small Business Enterprises. All requests for amendment to the Utilization Plan shall be submitted to the Department of Transportation, Bureau of Small Business Enterprises, Contract Compliance Section, 2300 South Dirksen Parkway, Room 319, Springfield, Illinois 62764. Telephone number (217) 785-4611. Telefax number (217) 785-1524.

(b) The Contractor must notify and obtain written approval from the Department's Bureau of Small Business Enterprises prior to replacing a DBE or making any change in the participation of a DBE.

Approval for replacement will be granted only if it is demonstrated that the DBE is unable or unwilling to perform. The Contractor must make every good faith effort to find another certified DBE subcontractor to substitute for the original DBE. The good faith efforts shall be directed at finding another DBE to perform at least the same amount of work under the contract as the original DBE, to the extent needed to meet the contract goal.

(c) Any deviation from the DBE condition-of-award or contract specifications must be approved, in writing, by the Department. The Contractor shall notify affected DBEs in writing of any changes in the scope of work which result in a reduction in the dollar amount condition-of-award to the contract.

(d) In addition to the above requirements for reductions in the condition of award, additional requirements apply to the two cases of Contractor-initiated work substitution proposals. Where the contract allows alternate work methods which serve to delete or create underruns in condition of award DBE work, and the Contractor selects that alternate method or, where the Contractor proposes a substitute work method or material that serves to diminish or delete work committed to a DBE and replace it with other work, then the Contractor must demonstrate one of the following:

(1) That the replacement work will be performed by the same DBE (as long as the DBE is certified in the respective item of work) in a modification of the condition of award; or
(2) That the DBE is aware that its work will be deleted or will experience underruns and has agreed in writing to the change. If this occurs, the Contractor shall substitute other work of equivalent value to a certified DBE or provide documentation of good faith efforts to do so; or
(3) That the DBE is not capable of performing the replacement work or has declined to perform the work at a reasonably competitive price. If this occurs, the Contractor shall substitute other work of equivalent value to a certified DBE or provide documentation of good faith efforts to do so.

(e) Where the revision includes work committed to a new DBE subcontractor, not previously involved in the project, then a Request for Approval of Subcontractor, Department form BC 260A, must be signed and submitted.

(f) If the commitment of work is in the form of additional tasks assigned to an existing subcontract, than a new Request for Approval of Subcontractor shall not be required. However, the Contractor must document efforts to assure that the existing DBE subcontractor is capable of performing the additional work and has agreed in writing to the change.

(g) All work indicated for performance by an approved DBE shall be performed, managed, and supervised by the DBE executing the Participation Statement. The Contractor shall not terminate for convenience a DBE listed in the Utilization Plan and then perform the work of the terminated DBE with its own forces, those of an affiliate or those of another subcontractor, whether DBE or not, without first obtaining the written consent of the Bureau of Small Business Enterprises to amend the Utilization Plan. The Contractor shall notify the Bureau of Small Business Enterprises of any termination for reasons other than convenience, and shall obtain approval for inclusion of the substitute DBE in the Utilization Plan.

If good faith efforts following a termination of a DBE for cause are not successful, the Contractor shall contact the Bureau of Small Business Enterprises and provide a full accounting of the efforts undertaken to obtain substitute DBE participation. The Bureau of Small Business Enterprises will evaluate the good faith efforts in light of all circumstances surrounding the performance status of the contract, and determine whether the contract goal should be amended.

(h) The Contractor shall maintain a record of payments for work performed to the DBE participants. The records shall be made available to the Department for inspection upon request. After the performance of the final item of work or delivery of material by a DBE and final payment therefore to the DBE by the Contractor, but not later than thirty calendar days after payment has been made by the Department to the Contractor for such work or material, the Contractor shall submit a DBE Payment Agreement on Department form SBE 2115 to the Regional Engineer. If full and final payment has not been made to the DBE, the DBE Payment Agreement shall indicate whether a disagreement as to the payment required exists between the Contractor and the DBE or if the Contractor believes that the work has not been satisfactorily completed. If the Contractor does not have the full amount of work indicated in the Utilization Plan performed by the DBE companies indicated in the Utilization Plan and after good faith efforts are reviewed, the Department may deduct from contract payments to the Contractor the amount of the goal not achieved as liquidated and ascertained damages. The Contractor may request an administrative reconsideration of any amount deducted as damages pursuant to subsection (j) of this part.

(i) The Department reserves the right to withhold payment to the Contractor to enforce the provisions of this Special Provision. Final payment shall not be made on the contract until such time as the Contractor submits sufficient documentation demonstrating achievement of the goal in accordance with this Special Provision or after liquidated damages have been determined and collected.

(j) Notwithstanding any other provision of the contract, including but not limited to Article 109.09 of the Standard Specifications, the Contractor may request administrative reconsideration of a decision to deduct the amount of the goal not achieved as liquidated damages. A request to reconsider shall be delivered to the Contract Compliance Section and shall be handled and considered in the same manner as set forth in paragraph (c) of "Good Faith Effort Procedures" of this Special Provision, except a final decision that a good faith effort was not made during contract performance to achieve the goal agreed to in the Utilization Plan shall be the final administrative decision of the Department.

ENGINEER'S FIELD OFFICE TYPE A (BDE)
Effective: April 1, 2007 Revised: January 1, 2011

Revise Article 670.02 of the Standard Specifications to read:

"**670.02 Engineer's Field Office Type A.** Type A field offices shall have a minimum ceiling height of 7 ft (2 m) and a minimum floor space 450 sq ft (42 sq m). The office shall be provided with sufficient heat, natural and artificial light, and air conditioning.

The office shall have an electronic security system that will respond to any breach of exterior doors and windows.

Doors and windows shall be equipped with locks. Doors shall also be equipped with dead bolt locks or other secondary locking device.

Windows shall be equipped with exterior screens to allow adequate ventilation. All windows shall be equipped with interior shades, curtains, or blinds. Adequate all-weather parking space shall be available to accommodate a minimum of ten vehicles.

Suitable on-site sanitary facilities meeting Federal, State, and local health department requirements shall be provided, maintained clean and in good working condition, and shall be stocked with lavatory and sanitary supplies at all times.

Sanitary facilities shall include hot and cold potable running water, lavatory and toilet as an integral part of the office where available. Solid waste disposal consisting of two waste baskets and an outside trash container of sufficient size to accommodate a weekly provided pick-up service.

In addition, the following furniture and equipment shall be furnished.

(a) Four desks with minimum working surface 42 x 30 in. (1.1 m x 750 mm) each and five non-folding chairs with upholstered seats and backs.

(b) One desk with minimum working surface 48 x 72 in. (1.2 x 1.8 m) with height adjustment of 23 to 30 in. (585 to 750 mm).

(c) One four-post drafting table with minimum top size of 37 1/2 x 48 in. (950 mm x 1.2 m). The top shall be basswood or equivalent and capable of being tilted through an angle of 50 degrees. An adjustable height drafting stool with upholstered seat and back shall also be provided.

(d) Two free standing four drawer legal size file cabinet with lock and an underwriters' laboratories insulated file device 350 degrees one hour rating.

(e) One 6 ft (1.8 m) folding table with six folding chairs.

(f) One equipment cabinet of minimum inside dimension of 44 in. (1100 mm) high x 24 in. (600 mm) wide x 30 in. (750 mm) deep with lock. The walls shall be of steel with a 3/32 in. (2 mm) minimum thickness with concealed hinges and enclosed lock constructed in such a manner as to prevent entry by force. The cabinet assembly shall be permanently attached to a structural element of the field office in a manner to prevent theft of the entire cabinet.

(g) One refrigerator with a minimum size of 16 cu ft (0.45 cu m) with a freezer unit.

(h) One electric desk type tape printing calculator.

(i) A minimum of two communication paths. The configuration shall include:

(1) Internet Connection. An internet service connection using telephone DSL, cable broadband, or CDMA wireless technology. Additionally, an 802.11g/N wireless router shall be provided, which will allow connection by the Engineer and up to four Department staff.

(2) Telephone Lines. Three separate telephone lines.

(j) One plain paper copy machine capable of reproducing prints up to 11 x 17 in. (280 x 432 mm) with an automatic feed tray capable of storing 30 sheets of paper. Letter size and 11 x 17 in. (280 x 432 mm) paper shall be provided.

(k) One plain paper fax machine with paper.

(l) Two telephones, with touch tone, where available, and a digital telephone answering machine, for exclusive use by the Engineer.

(m) One electric water cooler dispenser.

(n) One first-aid cabinet fully equipped.

(o) One microwave oven, 1 cu ft (0.03 cu m) minimum capacity.

(p) One fire-proof safe, 0.5 cu ft (0.01 cu m) minimum capacity.

(q) One electric paper shredder.

(r) One post mounted rain gauge, located on the project site for each 5 miles (8 km) of project length."

Revise the first sentence of the first paragraph of Article 670.07 of the Standard Specifications to read:

"The building or buildings fully equipped as specified will be paid for on a monthly basis until the building or buildings are released by the Engineer."

Revise the last sentence of the first paragraph of Article 670.07 of the Standard Specifications to read:

"This price shall include all utility costs and shall reflect the salvage value of the building or buildings, equipment, and furniture which become the property of the Contractor after release by the Engineer, except that the Department will pay that portion of the monthly long distance and monthly local telephone bills that, when combined, exceed $150."

EQUIPMENT RENTAL RATES (BDE)
Effective: August 2, 2007 Revised: January 2, 2008

Replace the second and third paragraphs of Article 105.07(b)(4)a. of the Standard Specifications with the following:

"Equipment idled which cannot be used on other work, and which is authorized to standby on the project site by the Engineer, will be paid for according to Article 109.04(b)(4)."

Replace Article 109.04(b)(4) of the Standard Specifications with the following:

"(4) Equipment. Equipment used for extra work shall be authorized by the Engineer. The equipment shall be specifically described, be of suitable size and capacity for the work to be performed, and be in good operating condition. For such equipment, the Contractor will be paid as follows.

a. Contractor Owned Equipment. Contractor owned equipment will be paid for by the hour using the applicable FHWA hourly rate from the "Equipment Watch Rental Rate Blue Book" (Blue Book) in effect when the force account work begins. The FHWA hourly rate is calculated as follows.

FHWA hourly rate = (monthly rate/176) x (model year adj.) x (Illinois adj.) + EOC

Where: EOC = Estimated Operating Costs per hour (from the Blue Book)

The time allowed will be the actual time the equipment is operating on the extra work. For the time required to move the equipment to and from the site of the extra work and any authorized idle (standby) time, payment will be made at the following hourly rate: 0.5 x (FHWA hourly rate - EOC).

All time allowed shall fall within the working hours authorized for the extra work.

The rates above include the cost of fuel, oil, lubrication, supplies, small tools, necessary attachments, repairs, overhaul and maintenance of any kind, depreciation, storage, overhead, profits, insurance, and all incidentals. The rates do not include labor.

The Contractor shall submit to the Engineer sufficient information for each piece of equipment and its attachments to enable the Engineer to determine the proper equipment category. If a rate is not established in the Blue Book for a particular piece of equipment, the Engineer will establish a rate for that piece of equipment that is consistent with its cost and use in the industry.

b. Rented Equipment. Whenever it is necessary for the Contractor to rent equipment to perform extra work, the rental and transportation costs of the equipment plus five percent for overhead will be paid. In no case shall the rental rates exceed those of established distributors or equipment rental agencies.

All prices shall be agreed to in writing before the equipment is used."

FRICTION AGGREGATE (BDE)
Effective: January 1, 2011

Revise Article 1004.01(a)(4) of the Standard Specifications to read:

"(4) Crushed Stone. Crushed stone shall be the angular fragments resulting from crushing undisturbed, consolidated deposits of rock by mechanical means. Crushed stone shall be divided into the following, when specified.

a. Carbonate Crushed Stone. Carbonate crushed stone shall be either dolomite or limestone.

Dolomite shall contain 11.0 percent or more magnesium oxide (MgO). Limestone shall contain less than 11.0 percent magnesium oxide (MgO).

b. Crystalline Crushed Stone. Crystalline crushed stone shall be either metamorphic or igneous stone, including but is not limited to, quartzite, granite, rhyolite and diabase."

Revise Article 1004.03(a) of the Standard Specifications to read:

"**1004.03 Coarse Aggregate for Hot-Mix Asphalt (HMA).** The aggregate shall be according to Article 1004.01 and the following.

(a) Description. The coarse aggregate for HMA shall be according to the following table.

Use	Mixture	Aggregates Allowed
Class A	Seal or Cover	Allowed Alone or in Combination: Gravel Crushed Gravel Carbonate Crushed Stone Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag Crushed Concrete
HMA All Other	Stabilized Subbase or Shoulders	Allowed Alone or in Combination: Gravel Crushed Gravel Carbonate Crushed Stone Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag[1/] Crushed Concrete
HMA High ESAL Low ESAL	Binder IL-25.0, IL-19.0, or IL-19.0L SMA Binder	Allowed Alone or in Combination: Crushed Gravel Carbonate Crushed Stone[2/] Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Concrete[3/]
HMA High ESAL Low ESAL	C Surface and Leveling Binder IL-12.5,IL-9.5, or IL-9.5L SMA Ndesign 50 Surface	Allowed Alone or in Combination: Crushed Gravel Carbonate Crushed Stone[2/] Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag[4/] Crushed Concrete[3/]

<table>
<tr><th>Use</th><th>Mixture</th><th>Aggregates Allowed</th></tr>
<tr><td rowspan="5">HMA
High ESAL</td><td rowspan="5">D Surface and Leveling Binder
IL-12.5 or
IL-9.5

SMA
Ndesign 50
Surface</td><td colspan="2"><u>Allowed Alone or in Combination:</u>

Crushed Gravel
Carbonate Crushed Stone (other than Limestone)[2/]
Crystalline Crushed Stone
Crushed Sandstone
Crushed Slag (ACBF)[5/]
Crushed Steel Slag[4/ 5/]
Crushed Concrete[3/]</td></tr>
<tr><td colspan="2"><u>Other Combinations Allowed:</u></td></tr>
<tr><td>Up to...</td><td>With...</td></tr>
<tr><td>25% Limestone</td><td>Dolomite</td></tr>
<tr><td>50% Limestone</td><td>Any Mixture D aggregate other than Dolomite</td></tr>
<tr><td>75% Limestone</td><td>Crushed Slag (ACBF)[5/] or Crushed Sandstone</td></tr>
<tr><td rowspan="6">HMA
High ESAL</td><td rowspan="6">E Surface
IL-12.5 or
IL-9.5

SMA
Ndesign 80
Surface</td><td colspan="2"><u>Allowed Alone or in Combination:</u>

Crushed Gravel
Crystalline Crushed Stone
Crushed Sandstone
Crushed Slag (ACBF)[5/]
Crushed Steel Slag[5/]
Crushed Concrete[3/]

No Limestone.</td></tr>
<tr><td colspan="2"><u>Other Combinations Allowed:</u></td></tr>
<tr><td>Up to...</td><td>With...</td></tr>
<tr><td>50% Dolomite[2/]</td><td>Any Mixture E aggregate</td></tr>
<tr><td>75% Dolomite[2/]</td><td>Crushed Sandstone, Crushed Slag (ACBF)[5/], Crushed Steel Slag[5/], or Crystalline Crushed Stone</td></tr>
<tr><td>75% Crushed Gravel or Crushed Concrete[3/]</td><td>Crushed Sandstone, Crystalline Crushed Stone, Crushed Slag (ACBF)[5/], or Crushed Steel Slag[5/]</td></tr>
<tr><td>HMA
High ESAL</td><td>F Surface
IL-12.5 or
IL-9.5

SMA
Ndesign 80
Surface</td><td colspan="2"><u>Allowed Alone or in Combination:</u>

Crystalline Crushed Stone
Crushed Sandstone
Crushed Slag (ACBF)[5/]
Crushed Steel Slag[5/]
No Limestone.</td></tr>
</table>

		Other Combinations Allowed:	
		Up to...	*With...*
		50% Crushed Gravel, Crushed Concrete[3/], or Dolomite[2/]	Crushed Sandstone, Crushed Slag (ACBF)[5/], Crushed Steel Slag[5/], or Crystalline Crushed Stone

1/ Crushed steel slag allowed in shoulder surface only.
2/ Carbonate crushed stone shall not be used in SMA Ndesign 80. In SMA Ndesign 50, carbonate crushed stone shall not be blended with any of the other aggregates allowed alone in Ndesign 50 SMA binder or Ndesign 50 SMA surface.
3/ Crushed concrete will not be permitted in SMA mixes.
4/ Crushed steel slag shall not be used as leveling binder.
5/ When either slag is used, the blend percentages listed shall be by volume."

HOT-MIX ASPHALT – ANTI-STRIPPING ADDITIVE (BDE)
Effective: November 1, 2009

Revise the first and second paragraphs of Article 1030.04(c) of the Standard Specifications to read:

"(c) Determination of Need for Anti-Stripping Additive. The mixture designer shall determine if an additive is needed in the mix to prevent stripping. The determination will be made on the basis of tests performed according to Illinois Modified AASHTO T 283. To be considered acceptable by the Department as a mixture not susceptible to stripping, the conditioned to unconditioned split tensile strength ratio (TSR) shall be equal to or greater than 0.85 for 6 in. (150 mm) specimens. Mixtures, either with or without an additive, with TSRs less than 0.85 for 6 in. (150 mm) specimens will be considered unacceptable. Also, the conditioned tensile strength for mixtures containing an anti-strip additive shall not be lower than the original conditioned tensile strength determined for the same mixture without the anti-strip additive.

If it is determined that an additive is required, the additive may be hydrated lime, slaked quicklime, or a liquid additive, at the Contractor's option."

HOT-MIX ASPHALT - DENSITY TESTING OF LONGITUDINAL JOINTS (BDE)
Effective: January 1, 2010

Description. This work shall consist of testing the density of longitudinal joints as part of the quality control/quality assurance (QC/QA) of hot-mix asphalt (HMA). Work shall be according to Section 1030 of the Standard Specifications except as follows.

Quality Control/Quality Assurance (QC/QA). Delete the second and third sentence of the third paragraph of Article 1030.05(d)(3) of the Standard Specifications.

Add the following paragraphs to the end of Article 1030.05(d)(3) of the Standard Specifications:

"Longitudinal joint density testing shall be performed at each random density test location.

Longitudinal joint testing shall be located at a distance equal to the lift thickness or a minimum of 2 in. (50 mm), from each pavement edge. (i.e. for a 4 in. (100 mm) lift the near edge of the density gauge or core barrel shall be within 4 in. (100 mm) from the edge of pavement.) Longitudinal joint density testing shall be performed using either a correlated nuclear gauge or cores.

a. Confined Edge. Each confined edge density shall be represented by a one-minute nuclear density reading or a core density and shall be included in the average of density readings or core densities taken across the mat which represents the Individual Test.

b. Unconfined Edge. Each unconfined edge joint density shall be represented by an average of three one-minute density readings or a single core density at the given density test location and shall meet the density requirements specified herein. The three one-minute readings shall be spaced ten feet apart longitudinally along the unconfined pavement edge and centered at the random density test location."

Revise the Density Control Limits table in Article 1030.05(d)(4) of the Standard Specifications to read:

"Mixture Composition	Parameter	Individual Test (includes confined edges)	Unconfined Edge Joint Density Minimum
IL-9.5, IL-12.5	Ndesign ≥ 90	92.0 – 96.0%	90.0%
IL-9.5,IL-9.5L, IL-12.5	Ndesign < 90	92.5 – 97.4%	90.0%
IL-19.0, IL-25.0	Ndesign ≥ 90	93.0 – 96.0%	90.0%
IL-19.0, IL-19.0L, IL-25.0	Ndesign < 90	93.0 – 97.4%	90.0%
SMA	Ndesign = 50 & 80	93.5 – 97.4%	91.0%
All Other	Ndesign = 30	93.0 - 97.4%	90.0%"

HOT-MIX ASPHALT – DROP-OFFS (BDE)
Effective: January 1, 2010

Revise the third paragraph of Article 701.07 of the Standard Specifications to read:

"At locations where construction operations result in a differential in elevation exceeding 3 in. (75 mm) between the edge of pavement or edge of shoulder within 3 ft (900 mm) of the edge of the pavement and the earth or aggregate shoulders, Type I or II barricades or vertical panels shall be placed at 100 ft (30 m) centers on roadways where the posted speed limit is 45 mph or greater and at 50 ft (15 m) centers on roadways where the posted speed limit is less than 45 mph."

LIQUIDATED DAMAGES (BDE)
Effective: April 1, 2009 Revised: April 1, 2011

Revise the table in Article 108.09 of the Standard Specifications to read:

"Schedule of Deductions for Each Day of Overrun in Contract Time			
Original Contract Amount		Daily Charges	
From More Than	To and Including	Calendar Day	Work Day
$ 0	$ 100,000	$ 475	$ 675
100,000	500,000	750	1,050
500,000	1,000,000	1,025	1,425
1,000,000	3,000,000	1,275	1,725
3,000,000	6,000,000	1,425	2,000
6,000,000	12,000,000	2,300	3,450
12,000,000	And over	5,800	8,125"

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM / EROSION AND SEDIMENT CONTROL DEFICIENCY DEDUCTION (BDE)

Effective: April 1, 2007 Revised: November 1, 2009

Revise Article 105.03(a) of the Standard Specifications to read:

"(a) National Pollutant Discharge Elimination System (NPDES) / Erosion and Sediment Control Deficiency Deduction When the Engineer is notified or determines an erosion and/or sediment control deficiency(s) exists, or the Contractor's activities represents a violation of the Department's NPDES permits, the Engineer will notify and direct the Contractor to correct the deficiency within a specified time. The specified time, which begins upon notification to the Contractor, will be from 1/2 hour to 1 week based on the urgency of the situation and the nature of the work effort required. The Engineer will be the sole judge.

A deficiency may be any lack of repair, maintenance, or implementation of erosion and/or sediment control devices included in the contract, or any failure to comply with the conditions of the Department's NPDES permits. A deficiency may also be applied to situations where corrective action is not an option such as the failure to participate in a jobsite inspection of the project, failure to install required measures prior to initiating earth moving operations, disregard of concrete washout requirements, or other disregard of the NPDES permit.

If the Contractor fails to correct a deficiency within the specified time, a daily monetary deduction will be imposed for each calendar day or portion of a calendar day until the deficiency is corrected to the satisfaction of the Engineer. The calendar day(s) will begin with notification to the Contractor and end with the Engineer's acceptance of the correction. The base value of the daily monetary deduction is $1000.00 and will be applied to each location for which a deficiency exists. The value of the deficiency deduction assessed for each infraction will be determined by multiplying the base value by a Gravity Adjustment Factor provided in Table A. Except for failure to participate in a required jobsite inspection of the project prior to initiating earthmoving operations which will be based on the total acreage of planned disturbance at the following multipliers: <5 Acres: 1; 5-10 Acres: 2; >10-25 Acres: 3; >25 Acres: 5. For those deficiencies where corrective action was not an option, the monetary deduction will be immediate and will be valued at one calendar day multiplied by a Gravity Adjustment Factor.

Table A Deficiency Deduction Gravity Adjustment Factors				
Types of Violations	Soil Disturbed and Not Permanently Stabilized At Time of Violation			
	< 5 Acres	5 - 10 Acres	>10 - 25 Acres	> 25 Acres
Failure to Install or Properly Maintain BMP	0.1 - 0.5	0.2 - 1.0	0.5 - 2.5	1.0 - 5
Careless Destruction of BMP	0.2 - 1	0.5 - 2.5	1.0 - 5.	1.0 - 5
Intrusion into Protected Resource	1.0 - 5	1.0 - 5	2.0 - 10	2.0 - 10
Failure to properly manage Chemicals, Concrete Washouts or Residuals, Litter or other Wastes	0.2 - 1	0.2 - 1	0.5 - 2.5	1.0 - 5
Improper Vehicle and Equipment Maintenance, Fueling or Cleaning	0.1 - 0.5	0.2 - 1	0.2 - 1	0.5 - 2.5
Failure to Provide or Update Written or Graphic Plans Required by SWPPP	0.2 - 1	0.5 - 2.5	1.0 - 5	1.0 - 5
Failure to comply with Other Provisions of the NPDES Permit	0.1 - 0.5	0.2 - 1	0.2 - 1	0.5 - 2.5”

PAYMENTS TO SUBCONTRACTORS (BDE)
Effective: June 1, 2000 Revised: January 1, 2006

Federal regulations found at 49 CFR §26.29 mandate the Department to establish a contract clause to require Contractors to pay subcontractors for satisfactory performance of their subcontracts and to set the time for such payments.

State law also addresses the timing of payments to be made to subcontractors and material suppliers. Section 7 of the Prompt Payment Act, 30 ILCS 540/7, requires that when a Contractor receives any payment from the Department, the Contractor shall make corresponding, proportional payments to each subcontractor and material supplier performing work or supplying material within 15 calendar days after receipt of the Department payment. Section 7 of the Act further provides that interest in the amount of two percent per month, in addition to the payment due, shall be paid to any subcontractor or material supplier by the Contractor if the payment required by the Act is withheld or delayed without reasonable cause. The Act also provides that the time for payment required and the calculation of any interest due applies to transactions between subcontractors and lower-tier subcontractors and material suppliers throughout the contracting chain.

This Special Provision establishes the required federal contract clause, and adopts the 15 calendar day requirement of the State Prompt Payment Act for purposes of compliance with the federal regulation regarding payments to subcontractors. This contract is subject to the following payment obligations.

When progress payments are made to the Contractor according to Article 109.07 of the Standard Specifications, the Contractor shall make a corresponding payment to each subcontractor and material supplier in proportion to the work satisfactorily completed by each subcontractor and for the material supplied to perform any work of the contract. The proportionate amount of partial payment due to each subcontractor and material supplier throughout the contracting chain shall be determined by the quantities measured or otherwise determined as eligible for payment by the Department and included in the progress payment to the Contractor.

Subcontractors and material suppliers shall be paid by the Contractor within 15 calendar days after the receipt of payment from the Department. The Contractor shall not hold retainage from the subcontractors. These obligations shall also apply to any payments made by subcontractors and material suppliers to their subcontractors and material suppliers; and to all payments made to lower tier subcontractors and material suppliers throughout the contracting chain. Any payment or portion of a payment subject to this provision may only be withheld from the subcontractor or material supplier to whom it is due for reasonable cause.

This Special Provision does not create any rights in favor of any subcontractor or material supplier against the State or authorize any cause of action against the State on account of any payment, nonpayment, delayed payment, or interest claimed by application of the State Prompt Payment Act. The Department will not approve any delay or postponement of the 15 day requirement except for reasonable cause shown after notice and hearing pursuant to Section 7(b) of the State Prompt Payment Act. State law creates other and additional remedies available to any subcontractor or material supplier, regardless of tier, who has not been paid for work properly performed or material furnished. These remedies are a lien against public funds set forth in Section 23(c) of the Mechanics Lien Act, 770 ILCS 60/23(c), and a recovery on the Contractor's payment bond according to the Public Construction Bond Act, 30 ILCS 550.

POST MOUNTING OF SIGNS (BDE)
Effective: January 1, 2011

Revise the second paragraph of Article 701.14 of the Standard Specifications to read:

"Post mounted signs shall be a breakaway design. The sign shall be within five degrees of vertical. Two posts shall be used for signs greater than 16 sq ft (1.5 sq m) in area or where the height between the sign and the ground exceeds 7 ft (2.1 m)."

SUBCONTRACTOR MOBILIZATION PAYMENTS (BDE)
Effective: April 2, 2005 Revised: April 1, 2011

To account for the preparatory work and operations necessary for the movement of subcontractor personnel, equipment, supplies, and incidentals to the project site and for all other work or operations that must be performed or costs incurred when beginning work approved for subcontracting according to Article 108.01 of the Standard Specifications, the Contractor shall make a mobilization payment to each subcontractor.

This mobilization payment shall be made at least 14 days prior to the subcontractor starting work. The amount paid shall be equal to 3 percent of the amount of the subcontract reported on form BC 260A submitted for the approval of the subcontractor's work.

The mobilization payment to the subcontractor is an advance payment of the reported amount of the subcontract and is not a payment in addition to the amount of the subcontract; therefore, the amount of the advance payment will be deducted from future progress payments.

This provision shall be incorporated directly or by reference into each subcontract approved by the Department.

TRUCK MOUNTED/TRAILER MOUNTED ATTENUATORS (BDE)
Effective: January 1, 2010

Revise Article 701.03(k) of the Standard Specifications to read:

"(k) Truck Mounted/Trailer Mounted Attenuators ..... 1106.02"

Revise Article 701.15(h) of the Standard Specifications to read:

"(h) Truck Mounted/Trailer Mounted Attenuators (TMA). TMA units shall have a roll ahead distance in the event of an impact. The TMA shall be between 100 and 200 ft (30 and 60 m) behind the vehicle ahead or the workers. This distance may be extended by the Engineer.

TMA host vehicles shall have the parking brake engaged when stationary.

The driver and passengers of the TMA host vehicle should exit the vehicle if the TMA is to remain stationary for 15 minutes or more in duration."

Revise Article 1106.02(g) of the Standard Specifications to read:

"(g) Truck Mounted/Trailer Mounted Attenuators. The attenuator shall be a NCHRP 350 approved unit for Test Level 3. Test Level 2 may be used as directed by the Engineer for normal posted speeds less than or equal to 45 mph."

UTILITY COORDINATION AND CONFLICTS (BDE)
Effective: April 1, 2011

Revise Article 105.07 of the Standard Specifications to read:

"**105.07 Cooperation with Utilities.** The Department reserves the right at any time to allow work by utilities on or near the work covered by the contract. The Contractor shall conduct his/her work so as not to interfere with or hinder the progress or completion of the work being performed by utilities. The Contractor shall also arrange the work and shall place and dispose of the materials being used so as not to interfere with the operations of utility work in the area.

The Contractor shall cooperate with the owners of utilities in their removal and rearrangement operations so work may progress in a reasonable manner, duplication or rearrangement of work may be reduced to a minimum, and services rendered by those parties will not be unnecessarily interrupted.

The Contractor shall coordinate with any planned utility adjustment or new installation and the Contractor shall take all precautions to prevent disturbance or damage to utility facilities. Any failure on the part of the utility owner, or their representative, to proceed with any planned utility adjustment or new installation shall be reported promptly by the Contractor to the Engineer."

Revise the first sentence of the last paragraph of Article 107.19 of the Standard Specifications to read:

"When the Contractor encounters unexpected regulated substances due to the presence of utilities in unanticipated locations, the provisions of Article 107.40 shall apply; otherwise, if the Engineer does not direct a resumption of operations, the provisions of Article 108.07 shall apply."

Revise Article107.31 of the Standard Specification to read:

"**107.31 Reserved.**"

Add the following four Articles to Section 107 of the Standard Specifications:

"**107.37 Locations of Utilities within the Project Limits.** All known utilities existing within the limits of construction are either indicated on the plans or visible above ground. For the purpose of this Article, the limits of proposed construction are defined as follows:

(a) Limits of Proposed Construction for Utilities Paralleling the Roadway.

(1) The horizontal limits shall be a vertical plane, outside of, parallel to, and 2 ft (600 mm) distant at right angles from the plan or revised slope limits.

In cases where the limits of excavation for structures are not shown on the plans, the horizontal limits shall be a vertical plane 4 ft (1.2 m) outside the edges of structure footings or the structure where no footings are required.

(2) The upper vertical limits shall be the regulations governing the roadbed clearance for the specific utility involved.

(3) The lower vertical limits shall be either the top of the utility at the depth below the proposed grade as prescribed by the governing agency or the limits of excavation, whichever is less.

(b) Limits of Proposed Construction for Utilities Crossing the Roadway in a Generally Transverse Direction.

(1) Utilities crossing excavations for structures that are normally made by trenching such as sewers, underdrains, etc. and all minor structures such as manholes, inlets, foundations for signs, foundations for traffic signals, etc., the limits shall be the space to be occupied by the proposed permanent construction, unless otherwise required by the regulations governing the specific utility involved.

(2) For utilities crossing the proposed site of major structures such as bridges, sign trusses, etc., the limits shall be as defined above for utilities extending in the same general direction as the roadway.

It is understood and agreed that the Contractor has considered in the bid all of the permanent and temporary utilities in their present and/or adjusted positions as indicated in the contract. It is further understood the actual location of the utilities may be located anywhere within the tolerances provided in 220 ILCS 50/2.8 or Administrative Code Title 92 Part 530.40(c), and the proximity of some utilities to construction may require extraordinary measures by the Contractor to protect those utilities.

No additional compensation will be allowed for any delays, inconveniences, or damages sustained by the Contractor due to the presence of or any claimed interference from known utility facilities or any adjustment of them, except as specifically provided in the contract.

107.38 Adjustments of Utilities within the Project Limits. The adjustment of utilities consists of the relocation, removal, replacement, rearrangements, reconstruction, improvement, disconnection, connection, shifting, new installation, or altering of an existing utility facility in any manner.

Utilities which are to be adjusted shall be adjusted by the utility owner or the owner's representative or by the Contractor as a contract item. Generally, arrangements for adjusting known utilities will be made by the Department prior to project construction; however, utilities will not necessarily be adjusted in advance of project construction and, in some cases, utilities will not be removed from the proposed construction limits as described in Article 107.37. When utility adjustments must be performed in conjunction with construction, the utility adjustment work will be indicated in the contract.

The Contractor may make arrangements for adjustment of utilities indicated in the contract, but not scheduled by the Department for adjustment, provided the Contractor furnishes the Department with a signed agreement with the utility owner covering the adjustments to be made. The cost of any such adjustments shall be the responsibility of the Contractor.

107.39 Contractor's Responsibility for Locating and Protecting Utility Property and Services. At points where the Contractor's operations are adjacent to properties or facilities of utility 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.

Within the State of Illinois, a State-Wide One Call Notice System has been established for notifying utilities. Outside the city limits of the City of Chicago, the system is known as the Joint Utility Locating Information for Excavators (JULIE) System. Within the city limits of the City of Chicago the system is known as DIGGER. All utility companies and municipalities which have buried utility facilities in the State of Illinois are a part of this system.

The Contractor shall call JULIE (800-892-0123) or DIGGER (312-744-7000), a minimum of 48 hours in advance of work being done in the area, and they will notify all member utility companies involved their respective utility should be located.

For utilities which are not members of JULIE or DIGGER, the Contractor shall contact the owners directly. The plan general notes will indicate which utilities are not members of JULIE or DIGGER.

The following table indicates the color of markings required of the State-Wide One Call Notification System.

Utility Service	Color
Electric Power, Distribution and Transmission	Safety Red
Municipal Electric Systems	Safety Red
Gas Distribution and Transmission	High Visibility Safety Yellow
Oil Distribution and Transmission	High Visibility Safety Yellow

Telephone and Telegraph System	Safety Alert Orange
Community Antenna Television Systems	Safety Alert Orange
Water Systems	Safety Precaution Blue
Sewer Systems	Safety Green
Non-Potable Water and Slurry Lines	Safety Purple
Temporary Survey	Safety Pink
Proposed Excavation	Safety White (Black when snow is on the ground)

The State-Wide One Call Notification System will provide for horizontal locations of utilities. When it is determined that the vertical location of the utility is necessary to facilitate construction, the Engineer may make the request for location from the utility after receipt of notice from the Contractor. If the utility owner does not field locate their facilities to the satisfaction of the Engineer, the Engineer will authorize the Contractor in writing to proceed to locate the facilities in the most economical and reasonable manner, subject to the approval of the Engineer, and be paid according to Article 109.04.

The Contractor shall be responsible for maintaining the excavations or markers provided by the utility owners.

The Contractor shall take all necessary precautions for the protection of the utility facilities. The Contractor shall be responsible for any damage or destruction of utility facilities resulting from neglect, misconduct, or omission in the Contractor's manner or method of execution or nonexecution of the work, or caused by defective work or the use of unsatisfactory materials. Whenever any damage or destruction of a utility facility occurs as a result of work performed by the Contractor, the utility company will be immediately notified. The utility company will make arrangements to restore such facility to a condition equal to that existing before any such damage or destruction was done.

In the event of interruption of 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 the said authority in the restoration of service. If water service is interrupted, repair work shall be continuous until the service is restored. No work shall be undertaken around fire hydrants until provisions for continued service have been approved by the local fire authority.

107.40 Conflicts with Utilities. Except as provided hereinafter, the discovery of a utility in an unanticipated location will be evaluated according to Article 104.03. It is understood and agreed that the Contractor has considered in the bid all facilities not meeting the definition of a utility in an unanticipated location and no additional compensation will be allowed for any delays, inconveniences, or damages sustained by the Contractor due to the presence of or any claimed interference from such facilities.

When the Contractor discovers a utility in an unanticipated location, the Contractor shall not interfere with said utility, shall take proper precautions to prevent damage or interruption of the utility, and shall promptly notify the Engineer of the nature and location of said utility.

(a) Definition. A utility in an unanticipated location is defined as an active or inactive utility, which is either:

(1) Located underground and (a) not shown in any way in any location on the contract documents; (b) not identified in writing by the Department to the Contractor prior to the letting; or (c) not located relative to the location shown in the contract within the tolerances provided in 220 ILCS 50/2.8 or Administrative Code Title 92 Part 530.40(c); or

(2) Located above ground or underground and not relocated as provided in the contract.

Service connections shall not be considered to be utilities in unanticipated locations.

(b) Compensation. Compensation will not be allowed for delays, inconveniences, or damages sustained by the Contractor from conflicts with facilities not meeting the above definition; or if a conflict with a utility in an unanticipated location does not cause a shutdown of the work applicable to the utility or a documentable reduction in the rate of progress exceeding the limits set herein. The provisions of Article 104.03 notwithstanding, compensation for delays caused by a utility in an unanticipated location will be paid according to the provisions of this Article governing minor and major delays or reduced rate of production which are defined as follows:

(1) Minor Delay. A minor delay occurs when the Contractor's operation is completely stopped by a utility in an unanticipated location for more than two hours, but not to exceed three weeks.

(2) Major Delay. A major delay occurs when the Contractor's operation is completely stopped by a utility in an unanticipated location for more than three weeks.

(3) Reduced Rate of Production Delay. A reduced rate of production delay occurs when the contractor's rate of production decreases by more than 25 percent and lasts longer than seven days.

(c) Payment. Payment for Minor, Major and Reduced Rate of Production Delays will be made as follows.

(1) Minor Delay. Labor idled which cannot be used on other work will be paid for according to Article 109.04(b)(1) and (2) for the time between start of the delay and the minimum remaining hours in the work shift required by the prevailing practice in the area.

Equipment idled which cannot be used on other work will be paid for according to Article 109.04(b)(4). The length of time paid for will be the time between start of delay and eight hours working time from start of shift being worked.

For delays exceeding the initial shift, excluding Saturdays, Sundays, and holidays, Contractor-owned equipment idled by the delay which cannot be used on other work and remaining at the work site, will be paid at one-half the rate permitted in Article 109.04(b)(4) using a maximum eight hours per day for computation purposes. Equipment rented from an independent source will be paid at rates being paid by the Contractor plus move-in move-out costs, but the total amount paid will not exceed three weeks rental.

(2) Major Delay. Labor will be the same as for a minor delay.

Equipment will be the same as for a minor delay, except Contractor-owned equipment will be limited to three weeks plus the cost of move-out to either the Contractor's yard or another job, whichever is less. Rental equipment may be paid for longer than three weeks provided the Contractor presents adequate support to the Department (including lease agreement) to show retaining equipment on the job is the most economical course to follow and in the public interest.

(3) Reduced Rate of Production Delay. The Contractor will be compensated for the reduced productivity for labor and equipment time in excess of the 25 percent threshold for that portion of the delay in excess of seven days. Determination of compensation will be in accordance with Article 104.02, except labor and material additives will not be permitted.

Whether covered by (1), (2) or (3) above, additional traffic control required as a result of the operation(s) delayed will be paid for according to Article 109.04 for the total length of the delay.

If the delay is clearly shown to have caused work, which would have otherwise been completed, to be done after material or labor costs have increased, such increases may be paid. Payment for materials will be limited to increased cost substantiated by documentation furnished by the Contractor. Payment for increased labor rates will include those items in Article 109.04(b)(1) and (2), except the 35 percent and ten percent additives will not be permitted. On a working day contract, a delay occurring between November 30 and May 1, when work has not started, will not be considered as eligible for payment of measured labor and material costs.

Project overhead (not including interest) will be allowed when all progress on the contract has been delayed, and will be calculated as 15 percent of the delay claim.

(d) Other Obligations of Contractor. Upon payment of a claim under this provision, the Contractor shall assign subrogation rights to the Department for the Department's efforts of recovery from any other party for monies paid by the Department as a result of any claim under this Provision. The Contractor shall fully cooperate with the Department in its efforts to recover from another party any money paid to the Contractor for delay damages under this Provision."

STEEL COST ADJUSTMENT (BDE) (RETURN FORM WITH BID)
Effective: April 2, 2004 Revised: April 1, 2009

Description. Steel cost adjustments will be made to provide additional compensation to the Contractor, or a credit to the Department, for fluctuations in steel prices when optioned by the Contractor. The bidder shall indicate on the attached form whether or not this special provision will be part of the contract and submit the completed form with his/her bid. Failure to submit the form or failure to indicate contract number, company name, and sign and date the form shall make this contract exempt of steel cost adjustments for all items of steel. Failure to indicate "Yes" for any item of work will make that item of steel exempt from steel cost adjustment.

Types of Steel Products. An adjustment will be made for fluctuations in the cost of steel used in the manufacture of the following items:

Metal Piling (excluding temporary sheet piling)
Structural Steel
Reinforcing Steel

Other steel materials such as dowel bars, tie bars, mesh reinforcement, guardrail, steel traffic signal and light poles, towers and mast arms, metal railings (excluding wire fence), and frames and grates will be subject to a steel cost adjustment when the pay items they are used in has a contract value of $10,000 or greater.

Documentation. Sufficient documentation shall be furnished to the Engineer to verify the following:

(a) The dates and quantity of steel, in lb (kg), shipped from the mill to the fabricator.

(b) The quantity of steel, in lb (kg), incorporated into the various items of work covered by this special provision. The Department reserves the right to verify submitted quantities.

Method of Adjustment. Steel cost adjustments will be computed as follows:

SCA = Q X D

Where: SCA = steel cost adjustment, in dollars
Q = quantity of steel incorporated into the work, in lb (kg)
D = price factor, in dollars per lb (kg)

$D = MPI_M - MPI_L$

Where: MPI_M = The Materials Cost Index for steel as published by the Engineering News-Record for the month the steel is shipped from the mill. The indices will be converted from dollars per 100 lb to dollars per lb (kg).

MPI_L = The Materials Cost Index for steel as published by the Engineering News-Record for the month prior to the letting. The indices will be converted from dollars per 100 lb to dollars per lb (kg).

The unit weights (masses) of steel that will be used to calculate the steel cost adjustment for the various items are shown in the attached table.

No steel cost adjustment will be made for any products manufactured from steel having a mill shipping date prior to the letting date.

If the Contractor fails to provide the required documentation, the method of adjustment will be calculated as described above; however, the MPI_M will be based on the date the steel arrives at the job site. In this case, an adjustment will only be made when there is a decrease in steel costs.

Basis of Payment. Steel cost adjustments may be positive or negative but will only be made when there is a difference between the MPI_L and MPI_M in excess of five percent, as calculated by:

$$\text{Percent Difference} = \{(MPI_L - MPI_M) \div MPI_L\} \times 100$$

Steel cost adjustments will be calculated by the Engineer and will be paid or deducted when all other contract requirements for the items of work are satisfied. Adjustments will only be made for fluctuations in the cost of the steel as described herein. No adjustment will be made for changes in the cost of manufacturing, fabrication, shipping, storage, etc.

The adjustments shall not apply during contract time subject to liquidated damages for completion of the entire contract.

Attachment

Item	Unit Mass (Weight)
Metal Piling (excluding temporary sheet piling)	
Furnishing Metal Pile Shells 12 in. (305 mm), 0.179 in. (3.80 mm) wall thickness)	23 lb/ft (34 kg/m)
Furnishing Metal Pile Shells 12 in. (305 mm), 0.250 in. (6.35 mm) wall thickness)	32 lb/ft (48 kg/m)
Furnishing Metal Pile Shells 14 in. (356 mm), 0.250 in. (6.35 mm) wall thickness)	37 lb/ft (55 kg/m)
Other piling	See plans
Structural Steel	See plans for weights (masses)
Reinforcing Steel	See plans for weights (masses)
Dowel Bars and Tie Bars	6 lb (3 kg) each
Mesh Reinforcement	63 lb/100 sq ft (310 kg/sq m)
Guardrail	
Steel Plate Beam Guardrail, Type A w/steel posts	20 lb/ft (30 kg/m)
Steel Plate Beam Guardrail, Type B w/steel posts	30 lb/ft (45 kg/m)
Steel Plate Beam Guardrail, Types A and B w/wood posts	8 lb/ft (12 kg/m)
Steel Plate Beam Guardrail, Type 2	305 lb (140 kg) each
Steel Plate Beam Guardrail, Type 6	1260 lb (570 kg) each
Traffic Barrier Terminal, Type 1 Special (Tangent)	730 lb (330 kg) each
Traffic Barrier Terminal, Type 1 Special (Flared)	410 lb (185 kg) each
Steel Traffic Signal and Light Poles, Towers and Mast Arms	
Traffic Signal Post	11 lb/ft (16 kg/m)
Light Pole, Tenon Mount and Twin Mount, 30 - 40 ft (9 – 12 m)	14 lb/ft (21 kg/m)
Light Pole, Tenon Mount and Twin Mount, 45 - 55 ft (13.5 – 16.5 m)	21 lb/ft (31 kg/m)
Light Pole w/Mast Arm, 30 - 50 ft (9 – 15.2 m)	13 lb/ft (19 kg/m)
Light Pole w/Mast Arm, 55 - 60 ft (16.5 – 18 m)	19 lb/ft (28 kg/m)
Light Tower w/Luminaire Mount, 80 - 110 ft (24 – 33.5 m)	31 lb/ft (46 kg/m)
Light Tower w/Luminaire Mount, 120 - 140 ft (36.5 – 42.5 m)	65 lb/ft (97 kg/m)
Light Tower w/Luminaire Mount, 150 - 160 ft (45.5 – 48.5 m)	80 lb/ft (119 kg/m)
Metal Railings (excluding wire fence)	
Steel Railing, Type SM	64 lb/ft (95 kg/m)
Steel Railing, Type S-1	39 lb/ft (58 kg/m)
Steel Railing, Type T-1	53 lb/ft (79 kg/m)
Steel Bridge Rail	52 lb/ft (77 kg/m)
Frames and Grates	
Frame	250 lb (115 kg)
Lids and Grates	150 lb (70 kg)

RETURN WITH BID

ILLINOIS DEPARTMENT OF TRANSPORTATION

OPTION FOR STEEL COST ADJUSTMENT

The bidder shall submit this completed form with his/her bid. Failure to submit the form or properly complete contract number, company name, and sign and date the form shall make this contract exempt of steel cost adjustments for all items of steel. Failure to indicate "Yes" for any item of work will make that item of steel exempt from steel cost adjustment. After award, this form, when submitted shall become part of the contract.

Contract No.: _____

Company Name:_____

Contractor's Option:

Is your company opting to include this special provision as part of the contract plans for the following items of work?

Metal Piling	Yes	☐
Structural Steel	Yes	☐
Reinforcing Steel	Yes	☐
Dowel Bars, Tie Bars and Mesh Reinforcement	Yes	☐
Guardrail	Yes	☐
Steel Traffic Signal and Light Poles, Towers and Mast Arms	Yes	☐
Metal Railings (excluding wire fence)	Yes	☐
Frames and Grates	Yes	☐

Signature: _____ **Date:** _____

REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONSTRUCTION CONTRACTS

ATTACHMENTS

I. GENERAL

1. These contract provisions shall apply to all word performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

2. Except as otherwise provided for in each section, the contractor shall insert in each subcontract all of the stipulations contained in these Required Contract Provisions, and further require their inclusion in any lower tier subcontract or purchase order that may in turn be made. The Required Contract Provisions shall not be incorporated by reference in any case. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with these Required Contract Provisions.

3. A breach of any of the stipulations contained in these Required Contract Provisions shall be sufficient grounds for termination of the contract.

4. A breach of the following clauses of the Required Contract Provisions may also be grounds for debarment as provided in 29 CFR 5.12:

Section I, paragraph 2;
Section IV, paragraphs 1, 2, 3, 4 and 7;
Section V, paragraphs 1 and 2a through 2g.

5. Disputes arising out of the labor standards provisions of Section IV (except paragraph 5) and Section V of these Required Contract Provisions shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the U.S. Department of Labor (DOL) as set forth in 29 CFR 5, 6 and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the DOL, or the contractor's employees or their representatives.

6. Selection of Labor: During the performance of this contract, the contractor shall not:

a. Discriminate against labor from any other State, possession, or territory of the United States (except for employment preference for Appalachian contracts, when applicable, as specified in Attachment A), or

b. Employ convict labor for any purpose within the limits of the project unless it is labor performed by convicts who are on parole, supervised release, or probation.

II. NONDISCRIMINATION

(Applicable to all Federal-aid construction contracts and to all related subcontracts of $10,000 or more.)

1. Equal Employment Opportunity: Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630 and 41 CFR 60 (and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The Equal Opportunity Construction Contract Specifications set forth under 41 CFR 60-4.3 and the provisions of the American Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the State highway agency (SHA) and the Federal Government in carrying out EEO obligations and in their review of his/her activities under the contract.

b. The contractor will accept as his operating policy the following statement: "It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: 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, preapprenticeship, and/or on-the-job-training."

2. EEO Officer: The contractor will designate and make known to the SHA contracting officers an EEO Officer who will have the responsibility for an must be capable of effectively administering and promoting an active contractor program of EEO and who must be assigned adequate authority and responsibility to do so.

3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minority group employees.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees,

applicants for employment and potential employees.
e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. Recruitment: When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minority groups in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employees referral sources likely to yield qualified minority group applicants. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish which such identified sources procedures whereby minority group applicants may be referred to the contractor for employment consideration.
b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, he is expected to observe the provisions of that agreement to the extent that the system permits the contractor's compliance with EEO contract provisions. (The DOL has held that where implementation of such agreements have the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Executive Order 11246, as amended.)
c. The contractor will encourage his present employees to refer minority group applicants for employment. Information and procedures with regard to referring minority group applicants will be discussed with employees.

5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.
b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.
c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.
d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with his obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of his avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minority group and women employees, and applicants for employment.
b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision.
c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.
d. The contractor will periodically review the training and promotion potential of minority group and women employees and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use his/her best efforts to obtain the cooperation of such unions to increase opportunities for minority groups and women within the unions, and to effect referrals by such unions of minority and female employees. Actions by the contractor either directly or through a contractor's association acting as agent will include the procedures set forth below:

a. The contractor will use best efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minority group members and women for membership in the unions and increasing the skills of minority group employees and women so that they may qualify for higher paying employment.
b. The contractor will use best efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.
c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the SHA and shall set forth what efforts have been made to obtain such information.
d. In the event the union is unable to provide the contractor with a reasonable flow of minority and women referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or quailifiable minority group persons and women. (The DOL has held that it shall be no excuse that the union with which the contractor has a collective bargaining agreement providing for exclusive referral failed to refer minority employees.) In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the SHA.

8. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment: The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment.

a. The contractor shall notify all potential subcontractors and suppliers of his/her EEO obligations under this contract.
b. Disadvantaged business enterprises (DBE), as defined in 49 CFR 23, shall have equal opportunity to compete for and perform subcontracts which the contractor enters into pursuant to this contract. The contractor will use his best efforts to solicit bids from
and to utilize DBE subcontractors or subcontractors with meaningful
minority group and female representation among their employees.
Contractors shall obtain lists of DBE construction firms from SHA

personnel.

c. The contractor will use his best efforts to ensure subcontractor compliance with their EEO obligations.

9. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall 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 SHA and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women;

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minority and female employees; and

(4) The progress and efforts being made in securing the services of DBE subcontractors or subcontractors with meaningful minority and female representation among their employees.

b. The contractors will submit an annual report to the SHA each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data.

III. NONSEGREGATED FACILITIES

(Applicable to all Federal-aid construction contracts and to all related subcontracts of $10,000 or more.)

a. By submission of this bid, the execution of this contract or subcontract, or the consummation of this material supply agreement or purchase order, as appropriate, the bidder, Federal-aid construction contractor, subcontractor, material supplier, or vendor, as appropriate, certifies that the firm does not maintain or provide for its employees any segregated facilities at any of its establishments, and that the firm does not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. The firm agrees that a breach of this certification is a violation of the EEO provisions of this contract. The firm further certifies that no employee will be denied access to adequate facilities on the basis of sex or disability.

b. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, timeclocks, 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, color, religion, national origin, age or disability, because of habit, local custom, or otherwise. The only exception will be for the disabled when the demands for accessibility override (e.g. disabled parking).

c. The contractor agrees that it has obtained or will obtain identical certification from proposed subcontractors or material suppliers prior to award of subcontracts or consummation of material supply agreements of $10,000 or more and that it will retain such certifications in its files.

IV. PAYMENT OF PREDETERMINED MINIMUM WAGE

(Applicable to all Federal-aid construction contracts exceeding $2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural minor collectors, which are exempt.)

1. General:

a. All mechanics and laborers employed or working upon the site of the work will be paid unconditionally and not less often than once a week and without subsequent deduction or rebate on any account [except such payroll deductions as are permitted by regulations (29 CFR 3) issued by the Secretary of Labor under the Copeland Act (40 U.S.C. 276c)] the full amounts of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment. The payment shall be computed at wage rates not less than those contained in the wage determination of the Secretary of Labor (hereinafter "the wage determination") which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor or its subcontractors and such laborers and mechanics. The wage determination (including any additional classifications and wage rates conformed under paragraph 2 of this Section IV and the DOL poster (WH-1321) or Form FHWA-1495) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers. For the purpose of this Section, contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act (40 U.S.C. 276a) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of Section IV, paragraph 3b, hereof. Also, for the purpose of this Section, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in paragraphs 4 and 5 of this Section IV.

b. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein, provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed.

c. All rulings and interpretations of the Davis-Bacon Act and related acts contained in 29 CFR 1, 3, and 5 are herein incorporated by reference in this contract.

2. Classification:

a. The SHA contracting officer shall require that any class of laborers or mechanics employed under the contract, which is not listed in the wage determination, shall be classified in conformance with the wage determination.

b. The contracting officer shall approve an additional classification, wage rate and fringe benefits only when the following criteria have been met:

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

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

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

(4) with respect to helpers, when such a classification prevails in the area in which the work is performed.

c. If the contractor or subcontractors, as appropriate, the laborers and mechanics (if known) to be employed in the additional classification or their representatives, and the

contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the DOL, Administrator of the Wage and Hour Division, Employment Standards Administration, Washington, D.C. 20210. The Wage and Hour Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

d. In the event the contractor or subcontractors, as appropriate, the laborers or mechanics to be employed in the additional classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the question, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. Said Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advised the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

e. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraph 2c or 2d of this Section IV shall be paid to all workers performing work in the additional classification from the first day on which work is performed in the classification.

3. Payment of Fringe Benefits:

a. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor or subcontractors, as appropriate, shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly case equivalent thereof.

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

4. Apprentices and Trainees (Programs of the U.S. DOL) and Helpers:

a. Apprentices:

(1) Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the DOL, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau, or if a person is employed in his/her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State apprenticeship agency (where appropriate) to be eligible for probationary employment as an apprentice.

(2) The allowable ratio of apprentices to journeyman-level employees on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate listed in the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor or subcontractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman-level hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

(3) Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator for the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

(4) In the event the Bureau of Apprenticeship and Training, or a State apprenticeship agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor or subcontractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the comparable work performed by regular employees until an acceptable program is approved.

b. Trainees:

(1) Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the DOL, Employment and Training Administration.

(2) The ratio of trainees to journeyman-level employees on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

(3) Every trainee must be paid at not less than the rate specified in the approved program for his/her level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman-level wage rate on the wage determination which provides for less than full fringe benefits for apprentices, in which cases such trainees shall receive the same fringe benefits as apprentices.

(4) In the event the Employment and Training Administration

withdraws approval of a training program, the contractor or subcontractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Helpers:

Helpers will be permitted to work on a project if the helper classification is specified and defined on the applicable wage determination or is approved pursuant to the conformance procedure set forth in Section IV. 2. Any worker listed on a payroll at a helper wage rate, who is not a helper under a approved definition, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed.

5. Apprentices and Trainees (Programs of the U.S. DOT):

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

6. Withholding:

The SHA shall upon its own action or upon written request of an authorized representative of the DOL withhold, or cause to be withheld, from the contractor or subcontractor under this contract or any other Federal contract with the same prime contractor or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements which is held by the same prime contractor, as much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainee's and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the SHA contracting officer may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

7. Overtime Requirements:

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers, mechanics, watchmen, or guards (including apprentices, trainees, and helpers described in paragraphs 4 and 5 above) shall require or permit any laborer, mechanic, watchman, or guard in any workweek in which he/she is employed on such work, to work in excess of 40 hours in such workweek unless such laborer, mechanic, watchman, or guard receives compensation at a rate not less than one-and-one-half times his/her basic rate of pay for all hours worked in excess of 40 hours in such workweek.

8. Violation:

Liability for Unpaid Wages; Liquidated Damages: In the event of any violation of the clause set forth in paragraph 7 above, the contractor and any subcontractor responsible thereof shall be liable to the affected employee for his/her unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer, mechanic, watchman, or guard employed in violation of the clause set forth in paragraph 7, in the sum of $10 for each calendar day on which such employee was required or permitted to work in excess of the standard work week of 40 hours without payment of the overtime wages required by the clause set forth in paragraph 7.

9. Withholding for Unpaid Wages and Liquidated Damages:

The SHA shall; upon its own action or upon written request of any authorized representative of the DOL withhold, or cause to be withheld, from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 8 above.

V. STATEMENTS AND PAYROLLS

(Applicable to all Federal-aid construction contracts exceeding $2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural collectors, which are exempt.)

1. Compliance with Copeland Regulations (29 CFR 3):

The contractor shall comply with the Copeland Regulations of the Secretary of Labor which are herein incorporated by reference.

2. Payrolls and Payroll Records:

a. Payrolls and basic records relating thereto shall be maintained by the contractor and each subcontractor during the course of the work and preserved for a period of 3 years from the date of completion of the contract for all laborers, mechanics, apprentices, trainees, watchmen, helpers, and guards working at the site of the work.

b. The payroll records shall contain the name, social security number, and address of each such employee; his or her correct classification; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalent thereof the types described in Section 1(b)(2)(B) of the Davis Bacon Act); daily and weekly number of hours worked; deductions made; and actual wages paid. In addition, for Appalachian contracts, the payroll records shall contain a notation indicating whether the employee does, or does not, normally reside in the labor area as defined in Attachment A, paragraph 1. Whenever the Secretary of Labor, pursuant to Section IV, paragraph 3b, has found that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis Bacon Act, the contractor and each subcontractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, that the plan or program has been communicated in writing to the laborers or mechanics affected, and show the cost anticipated or the actual cost incurred in providing benefits. Contractors or subcontractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprentices and trainees, and ratios and wage rates prescribed in the applicable programs.

c. Each contractor and subcontractor shall furnish, each week in which any contract work is performed, to the SHA resident engineer a payroll of wages paid each of its employees (including apprentices trainees, and helpers, described in Section IV, paragraphs 4 and 5, and watchmen and guards engaged on work during the preceding weekly payroll period). The payroll submitted shall set out accurately and completely

all of the information required to be maintained under paragraph 2b of this Section V. This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal stock number 029-005-0014-1), U.S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for submitting payroll copies of all subcontractors.

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

(1) that the payroll for the payroll period contains the information required to be maintained under paragraph 2b of this Section V and that such information is correct and complete;

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

(3) that each laborer or mechanic has been paid not less that the applicable wage rate and fringe benefits or cash equivalent for the classification of worked performed, as specified in the applicable wage determination incorporated into the contract.

e. The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 2d of this Section V.

f. The falsification of any of the above certifications may subject the contractor to civil or criminal prosecution under 18 U/S. C. 1001 and 31 U.S.C. 231.

g. The contractor or subcontractor shall make the records required under paragraph 2b of this Section V available for inspection, copying, or transcription by authorized representatives of the SHA, the FHWA, or the DOL, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the SHA, the FHWA, the DOL, or all may, after written notice to the contractor, sponsor, applicant, or owner, take such actions as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

VI. RECORD OF MATERIALS, SUPPLIES, AND LABOR

1. On all federal-aid contracts on the national highway system, except those which provide solely for the installation of protective devices at railroad grade crossings, those which are constructed on a force account or direct labor basis, highway beautification contracts, and contracts for which the total final construction cost for roadway and bridge is less than $1,000,000 (23 CFR 635) the contractor shall:

a. Become familiar with the list of specific materials and supplies contained in Form FHWA-47, "Statement of Materials and Labor Used by Contractor of Highway Construction Involving Federal Funds," prior to the commencement of work under this contract.

b. Maintain a record of the total cost of all materials and supplies purchased for and incorporated in the work, and also of the quantities of those specific materials and supplies listed on Form FHWA-47, and in the units shown on Form FHWA-47.

c. Furnish, upon the completion of the contract, to the SHA resident engineer on /Form FHWA-47 together with the data required in paragraph 1b relative to materials and supplies, a final labor summary of all contract work indicating the total hours worked and the total amount earned.

2. At the prime contractor's option, either a single report covering all contract work or separate reports for the contractor and for each subcontract shall be submitted.

VII. SUBLETTING OR ASSIGNING THE CONTRACT

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the State. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractors' own organization (23 CFR 635).

a. "Its own organization" shall be construed to include only workers employed and paid directly by the prime contractor and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor, assignee, or agent of the prime contractor.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph 1 of Section VII is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the SHA contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the SHA contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the SHA has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

VIII. SAFETY: ACCIDENT PREVENTION

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the SHA contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in

surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S. C. 333).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).

IX. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, the following notice shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

NOTICE TO ALL PERSONNEL ENGAGED ON FEDERAL-AID HIGHWAY PROJECTS

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined not more than $10,000 or imprisoned not more than 5 years or both."

X. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

(Applicable to all Federal-aid construction contracts and to all related subcontracts of $100,000 or more).

By submission of this bid or the execution of this contract, or subcontract, as appropriate, the bidder, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any facility that is or will be utilized in the performance of this contract, unless such contract is exempt under the Clean Air Act, as amended (42 U.S.C. 1857 et seq., as amended by Pub.L. 91-604), and under the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq., as amended by Pub.L. 92-500), Executive Order 11738, and regulations in implementation thereof (40 CFR 15) is not listed, on the date of contract award, on the U.S. Environmental Protection Agency (EPA) List of Violating Facilities pursuant to 40 CFR 15.20.

2. That the firm agrees to comply and remain in compliance with all the requirements of Section 114 of the Clean Air Act and Section 308 of the Federal Water Pollution Control Act and all regulations and guidelines listed thereunder.

3. That the firm shall promptly notify the SHA of the receipt of any communication from the Director, Office of Federal Activities, EPA indicating that a facility that is or will be utilized for the contract is under consideration to be listed on the EPA List of Violating Facilities.

4. That the firm agrees to include or cause to be included the requirements of paragraph 1 through 4 of this Section X in every nonexempt subcontract, and further agrees to take such action as the government may direct as a means of enforcing such requirements.

XI. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

1. Instructions for Certification - Primary Covered Transactions:

(Applicable to all Federal-aid contracts - 49 CFR 29)

a. By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.
b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.
c. The certification in this clause is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause of default.
d. The prospective primary participant shall provide immediate written notice to the department or agency to whom this proposal is submitted if any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
e. The terms "covered transaction," "debarred," "suspended," "ineligible,""lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the department or agency to which this proposal

is submitted for assistance in obtaining a copy of those regulations.

f. The prospective primary participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification in all lower tier covered transactions

and in all solicitations for lower tier covered transactions.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the nonprocurement portion of the "Lists of Parties Excluded from Federal Procurement or Nonprocurement Programs" (Nonprocurement List) which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph f of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

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Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Primary Covered Transactions

1. The prospective primary 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 agency;

b. Have not within a 3-year period preceding this proposal been convicted of or had a civil judgment rendered against them for 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 governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph 1b of this certification; and

d. Have not within a 3-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

2. Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

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2. Instructions for Certification - Lower Tier Covered Transactions:

(Applicable to all subcontracts, purchase orders and other lower tier transactions of $25,000 or more - 49 CFR 29)

a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "primary covered transaction," "participant," "person," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.

e. The prospective lower tie participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealing.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

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Certification Regarding Debarment, Suspension, Ineligibility And Voluntary Exclusion-Lower Tier Covered Transactions:

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

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XII. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

(Applicable to all Federal-aid construction contracts and to all related subcontracts which exceed $100,000 - 49 CFR 20)

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal 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.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. 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.

3. The prospective participant also agrees by submitting his or her bid or proposal that he or she shall require that the language of this certification be included in all lower tier subcontracts, which exceed $100,000 and that all such recipients shall certify and disclose accordingly.

MINIMUM WAGES FOR FEDERAL AND FEDERALLY ASSISTED CONSTRUCTION CONTRACTS

This project is funded, in part, with Federal-aid funds and, as such, is subject to the provisions of the Davis-Bacon Act of March 3, 1931, as amended (46 Sta. 1494, as amended, 40 U.S.C. 276a) and of other Federal statutes referred to in a 29 CFR Part 1, Appendix A, as well as such additional statutes as may from time to time be enacted containing provisions for the payment of wages determined to be prevailing by the Secretary of Labor in accordance with the Davis-Bacon Act and pursuant to the provisions of 29 CFR Part 1. The prevailing rates and fringe benefits shown in the General Wage Determination Decisions issued by the U.S. Department of Labor shall, in accordance with the provisions of the foregoing statutes, constitute the minimum wages payable on Federal and federally assisted construction projects to laborers and mechanics of the specified classes engaged on contract work of the character and in the localities described therein.

General Wage Determination Decisions, modifications and supersedes decisions thereto are to be used in accordance with the provisions of 29 CFR Parts 1 and 5. Accordingly, the applicable decision, together with any modifications issued, must be made a part of every contract for performance of the described work within the geographic area indicated as required by an applicable DBRA Federal prevailing wage law and 29 CFR Part 5. The wage rates and fringe benefits contained in the General Wage Determination Decision shall be the minimum paid by contractors and subcontractors to laborers and mechanics.

NOTICE

The most current **General Wage Determination Decisions** (wage rates) are available on the IDOT web site. They are located on the Letting and Bidding page at http://www.dot.state.il.us/desenv/delett.html.

In addition, ten (10) days prior to the letting, the applicable Federal wage rates will be e-mailed to subscribers. It is recommended that all contractors subscribe to the Federal Wage Rates List or the Contractor's Packet through IDOT's subscription service.

PLEASE NOTE: if you have already subscribed to the Contractor's Packet you will automatically receive the Federal Wage Rates.

The instructions for subscribing are at http://www.dot.state.il.us/desenv/subsc.html.

If you have any questions concerning the wage rates, please contact IDOT's Chief Contract Official at 217-782-7806.