CITY OF ANN ARBOR
INVITATION TO BID

Leslie Park Golf Course
Golf Cart Storage Building

ITB No.: 4446

Due Date: Wednesday, May 18, 2016 at 2:00pm (local time)

Community Services Area
Parks and Recreation Unit

Issued By:

City of Ann Arbor
Procurement Unit
301 E. Huron Street
Ann Arbor, MI 48104

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ATTACHMENTS

City of Ann Arbor Prevailing Wage Declaration Form
City of Ann Arbor Living Wage Forms
City of Ann Arbor Vendor Conflict of Interest Disclosure Form
City of Ann Arbor Non-Discrimination Ordinance Notice and Declaration Form

NOTICE OF PRE-BID CONFERENCE

A pre-bid conference for this project will be held on **Monday, May 9, 2016 at 9:00a.m.** at **Leslie Park Golf Course.**

Attendance at this conference is highly recommended. Administrative and technical questions regarding this project will be answered at this time. The pre-bid conference is for information only. Any answers furnished will not be official until verified in writing by the Financial Service Area, Procurement Unit. Answers that change or substantially clarify the bid will be affirmed in an addendum.

INSTRUCTIONS TO BIDDERS

General

Work to be done under this Contract is generally described through the detailed specifications and must be completed fully in accordance with the contract documents. All work to be done under this Contract is located in or near the City of Ann Arbor.

Any Bid which does not conform fully to these instructions may be rejected.

Preparation of Bids

Bids should be prepared providing a straight-forward, concise description of the Bidder's ability to meet the requirements of the ITB. Bids shall be written in ink or typewritten. No erasures are permitted. Mistakes may be crossed out and corrected and must be initialed and dated in ink by the person signing the Bid.

Bids must be submitted on the "Bid Forms" provided with each blank properly filled in. If forms are not fully completed it may disqualify the bid. No alternative bid will be considered unless alternative bids are specifically requested. If alternatives are requested, any deviation from the specification must be fully described, in detail on the "Alternate" section of Bid form.

Each person signing the Bid certifies that he/she is the person in the Bidder's firm/organization responsible for the decision as to the fees being offered in the Bid and has not and will not participated in any action contrary to the terms of this provision.

Questions or Clarification on ITB Specifications

All questions regarding this ITB shall be submitted via email. Emailed questions and inquires will be accepted from any and all prospective Bidders in accordance with the terms and conditions of the ITB.

All questions shall be due on or before **Wednesday, May 11, 2016 by 3:00 p.m.** and should be addressed as follows:

Specification/Scope of Work questions emailed to neil.wager@stantec.com
Bid Process and HR Compliance questions emailed to cspencer@a2gov.org

Any error, omissions or discrepancies in the specification discovered by a prospective contractor and/or service provider shall be brought to the attention of Amy Kuras, Park Planner at akuras@a2gov.org after discovery as possible. Further, the contractor and/or service provide shall not be allowed to take advantage of errors, omissions or discrepancies in the specifications.

Addenda

If it becomes necessary to revise any part of the ITB, notice of the Addendum will be posted to Michigan Inter-governmental Trade Network (MITN) www.mitn.info and/or City of Ann Arbor web site www.A2gov.org for all parties to download.

Each Bidder must in its Bid, to avoid any miscommunications, acknowledge all addenda which it has received, but the failure of a Bidder to receive, or acknowledge receipt of; any addenda

shall not relieve the Bidder of the responsibility for complying with the terms thereof.

The City will not be bound by oral responses to inquiries or written responses other than written addenda.

Bid Submission

All Bids are due and must be delivered to the City of Ann Arbor Procurement Unit on or before **Wednesday, May 18th by 2 p.m.** Bids submitted late or via oral, telephonic, telegraphic, electronic mail or facsimile **will not** be considered or accepted.

Each Bidder must submit one (1) original Bid and **two (2)** Bid copies in a sealed envelope clearly marked: **ITB No. 4446, Leslie Park Golf Course Cart Storage Building.**

Bids must be addressed and delivered to:

City of Ann Arbor
Procurement Unit,
c/o Customer Services, 1st Floor
301 East Huron Street
P.O. Box 8647
Ann Arbor, MI 48107

All Bids received on or before the Due Date will be publicly opened and recorded immediately. No immediate decisions are rendered.

The following forms provided within this ITB Document must be included in submitted bids.

- **City of Ann Arbor Prevailing Wage Declaration of Compliance**
- **City of Ann Arbor Living Wage Ordinance Declaration of Compliance**
- **Vendor Conflict of Interest Disclosure Form**
- **City of Ann Arbor Non-Discrimination Ordinance Declaration of Compliance**

Bids that fail to provide these completed forms listed above upon bid opening will be rejected as non-responsive and will not be considered for award.

Hand delivered bids will be date/time stamped/signed by the Procurement Unit at the address above in order to be considered. Normal business hours are 9:00 a.m. to 3:00 p.m. Monday through Friday, excluding Holidays. The City will not be liable to any Bidder for any unforeseen circumstances, delivery or postal delays. Postmarking to the Due Date will not substitute for receipt of the Bid. Each Bidder is responsible for submission of their Bid.

Additional time for submission of bids past the stated due date and time will not be granted to a single Bidder; however, additional time may be granted to all Bidders when the City determines in its sole discretion that circumstances warrant it.

Award

The City intends to award a Contract(s) to the lowest responsible Bidder(s). On multi-divisional contracts, separate divisions may be awarded to separate Bidders. The City may also utilize alternatives offered in the Bid Forms, if any, to determine the lowest responsible Bidder on each division, and award multiple divisions to a single Bidder, so that the lowest total cost is achieved for the City. For unit price bids, the Contract will be awarded based upon the unit prices and the lump sum prices stated by the bidder for the work items specified in the bid documents, with

consideration given to any alternates selected by the City. If the City determines that the unit price for any item is materially different for the work item bid than either other bidders or the general market, the City, in its sole discretion, in addition to any other right it may have, may reject the bid as not responsible or non-conforming.

The acceptability of major subcontractors will be considered in determining if a Bidder is responsible. In comparing Bids, the City will give consideration to alternate Bids for items listed in the bid forms. All key staff and subcontractors are subject to the approval by the City.

Official Documents

The City of Ann Arbor officially distributes bid documents from the Procurement Unit or through the Michigan Intergovernmental Trade Network (MITN). Copies of the bid documents obtained from any other source are not Official copies. Addenda and other bid information will only be posted to these official distribution sites. If you obtained City of Ann Arbor Bid documents from other sources, it is recommended that you register on www.MITN.info and obtain an official Bid.

Bid Security

Each bid must be accompanied by a certified check, or Bid Bond by a surety licensed and authorized to do business within the State of Michigan, in the amount of 5% of the total of the bid price.

Withdrawal of Bids

After the time of opening, no Bid may be withdrawn for the period of ninety (90) days.

Contract Time

Time is of the essence in the performance of the work under this Contract. The available time for work under this Contract is indicated on page C-2, Article III of the Contract. If these time requirements can not be met, the Bidder must stipulate on Bid Form Section 3 - Time Alternate its schedule for performance of the work. Consideration will be given to time in evaluating bids.

Liquidated Damages

A liquidated damages clause, as given on page C-2, Article III of the Contract, provides that the Contractor shall pay the City as liquidated damages, and not as a penalty, a sum certain per day for each and every day that the Contractor may be in default of completion of the specified work, within the time(s) stated in the Contract, or written extensions.

Liquidated damages clauses, as given in the General Conditions, provide further that the City shall be entitled to impose and recover liquidated damages for breach of the obligations under Chapter 112 of the City Code.

The liquidated damages are for the non-quantifiable aspects of any of the previously identified events and do not cover actual damages that can be shown or quantified nor are they intended to preclude recovery of actual damages in addition to the recovery of liquidated damages.

Human Rights Information

All contractors proposing to do business with the City shall satisfy the contract compliance

administrative policy adopted by the City Administrator in accordance with the Section 9:158 of the Ann Arbor City Code. Breach of the obligation not to discriminate as outlined in Section 5, beginning at page GC-3 shall be a material breach of the contract. Contractors are required to post a copy of Ann Arbor's Non-Discrimination Ordinance attached at all work locations where its employees provide services under a contract with the City.

Wage Requirements

Section 4, beginning at page GC-2, outlines the requirements for payment of prevailing wages and for payment of a "living wage" to employees providing service to the City under this contract. The successful bidder and its subcontractors must comply with all applicable requirements and provide documentary proof of compliance when requested.

For laborers whose wage level are subject to federal, state and/or local prevailing wage law the appropriate Davis-Bacon wage rate classification is identified based upon the work including within this contract. **The wage determination(s) current on the date 10 days before bids are due shall apply to this contract.** The U.S. Department of Labor (DOL) has provided explanations to assist with classification in the following resource link: www.wdol.gov

Conflict Of Interest Disclosure

The City of Ann Arbor Purchasing Policy requires that prospective Vendors complete a Conflict of Interest Disclosure form. A contract may not be awarded to the selected Vendor unless and until the Procurement Unit and the City Administrator have reviewed the Disclosure form and determined that no conflict exists under applicable federal, state, or local law or administrative regulation. Not every relationship or situation disclosed on the Disclosure Form may be a disqualifying conflict. Depending on applicable law and regulations, some contracts may awarded on the recommendation of the City Administrator after full disclosure, where such action is allowed by law, if demonstrated competitive pricing exists and/or it is determined the award is in the best interest of the City. A copy of the Vendor Conflict of Interest Disclosure Form is attached.

Major Subcontractors

The Bidder shall identify on Bid Form Section 4 each major subcontractor it expects to engage for this Contract if the work to be subcontracted is 15% or more of the bid sum or over $50,000, whichever is less. The Bidder also shall identify the work to be subcontracted to each major subcontractor. The Bidder shall not change or replace a subcontractor without approval by the City.

Debarment

Submission of a Bid in response to this ITB is certification that the Bidder is not currently debarred, suspended, proposed for debarment, and declared ineligible or voluntarily excluded from participation in this transaction by any State or Federal departments or agency. Submission is also agreement that the City will be notified of any changes in this status.

Disclosures

After bids are opened, all information in a submitter's bid is subjected to disclosure under the provisions of Michigan Public Act No. 442 of 1976, as amended (MCL 15.231 et seq.) known as

the “Freedom of Information Act.” The Freedom of Information Act also provides for the complete disclosure of contracts and attachments thereto except where specifically exempted.

Bid Protest

All Bid protests must be in writing and filed with the Purchasing Agent within five (5) business days of the award action. The bidder must clearly state the reasons for the protest. If a bidder contacts a City Service Area/Unit and indicates a desire to protest an award, the Service Area/Unit shall refer the bidder to the Purchasing Agent. The Purchasing Agent will provide the bidder with the appropriate instructions for filing the protest. The protest shall be reviewed by the City Administrator or designee whose decision shall be final.

Cost Liability

The City of Ann Arbor assumes no responsibility or liability for costs incurred by the Bidder prior to the execution of a contract with the City. By submitting a bid, a bidder agrees to bear all costs incurred or related to the preparation, submission and selection process for the bid.

Reservation of Rights

The City of Ann Arbor reserves the right to accept any bid or alternative bid proposed in whole or in part, to reject any or all bids or alternatives bids in whole or in part and to waive irregularity and/or informalities in any bid and to make the award in any manner deemed in the best interest of the City.

INVITATION TO BID

City of Ann Arbor
Guy C. Larcom Municipal Building
Ann Arbor, Michigan 48107

Ladies and Gentlemen:

The undersigned, as Bidder, declares that this Bid is made in good faith, without fraud or collusion with any person or persons bidding on the same Contract; that this Bidder has carefully read and examined the bid documents, including City Nondiscrimination requirements and Declaration of Compliance Form, Living Wage requirements and Declaration of Compliance Form, Prevailing Wage requirements and Declaration of Compliance Form, Vendor Conflict of Interest Form, Notice of Pre-Bid Conference, Instructions to Bidders, Bid, Bid Forms, Contract, Bond Forms, General Conditions, Standard Specifications, Detailed Specifications, all Addenda, and the Plans (if applicable) and understands them. The Bidder declares that it conducted a full investigation at the site and of the work proposed and is fully informed as to the nature of the work and the conditions relating to the work's performance. The Bidder also declares that it has extensive experience in successfully completing projects similar to this one.

The Bidder acknowledges that it has not received or relied upon any representations or warrants of any nature whatsoever from the City of Ann Arbor, its agents or employees, and that this Bid is based solely upon the Bidder's own independent business judgment.

The undersigned proposes to perform all work shown on the plans or described in the bid documents, including any addenda issued, and to furnish all necessary machinery, tools, apparatus, and other means of construction to do all the work, furnish all the materials, and complete the work in strict accordance with all terms of the Contract of which this Bid is one part.

In accordance with these bid documents, and Addenda numbered _____, the undersigned, as Bidder, proposes to perform at the sites in and/or around Ann Arbor, Michigan, all the work included herein for the amounts set forth in the Bid Forms.

The Bidder declares that it has become fully familiar with the liquidated damage clauses for completion times and for compliance with City Code Chapter 112, understands and agrees that the liquidated damages are for the non-quantifiable aspects of non-compliance and do not cover actual damages that may be shown and agrees that if awarded the Contract, all liquidated damage clauses form part of the Contract.

The Bidder declares that it has become fully familiar with the provisions of Chapter 14, Section 1:320 (Prevailing wages) and Chapter 23 (Living Wage) of the Code of the City of Ann Arbor and that it understands and agrees to comply, to the extent applicable to employees providing services to the City under this Contract, with the wage and reporting requirements stated in the City Code provisions cited. Bidder certifies that the statements contained in the City Prevailing Wage and Living Wage Declaration of Compliance Forms are true and correct. Bidder further agrees that the cited provisions of Chapter 14 and Chapter 23 form a part of this Contract.

The Bidder declares that it has become familiar with the City Conflict of Interest Disclosure Form and certifies that the statement contained therein is true and correct.

The Bidder encloses a certified check or Bid Bond in the amount of 5% of the total of the Bid Price. The Bidder agrees both to contract for the work and to furnish the necessary Bonds and insurance documentation within 10 days after being notified of the acceptance of the Bid.

If this Bid is accepted by the City and the Bidder fails to contract and furnish the required Bonds and insurance documentation within 10 days after being notified of the acceptance of this Bid, then the Bidder shall be considered to have abandoned the Contract and the certified check or Bid Bond accompanying this Bid shall become due and payable to the City.

If the Bidder enters into the Contract in accordance with this Bid, or if this Bid is rejected, then the accompanying check or Bid Bond shall be returned to the Bidder.

In submitting this Bid, it is understood that the right is reserved by the City to accept any Bid, to reject any or all Bids, to waive irregularities and/or informalities in any Bid, and to make the award in any manner the City believes to be in its best interest.

SIGNED THIS _____ DAY OF _____, 201_.

_____	_____
Bidder's Name	Authorized Signature of Bidder
_____	_____
Official Address	(Print Name of Signer Above)
_____	_____
Telephone Number	Email Address for Award Notice

LEGAL STATUS OF BIDDER

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

Bidder declares that it is:

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

NOTE: If not incorporated in Michigan, please attach the corporation's Certificate of Authority

* A limited liability company doing business under the laws of the State of _____, whom _____ bearing the title of _____ whose signature is affixed to this proposal, is authorized to execute contract on behalf of the LLC.

* A partnership, organized under the laws of the state of _____ and filed in the county of _____, whose members are (list all members and the street and mailing address of each) (attach separate sheet if necessary):

_____

_____

_____

_____

_____

* An individual, whose signature with address, is affixed to this Bid: _____ (initial here)

Authorized Official

_____ **Date** _____**,** 201_

(Print) Name _____ Title _____

Company: _____

Address: _____

Contact Phone ( ) _____ Fax ( ) _____

Email: _____

BID FORM

Section 1 – Schedule of Prices

Company: _____

Project: **Leslie Park Golf Course – Golf Cart Storage Building, ITB No.: 4446**

Unit Price Bid

Base Bid – Leslie Park Golf Course Golf Cart Storage Building					
Item No.	**Item Description**	**Qty**	**Unit**	**Unit Price**	**Total Price**
1	General Conditions, Insurance, Bonds, Mobilization Max. 5% of Bid	1	LS	$	$
2	Silt Fence/Erosion Control	1	LS	$	$
3	Site Demolition	1	LS	$	$
4	Foundation, and Slab Construction	1	LS	$	$
5	Golf Cart Storage Building Kit	1	LS	$	$
6	Golf Cart Storage Building Construction without Eave Lights	1	LS	$	$
7	6” Deep 23A Gravel Driveway	1	LS	$	$
8	Demobilization and Final Grading	1	LS	$	$
9	DTE Utility Upgrade Allowance	1	LS	$	$ 40,000.00
10	Construction Allowance	1	LS	$	$ 5,000.00
				TOTAL BID	$
Alternate Bid No. 1					
1	Water and Sanitary Service Extension	1	LS	$	$
				TOTAL BID	$
Alternate Bid No. 2					
1	Golf Cart Storage Building Kit w/ Eave Lights	1	LS	$	$
2	Golf Cart Storage Building Construction w/ Eave Lights	1	LS	$	$
				TOTAL BID	$

TOTAL BID AMOUNT (Base Bid and Alternate Bids) **$**_____

BID FORM

Section 2 - Material and Equipment Alternates

The Base Bid proposal price shall include materials and equipment selected from the designated items and manufacturers listed in the bidding documents. This is done to establish uniformity in bidding and to establish standards of quality for the items named.

If the Contractor wishes to quote alternate items for consideration by the City, it may do so under this Section. A complete description of the item and the proposed price differential must be provided. Unless approved at the time of award, substitutions where items are specifically named will be considered only as a negotiated change in Contract Sum.

Item Number	Description	Add/Deduct Amount

If the Bidder does not suggest any material or equipment alternate, the Bidder **MUST** complete the following statement:

For the work outlined in this request for bid, the bidder does NOT propose any material or equipment alternate under the Contract.

Signature of Authorized Representative of Bidder _____ Date _____

BID FORM

Section 3 - Time Alternate

If the Bidder takes exception to the time stipulated in Article III of the Contract, Time of Completion, page C-2, it is requested to stipulate below its proposed time for performance of the work. Consideration will be given to time in evaluating bids.

If the Bidder does not suggest any time alternate, the Bidder **MUST** complete the following statement:

For the work outlined in this request for bid, the bidder does NOT propose any time alternate under the Contract.

Signature of Authorized Representative of Bidder _____ Date _____

BID FORM

Section 4 - Major Subcontractors

For purposes of this Contract, a Subcontractor is anyone (other than the Contractor) who performs work (other than or in addition to the furnishing of materials, plans or equipment) at or about the construction site, directly or indirectly for or on behalf of the Contractor (and whether or not in privity of Contract with the Contractor), but shall not include any individual who furnishes merely the individual's own personal labor or services.

Contractor agrees that all subcontracts entered into by the Contractor shall contain similar wage provision to Section 4 of the General Conditions covering subcontractor's employees who perform work on this contract.

For the work outlined in these documents the Bidder expects to engage the following major subcontractors to perform the work identified:

Subcontractor (Name and Address)	Work	Amount
	Dewatering	
	Heavy Equipment Operator	
	Demolition	
	Rebar Installation	
	Electrical Work	
	Grading	

If the Bidder does not expect to engage any major subcontractor, the Bidder **MUST** complete the following statement:

For the work outlined in this request for bid, the bidder does NOT expect to engage any major subcontractor to perform work under the Contract.

Signature of Authorized Representative of Bidder_____ Date _____

BID FORM

Section 5 – References

Include a minimum of three (3) reference from similar project completed within the past five (5) years.

[Refer also to Instructions to Bidders for additional requirements, if any]

1) _____ _____ _____
Project Name Cost Date Constructed

_____ _____
Contact Name Phone Number

2) _____ _____ _____
Project Name Cost Date Constructed

_____ _____
Contact Name Phone Number

3) _____ _____ _____
Project Name Cost Date Constructed

_____ _____
Contact Name Phone Number

SAMPLE STANDARD CONTRACT

If a contract is awarded, the selected contractor will be required to adhere to a set of general contract provisions which will become a part of any formal agreement. These provisions are general principles which apply to all contractors of service to the City of Ann Arbor such as the following:

CONTRACT

THIS AGREEMENT is made on the _____ day of _____, 2015, between the CITY OF ANN ARBOR, a Michigan Municipal Corporation, 301 East Huron Street, Ann Arbor, Michigan 48104 ("City") and _____("Contractor")

_____

(An individual/partnership/corporation, include state of incorporation) (Address)

Based upon the mutual promises below, the Contractor and the City agree as follows:

ARTICLE I - Scope of Work

The Contractor agrees to furnish all of the materials, equipment and labor necessary; and to abide by all the duties and responsibilities applicable to it for the project titled "Leslie Park Golf Course Golf Cart Storage Building" in accordance with the requirements and provisions of the following documents, including all written modifications incorporated into any of the documents, which are incorporated as part of this Contract:

Non-discrimination and Living Wage
Declaration of Compliance Forms (if applicable)
Vendor Conflict of Interest Form
Prevailing Wage Declaration of Compliance Form (if applicable)
Bid Forms
Contract and Exhibits
Bonds
General Conditions
Standard Specifications
Detailed Specifications
Plans
Addenda

ARTICLE II - Definitions

Administering Service Area/Unit means **Community Services Area**

Project means **Leslie Park Golf Course Golf Cart Storage Building, ITB 4446**

ARTICLE III - Time of Completion

(A) The work to be completed under this Contract shall begin immediately on the date specified in the Notice to Proceed issued by the City.

(B) The entire work for this Contract shall be completed within one hundred eighty days (180) consecutive calendar days.

(C) Failure to complete all the work within the time specified above, including any extension granted in writing by the Supervising Professional, shall obligate the Contractor to pay the City, as liquidated damages and not as a penalty, an amount equal to $250.00 for each calendar day of delay in the completion of all

the work. If any liquidated damages are unpaid by the Contractor, the City shall be entitled to deduct these unpaid liquidated damages from the monies due the Contractor.

The liquidated damages are for the non-quantifiable aspects of any of the previously identified events and do not cover actual damages that can be shown or quantified nor are they intended to preclude recovery of actual damages in addition to the recovery of liquidated damages.

ARTICLE IV - The Contract Sum

(A) The City shall pay to the Contractor for the performance of the Contract, the unit prices as given in the Bid Form for the estimated bid total of:

_____Dollars ($_____)

(B) The amount paid shall be equitably adjusted to cover changes in the work ordered by the Supervising Professional but not required by the Contract Documents. Increases or decreases shall be determined only by written agreement between the City and Contractor.

ARTICLE V - Assignment

This Contract may not be assigned or subcontracted any portion of any right or obligation under this contract without the written consent of the City. Notwithstanding any consent by the City to any assignment, Contractor shall at all times remain bound to all warranties, certifications, indemnifications, promises and performances, however described, as are required of it under this contract unless specifically released from the requirement, in writing, by the City.

ARTICLE VI - Choice of Law

This Contract shall be construed, governed, and enforced in accordance with the laws of the State of Michigan. By executing this agreement, the Contractor and the City agree to venue in a court of appropriate jurisdiction sitting within Washtenaw County for purposes of any action arising under this Contract. The parties stipulate that the venue referenced in this Contract is for convenience and waive any claim of non-convenience.

Whenever possible, each provision of the Contract will be interpreted in a manner as to be effective and valid under applicable law. The prohibition or invalidity, under applicable law, of any provision will not invalidate the remainder of the Contract.

ARTICLE VII - Relationship of the Parties

The parties of the Contract agree that it is not a Contract of employment but is a Contract to accomplish a specific result. Contractor is an independent Contractor performing services for the City. Nothing contained in this Contract shall be deemed to constitute any other relationship between the City and the Contractor.

Contractor certifies that it has no personal or financial interest in the project other than the compensation it is to receive under the Contract. Contractor certifies that it is not, and shall not become, overdue or in default to the City for any Contract, debt, or any other obligation to the City including real or personal property taxes. City shall have the right to set off any such debt against compensation awarded for services under this agreement.

ARTICLE VIII - Notice

All notices given under this Contract shall be in writing, and shall be by personal delivery or by certified mail with return receipt requested to the parties at their respective addresses as specified in the Contract Documents or other address the Contractor may specify in writing. Notice will be deemed given on the date when one of the following first occur: (1) the date of actual receipt; or (2) three days after mailing certified U.S. mail.

ARTICLE IX - Indemnification

To the fullest extent permitted by law, Contractor shall indemnify, defend and hold harmless the City, its officers, employees and agents harmless from all suits, claims, judgments and expenses including attorney's fees resulting or alleged to result, in whole or in part, from any act or omission, which is in any way connected or associated with this Contract, by the Contractor or anyone acting on the Contractor's behalf under this Contract. Contractor shall not be responsible to indemnify the City for losses or damages caused by or resulting from the City's sole negligence. The provisions of this Article shall survive the expiration or earlier termination of this contract for any reason.

ARTICLE X - Entire Agreement

This Contract represents the entire understanding between the City and the Contractor and it supersedes all prior representations, negotiations, agreements, or understandings whether written or oral. Neither party has relied on any prior representations in entering into this Contract. No terms or conditions of either party's invoice, purchase order or other administrative document shall modify the terms and conditions of this Contract, regardless of the other party's failure to object to such form. This Contract shall be binding on and shall inure to the benefit of the parties to this Contract and their permitted successors and permitted assigns and nothing in this Contract, express or implied, is intended to or shall confer on any other person or entity any legal or equitable right, benefit, or remedy of any nature whatsoever under or by reason of this Contract. This Contract may be altered, amended or modified only by written amendment signed by the City and the Contractor.

FOR CONTRACTOR

By_____

Its:_____

FOR THE CITY OF ANN ARBOR

By_____
Christopher Taylor, Mayor

By_____
Jacqueline Beaudry, City Clerk

Approved as to substance

By_____
Tom Crawford
Interim City Administrator

By_____
Derek Delacourt
Community Services Area Administrator

Approved as to form and content

_____

Stephen K. Postema, City Attorney

PERFORMANCE BOND

(1) _____ of _____ (referred to as "Principal"), and _____, a corporation duly authorized to do business in the State of Michigan (referred to as "Surety"), are bound to the City of Ann Arbor, Michigan (referred to as "City"), for

$ _____, the payment of which Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, by this bond.

(2) The Principal has entered a written Contract with the City dated _____, 201_, for: _____ _____ and this bond is given for that Contract in compliance with Act No. 213 of the Michigan Public Acts of 1963, as amended, being MCL 129.201 et seq.

(3) Whenever the Principal is declared by the City to be in default under the Contract, the Surety may promptly remedy the default or shall promptly:

(a) complete the Contract in accordance with its terms and conditions; or

(b) obtain a bid or bids for submission to the City for completing the Contract in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible bidder, arrange for a Contract between such bidder and the City, and make available, as work progresses, sufficient funds to pay the cost of completion less the balance of the Contract price; but not exceeding, including other costs and damages for which Surety may be liable hereunder, the amount set forth in paragraph 1.

(4) Surety shall have no obligation to the City if the Principal fully and promptly performs under the Contract.

(5) Surety agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder, or the specifications accompanying it shall in any way affect its obligations on this bond, and waives notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the work, or to the specifications.

SIGNED AND SEALED this _____ day of _____, 201_.

_____	_____
(Name of Surety Company)	(Name of Principal)
By _____	By _____
(Signature)	(Signature)
Its _____	Its _____
(Title of Office)	(Title of Office)
Approved as to form:	Name and address of agent:
_____	_____
Stephen K. Postema, City Attorney	_____
	_____

LABOR AND MATERIAL BOND

(1) _____

of _____(referred to as "Principal"), and _____, a corporation duly authorized to do business in the State of Michigan, (referred to as "Surety"), are bound to the City of Ann Arbor, Michigan (referred to as "City"), for the use and benefit of claimants as defined in Act 213 of Michigan Public Acts of 1963, as amended, being MCL 129.201 et seq., in the amount of

$ _____, for the payment of which Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, by this bond.

(2) The Principal has entered a written Contract with the City, dated _____, 201_, for _____

_____; and this bond is given for that Contract in compliance with Act No. 213 of the Michigan Public Acts of 1963 as amended;

(3) If the Principal fails to promptly and fully repay claimants for labor and material reasonably required under the Contract, the Surety shall pay those claimants.

(4) Surety's obligations shall not exceed the amount stated in paragraph 1, and Surety shall have no obligation if the Principal promptly and fully pays the claimants.

SIGNED AND SEALED this _____ day of _____, 201_

_____	_____
(Name of Surety Company)	(Name of Principal)
By _____	By _____
(Signature)	(Signature)
Its _____	Its _____
(Title of Office)	(Title of Office)
Approved as to form:	Name and address of agent:
_____	_____
Stephen K. Postema, City Attorney	_____
	_____

GENERAL CONDITIONS

Section 1 - Execution, Correlation and Intent of Documents

The contract documents shall be signed in 2 copies by the City and the Contractor.

The contract documents are complementary and what is called for by any one shall be binding. The intention of the documents is to include all labor and materials, equipment and transportation necessary for the proper execution of the work. Materials or work described in words which so applied have a well-known technical or trade meaning have the meaning of those recognized standards.

In case of a conflict among the contract documents listed below in any requirement(s), the requirement(s) of the document listed first shall prevail over any conflicting requirement(s) of a document listed later.

(1) Addenda in reverse chronological order; (2) Detailed Specifications; (3) Standard Specifications; (4) Plans; (5) General Conditions; (6) Contract; (7) Bid Forms; (8) Bond Forms; (9) Bid.

Section 2 - Order of Completion

The Contractor shall submit with each invoice, and at other times reasonably requested by the Supervising Professional, schedules showing the order in which the Contractor proposes to carry on the work. They shall include the dates at which the Contractor will start the several parts of the work, the estimated dates of completion of the several parts, and important milestones within the several parts.

Section 3 - Familiarity with Work

The Bidder or its representative shall make personal investigations of the site of the work and of existing structures and shall determine to its own satisfaction the conditions to be encountered, the nature of the ground, the difficulties involved, and all other factors affecting the work proposed under this Contract. The Bidder to whom this Contract is awarded will not be entitled to any additional compensation unless conditions are clearly different from those which could reasonably have been anticipated by a person making diligent and thorough investigation of the site.

The Bidder shall immediately notify the City upon discovery, and in every case prior to submitting its Bid, of every error or omission in the bidding documents that would be identified by a reasonably competent, diligent Bidder. In no case will a Bidder be allowed the benefit of extra compensation or time to complete the work under this Contract for extra expenses or time spent as a result of the error or omission.

Section 4 - Wage Requirements

Under this Contract, the Contractor shall conform to Chapter 14 of Title I of the Code of the City of Ann Arbor as amended; which in part states "...that all craftsmen, mechanics and laborers employed directly on the site in connection with said improvements, including said employees of subcontractors, shall receive the prevailing wage for the corresponding classes of craftsmen,

mechanics and laborers, as determined by statistics for the Ann Arbor area compiled by the United States Department of Labor. At the request of the City, any contractor or subcontractor shall provide satisfactory proof of compliance with the contract provisions required by the Section."

Where the Contract and the Ann Arbor City Ordinance are silent as to definitions of terms required in determining contract compliance with regard to prevailing wages, the definitions provided in the Davis-Bacon Act as amended (40 U.S.C. 278-a to 276-a-7) for the terms shall be used.

If the Contractor is a “covered employer” as defined in Chapter 23 of the Ann Arbor City Code, the Contractor agrees to comply with the living wage provisions of Chapter 23 of the Ann Arbor City Code. The Contractor agrees to pay those employees providing Services to the City under this Agreement a “living wage,” as defined in Section 1:815 of the Ann Arbor City Code, as adjusted in accordance with Section 1:815(3); to post a notice approved by the City of the applicability of Chapter 23 in every location in which regular or contract employees providing services under this Agreement are working; to maintain records of compliance; if requested by the City, to provide documentation to verify compliance; to take no action that would reduce the compensation, wages, fringe benefits, or leave available to any employee or person contracted for employment in order to pay the living wage required by Section 1:815; and otherwise to comply with the requirements of Chapter 23.

Contractor agrees that all subcontracts entered into by the Contractor shall contain similar wage provision covering subcontractor’s employees who perform work on this contract.

Section 5 - Non-Discrimination

The Contractor agrees to comply, and to require its subcontractor(s) to comply, with the nondiscrimination provisions of MCL 37.2209. The Contractor further agrees to comply with the provisions of Section 9:158 of Chapter 112 of Title IX of the Ann Arbor City Code, and to assure that applicants are employed and that employees are treated during employment in a manner which provides equal employment opportunity.

Section 6 - Materials, Appliances, Employees

Unless otherwise stipulated, the Contractor shall provide and pay for all materials, labor, water, tools, equipment, light, power, transportation, and other facilities necessary or used for the execution and completion of the work. Unless otherwise specified, all materials incorporated in the permanent work shall be new, and both workmanship and materials shall be of the highest quality. The Contractor shall, if required, furnish satisfactory evidence as to the kind and quality of materials.

The Contractor shall at all times enforce strict discipline and good order among its employees, and shall seek to avoid employing on the work any unfit person or anyone not skilled in the work assigned.

Adequate sanitary facilities shall be provided by the Contractor.

Section 7 - Qualifications for Employment

The Contractor shall employ competent laborers and mechanics for the work under this Contract. For work performed under this Contract, employment preference shall be given to qualified local residents.

Section 8 - Royalties and Patents

The Contractor shall pay all royalties and license fees. It shall defend all suits or claims for infringements of any patent rights and shall hold the City harmless from loss on account of infringement except that the City shall be responsible for all infringement loss when a particular process or the product of a particular manufacturer or manufacturers is specified, unless the City has notified the Contractor prior to the signing of the Contract that the particular process or product is patented or is believed to be patented.

Section 9 - Permits and Regulations

The Contractor must secure and pay for all permits, permit or plan review fees and licenses necessary for the prosecution of the work. These include but are not limited to City building permits, right-of-way permits, lane closure permits, right-of-way occupancy permits, and the like. The City shall secure and pay for easements shown on the plans unless otherwise specified.

The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work as drawn and specified. If the Contractor observes that the contract documents are at variance with those requirements, it shall promptly notify the Supervising Professional in writing, and any necessary changes shall be adjusted as provided in the Contract for changes in the work.

Section 10 - Protection of the Public and of Work and Property

The Contractor is responsible for the means, methods, sequences, techniques and procedures of construction and safety programs associated with the work contemplated by this contract. The Contractor, its agents or sub-contractors, shall comply with the "General Rules and Regulations for the Construction Industry" as published by the Construction Safety Commission of the State of Michigan and to all other local, State and National laws, ordinances, rules and regulations pertaining to safety of persons and property.

The Contractor shall take all necessary and reasonable precautions to protect the safety of the public. It shall continuously maintain adequate protection of all work from damage, and shall take all necessary and reasonable precautions to adequately protect all public and private property from injury or loss arising in connection with this Contract. It shall make good any damage, injury or loss to its work and to public and private property resulting from lack of reasonable protective precautions, except as may be due to errors in the contract documents, or caused by agents or employees of the City. The Contractor shall obtain and maintain sufficient insurance to cover damage to any City property at the site by any cause.

In an emergency affecting the safety of life, or the work, or of adjoining property, the Contractor is, without special instructions or authorization from the Supervising Professional, permitted to act at its discretion to prevent the threatened loss or injury. It shall also so act, without appeal, if authorized or instructed by the Supervising Professional.

Any compensation claimed by the Contractor for emergency work shall be determined by agreement or in accordance with the terms of Claims for Extra Cost - Section 15.

Section 11 - Inspection of Work

The City shall provide sufficient competent personnel for the inspection of the work.

The Supervising Professional shall at all times have access to the work whenever it is in preparation or progress, and the Contractor shall provide proper facilities for access and for inspection.

If the specifications, the Supervising Professional's instructions, laws, ordinances, or any public authority require any work to be specially tested or approved, the Contractor shall give the Supervising Professional timely notice of its readiness for inspection, and if the inspection is by an authority other than the Supervising Professional, of the date fixed for the inspection. Inspections by the Supervising Professional shall be made promptly, and where practicable at the source of supply. If any work should be covered up without approval or consent of the Supervising Professional, it must, if required by the Supervising Professional, be uncovered for examination and properly restored at the Contractor's expense.

Re-examination of any work may be ordered by the Supervising Professional, and, if so ordered, the work must be uncovered by the Contractor. If the work is found to be in accordance with the contract documents, the City shall pay the cost of re-examination and replacement. If the work is not in accordance with the contract documents, the Contractor shall pay the cost.

Section 12 - Superintendence

The Contractor shall keep on the work site, during its progress, a competent superintendent and any necessary assistants, all satisfactory to the Supervising Professional. The superintendent will be responsible to perform all on-site project management for the Contractor. The superintendent shall be experienced in the work required for this Contract. The superintendent shall represent the Contractor and all direction given to the superintendent shall be binding as if given to the Contractor. Important directions shall immediately be confirmed in writing to the Contractor. Other directions will be confirmed on written request. The Contractor shall give efficient superintendence to the work, using its best skill and attention.

Section 13 - Changes in the Work

The City may make changes to the quantities of work within the general scope of the Contract at any time by a written order and without notice to the sureties. If the changes add to or deduct from the extent of the work, the Contract Sum shall be adjusted accordingly. All the changes shall be executed under the conditions of the original Contract except that any claim for extension of time caused by the change shall be adjusted at the time of ordering the change.

In giving instructions, the Supervising Professional shall have authority to make minor changes in the work not involving extra cost and not inconsistent with the purposes of the work, but otherwise, except in an emergency endangering life or property, no extra work or change shall be made unless in pursuance of a written order by the Supervising Professional, and no claim for an addition to the Contract Sum shall be valid unless the additional work was ordered in writing.

The Contractor shall proceed with the work as changed and the value of the work shall be determined as provided in Claims for Extra Cost - Section 15.

Section 14 - Extension of Time

Extension of time stipulated in the Contract for completion of the work will be made if and as the Supervising Professional may deem proper under any of the following circumstances:

(1) When work under an extra work order is added to the work under this Contract;

(2) When the work is suspended as provided in Section 20;

(3) When the work of the Contractor is delayed on account of conditions which could not have been foreseen, or which were beyond the control of the Contractor, and which were not the result of its fault or negligence;

(4) Delays in the progress of the work caused by any act or neglect of the City or of its employees or by other Contractors employed by the City;

(5) Delay due to an act of Government;

(6) Delay by the Supervising Professional in the furnishing of plans and necessary information;

(7) Other cause which in the opinion of the Supervising Professional entitles the Contractor to an extension of time.

The Contractor shall notify the Supervising Professional within 7 days of an occurrence or conditions which, in the Contractor's opinion, entitle it to an extension of time. The notice shall be in writing and submitted in ample time to permit full investigation and evaluation of the Contractor's claim. The Supervising Professional shall acknowledge receipt of the Contractor's notice within 7 days of its receipt. Failure to timely provide the written notice shall constitute a waiver by the Contractor of any claim.

In situations where an extension of time in contract completion is appropriate under this or any other section of the contract, the Contractor understands and agrees that the only available adjustment for events that cause any delays in contract completion shall be extension of the required time for contract completion and that there shall be no adjustments in the money due the Contractor on account of the delay.

Section 15 - Claims for Extra Cost

If the Contractor claims that any instructions by drawings or other media issued after the date of the Contract involved extra cost under this Contract, it shall give the Supervising Professional written notice within 7 days after the receipt of the instructions, and in any event before proceeding to execute the work, except in emergency endangering life or property. The procedure shall then be as provided for Changes in the Work-Section l3. No claim shall be valid unless so made.

If the Supervising Professional orders, in writing, the performance of any work not covered by the contract documents, and for which no item of work is provided in the Contract, and for which no unit price or lump sum basis can be agreed upon, then the extra work shall be done on a Cost-Plus-Percentage basis of payment as follows:

(1) The Contractor shall be reimbursed for all reasonable costs incurred in doing the work, and shall receive an additional payment of 15% of all the reasonable costs to cover both its indirect overhead costs and profit;

(2) The term "Cost" shall cover all payroll charges for employees and supervision required under the specific order, together with all worker's compensation, Social Security, pension and retirement allowances and social insurance, or other regular payroll charges on same; the cost of all material and supplies required of either temporary or permanent character; rental of all power-driven equipment at agreed upon rates, together with cost of fuel and supply charges for the equipment; and any costs incurred by the Contractor as a direct result of executing the order, if approved by the Supervising Professional;

(3) If the extra is performed under subcontract, the subcontractor shall be allowed to compute its charges as described above. The Contractor shall be permitted to add an additional charge of 5% percent to that of the subcontractor for the Contractor's supervision and contractual responsibility;

(4) The quantities and items of work done each day shall be submitted to the Supervising Professional in a satisfactory form on the succeeding day, and shall be approved by the Supervising Professional and the Contractor or adjusted at once;

(5) Payments of all charges for work under this Section in any one month shall be made along with normal progress payments. Retainage shall be in accordance with Progress Payments-Section 16.

No additional compensation will be provided for additional equipment, materials, personnel, overtime or special charges required to perform the work within the time requirements of the Contract.

When extra work is required and no suitable price for machinery and equipment can be determined in accordance with this Section, the hourly rate paid shall be 1/40 of the basic weekly rate listed in the Rental Rate Blue Book published by Dataquest Incorporated and applicable to the time period the equipment was first used for the extra work. The hourly rate will be deemed to include all costs of operation such as bucket or blade, fuel, maintenance, "regional factors", insurance, taxes, and the like, but not the costs of the operator.

Section 16 - Progress Payments

The Contractor shall submit each month, or at longer intervals, if it so desires, an invoice covering work performed for which it believes payment, under the Contract terms, is due. The submission shall be to the City's Finance Department - Accounting Division. The Supervising Professional will, within 10 days following submission of the invoice, prepare a certificate for payment for the work in an amount to be determined by the Supervising Professional as fairly representing the acceptable work performed during the period covered by the Contractor's invoice. To insure the proper performance of this Contract, the City will retain a percentage of the estimate in accordance with Act 524, Public Acts of 1980. The City will then, following the receipt of the Supervising Professional's Certificate, make payment to the Contractor as soon as feasible, which is anticipated will be within 15 days.

An allowance may be made in progress payments if substantial quantities of permanent material have been delivered to the site but not incorporated in the completed work if the Contractor, in the opinion of the Supervising Professional, is diligently pursuing the work under this Contract. Such materials shall be properly stored and adequately protected. Allowance in the estimate shall be at the invoice price value of the items. Notwithstanding any payment of any allowance, all risk of loss due to vandalism or any damages to the stored materials remains with the Contractor.

In the case of Contracts which include only the Furnishing and Delivering of Equipment, the payments shall be; 60% of the Contract Sum upon the delivery of all equipment to be furnished, or in the case of delivery of a usable portion of the equipment in advance of the total equipment delivery, 60% of the estimated value of the portion of the equipment may be paid upon its delivery in advance of the time of the remainder of the equipment to be furnished; 30% of the Contract Sum upon completion of erection of all equipment furnished, but not later than 60 days after the date of delivery of all of the equipment to be furnished; and payment of the final 10% on final completion of erection, testing and acceptance of all the equipment to be furnished; but not later than l80 days after the date of delivery of all of the equipment to be furnished, unless testing has been completed and shows the equipment to be unacceptable.

With each invoice for periodic payment, the Contractor shall enclose a Contractor's Declaration - Section 43, and an updated project schedule per Order of Completion - Section 2.

Section 17 - Deductions for Uncorrected Work

If the Supervising Professional decides it is inexpedient to correct work that has been damaged or that was not done in accordance with the Contract, an equitable deduction from the Contract price shall be made.

Section 18 - Correction of Work Before Final Payment

The Contractor shall promptly remove from the premises all materials condemned by the Supervising Professional as failing to meet Contract requirements, whether incorporated in the work or not, and the Contractor shall promptly replace and re-execute the work in accordance with the Contract and without expense to the City and shall bear the expense of making good all work of other contractors destroyed or damaged by the removal or replacement.

If the Contractor does not remove the condemned work and materials within l0 days after written notice, the City may remove them and, if the removed material has value, may store the material at the expense of the Contractor. If the Contractor does not pay the expense of the removal within 10 days thereafter, the City may, upon 10 days written notice, sell the removed materials at auction or private sale and shall pay to the Contractor the net proceeds, after deducting all costs and expenses that should have been borne by the Contractor. If the removed material has no value, the Contractor must pay the City the expenses for disposal within 10 days of invoice for the disposal costs.

The inspection or lack of inspection of any material or work pertaining to this Contract shall not relieve the Contractor of its obligation to fulfill this Contract and defective work shall be made good. Unsuitable materials may be rejected by the Supervising Professional notwithstanding that the work and materials have been previously overlooked by the Supervising Professional and accepted or estimated for payment or paid for. If the work or any part shall be found defective at any time before the final acceptance of the whole work, the Contractor shall forthwith make good the defect in a manner satisfactory to the Supervising Professional. The judgment and the decision of the Supervising Professional as to whether the materials supplied and the work done under this Contract comply with the requirements of the Contract shall be conclusive and final.

Section 19 - Acceptance and Final Payment

Upon receipt of written notice that the work is ready for final inspection and acceptance, the Supervising Professional will promptly make the inspection. When the Supervising Professional finds the work acceptable under the Contract and the Contract fully performed, the Supervising Professional will promptly sign and issue a final certificate stating that the work required by this Contract has been completed and is accepted by the City under the terms and conditions of the Contract. The entire balance found to be due the Contractor, including the retained percentage, shall be paid to the Contractor by the City within 30 days after the date of the final certificate.

Before issuance of final certificates, the Contractor shall file with the City:

(1) The consent of the surety to payment of the final estimate;

(2) The Contractor's Affidavit in the form required by Section 44.

In case the Affidavit or consent is not furnished, the City may retain out of any amount due the Contractor, sums sufficient to cover all lienable claims.

The making and acceptance of the final payment shall constitute a waiver of all claims by the City except those arising from:

(1) unsettled liens;

(2) faulty work appearing within 12 months after final payment;

(3) hidden defects in meeting the requirements of the plans and specifications;

(4) manufacturer's guarantees.

It shall also constitute a waiver of all claims by the Contractor, except those previously made and still unsettled.

Section 20 - Suspension of Work

The City may at any time suspend the work, or any part by giving 5 days notice to the Contractor in writing. The work shall be resumed by the Contractor within 10 days after the date fixed in the written notice from the City to the Contractor to do so. The City shall reimburse the Contractor for expense incurred by the Contractor in connection with the work under this Contract as a result of the suspension.

If the work, or any part, shall be stopped by the notice in writing, and if the City does not give notice in writing to the Contractor to resume work at a date within 90 days of the date fixed in the written notice to suspend, then the Contractor may abandon that portion of the work suspended and will be entitled to the estimates and payments for all work done on the portions abandoned, if any, plus 10% of the value of the work abandoned, to compensate for loss of overhead, plant expense, and anticipated profit.

Section 21 - Delays and the City's Right to Terminate Contract

If the Contractor refuses or fails to prosecute the work, or any separate part of it, with the diligence required to insure completion, ready for operation, within the allowable number of consecutive calendar days specified plus extensions, or fails to complete the work within the required time, the City may, by written notice to the Contractor, terminate its right to proceed with the work or any part of the work as to which there has been delay. After providing the notice the City may take over the work and prosecute it to completion, by contract or otherwise, and the Contractor and its sureties shall be liable to the City for any excess cost to the City. If the Contractor's right to proceed is terminated, the City may take possession of and utilize in completing the work, any materials, appliances and plant as may be on the site of the work and useful for completing the work. The right of the Contractor to proceed shall not be terminated or the Contractor charged with liquidated damages where an extension of time is granted under Extension of Time - Section 14.

If the Contractor is adjudged a bankrupt, or if it makes a general assignment for the benefit of creditors, or if a receiver is appointed on account of its insolvency, or if it persistently or repeatedly refuses or fails except in cases for which extension of time is provided, to supply enough properly skilled workers or proper materials, or if it fails to make prompt payments to subcontractors or for material or labor, or persistently disregards laws, ordinances or the instructions of the Supervising Professional, or otherwise is guilty of a substantial violation of any provision of the Contract, then the City, upon the certificate of the Supervising Professional that sufficient cause exists to justify such action, may, without prejudice to any other right or remedy and after giving the Contractor 3 days written notice, terminate this Contract. The City may then take possession of the premises and of all materials, tools and appliances thereon and without prejudice to any other remedy it may have, make good the deficiencies or finish the work by whatever method it may deem expedient, and deduct the cost from the payment due the Contractor. The Contractor shall not be entitled to receive any further payment until the work is finished. If the expense of finishing the work, including compensation for additional managerial and administrative services exceeds the unpaid balance of the Contract Sum, the

Contractor and its surety are liable to the City for any excess cost incurred. The expense incurred by the City, and the damage incurred through the Contractor's default, shall be certified by the Supervising Professional.

Section 22 - Contractor's Right to Terminate Contract

If the work should be stopped under an order of any court, or other public authority, for a period of 3 months, through no act or fault of the Contractor or of anyone employed by it, then the Contractor may, upon 7 days written notice to the City, terminate this Contract and recover from the City payment for all acceptable work executed plus reasonable profit.

Section 23 - City's Right To Do Work

If the Contractor should neglect to prosecute the work properly or fail to perform any provision of this Contract, the City, 3 days after giving written notice to the Contractor and its surety may, without prejudice to any other remedy the City may have, make good the deficiencies and may deduct the cost from the payment due to the Contractor.

Section 24 - Removal of Equipment and Supplies

In case of termination of this Contract before completion, from any or no cause, the Contractor, if notified to do so by the City, shall promptly remove any part or all of its equipment and supplies from the property of the City, failing which the City shall have the right to remove the equipment and supplies at the expense of the Contractor.

The removed equipment and supplies may be stored by the City and, if all costs of removal and storage are not paid by the Contractor within 10 days of invoicing, the City upon 10 days written notice may sell the equipment and supplies at auction or private sale, and shall pay the Contractor the net proceeds after deducting all costs and expenses that should have been borne by the Contractor and after deducting all amounts claimed due by any lien holder of the equipment or supplies.

Section 25 - Responsibility for Work and Warranties

The Contractor assumes full responsibility for any and all materials and equipment used in the construction of the work and may not make claims against the City for damages to materials and equipment from any cause except negligence or willful act of the City. Until its final acceptance, the Contractor shall be responsible for damage to or destruction of the project (except for any part covered by Partial Completion and Acceptance - Section 26). The Contractor shall make good all work damaged or destroyed before acceptance. All risk of loss remains with the Contractor until final acceptance of the work (Section 19) or partial acceptance (Section 26). The Contractor is advised to investigate obtaining its own builders risk insurance.

The Contractor shall guarantee the quality of the work for a period of one year. The Contractor shall also unconditionally guarantee the quality of all equipment and materials that are furnished and installed under the contract for a period of one year. At the end of one year after the Contractor's receipt of final payment, the complete work, including equipment and materials furnished and installed under the contract, shall be inspected by the Contractor and the Supervising Professional. Any defects shall be corrected by the Contractor at its expense as soon as practicable but in all cases within 60 days. Any defects that are identified prior to the end of one year shall also be inspected by the Contractor and the Supervising Professional and shall be corrected by the Contractor at its expense as soon as practicable but in all cases within 60 days.

The Contractor shall assign all manufacturer or material supplier warranties to the City prior to

final payment. The assignment shall not relieve the Contractor of its obligations under this paragraph to correct defects.

Section 26 - Partial Completion and Acceptance

If at any time prior to the issuance of the final certificate referred to in Acceptance and Final Payment - Section 19, any portion of the permanent construction has been satisfactorily completed, and if the Supervising Professional determines that portion of the permanent construction is not required for the operations of the Contractor but is needed by the City, the Supervising Professional shall issue to the Contractor a certificate of partial completion, and immediately the City may take over and use the portion of the permanent construction described in the certificate, and exclude the Contractor from that portion.

The issuance of a certificate of partial completion shall not constitute an extension of the Contractor's time to complete the portion of the permanent construction to which it relates if the Contractor has failed to complete it in accordance with the terms of this Contract. The issuance of the certificate shall not release the Contractor or its sureties from any obligations under this Contract including bonds.

If prior use increases the cost of, or delays the work, the Contractor shall be entitled to extra compensation, or extension of time, or both, as the Supervising Professional may determine.

Section 27 - Payments Withheld Prior to Final Acceptance of Work

The City may withhold or, on account of subsequently discovered evidence, nullify the whole or part of any certificate to the extent reasonably appropriate to protect the City from loss on account of:

(1) Defective work not remedied;

(2) Claims filed or reasonable evidence indicating probable filing of claims by other parties against the Contractor;

(3) Failure of the Contractor to make payments properly to subcontractors or for material or labor;

(4) Damage to another Contractor.

When the above grounds are removed or the Contractor provides a Surety Bond satisfactory to the City which will protect the City in the amount withheld, payment shall be made for amounts withheld under this section.

Section 28 - Contractor's Insurance

(1) The Contractor shall procure and maintain during the life of this Contract, including the guarantee period and during any warranty work, such insurance policies, including those set forth below, as will protect itself and the City from all claims for bodily injuries, death or property damage which may arise under this Contract; whether the acts were made by the Contractor or by any subcontractor or anyone employed by them directly or indirectly. The following insurance policies are required:

(a) Worker's Compensation Insurance in accordance with all applicable state and federal statutes. Further, Employers Liability Coverage shall be obtained in the following minimum amounts:

Bodily Injury by Accident - $500,000 each accident
Bodily Injury by Disease - $500,000 each employee
Bodily Injury by Disease - $500,000 each policy limit

(b) Commercial General Liability Insurance equivalent to, as a minimum, Insurance Services Office form CG 00 01 07 98. The City of Ann Arbor shall be named as an additional insured. There shall be no added exclusions or limiting endorsements specifically for the following coverages: Products and Completed Operations, Explosion, Collapse and Underground coverage or Pollution. Further there shall be no added exclusions or limiting endorsements which diminish the City's protections as an additional insured under the policy. The following minimum limits of liability are required:

$1,000,000	Each occurrence as respect Bodily Injury Liability or Property Damage Liability, or both combined.
$2,000,000	Per Job General Aggregate
$1,000,000	Personal and Advertising Injury
$2,000,000	Products and Completed Operations Aggregate

(c) Motor Vehicle Liability Insurance, including Michigan No-Fault Coverages, equivalent to, as a minimum, Insurance Services Office form CA 00 01 07 97. The City of Ann Arbor shall be named as an additional insured. There shall be no added exclusions or limiting endorsements which diminish the City's protections as an additional insured under the policy. Coverage shall include all owned vehicles, all non-owned vehicles and all hired vehicles. Further, the limits of liability shall be $1,000,000 for each occurrence as respects Bodily Injury Liability or Property Damage Liability, or both combined.

(d) Umbrella/Excess Liability Insurance shall be provided to apply excess of the Commercial General Liability, Employers Liability and the Motor Vehicle coverage enumerated above, for each occurrence and for aggregate in the amount of $1,000,000.

(2) Insurance required under subsection (1)(b) and (1)(c) above shall be considered primary as respects any other valid or collectible insurance that the City may possess, including any self-insured retentions the City may have; and any other insurance the City does possess shall be considered excess insurance only and shall not be required to contribute with this insurance. Further, the Contractor agrees to waive any right of recovery by its insurer against the City.

(3) In the case of all Contracts involving on-site work, the Contractor shall provide to the City before the commencement of any work under this Contract documentation demonstrating it has obtained the above mentioned policies. Documentation must provide and demonstrate an unconditional 30 day written notice of cancellation in favor of the City of Ann Arbor. Further, the documentation must explicitly state the following: (a) the policy number; name of insurance company; name and address of the agent or authorized representative; name and address of insured; project name; policy expiration date; and specific coverage amounts; (b) any deductibles or self-insured retentions which shall be approved by the City, in its sole discretion; (c) that the policy conforms to the requirements specified. An original certificate of insurance may be provided as an initial indication of the required insurance, provided that no later than 21 calendar days after commencement of any work the Contractor supplies a copy of the endorsements required on the policies. Upon request, the Contractor shall provide within 30 days a copy of the policy(ies) to the City. If any of the above coverages expire by their terms during the term of this Contract, the Contractor shall deliver proof of renewal and/or new policies to the Administering Service Area/Unit at least ten days prior to the expiration

date.

(4) Any Insurance provider of Contractor shall be admitted and authorized to do business in the State of Michigan and shall carry and maintain a minimum rating assigned by A.M. Best & Company's Key Rating Guide of "A-" Overall and a minimum Financial Size Category of "V". Insurance policies and certificates issued by non-admitted insurance companies are not acceptable unless approved in writing by the City.

Section 29 - Surety Bonds

Bonds will be required from the successful bidder as follows:

(1) A Performance Bond to the City of Ann Arbor for the amount of the bid(s) accepted;

(2) A Labor and Material Bond to the City of Ann Arbor for the amount of the bid(s) accepted.

Bonds shall be executed on forms supplied by the City in a manner and by a Surety Company authorized to transact business in Michigan and satisfactory to the City Attorney.

Section 30 - Damage Claims

The Contractor shall be held responsible for all damages to property of the City or others, caused by or resulting from the negligence of the Contractor, its employees, or agents during the progress of or connected with the prosecution of the work, whether within the limits of the work or elsewhere. The Contractor must restore all property injured including sidewalks, curbing, sodding, pipes, conduit, sewers or other public or private property to not less than its original condition with new work.

Section 31 - Refusal to Obey Instructions

If the Contractor refuses to obey the instructions of the Supervising Professional, the Supervising Professional shall withdraw inspection from the work, and no payments will be made for work performed thereafter nor may work be performed thereafter until the Supervising Professional shall have again authorized the work to proceed.

Section 32 - Assignment

Neither party to the Contract shall assign the Contract without the written consent of the other. The Contractor may assign any monies due to it to a third party acceptable to the City.

Section 33 - Rights of Various Interests

Whenever work being done by the City's forces or by other contractors is contiguous to work covered by this Contract, the respective rights of the various interests involved shall be established by the Supervising Professional, to secure the completion of the various portions of the work in general harmony.

The Contractor is responsible to coordinate all aspects of the work, including coordination of, and with, utility companies and other contractors whose work impacts this project.

Section 34 - Subcontracts

The Contractor shall not award any work to any subcontractor without prior written approval of the City. The approval will not be given until the Contractor submits to the City a written statement concerning the proposed award to the subcontractor. The statement shall contain all information the City may require.

The Contractor shall be as fully responsible to the City for the acts and omissions of its subcontractors, and of persons either directly or indirectly employed by them, as it is for the acts and omissions of persons directly employed by it.

The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work to bind subcontractors to the Contractor by the terms of the General Conditions and all other contract documents applicable to the work of the subcontractors and to give the Contractor the same power to terminate any subcontract that the City may exercise over the Contractor under any provision of the contract documents.

Nothing contained in the contract documents shall create any contractual relation between any subcontractor and the City.

Section 35 - Supervising Professional's Status

The Supervising Professional has the right to inspect any or all work. The Supervising Professional has authority to stop the work whenever stoppage may be appropriate to insure the proper execution of the Contract. The Supervising Professional has the authority to reject all work and materials which do not conform to the Contract and to decide questions which arise in the execution of the work.

The Supervising Professional shall make all measurements and determinations of quantities. Those measurements and determinations are final and conclusive between the parties.

Section 36 - Supervising Professional's Decisions

The Supervising Professional shall, within a reasonable time after their presentation to the Supervising Professional, make decisions in writing on all claims of the City or the Contractor and on all other matters relating to the execution and progress of the work or the interpretation of the contract documents.

Section 37 - Storing Materials and Supplies

Materials and supplies may be stored at the site of the work at locations agreeable to the City unless specific exception is listed elsewhere in these documents. Ample way for foot traffic and drainage must be provided, and gutters must, at all times, be kept free from obstruction. Traffic on streets shall be interfered with as little as possible. The Contractor may not enter or occupy with agents, employees, tools, or material any private property without first obtaining written permission from its owner. A copy of the permission shall be furnished to the Supervising Professional.

Section 38 - Lands for Work

The Contractor shall provide, at its own expense and without liability to the City, any additional land and access that may be required for temporary construction facilities or for storage of materials.

Section 39 - Cleaning Up

The Contractor shall, as directed by the Supervising Professional, remove at its own expense from the City's property and from all public and private property all temporary structures, rubbish and waste materials resulting from its operations unless otherwise specifically approved, in writing, by the Supervising Professional.

Section 40 - Salvage

The Supervising Professional may designate for salvage any materials from existing structures or underground services. Materials so designated remain City property and shall be transported or stored at a location as the Supervising Professional may direct.

Section 41 - Night, Saturday or Sunday Work

No night or Sunday work (without prior written City approval) will be permitted except in the case of an emergency and then only to the extent absolutely necessary. The City may allow night work which, in the opinion of the Supervising Professional, can be satisfactorily performed at night. Night work is any work between 8:00 p.m. and 7:00 a.m. No Saturday work will be permitted unless the Contractor gives the Supervising Professional at least 48 hours but not more than 5 days notice of the Contractor's intention to work the upcoming Saturday.

Section 42 - Sales Taxes

Under State law the City is exempt from the assessment of State Sales Tax on its direct purchases. Contractors who acquire materials, equipment, supplies, etc. for incorporation in City projects are not likewise exempt. State Law shall prevail. The Bidder shall familiarize itself with the State Law and prepare its Bid accordingly. No extra payment will be allowed under this Contract for failure of the Contractor to make proper allowance in this bid for taxes it must pay.

Section 43

CONTRACTOR'S DECLARATION

I hereby declare that I have not, during the period _____, 20___, to _____, 20___, performed any work, furnished any materials, sustained any loss, damage or delay, or otherwise done anything in addition to the regular items (or executed change orders) set forth in the Contract titled _____, for which I shall ask, demand, sue for, or claim compensation or extension of time from the City, except as I hereby make claim for additional compensation or extension of time as set forth on the attached itemized statement. I further declare that I have paid all payroll obligations related to this Contract that have become due during the above period and that all invoices related to this Contract received more than 30 days prior to this declaration have been paid in full except as listed below.

There is/is not (Contractor please circle one and strike one as appropriate) an itemized statement attached regarding a request for additional compensation or extension of time.

_____ _____

Contractor Date

By _____
(Signature)

Its _____
(Title of Office)

Past due invoices, if any, are listed below.

Section 44

CONTRACTOR'S AFFIDAVIT

The undersigned Contractor,_____, represents that on , 20___, it was awarded a contract by the City of Ann Arbor, Michigan to_____ under the terms and conditions of a Contract titled _____. The Contractor represents that all work has now been accomplished and the Contract is complete.

The Contractor warrants and certifies that all of its indebtedness arising by reason of the Contract has been fully paid or satisfactorily secured; and that all claims from subcontractors and others for labor and material used in accomplishing the project, as well as all other claims arising from the performance of the Contract, have been fully paid or satisfactorily settled. The Contractor agrees that, if any claim should hereafter arise, it shall assume responsibility for it immediately upon request to do so by the City of Ann Arbor.

The Contractor, for valuable consideration received, does further waive, release and relinquish any and all claims or right of lien which the Contractor now has or may acquire upon the subject premises for labor and material used in the project owned by the City of Ann Arbor.

This affidavit is freely and voluntarily given with full knowledge of the facts.

_____ _____
Contractor Date

By _____
(Signature)

Its _____
(Title of Office)

Subscribed and sworn to before me, on this _____ day of _____, 20__
_____ , _____ County, Michigan
Notary Public
_____ County, MI
My commission expires on:

STANDARD SPECIFICATIONS

All work under this contract shall be performed in accordance with the Public Services Department Standard Specifications in effect at the date of availability of the contract documents stipulated in the Bid. All work under this Contract which is not included in these Standard Specifications, or which is performed using modifications to these Standard Specifications, shall be performed in accordance with the Detailed Specifications included in these contract documents.

Standard Specifications are available online:
http://www.a2gov.org/departments/engineering/Pages/Engineering-and-Contractor-Resources.aspx

DETAILED SPECIFICATIONS

SECTION 01000

GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Work under this Contract consists constructing the Leslie Golf Course golf cart storage building and related work.

B. Contract Drawings are included which give specific locations for all work to be performed under this Contract. The Contract Drawings depict the general form of items for painting.

C. It is the intent of these Contract Documents that the CONTRACTOR shall provide a complete and finished product. Items shown on the Drawings and Specifications not specifically connected to a heading in the Bid Form are to be considered as incidental to the work.

1.02 EXISTING FACILITIES ACCESS

A. The CONTRACTOR shall be responsible for maintaining safe access for the public to the existing golf course parking lot, and all areas beyond the work zones.

B. Access to the golf course shall not be temporarily disrupted without coordination with and prior approval of the OWNER.

C. Prior to commencing work, the CONTRACTOR shall submit to the OWNER a detailed plan for bringing construction traffic to and from the site.

1.03 CONSTRUCTION WATER

A. Water for construction is available from the OWNER and may be obtained from the existing facilities. The CONTRACTOR shall be responsible for coordinating with the OWNER where the construction water required for the project may be obtained.

1.04 CONSTRUCTION POWER

A. Power for construction is available from the OWNER and may be obtained from the existing facilities. The CONTRACTOR shall be responsible for coordinating with the OWNER where the construction power required for the project may be obtained.

1.05 NOTIFICATION OF UTILITIES

A. The CONTRACTOR shall notify all utilities prior to any excavation.

B. MISS DIG – Utility providers are members of a utility communication system called "MISS DIG" that provides service to participating utilities. The CONTRACTORS shall contact "MISS DIG" not less than 72 hours before starting construction for assistance in locating utilities or for any work to be done on utilities. The MISS DIG toll free phone number is (800) 482-7171.

1.06 WORK SCHEDULE

A. The CONTRACTOR shall provide a work schedule. The schedule shall be complete and shall show in detail the manner in which he/she proposes to complete the work under this Contract and the approximate monthly billing of the Contract. The purpose of the schedule is to assist the OWNER in notifying the public of inconveniences and to anticipate cash-flow on the job, and to determine if the CONTRACTOR is reasonably proceeding with the work to assure completion within the specified time period.

B. Work hours shall be restricted to Monday through Friday, 7AM to 7PM. Work shall not be conducted on City holidays. Exceptions to work hour limits shall be granted only by written permission of the OWNER.

1.07 CONSTRUCTION SEQUENCE

A. The CONTRACTOR shall coordinate and schedule his work with the OWNER when his operation may affect access to existing facilities or interfere with facility access and operations. The CONTRACTOR shall coordinate his operations with the facility superintendent.

B. Prior to commencing the work, the CONTRACTOR shall provide the ENGINEER a detailed schedule of the proposed work. The schedule shall include a list of tasks required to complete the work; their relevancy to each other; expected duration; and completion dates.

C. The CONTRACTOR is responsible for presenting a construction sequence with the detailed schedule to the OWNER/ENGINEER for review. All proposed improvements shall be constructed only in accordance with an approved schedule.

1.08 TRAFFIC MAINTENANCE

A. The job site must be barricaded and signed to prevent access to the site in strict accordance with the most recent edition of the Michigan Manual of Uniform Traffic Control Devices.

B. Because the availability of roads and streets is critical for the traveling public, the CONTRACTOR shall not close a road to traffic at any time. Through and local traffic shall always be maintained by the use of 2-lane construction techniques and by the use of temporary roadways and flaggers.

C. The CONTRACTOR shall provide all required Type II and Type III barricades, flashers, flashing arrows, flaggers, and all signing required to properly and safely maintain traffic flow through the construction area in accordance with the Michigan Manual of Uniform Traffic Control Devices. The CONTRACTOR shall provide as many signs and barricades as required by the ENGINEER to protect and maintain traffic through this area at all times. The CONTRACTOR shall add any additional devices required by the ENGINEER to provide a smooth flow of traffic.

D. In the event of the CONTRACTOR's failure to comply with these provisions, the OWNER may, with or without notice, cause the same to be done; and will deduct the cost of such work from any money due or to become due the CONTRACTOR under this Contract, but the performance of such work by the OWNER or at the OWNER's insistence, shall serve in no way to release the CONTRACTOR from their general or particular liability for the safety of the Public or the work.

E. Access to fire hydrants and water valves shall always be maintained. The CONTRACTOR's truck and equipment operations on public streets shall be governed by City or County regulations as applicable, and all other local traffic ordinances, and regulations of the City of Ann Arbor Fire and Police Departments.

F. Payment for traffic maintenance, the furnishing of flaggers, barricades, signs, flashers and maintenance of these devices shall be incidental to the Contract.

1.09 CONSTRUCTION PERMITS

A. The CONTRACTOR will be required to follow the requirements established by all permits necessary for the construction of this project. The following is a list of permits that must be obtained prior to the beginning of construction.

1. Soil Erosion and Sedimentation Control Permit, as part of Public Act 451 (1994), Part 91.

2. Applicable City Building Permits (all trades).

B. The permits shall be issued by the City of Ann Arbor. The CONTRACTOR will be required to adhere to all requirements of the permits. The CONTRACTOR shall have an SESC-certified inspector assigned to the project to complete all required inspections and reports. An electronic copy of all inspections shall be provided to the OWNER.

1.10 MATERIAL TESTING

A. The CONTRACTOR shall provide and pay for the service of an independent testing laboratory, approved by the ENGINEER, to provide all painting, material and compaction testing. The type and minimum frequency of testing shall be as follows:

1. Concrete.
   a. Temperature, slump, air entrainment (each load)
   b. 5 cylinders for strength testing (each load)

2. Soils.
   a. Sieve analysis from certified pit. (two locations)
   b. Modified proctor
   c. Compaction testing for all fill materials – two (2) per location, each 8-inch lift, and one additional test per 1,000 ft^3 of fill.

B. The CONTRACTOR shall notify the OWNER and ENGINEER of all previous test results at least 48 hours in advance of all new materials to be used. Any area failing tests shall be corrected and retested at the CONTRACTOR's expense.

C. CONTRACTOR shall furnish copies of all test reports to the OWNER and ENGINEER.

D. Pre-approved companies for concrete and soils testing shall be: CTI & Associates; Testing Engineers & Consultants, Inc. (TEC); Soils and Materials Engineers, Inc. (SME); Haengel & Associates Engineering, Inc. (HAE); or Professional Service Industries, Inc. (PSI).

1.11 DUST AND MUD CONTROL

A. All haul roads, detour roads, and other public and private roads, driveways and parking lots used by the CONTRACTOR must be maintained in a dust free condition during the life of this Contract. The control of dust shall be accomplished by the application of dust control materials and methods of application as approved and as directed by the ENGINEER. Such dust control materials shall be applied as often as is necessary to control the dust.

B. Cost of providing dust control shall be included as part of traffic maintenance.

C. Should the CONTRACTOR be negligent in providing dust control, the OWNER may, with or without notice, cause the same to be done and deduct the cost of such work from any monies due or to become due the CONTRACTOR under this Contract, but the performance of such work by the OWNER, or by the OWNER's direction, shall serve in no way to release the CONTRACTOR from liability for dust control.

1.12 DIGITAL PHOTOGRAPHIC RECORD

A. The CONTRACTOR shall furnish to the OWNER a digital photographic record for all areas proposed for improvement and all access ways to the work area. In general, the CONTRACTOR shall include parking lots, access paths for construction traffic, storage and staging areas and all areas and structures that may be impacted by his activities.

B. The photographs shall be stored on a CD or DVD of such quality to accurately show the existing conditions. The record shall be produced one (1) week prior to the placement of materials or equipment in the construction area.

C. The record shall include overview photos of each entire area; and detailed photos of key features, including structures, pavements, structures, utilities, equipment, etc. The photographs shall be ordered in sequential sets as follows: photograph of a sign board identifying each separate area; overview photo or photos of that area; and detailed views relevant only to that particular area. The overview photographs should enable to viewer to identify both the area in question and the particular items that are shown in detail in the photographs immediately following.

D. The photographs must be recorded while the visibility is clear and at no time will it be allowed during periods of ground cover.

E. The photographic record shall include date, time, and location at appropriate intervals. The location shall be easily referenced to the Contract Drawings.

1.13 PROJECT PROGRESS MEETING

A. The CONTRACTOR shall be available and attend project progress meetings to be held at least twice a month, as necessary, or at an alternate frequency defined by the ENGINEER/OWNER. It shall be the responsibility of the CONTRACTOR to have a representative, including key subcontractors, present at each meeting..

1.14 METHOD OF MEASUREMENT AND BASIS OF PAYMENT

A. GENERAL

The method of measurement and the basis of payment for each item in the Proposal will be as specified in the schedule attached. The items are generally grouped by the section of the Specifications under which the particular unit of work is detailed. There will be no payment allowed for any unit of work not specifically mentioned in the Proposal as a bid item, and any such unit of work not mentioned in the Proposal, but necessary for the completion of the Project, will be considered as incidental to the construction of the Project.

B. MEASUREMENT

Quantities of work completed under the Contract will be measured by the ENGINEER according to the United States standard measures. When tons are specified, the unit shall be the ton of 2000 pounds. When measurements are stated in miles, stations, acres, they will be horizontal measurements unless specified otherwise. Where measurements are specified to be "in place,"

they will be taken along the actual surface of the completed item to obtain lineal, area, or volume measurements.

C. PAYMENT

In each and every instance in the following Measurement and Payment Schedule, where a Basis of Payment is specified, it shall be understood to be prefaced by the following statement, "**The contract unit price bid in the Proposal will be payment in full for all labor, materials, and equipment necessary to do the following according to the Plans and Specifications**." Payment shall be made on the basis of the actual quantity of the item completed and accepted at the unit price for such item named in the Proposal.

BID ITEMS – BASE BID
(ITEMS APPLY SEPARATELY TO EACH LOCATION SPECIFIED IN THE BID FORM)

ITEM IN PROPOSAL	METHOD OF MEASUREMENT	BASIS OF PAYMENT
General Conditions, Insurance, Bonds Mobilization	By the unit lump sum (LS)	The complete cost of insurance, bonds, permits and mobilization for the project and other requirements of General Conditions. Includes offices, stores, conveniences, and other temporary facilities, soil erosion and site preparation, and whatever means the CONTRACTOR deems necessary for accessing the work, organizing the project, coordination with OWNER, ENGINEER, third parties and sub-contractors, obtaining all permits, permit inspection fees, permit requirements, Shop Drawings, paperwork, bringing equipment to the site as required, management of job, and all related work. Any costs assumed to be above and beyond the value of this pay item shall be incidental to other pay items in the Contract. The maximum amount of this item shall be 5% of the Contract Total.
Golf Cart Storage Building Kit	By the unit lump sum (LS)	Cost of pre-engineered building kit for the proposed golf cart storage building.
Golf Cart Storage Building Erection	By the unit lump sum (LS)	Construction of new golf cart storage building, new electrical service, lighting and battery charging systems, gravel floor, and gravel driveway CIP as specified and shown in the Contract Documents.

ITEM IN PROPOSAL	METHOD OF MEASUREMENT	BASIS OF PAYMENT
Silt Fence/Erosion Control	By the unit lump sum (LS)	Install and remove required silt fencing and other specified erosion control measures. Includes restoration of areas affected by performance of this work.
Site Demolition	By the unit lump sum (LS)	Demolish the two (2) lamp posts, motion detection system, and fencing.
Foundation Construction	By the unit lump sum (LS)	All required grading, excavation, sheeting and shoring, subbase installation, foundation steel reinforcement, form work, electrical conduit, pipe wall sleeve systems, concrete, testing, and spoils removal from site.
23A Gravel Driveway CIP	By the unit lump sum (LS)	Delivery and placement, including load tickets, testing, and ENGINEER's field verification of quantity in place.
Demobilization and Final Restoration	By the unit lump sum (LS)	Removal of equipment from the site, restoration, and return of all OWNER facilities to full use. Final seeding and lawn restoration will be performed by the OWNER and not included in the bid price.
Allowance – Misc. Repairs	By the unit lump sum allowance (LS)	Allowance is to be used for repairs and unforeseen conditions as determined necessary by the OWNER. This excludes work called out under other Bid Items.
BID ITEM – ALTERNATE NO. 1		
Water and Sanitary Service Extension	By the unit lump (LS)	Installation of water service, utility sink, hose bib, ejector pump system, sanitary forcemain, maintenance room concrete slab, and future floor drain piping runs with all required appurtenances, and additional site restoration work CIP as specified and required in the Contract Documents..
BID ITEM – ALTERNATE NO. 2		
Golf Cart Storage Building Kit w/ Eave Lights	By the unit lump (LS)	Cost of pre-engineered building kit with eave lights option for the proposed golf cart storage building.

Golf Cart Storage Building Erection w/ Eave Lights	By the unit lump (LS)	Construction of new golf cart storage building with eave lights option, new electrical service, lighting and battery charging systems, gravel floor, and gravel driveway CIP as specified and shown in the Contract Documents.

END OF SECTION

SECTION 01010

SUMMARY OF WORK

PART 1 – GENERAL

1.1 SUMMARY OF WORK

A. Work under this contract consists of construction of the new Leslie Park Golf Course golf cart storage building and related work.

1.2 CONTRACT DOCUMENTS

A. The Work to be done is shown on the set of Drawings entitled Leslie Park Golf Course – Golf Cart Storage Building and dated April, 2016. The numbers and titles of all Drawings appear on the cover sheet of the Drawings. All drawings so enumerated shall be considered an integral part of the Contract Documents as defined herein.

B. Certain Document Sections refer to Divisions of the Contract Specifications. Sections are each individually numbered portions of the Specifications (numerically) such as 08110, 13182, 15206, etc. The term Division is used as a convenience term meaning all Sections within a numerical grouping. Division 16 would thus include Sections 16000 through 16955.

C. The prime CONTRACTOR shall be responsible for all work in the Contract Documents regardless of the division of disciplines.

1.3 GENERAL ARRANGEMENT

A. Drawings indicate the extent and general arrangement of the work. If any departures from the Drawings are deemed necessary by the CONTRACTOR to accommodate the materials and equipment CONTRACTOR proposes to furnish, details of such departures and reasons therefore shall be submitted as soon as practicable to the Engineer for approval by OWNER and Engineer. No such departures shall be made without the prior written approval of the OWNER or Engineer. Approved changes shall be made without additional cost to the OWNER for this work or related work under other Contracts of the Project.

B. The specific equipment proposed for use by the CONTRACTOR on the project may require changes in structures, auxiliary equipment, piping, electrical, mechanical, controls or other work to provide a complete satisfactory operating installation. The CONTRACTOR shall submit to the Engineer, for approval by OWNER and Engineer, all necessary Drawings and details showing such changes to verify conformance with the overall project structural and architectural requirements and overall project operating performance. The Bid Price shall include all costs in connection with the preparation of new drawings and details and all changes to construction work to accommodate the proposed equipment, including increases in the costs of other Contracts.

1.4 CONSTRUCTION PERMITS, EASEMENTS AND ENCROACHMENTS

A. The OWNER shall obtain or cause to be obtained all permanent and temporary construction easements required. No easements are anticipated for this project.

B. The CONTRACTOR shall obtain, keep current and pay all fees for any other necessary construction permits from those authorities, agencies, or municipalities having jurisdiction over land areas, utilities, or structures which are located within the Contract limits and which

will be occupied, encountered, used, or temporarily interrupted by the CONTRACTOR's operations unless otherwise stated. CONTRACTOR shall pay plan review fees and any other fees for required permits. Record copies of all permits shall be furnished to the ENGINEER and OWNER.

C. When construction permits are accompanied by regulations or requirements issued by a particular authority, agency or municipality, it shall be the CONTRACTOR's responsibility to become familiar with and comply with such regulations or requirements as they apply to CONTRACTOR's operations on this Project.

D. The CONTRACTOR will be required to follow the requirements established by all permits necessary for the construction of this project. The following is a list of all permits that must be obtained prior to the beginning of construction.

1. Applicable City Building Permits (all trades).

2. Soil Erosion and Sedimentation Control Permit.

1.5 ADDITIONAL ENGINEERING SERVICES

A. In the event that the ENGINEER is required to provide additional engineering services as a result of substitution of materials or equipment which are not "or equal" by the CONTRACTOR, or changes by the CONTRACTOR in dimension, weight, power requirements, etc., of the equipment and accessories furnished, or if the ENGINEER is required to examine and evaluate any changes proposed by the CONTRACTOR for the convenience of the CONTRACTOR, then the ENGINEER's charges in connection with such additional services shall be charged to the CONTRACTOR by the OWNER.

B. Structural design shown on the Contract Drawings is based upon typical weights for the proposed building kit as indicated on the Contract Drawings and specified. If the building kit furnished exceeds the weights of said equipment, the CONTRACTOR shall assume the responsibility for all costs of redesign and for any construction changes required to accommodate the building kit furnished, including the ENGINEER's expenses in connection therewith.

C. In the event that the ENGINEER is required to provide additional engineering services as a result of CONTRACTOR's errors, omissions, or failure to conform to the requirements of the Contract Documents, or if the ENGINEER is required to examine and evaluate any changes proposed by the CONTRACTOR solely for the convenience of the CONTRACTOR, then the ENGINEER's charges in connection with such additional services shall be charged to the CONTRACTOR by the OWNER.

1.6 ADDITIONAL OWNER'S EXPENSES

A. In the event the Work of this Contract is not completed within the time set forth in the Contract or within the time to which such completion may have been extended in accordance with the Contract Documents, the additional engineering or inspection charges incurred by the OWNER may be charged to the CONTRACTOR and deducted from the monies due the CONTRACTOR. Extra work or supplemental Contract work added to the original Contract, as well as extenuating circumstances beyond the control of the CONTRACTOR, will be given due consideration by the OWNER before assessing engineering and inspection charges against the CONTRACTOR.

B. Charges assessed to the CONTRACTOR for additional engineering and inspection costs will be determined based on actual hours charged to the job by the ENGINEER. Daily rates will

depend on the number and classifications of employees involved, but in no case shall such charges exceed $900 per day for field personnel and $1,100 per day for engineering personnel, based on an eight hour workday.

C. Charges for additional OWNER's expenses shall be in addition to any liquidated damages assessed in accordance with the Contract.

1.7 PROTECTION OF WORK

A. Unless otherwise specifically permitted, all work that would be subject to damage shall be stopped during inclement, stormy or freezing weather. Only such work as will not suffer injury to workmanship or materials will be permitted. CONTRACTOR shall carefully protect the work against damage or injury from the weather, and when work is permitted during freezing weather, CONTRACTOR shall provide and maintain approved facilities for heating the materials and for protecting the finished work.

1.8 SUBSURFACE DATA

A. Subsurface data is offered in good faith solely for placing the Bidder in receipt of all information available to the OWNER and ENGINEER.

B. The Bidder must interpret such subsurface data according to Bidder's own judgment and shall acknowledge that Bidder is not relying upon the same as accurately describing the subsurface conditions, which may be found to exist.

1. The test boring logs present factual information of the subsurface conditions at the specific test boring location only. The Bidder should not consider, or conclude, that the subsurface conditions will be consistent between test boring locations.

C. The Bidder further acknowledges that Bidder assumes all risks contingent upon the nature of the sub-surface conditions to be actually encountered in performing the work covered by the Contract, even though such actual conditions may result in the Bidder performing more or less work than Bidder originally anticipated.

D. The Bidder is further advised that the OWNER has made sub-surface investigations and a report has been prepared, in connection with this project for the ENGINEER, a copy of which is appended to the rear of these specifications.

E. In making this data available, the OWNER makes no guarantee, either expressed or implied, as to their accuracy or to the accuracy of any interpretation thereof.

1.9 SURVEYS AND LAYOUT

A. All work under this Contract shall be constructed in accordance with the lines and grades shown on the Drawings or as directed by the ENGINEER or OWNER. Elevation of existing ground and appurtenances are believed to be reasonably correct but are not guaranteed to be absolute and therefore are presented only as an approximation. Any error or apparent discrepancy in the data shown or omissions of data required for accurately accomplishing the stake out survey shall be referred immediately to the ENGINEER for interpretation or correction.

B. All survey work for construction control purposes, staking, and all related work shall be performed by the CONTRACTOR.

C. CONTRACTOR shall have the responsibility to carefully preserve the bench marks, reference points and stakes, and in the case of destruction thereof by the CONTRACTOR or resulting from CONTRACTOR's negligence, the CONTRACTOR shall be charged with the expense and damage resulting therefrom and shall be responsible for any mistakes that may be caused by the unnecessary loss or disturbance of such bench marks, reference points and stakes.

D. Existing or new control points, property markers and monuments that will be or are destroyed during the normal causes of construction shall be reestablished by the CONTRACTOR and all reference ties recorded therefore shall be furnished to the OWNER and ENGINEER. All computations necessary to establish the exact position of the work shall be made and preserved by the CONTRACTOR.

E. The OWNER or ENGINEER may check all or any portion of the work and the CONTRACTOR shall afford all necessary assistance to the OWNER and ENGINEER in carrying out such checks. Any necessary corrections to the work shall be immediately made by the CONTRACTOR. Such checking by the OWNER or ENGINEER shall not relieve the CONTRACTOR of any responsibilities for the accuracy or completeness of CONTRACTOR's work.

1.10 RESIDENT PROJECT REPRESENTATIVES

A. If the OWNER authorizes the ENGINEER, the ENGINEER shall provide a resident project representative to assist the ENGINEER in carrying out his responsibilities at the site. The resident may not be full-time on-site and the CONTRACTOR shall be responsible for coordination with the ENGINEER. The furnishing of such resident project representatives shall not make the ENGINEER responsible for the CONTRACTOR's construction means, methods, techniques, sequences, or procedures or for any safety precautions or programs in connection with the work. The CONTRACTOR shall remain solely responsible for meeting the requirements of the Contract Documents.

1.11 FIRE PROTECTION

A. CONTRACTOR shall take all necessary precautions to prevent fires at or adjacent to the work, buildings, etc., and shall provide adequate facilities for extinguishing fires which do occur. Burning of debris is not permitted on the project site.

B. When fire or explosion hazards are created in the vicinity of the work as a result of the locations of fuel tanks, or similar hazardous utilities or devices, the CONTRACTOR shall immediately alert the local Fire Marshal, the ENGINEER, and the OWNER of such tank or device. The CONTRACTOR shall exercise all safety precautions and shall comply with all instructions issued by the Fire Marshal and shall cooperate with the OWNER of the tank or device to prevent the occurrence of fire or explosion.

C. Fire protection alarm and detection systems shall comply with the Michigan International Building Code 2009 and NFPA standards.

D. Hydrants must be maintained in service and approved during all phases of work.

E. Storage area for construction materials must not interfere with fire/emergency site access.

F. All material demolished from site should not be stored on location.

1.12 CHEMICALS

A. All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, or reactant of other classification, must show approval of either the EPA or USDA. Use of all such chemicals and disposal of residues shall be in strict conformance with all applicable rules and regulations.

B. Provide MSDS/SDS sheets for all chemicals to OWNER.

1.13 FIRST AID FACILITIES AND ACCIDENTS

A. First Aid Facilities

1. The CONTRACTOR shall provide at the site such equipment and facilities as are necessary to supply first aid to any of CONTRACTOR's personnel who may be injured in connection with the work.

B. Accidents

1. The CONTRACTOR shall promptly report, in writing, to the ENGINEER and OWNER all accidents whatsoever out of, or in connection with, the performance of the work, whether on or adjacent to the site, which cause death, personal injury or property damage, giving full details and statements of witnesses.

2. If death, serious injuries, or serious damages are caused, the accident shall be reported immediately by telephone or messenger to both the OWNER and the ENGINEER.

3. If any claim is made by anyone against the CONTRACTOR or a Subcontractor on account of any accidents, the CONTRACTOR shall promptly report the facts, in writing, to the ENGINEER and OWNER, giving full details of the claim.

1.14 ULTIMATE DISPOSITION OF CLAIMS BY ONE CONTRACTOR ARISING FROM ALLEGED DAMAGE BY ANOTHER CONTRACTOR

A. During the progress of the work, other Contractors may be engaged in performing other work or may be awarded other Contracts for additional work on this project and/or on this site. In that event, the CONTRACTOR shall coordinate the work to be done hereunder with the work of such other Contractors and the CONTRACTOR shall fully cooperate with such other Contractors and carefully fit its own work to that provided under other Contracts as may be directed by the OWNER. The CONTRACTOR shall not commit or permit any act which will interfere with the performance of work by any other CONTRACTOR.

B. If the OWNER shall determine that the CONTRACTOR is failing to coordinate this work with the work of the other Contractors as the OWNER directed, then the OWNER shall have the right to withhold any payments otherwise due hereunder until the CONTRACTOR completely complies with the OWNER's directions.

C. If the CONTRACTOR notifies the OWNER in writing that another CONTRACTOR is failing to coordinate his work with the work of this Contract as directed, the OWNER will promptly investigate the charge. If the OWNER finds it to be true, he will promptly issue such directions to the other CONTRACTOR with respect thereto as the situation may require. The OWNER, the ENGINEER, nor any of their agents shall not, however, be liable for any damages suffered by the CONTRACTOR by reason of the other CONTRACTOR's failure to promptly comply with the directions so issued by the OWNER, or by reason of another CONTRACTOR's default in performance, it being understood that the OWNER does not guarantee the responsibility or continued efficiency of any CONTRACTOR.

D. The CONTRACTOR shall indemnify and hold the OWNER and the ENGINEER harmless from any and all claims of judgments for damages and from costs and expenses to which the OWNER may be subjected or which it may suffer or incur by reason of the CONTRACTOR's failure to comply with the OWNER's directions promptly.

E. Should the CONTRACTOR sustain any damage through any act or omission of any other CONTRACTOR having a Contract with the OWNER for the performance of work upon the site or of work which may be necessary to be performed for the proper execution of the work to be performed hereunder, or through any act or omission of a Subcontractor of such Contract, the CONTRACTOR shall have no claim against the OWNER or the ENGINEER for such damage, but shall have a right to recover such damage from the other CONTRACTOR.

F. Should any other CONTRACTOR having or who shall hereafter have a Contract with the OWNER for the performance of work upon the site sustain any damage through any act or omission of the CONTRACTOR hereunder or through any act or omission of any Subcontractor of the CONTRACTOR, the CONTRACTOR agrees to reimburse such other CONTRACTOR for all such damages and to defend at his own expense any suit based upon such claim and if any judgment or claims against the OWNER shall be allowed, the CONTRACTOR shall pay or satisfy such judgment or claim and pay all costs and expenses in connection therewith and shall indemnify and hold the OWNER harmless from all such claims.

G. The OWNER's right to indemnification hereunder shall in no way be diminished, waived or discharged, by its recourse to assessment of liquidated damages as provided in the Contract, or by the exercise of any other remedy provided for by Contract Documents or by law.

1.15 BLASTING AND EXPLOSIVES

A. The use of blasting or explosives shall not be allowed under this project.

1.16 LIMITS OF WORK AREA

A. The CONTRACTOR shall confine the construction operations within the Contract limits shown on the Drawings and/or property lines and/or fence lines. Storage of equipment and materials, or erection and use of sheds outside of the Contract limits, if such areas are the property of the OWNER, shall be used only with the OWNER's approval. Such storage or temporary structures, even within the Contract's limits, shall be confined to the OWNER's property and shall not be placed on properties designated as easements or rights-of-way unless specifically permitted elsewhere in the Contract Documents.

1.17 WEATHER CONDITIONS

A. No work shall be done when the weather is unsuitable. The CONTRACTOR shall take necessary precautions (in the event of impending storms) to protect all work, materials, or equipment from damage or deterioration due to floods, driving rain, or wind, and snow storms. The OWNER reserves the right to order that additional protection measures over and beyond those proposed by the CONTRACTOR, be taken to safeguard all components of the Project. The CONTRACTOR shall not claim any compensation for such precautionary measures so ordered, nor claim any compensation from the OWNER for damage to the work from weather elements.

B. The mixing and placing of concrete or pavement courses, the laying of masonry, and installation of sewers and water mains shall be stopped during rainstorms and when ordered by the OWNER; and all freshly placed work shall be protected by canvas or other suitable

covering in such manner as to prevent running water from coming in contact with it. Sufficient coverings shall be provided and kept ready at hand for this purpose. The limitations and requirements for mixing and placing concrete, or laying of masonry, in cold weather shall be as described elsewhere in these Specifications.

C. The ENGINEER shall have permissive authority over the work which is proposed to be done during the winter months. The CONTRACTOR shall provide adequate weather protection, temporary heating, ground thawing equipment and take any other measures which are necessary to insure that the work performed during the winter months is properly installed and protected against damage from freezing.

D. Any and all work performed during adverse conditions shall adhere to the applicable Codes and Standards (i.e. ACI, ASTM, etc.).

1.18 USE OF FACILITIES BEFORE COMPLETION

A. The OWNER reserves the right to enter and use any portion of the constructed facilities before final completion of the whole work to be done under this Contract. However, only those portions of the facilities which have been completed to the OWNER's satisfaction, as evidenced by issuing a Certificate of Partial Completion covering that part of the work, shall be placed in service.

B. It shall be the OWNER's responsibility to prevent premature connections to or use of any portion of the installed facilities by private or public parties, persons or groups of persons, before the OWNER issues the Certificate of Partial Completion covering that portion of the work to be placed in service.

C. Consistent with the approved progress schedule, the CONTRACTOR shall cooperate with the OWNER, his agents, and the ENGINEER to accelerate completion of those facilities, or portions thereof, which have been designated for early use by the OWNER.

1.19 DELIVERY, STORAGE, AND HANDLING

A. All materials, supplies and equipment, whether furnished by the CONTRACTOR or by the OWNER, shall be delivered, stored and handled as to prevent the inclusion of foreign materials and/or damage by water, freezing, breakage or other causes. The ENGINEER may require the CONTRACTOR to provide an enclosed storage shed for the storage of the above mentioned materials, supplies and equipment. Packaged materials shall be delivered in the original unopened containers and shall be stored until ready for use. All materials which have been stored shall meet the requirements of the Specifications at the time they are used in the project.

1.20 PROTECTION OF TREES

A. All trees which are to be preserved and which, in the opinion of the ENGINEER, might be subject to damage by the CONTRACTOR's operations, shall be adequately protected against damage to the bark by 2-inch thick vertical planking securely wired or tied completely around the tree trunk. Such protection shall not be removed until authorized by the ENGINEER.

B. Machine excavation shall not be made within a circular area of any tree, the diameter of the area in feet being equal to the radius of the tree in inches. Snow fencing shall be placed around this area for any tree in or facing the work area. If hand excavation within this area cuts across a large root of a tree, the butting of which, in the opinion of the ENGINEER, would be injurious to the tree, the CONTRACTOR shall tunnel under such root and protect it from injury throughout the work.

C. Trees which interfere with the work, and the removal of which is permitted, shall be removed by the CONTRACTOR at his expense and in a safe manner. Such tree removal shall be considered incidental to the work. No trees are to be removed without the expressed approval of the governmental body having jurisdiction thereof, and of the ENGINEER.

PART 2 – PRODUCTS

(NOT USED)

PART 3 – EXECUTION

(NOT USED)

END OF SECTION

SECTION 01210

ALLOWANCES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Cash Allowances

1.2 DEFINITIONS

A. Cash Allowance: A monetary sum that includes, as part of the contract price, the associated costs and requirements to complete the specified allowance.

1.3 SUBMITTALS

A. CONTRACTOR shall submit a detailed proposal to indicate the work to be performed that exceeds the contract scope.

B. The OWNER will review and either approve or deny the proposal.

1.4 OWNER'S INSTRUCTIONS

A. Use allowances only as directed for Owner's purposes, and only by Change Orders which designate amounts to be charged to the allowance.

B. If the actual price for the specified allowance is more or less than the stated allowance, the contract price shall be adjusted accordingly by Change Order. The adjustment in contract price shall be made in accordance with the General Conditions.

C. At project closeout, any amounts remaining in allowances will be credited to Owner by Change Order.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION

A. Contractor shall coordinate all required materials and labor associated for each allowance item with related materials and work specified in the Contract Documents.

3.2 CASH ALLOWANCE

A. A cash allowance of $5,000 shall be included in the contract price for additional work that the OWNER approves in advance. This allowance shall only be used to pay for the pre-approved work that exceeds the contract scope. All paperwork and coordination between the CONTRACTOR and OWNER shall be considered incidental to the Contract.

END OF SECTION

SECTION 01290

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Schedule of Values

B. Initial Application of Payment

C. Application for Payment

D. Application for Payment at Substantial Completion

E. Final Payment Application

1.2 RELATED SECTIONS

A. Section 01330 - Submittal Procedures

1.3 SCHEDULE OF VALUES

A. CONTRACTOR shall submit a typed Schedule of Values for review and approval. The approved Schedule of Values will be used to prepare future Applications for Payment.

B. CONTRACTOR shall submit the Schedule of Values in triplicate to the ENGINEER for approval within 15 days after the date of OWNER-CONTRACTOR Agreement execution.

C. Format: Identify each line item with number and title of the major Specification Section.

D. Include within each line item, a direct proportional amount of CONTRACTOR's overhead and profit.

E. Revise Schedule of Values to list approved Change Orders, with each Application for Payment.

F. Include the following Project Identification on the Schedule of Values:

1. Project Name and Location

2. Name of ENGINEER

3. Project Number

4. CONTRACTOR's Name and Address

5. Date of Submittal

G. Arrange Schedule of Values in a tabular form with separate rows for each Specification Section and separate columns for each major structure area of Work. Additionally, separate line items for the following shall be included:

1. Mobilization (Maximum 5% of Contract Total)

2. Bonds & Insurance

3. Allowances

4. Start-Up and Commissioning

5. Training and O&M Manuals (Minimum 1% of Contract Total)

6. Project Close-Out

H. Provide a breakdown of the Contract Price in sufficient detail to facilitate continued evaluation of Application for Payment and progress reports. Break principal subcontract amounts down into several line items.

I. For each part of the Work where an Application for Payment may include materials for equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

J. Update and resubmit the Schedule of Values when change orders result in a change in the contract price.

K. The Schedule of Valves shall be submitted as a shop drawing for OWNER approval.

L. The Schedule of Valves shall be divided into the following major headings:

1. General (Division 1)

2. Site Work (Division 2)

3. Structural (Division 3)

4. Architectural (Divisions 4 through 8, and 13)

5. Process (Divisions 15)

6. Electrical (Divisions 16)

M. The Schedule of Values shall provide a cost for the following items separate from the Divisions noted above.

1. Potable water and sanitary sewer service lines, utility sink, and ejector pump system.

1.4 INITIAL APPLICATION FOR PAYMENT

A. Administrative actions and submittals that must precede submittal of the first Application for Payment include the following:

1. List of Subcontractors

2. List of Principal Suppliers and Fabricators

3. Schedule of Values

4. CONTRACTOR's Construction Schedule (preliminary if not final)

1.5 APPLICATIONS FOR PAYMENT

A. Submit three (3) copies of each application.

B. Content and Format: Utilize Schedule of Values and Change Orders for listing items in Application for Payment.

C. Payment Period: Payments made according to the schedule described in the General Conditions and or in accordance with the OWNER's requirements.

D. With each copy of the applications submit Waiver of Lien from all subcontractors or suppliers for work included in Application for Payment, other than the first pay application.

E. Submit a completed CONTRACTOR's Declaration with each Application for Payment.

1.6 APPLICATION FOR PAYMENT AT SUBSTANTIAL COMPLETION

A. Following issuance of Certificate of Substantial Completion, submit an Application for Payment.

B. Administrative actions and submittals that shall proceed or coincide with this application include:

1. Occupancy permits and similar approvals.
2. Warranties (guarantees) and maintenance agreements.
3. Test/adjust/balance records.
4. Maintenance instructions; O&M manuals.
5. Meter readings.
6. Start-up performance reports and inspection reports.
7. Changeover information related to OWNER's occupancy, use, operation and maintenance.
8. Final cleaning.
9. Application for reduction of retainage, and consent of surety.
10. Advice on shifting insurance coverage.
11. List of incomplete work, recognized as exceptions to ENGINEER's Certificate of Substantial Completion.
12. As-Built Drawings.

1.7 FINAL PAYMENT APPLICATION

A. Administrative actions and submittals which must precede or coincide with submittal of the final payment Application for Payment include the following:

1. Completion of Project Closeout requirements.
2. Completion of items specified for completion after Substantial Completion.
3. Assurance that unsettled claims will be settled.
4. Assurance that work not complete and accepted will be completed without undue delay.
5. Proof that taxes, fees, and similar obligations have been paid.
6. Removal of temporary facilities and services.
7. Removal of surplus materials, rubbish, and similar elements.
8. Change of door locks to OWNER's access.
9. CONTRACTOR's waivers of liens for project.
10. Written description of how all punch list items were addressed.
11. Final pay application will not be approved until as-built drawings are submitted and approved by the Engineer.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 01310

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Project Superintendence.

B. Coordination and project conditions.

C. Field engineering.

D. Pre-Construction Conference.

E. Site Mobilization Meeting.

F. Progress meetings.

G. Preinstallation meetings.

1.2 PROJECT SUPERINTENDENCE

A. CONTRACTOR's superintendent shall be on site full time for the duration of the project and shall meet the experience requirements identified in the instructions to bidders.

1.3 COORDINATION AND PROJECT CONDITIONS

A. Coordinate with utility companies for construction of utilities to the construction site.

B. Coordinate with OWNER/ENGINEER to request OWNER-supplied surveying.

C. Coordinate with other contractors to complete connections to other work.

D. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation. Where installation of one part of the work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results. Where availability of space is limited, coordinate the installation of different components to assure maximum accessibility for required maintenance, service and repair. Make adequate provisions to accommodate items scheduled for later installation.

E. CONTRACTOR shall be responsible for coordinating any exchange of Safety Data Sheets or other hazard communication information required to be made available to or exchanged between or among employers at the project Site in accordance with the applicable Laws or Regulations. CONTRACTOR shall train CONTRACTOR's employees on use of these sheets and shall keep a master copy on hand at the project site.

F. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Schedules.
2. Installation and removal of temporary facilities.
3. Delivery and processing of submittals.
4. Progress meetings.
5. Request for Information (RFIs).
6. Project closeout activities.

H. Coordinate scheduling, submittals, and Work of the various sections of the Contract Documents to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

I. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

J. Check motor voltages and control characteristics.

K. Coordinate controls, interlocks, wiring of switches, and relays.

L. Coordinate wiring and control diagrams.

M. After OWNER occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of OWNER's activities.

1.4 FIELD ENGINEERING

A. CONTRACTOR shall protect survey control and reference points. Promptly notify ENGINEER of any discrepancies discovered.

B. Control datum for survey is shown on Drawings.

C. Field verify all dimensions and measurements.

D. Verify setbacks and easements; confirm drawing dimensions and elevations.

E. Provide field-engineering services. Establish elevations, lines, and levels utilizing recognized engineering survey practices.

F. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

G. Promptly report to ENGINEER the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

H. Replace dislocated survey control points based on original survey control. Make no changes without prior written Notice to Engineer.

1.5 PRE-CONSTRUCTION CONFERENCE

A. OWNER will schedule a Pre-Construction Conference and organizational meeting at the site or other convenient location prior to commencement of construction activities to review responsibilities and personnel assignments.

B. Attendees: OWNER, ENGINEER and ENGINEER's consultants, CONTRACTOR and its superintendent, major subcontractors, manufacturers, suppliers, utility companies, and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the work.

C. Agenda: Discuss items of significance that could affect progress including such topics as:

1. Site Access and Badging.
2. Tentative Construction Schedule.
3. Critical Work sequencing.
4. Designation of responsible personnel.
5. Coordination with other construction work and other contractors.
6. Procedures for processing field decisions and Change Orders.
7. Procedures for processing Applications for Payment.
8. Distribution of Contract Documents.
9. Submittal of Shop drawings, Product Data, Samples and Schedule.
10. Preparation of record documents
11. Use of the premises.
12. Office, work, and storage areas.
13. Equipment deliveries and priorities.
14. CONTRACTOR's Quality Assurance Plan.
15. Safety procedures.
16. First Aid.
17. Security.
18. Housekeeping.
19. Working hours.

20. Stormwater Management and Soil Erosion Control Provisions.

21. Utility Contacts.

D. In addition to the Pre-Construction Conference, ENGINEER may also require a Pre-Excavation, Concrete Pre-Pour Conference, and/or other critical activity conference in advance of the work. CONTRACTOR and Subcontractors performing excavation work on site shall describe their plans for shoring, dewatering, disposal of spoils, and any other particulars of the excavation process, including the technical basis for their selection of the means and methods to be employed.

1.6 SITE MOBILIZATION MEETING

A. OWNER will schedule a Site Mobilization meeting at the project site prior to the CONTRACTOR's occupancy.

B. Attendance is required by the OWNER, ENGINEER, CONTRACTOR's Superintendent, and the major subcontractors.

C. CONTRACTOR shall submit a site plan identifying the CONTRACTOR's limits of work, trailer and storage area locations, for coordination with other work.

D. Agenda:

1. Use of premises by OWNER and CONTRACTOR.

2. OWNER's requirements.

3. Construction facilities and controls.

4. Temporary utilities.

5. Survey.

6. Security and housekeeping procedures.

7. Schedules.

8. Procedures for maintaining record documents.

9. Inspection and acceptance of equipment put into service during the construction period.

1.7 SITE SAFETY MEETING

A. OWNER will schedule a Site Safety Meeting at the project site prior to the CONTRACTOR's occupancy.

B. Attendance is required by the OWNER, ENGINEER, CONTRACTOR's Superintendent, CONTRACTOR's Safety Officers, and all subcontractors.

C. Agenda:

1. Safety procedures.

2. First Aid.

3. Security.

1.8 PROGRESS MEETINGS

A. Schedule and administer meetings throughout the progress of the Work at maximum monthly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record and distribute the minutes.

C. Attendance Required: Job superintendent, major subcontractors and suppliers, OWNER, and ENGINEER as appropriate to agenda topics for each meeting.

D. Agenda:

1. Review minutes of previous meetings.

2. Review of Work progress.

3. Field observations, problems, and decisions.

4. Identification of problems that impede planned progress.

5. Review of submittals schedule and status of submittals.

6. Review of RFIs.

7. Review of off-site fabrication and delivery schedules.

8. Maintenance of progress schedule.

9. Corrective measures to regain projected schedules.

10. Planned progress during succeeding work period.

11. Coordination of projected progress.

12. Maintenance of quality and work standards.

13. Effect of proposed changes on progress schedule and coordination.

14. Other business relating to Work.

E. Record minutes and distributes copies within two days after meeting to participants, with copies to ENGINEER, OWNER, participants, and those affected by decisions made.

F. Submit updated construction schedule to the OWNER/ENGINEER for review two days before each progress meeting. Revise construction schedule as needed after each progress meeting and resubmit to the OWNER/ENGINEER with the meeting minutes.

1.9 PREINSTALLATION OR SHUTDOWN COORDINATION MEETING

A. When required in individual Specification sections, or as deemed necessary by the CONTRACTOR, ENGINEER or OWNER, convene a preinstallation or shutdown coordination meeting at the site prior to commencing work.

B. Require attendance of parties directly affecting, or affected by, Work of the specific section.

C. Notify OWNER/ENGINEER five working days in advance of meeting date.

D. Prepare agenda and preside at meeting:

1. Review conditions of shutdown, installation, preparation and installation procedures.

2. Review coordination with related work.

E. Record minutes and distributes copies within two days after meeting to participants, with copies to ENGINEER/OWNER participants, and those affected by decisions made.

1.10 FINAL INSPECTION MEETING

A. When the CONTRACTOR has provided written notice that the project is complete, a final inspection meeting shall be scheduled with the CONTRACTOR, ENGINEER, and OWNER.

B. ENGINEER will notify the CONTRACTOR in writing of all items which this inspection reveals are incomplete or defective.

C. CONTRACTOR shall immediately take all necessary measures to remedy such deficiencies. A written description of how each item has been addressed shall be submitted to the ENGINEER and OWNER.

1.11 CLOSEOUT/WARRANTY MEETING

A. Prior to final application for payment, a closeout/warranty meeting shall be scheduled with the CONTRACTOR, ENGINEER and OWNER.

B. Agenda:

1. Project record document review.

2. Verify receipt of spare parts and maintenance products.

3. Review preventative maintenance schedule.

4. Review submitted warranties and bonds.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 01320

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pre-Construction Documentation

B. Photographic Progress Documentation

1.2 ELECTRONIC STORAGE

A. Maintain organized electronic storage of project pre-construction and progress photos and video until Final Payment.

1.3 PRE-CONSTRUCTION DOCUMENTATION

A. CONTRACTOR shall take a sufficient number of digital Pre-Construction photographs, a minimum of 100, so as to resolve any disputes, which may arise regarding the considerations prior to and subsequent to construction.

B. CONTRACTOR shall furnish one USB flash drive of the digital Pre-Construction photographs to the ENGINEER, and shall make others available for review in settling any disputes.

C. In addition to photographs, the CONTRACTOR shall produce a high quality pre-construction video of the entire site on USB Flash Drive and submit it to the ENGINEER.

D. If a dispute arises where digital pre-construction photographs or video was not taken, the disputed area shall be restored to the extent directed by the ENGINEER and to the complete satisfaction of the OWNER.

1.4 PROGRESS PHOTOGRAPHS

A. CONTRACTOR shall take enough digital photographs to sufficiently record the construction progress of the project. All critical construction events shall be thoroughly recorded with photographs.

B. CONTRACTOR shall maintain one 3-ring binder in the construction trailer with photos printed on 8.5” x 11” pages. Each page of the binder shall have two 4” x 6” digital photos printed along with an identification caption below each photo. Photos shall be organized in tabbed sections by the type of work shown. Photo binder shall be delivered to the OWNER with the final application for payment.

C. With the each application for payment, the CONTRACTOR shall submit all photos taken during the previous month on one USB flash drive.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHS

A. Digital.

B. Size: 10.0 Megapixel Minimum.

C. Format: JPEG.

2.2 BINDER PAGES

A. Paper Size: 8.5” x 11”.

B. Paper Weight: 240 g/m^2.

C. Finish: Semi-Gloss.

2.3 IDENTIFICATION

A. Identify in caption below each print:

1. Description and location of view.

2. Time and date of exposure.

PART 3 - EXECUTION

3.1 TECHNIQUE

A. Factual presentation.

B. Correct exposure and focus.

1. High resolution and sharp.

2. Maximum depth-of-field.

3. Minimum distortion.

3.2 VIEWS REQUIRED

A. Consult with ENGINEER for instructions concerning views required.

B. Photograph from locations to adequately illustrate state of project, or condition of construction.

C. Take photographs from as close to the same position each time as practical.

D. Take two (2) series of ground level photographs from each of the corners of the main project site area on the first day of each month.

E. In addition, provide photographs prior to, at critical stages of, and at the end of construction, when they do not coincide with scheduled times.

3.3 DELIVERY OF PRINTS

A. Deliver digital copies of photos monthly to accompany each request for progress payment. Photos shall be submitted on one USB flash drive.

B. Deliver 3-ring photo binder with the final application for payment.

END OF SECTION

SECTION 01330

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Submittal Procedures

B. Certifications

C Shop Drawings

D. Product Data

E. Samples

F. Manufacturers' Instructions

G. Manufacturers' Field Reports

H. Construction Schedule

I. Submittal Schedule

1.2 SUBMITTAL PROCEDURES

A. Package each submittal appropriately for shipping and handling. This shall include an index either on the transmittal or within the submittal itself. Transmit each submittal from CONTRACTOR to ENGINEER using a transmittal form. Submittals received from sources other than CONTRACTOR will be returned without action. Use separate transmittals for items from different Specification sections. Number each submittal consecutively. Resubmittals should have the same number as the original, plus a letter designation for each Resubmittal (i.e. 7-A, 7-B, etc.)

B. Indicate on the transmittal relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations. Include CONTRACTOR's certification that information complies with Contract Document requirements. On Resubmittal, all changes shall be clearly identified for ease of review. Resubmittals shall be reviewed for the clearly identified changes only. Any changes not clearly identified will not be reviewed and original submittal shall govern.

C. Include the following information on the label for processing and recording action taken.

1. Project name.

2. Date.

3. Name and address of ENGINEER.

4. Name and address of CONTRACTOR.

5. Name and address of subcontractor.

6. Name and address of supplier.

7. Name of manufacturer.

8. Number and title of appropriate Specification sections.

9. Drawing number and detail references, as appropriate.

D. Schedule submittals to expedite the Project, and deliver to ENGINEER at business address. Coordinate submission of related items. Coordinate related activities that require sequential activity.

E. Submit a schedule of shop drawing submittals.

F. Review and approve shop drawings, project data, and samples before submitting them.

G. Verify field measurements, field construction criteria, catalog numbers, and similar data. Indicate on the submission exactly what was verified.

H. Any markings done by CONTRACTOR shall be done in a color other than red. Red is reserved for ENGINEER's marking.

I. The number of copies to be submitted will be determined at the pre-construction conference. Submittals are to be submitted and will be marked and returned to CONTRACTOR. Blue or black line prints shall be submitted in sufficient quantity for distribution to ENGINEER and OWNER recipients.

J. Coordinate each submittal with the requirements of the Contract Documents.

K. Provide space for CONTRACTOR and ENGINEER review stamps.

L. Apply CONTRACTOR's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.

M. Submit the number of copies that the CONTRACTOR requires, plus four copies that will be retained by the OWNER and ENGINEER.

N. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.

O. No claim will be allowed for damages or extension of time because of delays in the work resulting from rejection of material or from revision and resubmittal of shop drawings, project data, or samples.

P. No extension of contract time will be authorized because of failure to transmit submittals to ENGINEER sufficiently in advance of the work to permit processing.

Q. ENGINEER reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

R. Do not install materials or equipment which requires submittals until the submittals are returned with ENGINEER's/OWNER's stamp and initials or signature indicating approval. The OWNER shall have final approval authority.

S. CONTRACTOR's responsibility of errors, omissions, and deviations from requirements of Contract Documents in submittals is not relieved by the ENGINEER's review.

T. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with requirements.

U. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

V. Submittals not requested in conformance with this Specification will not be recognized or processed.

W. Revise and resubmit as required, identify all changes made since the previous submittal.

X. In the event that more than two (2) re-submittals of any submittal is necessary to achieve conformance to the contract requirements, CONTRACTOR shall be charged for excess engineering. The OWNER shall deduct these charges from the CONTRACTOR's final payment. Charges will be $115.00/hr. minimum 4 hours, for each additional submittal of an item. A tabulated record of such charges will be provided for the CONTRACTOR’s review prior to the processing of the final payment.

Y. Submit new project data and samples when the initial submittal is returned disapproved.

1.3 CERTIFICATIONS

A. When specified in individual specification sections, submit certification by the manufacturer, installation/application subcontractor, or the CONTRACTOR to ENGINEER, in quantities specified for Product Data.

B. Indicate that the material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certifications may be recent or previous test results of the material or product, but must be acceptable to ENGINEER.

1.4 SHOP DRAWINGS

A. Shop Drawings: Submit to ENGINEER for review for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Produce copies and distribute in accordance with Paragraph 1.2 - Submittal Procedures.

B. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of shop drawings. Standard information prepared without specific reference to the project is not considered shop drawings.

C. Shop drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings. Shop drawings include the following information:

1. Dimension.

2. Identification of products and materials included.

3. Compliance with specified standards.

4. Notation of coordination requirements.

5. Notation of dimensions established by field measurements.

D. Nameplate data for equipment including electric motors shall be included on shop drawings. Electric motor data shall state the manufacturer, horsepower, service factor, voltage, enclosure type, oversize wiring box, etc.

E. Shop drawings shall indicate shop painting requirements to include type of paint and manufacturer.

F. Standard manufactured items in the form of catalog work sheets showing illustrated cuts of the items to be furnished, scale details, sizes, dimensions, quantity, and all other pertinent information should be submitted and approved in a similar manner.

G. Measurements given on shop drawings or standard catalog sheets, as established from the Contract Drawings and as approved by ENGINEER, shall be followed. When it is necessary to verify field measurements, they shall be checked and established by CONTRACTOR. The field measurements so established shall be followed by CONTRACTOR and by all affected trades.

H. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

1.5 PRODUCT DATA

A. Product Data: Submit to ENGINEER for review for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Produce copies and distribute in accordance with Paragraph 1.2 - Submittal Procedures.

B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

C. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

1.6 SAMPLES

A. Submit full-size, fully fabricated samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers or materials, color range sets, and swatches showing color, texture, and pattern.

B. Mount, display, or package samples in the manner specified to facilitate review of qualities indicated. Prepare samples to match ENGINEER’s sample. Include the following:

1. Generic description of the sample.

2. Sample source.

3. Product name or name of manufacturer.

4. Compliance with recognized standards.

5. Availability and delivery time.

C. Submit samples for review of kind, color, pattern, and texture, for a final check of these characteristics with other elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

D. Refer to other specifications sections for requirements for samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

E. Preliminary Submittals: Where samples are for selection of color, pattern, texture, or similar characteristics from a range of standard choices, submit a full set of choices for the material or product.

1. Preliminary Submittals will be reviewed and returned with ENGINEER's mark indicating selection and other action.

F. Except for samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit 3 sets; one will be returned marked with the action taken.

G. Maintain sets of samples, as returned, at the site, for quality comparisons throughout the course of construction.

H. Unless noncompliance with Contract Document provisions is observed the submittal may serve as the final submittal.

I. Sample sets may be used to obtain final acceptance of the construction associated with each set.

1.7 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to ENGINEER for delivery to OWNER in quantities specified for Product Data.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.8 MANUFACTURER'S FIELD REPORTS

A. Submit reports for the OWNER.

B. Submit report in duplicate, within 7 days of observation, to ENGINEER and OWNER for Information.

C. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

1.9 CONSTRUCTION SCHEDULE

A. Bar Chart Schedule:

1. Prepare a fully developed, horizontal bar chart type construction schedule. Schedule shall be prepared electronically in Microsoft Project with critical path and links shown. Submit color copies of the schedule within 30 days of the date established for commencement of the work.

2. Provide a separate item bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the work as indicated on schedule of values.

3. Prepare schedule of sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for entire construction period.

4. Secure time commitments for performing critical elements of the work from parties involved. Coordinate each element on schedule with other construction activities; include minor elements involved in the sequence of the work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the work.

5. Coordinate construction schedule with schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other schedules.

6. Indicate completion in advance of the date established for substantial completion. Indicate substantial completion on the schedule to allow time for ENGINEER's procedures necessary for certification of substantial completion

B. Schedule Updating: Provide an updated construction schedule at each progress meeting. Color copies of the updated schedule shall be prepared for all attendees.

1.10 SUBMITTAL SCHEDULE

A. After development and acceptance of the construction schedule, prepare a complete schedule of submittals. Submit schedule within 10 days of the date required for establishment of construction schedule.

B. Coordinate submittal schedule with the list of subcontracts, schedule of values, and the list of products as well as construction schedule.

C. Prepare schedule in chronological order; include submittals required during the first 90 days Provide the following information:

1. Scheduled date for the first submittal.

2. Related section number.

3. Submittal category.

4. Name of subcontractor.

5. Description of the part of the work covered.

6. Scheduled date for Resubmittal.

7. Scheduled date ENGINEER's final release or approval.

D. The submittal schedule shall reflect critical path shop drawings that must be expedited.

E. Following response to initial submittal, print and distribute copies to ENGINEER, OWNER, subcontractors, and other parities required to comply with submittal dates indicated. Post copies in the project meeting room and field office.

F. When revisions are made, distribute to the same parities and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the work and are no longer involved in construction activities.

G. Schedule Updating: Provide an updated submittal schedule at each progress meeting.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

3.1 ENGINEER'S ACTION

A. Except for submittals for record, information or similar purposes, where action and return is required or requested, ENGINEER will review each submittal, mark to indicate action taken, and return promptly.

1. Compliance with specified characteristics is CONTRACTOR's responsibility.

B. Action Stamp: ENGINEER will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:

1. Final Unrestricted Release: Where submittals are marked "No Exceptions Taken" that part of the work covered by the submittal may proceed provided it complies with the requirements of the Contract Documents; final acceptance will depend upon the compliance.

2. Final-But-Restricted Release: When submittals are marked "Make Corrections Noted" that part of the work covered by the submittal may proceed, provided it complies with notation or correction on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.

3. Returned for Resubmittal: When submittal is marked "Rejected" or "Revise and Resubmit" do not proceed with the part of the work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.

a. Do not permit submittals marked "Rejected" or "Revise and Resubmit" to be used at site, or elsewhere where work is in progress.

4. Additional Information Needed: When submittal is marked "Submit Specified Item" CONTRACTOR shall submit requested information.

5. Other Action: Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned, marked “Acknowledge Receipt”.

6. The approval of ENGINEER shall not relieve CONTRACTOR of responsibility for errors on drawings or submittals as ENGINEER’s checking is intended to cover compliance with drawings and specifications and not enter into every detail of the shop work.

END OF SECTION

SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Temporary Utilities.

1. Temporary electricity.
2. Temporary lighting for construction purposes.
3. Internet service.
4. Temporary water service.
5. Temporary sanitary facilities.

B. Construction Facilities.

1. Field offices and sheds.

C. Temporary Controls.

1. Dust Control.
2. Barriers
3. Protection of the Work
4. Security measures.
5. Water control.

D. Removal of utilities, facilities, and controls.

1.2 TEMPORARY ELECTRICITY

A. Provide and pay for power service required from utility source as needed for construction operation.

B. Provide temporary electric feeder from electrical service at location as directed. Provide all necessary meters, disconnections and transformers. A separate meter shall be installed by the CONTRACTOR for the purpose of establishing compensation for electrical power usage.

C. Complement existing power service capacity and characteristics as required.

D. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.

E. Provide main service disconnect and over-current protection at convenient location.

1.3 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain incandescent lighting for construction operations.

B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

C. Maintain lighting and provide routine repairs.

1.4 INTERNET SERVICE

NOT USED

1.5 TEMPORARY WATER SERVICE

A. Water is not available at the construction site. CONTRACTOR shall make arrangements with the OWNER to have water available.

B. CONTRACTOR shall install an approved backflow preventer at the source prior to use. A meter shall be installed by the CONTRACTOR for the purpose of establishing compensation for water use, at no additional cost to the Owner.

1.6 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Existing facility use is not permitted. Provide at the time of project mobilization. Provide chemical toilets and provisions for replacement of chemicals and disposal of wastes for the duration of the contract.

1.7 FIELD OFFICES AND SHEDS

A. Prepare a drawing for submittal and approval showing construction facility layouts including temporary facilities, storage areas, parking, construction work and other related activities.

B. The ENGINEER does not require a field office.

C. Existing facilities shall not be used for field offices or for storage.

D. Locate offices and sheds a minimum distance of 30 feet (10m) from existing and new structures.

E. Construction: Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations with steps and landings at entrance doors.

1. Construction: Structurally sound, secure, weather tight enclosures for office and storage spaces. Maintain during progress of Work; remove when no longer needed.

2. Temperature Transmission Resistance of Floors, Walls, and Ceilings: Compatible with occupancy and storage requirements.

3. Exterior Materials: Weather resistant, finished in color acceptable to ENGINEER.

4. Interior Materials in Offices: Sheet type materials for walls and ceilings, pre-finished or painted; resilient floors and bases.

5. Lighting for Offices: 50 ft-C (538 lx) at desk top height, exterior lighting at entrance doors.

6. Fire Extinguishers: Appropriate type fire extinguisher at each office and each storage area.

7. Interior Materials in Storage Sheds: As required to provide specified conditions for storage of products.

F. Environmental Control:

1. Heating and Ventilating for Offices: Automatic equipment to maintain comfort conditions.

2. Storage Spaces: Heating and ventilation as needed to maintain products in accordance with Contract Documents; adequate lighting for maintenance and inspection of products.

G. Storage Areas and Sheds: Size to storage requirements for products of individual Sections, allowing for access and orderly provision for maintenance and for inspection of products.

H. Preparation: Fill and grade sites for temporary structures to provide drainage away from buildings.

I. Maintenance and Cleaning:

1. Periodic cleaning and maintenance for office and storage areas.

2. Maintain approach walks free of mud, water, and snow.

J. Removal: At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

1.8 DUST CONTROL

A. No dust migration off site shall be permitted.

B. All haul roads, detour roads, and other public and private roads, driveways and parking lots used by the CONTRACTOR must be maintained in a dust free condition during the life of this Contract. The control of the dust shall be accomplished by the application of dust control materials and methods of application as approved and as directed by the ENGINEER. Such dust control materials shall be applied as often as is necessary to control the dust.

C. Should the CONTRACTOR be negligent of his duties in providing dust control, the OWNER may, with or without notice, cause the same to be done and deduct the cost of such work from any monies due or to become due the CONTRACTOR under this Contract, but the performance of such work by the OWNER, or at his insistence, shall serve in no way to release the CONTRACTOR from his liability for dust control.

D. Dust Palliative may be any of the following:

1. Road oil of 30% asphalt base applied at the rate of 0.5 gallons per square yard.

2. Type 1-calcium chloride applied at the rate of 6 pounds per ton of aggregate.

3. Water, as required.

4. Other methods as approved by the ENGINEER.

E. Street Cleaning

1. Contractor shall provide street cleaning with water for City streets and golf course parking areas affected by spillage of excavated material or other material associated with the work.

2. Contractor shall provide street cleaning by the end of each workday when spillage has occurred, and upon request by OWNER.

3. Contractor shall sweep and clean the golf course parking lot and City streets adjacent to the job site when there is visible dust or debris on the parking lot and street surfaces that came from the construction site, from vehicles coming to or from the construction site, or is in any way associated with CONTRACTOR'S work on this contract.

1.9 BARRIERS

A. Provide barriers to protect existing facilities and adjacent properties from damage from construction operations.

B. Provide protection for plant life designated to remain. Replace damaged plants.

C. Protect non-owned vehicular traffic, stored materials, site and structures from damage.

1.10 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection where specified in individual Specification Sections.

B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

E. Prohibit traffic from landscaped areas.

1.11 WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water.

1.12 REMOVAL OF UTILITIES, FACILITIES AND CONTROLS

A. Remove temporary utilities, equipment, facilities, and materials prior to Substantial Completion inspection.

B. Remove underground installations. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 01550

VEHICULAR ACCESS AND PARKING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Vehicular Access

B. Security

C. Parking Areas

1.2 DESCRIPTION

A. CONTRACTOR shall provide temporary construction roads, walks, and appurtenances required during the Project for use by CONTRACTOR, OWNER's operations, chemical deliveries, other contractors working on the Project, and emergency vehicles. Temporary roads and parking areas shall be designed and maintained by CONTRACTOR and be fully usable in all weather conditions. Temporary roads that are used by the OWNER shall be designed and maintained to meet the loading requirements of AASHTO H-20 wheel loads.

B. Use of Existing Access Roads/Drives:

1. CONTRACTOR will be allowed to use OWNER'S existing roads/drives upon obtaining OWNER's written permission.

2. Prevent interference with traffic on existing roads, drives and parking areas. At all times, keep access roads and entrances serving the Site clear and available to OWNER, OWNER's employees, chemical deliveries, emergency vehicles, and other contractors. Do not use these areas for parking or storage of materials.

3. CONTRACTOR shall indemnify and hold harmless OWNER from expenses caused by CONTRACTOR's operations over existing roads and parking areas.

4. Schedule deliveries to minimize use of driveways and entrances.

1.3 SITE ACCESS

A. CONTRACTOR shall access the site via the north access road site adjacent to the parking lot.

1.4 SECURITY

A. The Contractor shall abide by and implement all site security measures in use at the Leslie Golf Course, whether in use at Bid time or subsequently implemented by the OWNER.

B. Contractor's security procedures shall include but shall not be limited to:

1. Maintain daily Sign-in/Sign-out log of personnel and visitors.

2. Allow OWNER to conduct background checks on CONTRACTOR'S personnel upon request.

C. Use of OWNER's security measures does not relieve CONTRACTOR of its responsibility to secure its own working spaces and materials.

1.5 CONTRACTOR PARKING

A. CONTRACTOR personnel and subcontractor personnel shall park in the first row of the parking lot adjacent to the site as shown in the Plan Set.

B. CONTRACTOR may park a limited number of construction vehicles within the staging area, provided a suitable parking area is constructed.

C. CONTRACTOR shall provide an off-site parking and staging area for his/her employee vehicles, equipment and materials, and his/her subcontractor's workers as necessary, at no additional cost to OWNER.

D. Disruption to the neighborhood (idling engines, radios, lights, etc.) before or after approved construction hours is prohibited.

1.6 MAINTENANCE OF ACCESS

A. CONTRACTOR shall maintain gate, driveway and parking to continuously provide access for OWNER vehicles, deliveries to the facility, emergency vehicles, and parking areas for OWNER's personnel.

B. Where existing pavement along access roads, drives, and parking lots is removed due to construction activities, the contractor shall place down a temporary surface immediately upon completion of the work in that location. Temporary surface shall consist of 6-inches of MDOT 21AA stone compacted to 98% maximum unit weight. If the temporary surface will be in place for longer than 2 weeks, CONTRACTOR shall provide a minimum 2-inch asphalt surface over 6-inches of MDOT 21AA.

C. Public roads shall be passable at all times and no parking which disrupts traffic is permitted on Traver Road or the Leslie Park Golf Course driveway.

D. When roads and parking without hard surfacing become contaminated with soil and create a nuisance, remove contaminated material and replace with clean aggregate as required.

E. Clean paved roads, driveways and parking areas over which CONTRACTOR's vehicles travel. Cleaning shall be done a minimum five (5) times per week or more frequently as directed by ENGINEER, and shall be by mechanical sweeper and water trucks. Areas to be cleaned include:

    1. Pavement, including driveways and parking areas, within the Leslie Park Golf Course limits.

    2. Public roads that require sweeping and cleaning due to CONTRACTOR's operations.

F. Dust resulting from CONTRACTOR's activities shall be controlled by CONTRACTOR to prevent nuisances at Site and nearby areas. Apply water to minimize airborne dust. Do not use water when water will cause hazardous or objectionable conditions such as ice, mud, ponds, and pollution.

G. Provide temporary, heavy-duty steel roadway plates to protect existing manholes, handholes, valve boxes, vaults, and similar buried facilities.

1.7 RESTORATION

A. Restore to pre-construction conditions existing roads, walks, and parking areas damaged by CONTRACTOR, subject to approval by OWNER of roads, walks, and parking areas.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 01600

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Basic Product Requirements

B. Product Options

C. Product Substitution Procedures

D. Product Delivery Requirements

E. Product Storage and Handling Requirements

1.2 BASIC PRODUCT REQUIREMENTS

A. Provide products of qualified manufacturers suitable for intended use. Provide products of each type by a single manufacturer unless specified otherwise.

B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

C. Provide interchangeable components of the same manufacturer for similar components.

1.3 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Products of one of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named in accordance with the following article.

1.4 PRODUCT SUBSTITUTION PROCEDURES

A. Instructions to Bidders specify requirements for submitting requests for Substitutions during the bidding period. This section specifies procedures and requirements affecting substitutions proposed by the CONTRACTOR after the Contract Date.

B. Where the term "substitutions" is used in this section, it means materials, equipment, or methods of construction which differ from the requirements in the Contract Documents. The term "substitutions" does not include:

1. Requirements provided by Addenda issued prior to the Contract date.

2. Changes made at the direction of ENGINEER.

3. Changes ordered by governing authorities.

4. Options described in the Contract Documents.

C. Substitutions will be considered in the event that:

1. They are related to "or equal" or "or pre-approved equal" provisions in the Contract Documents.

2. The specified requirements cannot be provided within the Contract Time due to causes beyond the CONTRACTOR's control.

3. The owner will gain a substantial advantage if substitutions are approved.

4. Substitutions will be considered when a product becomes unavailable through no fault of the CONTRACTOR.

D. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

E. A request constitutes a representation that the CONTRACTOR:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.

2. Will provide the same warranty for the Substitution as for the specified product.

3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to OWNER.

4. Waives claims for additional costs or time extension which may subsequently become apparent.

5. Will reimburse OWNER and/or ENGINEER for review or redesign services associated with re-approval by authorities.

6. Will reimburse the OWNER and/or ENGINEER for any costs incurred in the evaluation of any “or equal” or substitution proposal. Such costs shall include, but are not limited to, related charges of the ENGINEER made necessary by the evaluation and acceptance or rejection, as the case may be, of the proposed “or equal” or substitute material or equipment.

F. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

G. Substitution Submittal Procedure:

1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.

2. Submit Shop Drawings, Product Data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.

3. Submit itemized comparison between the specified product and the substitution product demonstration equivalent.

4. The ENGINEER will notify CONTRACTOR, in writing, of decision to accept or reject request.

5. Such submittals do not relieve the CONTRACTOR of obligation to later furnish shop drawings, product data, samples, and other submittals required by the Contract Documents.

H. If any “or equal” or substitute material or equipment differs materially from the material or equipment named or specified, and that difference was not expressly identified in the CONTRACTOR’s request, or results in changes in the work, the ENGINEER has authority to require removal and replacement of that “or equal” or substitute material or equipment. The CONTRACTOR shall bear the delay and costs resulting from (a) any such removal and replacement of “or equal” or substitute materials or equipment; (b) making “or equal” or substitute materials or equipment conform to the requirements of the Contract Documents; and (c) any changes in the work and/or in other work required to accommodate the “or equal” or substitute material or equipment, or both.

1.5 PRODUCT DELIVERY REQUIREMENTS

A. Transport and handle products in accordance with manufacturer's instructions.

B. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.6 PRODUCT STORAGE AND HANDLING REQUIREMENTS

A. Store and protect products in accordance with manufacturers' instructions.

B. Store with seals and labels intact and legible.

C. Store sensitive products in weather tight, climate controlled enclosures in an environment favorable to the product.

D. For exterior storage of fabricated products, place on sloped supports above ground.

E. Provide off-site storage and protection when site does not permit on-site storage or protection.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation and degradation of Products.

G. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained under acceptable condition.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 01740

CLEANING AND WASTE MANAGEMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Progress Cleaning

B. Final Cleaning

1.2 GENERAL

A. Execute cleaning, during progress of the Work, and at completion of the Work.

B. Adequate periodic cleaning will be a condition for recommendation of progress payments.

C. Waste Disposal

1. Properly dispose all waste materials, surplus materials, debris, and rubbish off the Project Site.

2. Provide suitable containers for storage of waste materials and debris.

3. Do not burn or bury rubbish and waste materials on the Project Site.

4. Do not dispose of volatile or hazardous wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.

5. Do not discharge wastes into streams or waterways.

6. Comply with all federal, state, and local anti-pollution laws, ordinances, codes, and regulations when disposing waste materials, debris, and/or rubbish.

1.3 PROGRESS CLEANING

A. CONTRACTOR shall periodically clean the work site at least once weekly

B. Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the work.

C. Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended.

D. Remove debris from concealed spaces before enclosing the space.

E. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials.

F. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration.

G. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

H. Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces and will not contaminate building systems or electrical or control panels.

1.4 FINAL CLEANING

A. Complete the following cleaning and waste-removal operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

1. Clean and remove from the Project rubbish, waste material, debris, and other foreign substances.

2. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

3. Hose clean sidewalks and loading areas.

4. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

5. Leave watercourses, gutters, and ditches open and clean.

6. Repair pavement, roads, sod, and all other areas affected by construction operations and restore them to original condition or to minimum condition specified.

7. Clean exposed exterior and interior finishes to a dirt-free condition, free of spatter, grease, stains, fingerprints, films, and similar foreign substances.

8. Clean, wax and polish wood, vinyl, and painted floors.

9. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, and similar spaces.

10. Sweep concrete floors broom clean in unoccupied spaces.

11. Clean transparent materials, including glass in doors and windows.

12. Remove tags and labels that are not permanent.

13. Touch up and otherwise repair and restore chipped, scratched, dented, or otherwise marred surfaces to specified finish and match adjacent surfaces. 1) Do not paint over “UL” or similar labels, including mechanical and electrical nameplates.

14. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

15. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

16. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and

defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

B. Maintain the cleaning until OWNER occupies the Project or portion thereof.

C. Leave Project clean and in a neat and orderly condition satisfactory to ENGINEER.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Use only those cleaning materials which will not create hazards to health or property and which will not damage surfaces.

B. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.

C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 01770

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Substantial Completion

B. Final Inspection

C. Request for Final Payment

1.2 SUBSTANTIAL COMPLETION

A. Substantial completion shall be the date as certified by the ENGINEER when the construction of the Project, or a specified part thereof, is sufficiently completed, in accordance with the Contract Documents, so that the Project, or specified part, can be fully utilized for the purposes for which it was intended.

B. Substantial completion of the golf cart storage building will not be granted until successful completion of the building, and operational demonstration of battery charging system has been completed to the satisfaction of the ENGINEER, and the OWNER.

C. Before requesting inspection for Certification of Substantial Completion, complete the following. List any exceptions in the request.

1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the work claimed as substantially complete. Include supporting documents for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the contract price.

2. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the work is not complete.

3. Advise OWNER of pending insurance changeover requirements.

4. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.

5. Obtain and submit releases enabling OWNER unrestricted use of the work and access to services and utilities; include occupancy permits, operating certificate, and similar releases.

6. Complete final cleanup requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.

7. Provide all required demonstration and training sessions.

D. Inspection Procedures: On receipt of a request for inspection, ENGINEER will either proceed with inspection or advise CONTRACTOR of unfilled requirements.

1. ENGINEER will prepare the Certificate of Substantial Completion following inspection, or advise CONTRACTOR of construction that must be completed or corrected before the certificate will be issued.

2. ENGINEER will repeat inspection when requested and assured by the CONTRACTOR that the work has been substantially completed.

3. Results of completed inspection for the basis of requirements for final acceptance.

4. Date of Substantial Completion will begin the warranty period unless noted otherwise.

1.3 FINAL ACCEPTANCE

A. Before requesting final inspection for certification of final acceptance and final payment, complete the following. List any exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.

2. Submit an updated final statement, accounting for final additional changes to the contract price.

3. Submit a copy of ENGINEER's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance. The list shall be endorsed and dated by the ENGINEER.

4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion, or when OWNER took possession of and responsibility for corresponding elements of the work.

5. Submit consent of surety to final payment.

6. Submit a final liquidated damages settlement statement.

7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

8. Submit record drawings, maintenance manuals, damage or settlement survey, property survey, and similar final record information.

9. Deliver tools, spare parts, extra stock, and similar items to OWNER.

10. Make final changeover of permanent locks and transmit keys to OWNER. Advise OWNER's personnel of changeover in security provisions.

11. Complete commissioning and training of OWNER's personnel.

12. Discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.

13. Complete final cleaning in accordance with Section 01740 – Cleaning and Waste

Management.

B. Reinspection Procedure: ENGINEER will inspect the work upon receipt of notice that work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the ENGINEER.

1. Upon completion of reinspection, ENGINEER will prepare a certificate of final acceptance, or advise CONTRACTOR of work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.

2. If necessary, reinspection by ENGINEER will be repeated.

1.4 REQUEST FOR FINAL PAYMENT

A. Submit request for final payment in accordance with the Agreement and General Conditions, as may be modified by the Supplementary Conditions, using procedure specified in Section 01290, Payment Procedures.

B. Request for final payment shall include:

1. Documents required for progress payments in Section 01290, Payment Procedures.

2. Documents required in the General Conditions, as may be modified by the Supplementary Conditions.

3. Releases or Waivers of Lien Rights:

a. When submitting releases or waivers of Lien rights, provide release or waiver by CONTRACTOR and each Subcontractor and Supplier that provided CONTRACTOR with labor, material, or equipment.

b. Provide list of Subcontractors and Suppliers for which release or waiver of Lien is required.

c. Each release or waiver of Lien shall be signed by an authorized representative of entity submitting release or waiver to CONTRACTOR, and shall include Subcontractor's or Supplier's corporate seal if applicable.

d. Release or waiver of Lien may be conditional upon receipt of final payment.

4. Consent of Surety.

5. Documentation that all punch list items are complete.

6. Warranties.

7. Operation and Maintenance Manuals.

8. Record Drawings being maintained by the CONTRACTOR.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 01781

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Operation and maintenance data/manuals.

1.2 SUBMITTALS

A. Submit operations and maintenance data for all equipment.

B. Quantity Required and Timing of Submittals:

1. Preliminary Submittal:

a. Printed Copies: 4 copies, exclusive of copies required by CONTRACTOR.

b. Electronic Copies: 1 copy.

c. Submit to ENGINEER by the earlier of: ninety days following approval of Shop Drawings and product data submittals, or thirty days prior to starting training of operations and maintenance personnel, or ten days prior to field quality control testing at the Site.

d. Furnish preliminary operation and maintenance data submittal in acceptable form and content, as determined by ENGINEER, before associated materials and equipment will be eligible for payment.

2. Final Submittal: Provide final submittal prior to Substantial Completion, unless submittal is specified as required prior to an interim Milestone.

a. Printed Copies: 4 copies.

b. Electronic Copies (Searchable PDF): 2 copies

1.3 OPERATION AND MAINTENANCE DATA/MANUALS

A. Binding and Cover:

1. Bind each operation and maintenance manual in durable, permanent, stiff-cover binder(s), comprising one or more volumes per copy as required. Binders shall be minimum one-inch wide and maximum of three-inch wide. Binders for each copy of each volume shall be identical.

2. Binders shall be locking three-ring/”D”-ring type, or three-post type. Three-ring binders shall be riveted to back cover and include plastic sheet lifter (page guard) at front of each volume.

3. Do not overfill binders.

4. Covers shall be oil-, moisture-, and wear-resistant, including identifying

information on cover and spine of each volume.

5. Provide the following information on cover of each volume:

   a. Title: “OPERATING AND MAINTENANCE INSTRUCTIONS”.

   b. Name or type of material or equipment covered in the manual.

   c. Volume number, if more than one volume is required, listed as “Volume __ of __”, with appropriate volume-designating numbers filled in.

   d. Name of Project and, if applicable, Contract name and number.

   e. Name of building or structure, as applicable.

6. Provide the following information on spine of each volume:

   a. Title: “OPERATING AND MAINTENANCE INSTRUCTIONS”.

   b. Name or type of material or equipment covered in the manual.

   c. Volume number, if more than one volume is required, listed as “Volume __ of __”, with appropriate volume-designating numbers filled in.

   d. Project name and building or structure name.

7. The manuals’ cover sheets and spines shall all be matching. The CONTRACTOR shall prepare a template for use by the various subcontractors.

B. Pages:

1. Print pages in manual on 30-pound (minimum) paper, 8.5 inches by 11 inches in size.

2. Provide each page with binding margin at least one inch wide. Punch each page with holes suitable for the associated binding.

C. Drawings:

1. Bind into the manual drawings, diagrams, and illustrations up to and including 11 inches by 17 inches in size, with reinforcing specified for pages.

2. Documents larger than 11 inches by 17 inches shall be folded and inserted into clear plastic pockets bound into the manual. Mark pockets with printed text indicating content and drawing numbers. Include no more than three drawing sheets per pocket.

D. Copy Quality and Document Clarity:

1. Contents shall be original-quality copies. Documents in the manual shall be either original manufacturer-printed documents or first-generation photocopies indistinguishable from originals. If original is in color, copies shall be in color. Manuals that contain copies that are unclear, not completely legible, off-center, skewed, or where text or drawings are cut by binding holes, are unacceptable. Pages that contain approval or date stamps, comments, or other markings that cover text or drawing are unacceptable. Faxed copies are unacceptable.

2. Clearly mark in ink to indicate all components of materials and equipment on catalog pages for ease of identification. In standard or pre-printed documents, indicate options furnished or cross out inapplicable content. Using highlighters to so indicate options furnished is unacceptable.

E. Organization:

1. Table of Contents:

a. Provide table of contents in each volume of each operations and maintenance manual.

b. Provide a master table of contents covering the complete set of volumes.

c. In table of contents and at least once in each chapter or section, identify materials and equipment by their functional names. Thereafter, abbreviations and acronyms may be used if their meaning is clearly indicated in a table bound at or near beginning of each volume. Using material or equipment model or catalog designations for identification is unacceptable.

2. Use dividers and labeled index tabs between equipment items and between major categories of information, such as operating instructions, preventive maintenance instructions, and other major subdivisions of data in each manual.

3. Each equipment item shall have an individual cover sheet with the following information:

a. Name or type of material or equipment.

b. Manufacturer's name, address, telephone number, fax number, and Internet website address.

c. Manufacturer's local service representative's or local parts supplier's name, address, telephone number, fax number, Internet website address, and e-mail addresses, when applicable.

d. Manufacturer's shop order and serial number(s) for materials, equipment or assembly furnished as well as City Equipment Identification numbers, if applicable.

e. City Equipment Identification Numbers, if applicable.

1.4 ELECTRONIC REQUIREMENTS

A. Electronic Copies of Operation and Maintenance Manuals:

1. Each electronic copy shall include all information included in printed copy.

2. Submit each electronic copy on a separate compact disc (CD), unless another electronic data transfer method or format is acceptable to Engineer.

3. File Format:

a. The O&M Manuals will be placed into the OWNER's Content

Management System. All electronic files shall be compatible with this system.

b. Files shall be in “portable document format (PDF)”. Files shall be entirely electronically searchable and created from the original document. Scanned/Image PDF’s will not be accepted.

c. Submit separate file for each separate document in the printed copy.

d. Within each file, provide bookmarks for the following:

1) Each chapter and subsection listed in the printed copy document’s table of contents.

2) Each figure.

3) Each table.

4) Each appendix.

4. Also provide drawings and figures in one of the following formats: “.bmp”, “.tif”, “.jpg”, or “.gif”. Submit files in a separate directory on the CD.

5. Technical drawings will be provided in both AutoDesk DWG format and PDF format.

1.5 CONTENT

A. Submit complete, detailed written operating instructions for each material or equipment item including: function; operating characteristics; limiting conditions; operating instructions for start-up, normal and emergency conditions; regulation and control; operational troubleshooting; and shutdown. Also include, as applicable, written descriptions of alarms generated by equipment and proper responses to such alarm conditions.

B. Submit written explanations of all safety considerations relating to operation and maintenance procedures.

C. Submit complete, detailed, written preventive maintenance instructions including all information and instructions to keep materials, equipment, and systems properly lubricated, adjusted, and maintained so that materials, equipment, and systems function economically throughout their expected service life. Instructions shall include:

1. Written explanations with illustrations for each preventive maintenance task such as inspection, adjustment, lubrication, calibration, and cleaning. Include pre-startup checklists for each equipment item and maintenance requirements for long-term shutdowns.

2. Recommended schedule for each preventive maintenance task.

3. Lubrication charts indicating recommended types of lubricants, frequency of application or change, and where each lubricant is to be used or applied.

4. Table of alternative lubricants.

5. Troubleshooting instructions.

6. List of required maintenance tools and equipment.

7. Spare parts.

D. Complete bills of material or parts lists for materials and equipment furnished. Lists or bills of material may be furnished on a per-drawing or per-equipment assembly basis. Bills of material shall indicate:

1. Manufacturer's name, address, telephone number, fax number, and Internet website address.

2. Manufacturer's local service representative's or local parts supplier's name, address, telephone number, fax number, Internet website address, and e-mail addresses, when applicable.

3. Manufacturer's shop order and serial number(s) for materials, equipment or assembly furnished.

4. For each part or piece include the following information:

a. Parts cross-reference number. Cross-reference number shall be used to identify the part on assembly drawings, Shop Drawings, or other type of graphic illustration where the part is clearly shown or indicated.

b. Part name or description.

c. Manufacturer's part number.

d. City Equipment Identification Number.

e. Quantity of each part used in each assembly.

f. Current unit price of the part at the time the operations and maintenance manual is submitted. Price list shall be dated.

E. Compete instructions for ordering replaceable parts, including reference numbers (such as shop order number or serial number) that will expedite the ordering process.

F. Manufacturer's recommended inventory levels for spare parts, extra stock materials, and consumable supplies for the initial two years of operation. Consumable supplies are items consumed or worn by operation of materials or equipment, and items used in maintaining the operation of material or equipment, including items such as lubricants, seals, reagents, and testing chemicals used for calibrating or operating the equipment. Include estimated delivery times, shelf life limitations, and special storage requirements.

G. Submit manufacturer's installation and operation bulletins, diagrams, schematics, and equipment cutaways. Avoid submitting catalog excerpts unless they are the only document available showing identification or description of particular component of the equipment. Where materials pertain to multiple models or types, mark the literature to indicate specific material or equipment supplied. Marking may be in the form of checking, arrows, or underlining to indicate pertinent information, or by crossing out or other means of obliterating information that does not apply to the materials and equipment furnished.

H. Submit original-quality copies of each approved and accepted Shop Drawing, product data, and other submittal, updated to indicate as-installed condition. Reduced drawings are acceptable only if reduction is to not less than one-half original size and all lines, dimensions, lettering, and text are completely legible on the reduction.

I. Submit complete electrical schematics and wiring diagrams, including complete point-to-point wiring and wiring numbers or colors between all terminal points.

J. Programmable Logic Controllers: If programmable logic controllers are furnished

1. Submit complete logic listings in one consistent format.

2. Format Requirements:

a. For ladder diagram logic, include complete cross-referencing of all logic elements. Annotate all elements with clearly understandable tags or descriptive labels.

b. For function block diagram, label each function block with understandable tags or descriptive labels. Describe purpose and action of each function block.

c. For sequential function chart, include extensive comments for each step to describe program step function.

d. For instruction list and structured text, include extensive comments for each program line to describe program line function.

1. Submit complete programmable logic controller listing of all input/output address assignments, tag assignments, and pre-set constant values, with functional point descriptions.

2. Submit complete manufacturer's programming manuals.

K. Copy of warranty bond and service contract as applicable.

L. When copyrighted material is used in operations and maintenance manuals, obtain copyright holder's written permission to use such material in the operation and maintenance manual.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 02240

DEWATERING

PART 1 - GENERAL

1.1 DESCRIPTION

A. If necessary, the CONTRACTOR shall supply all labor, materials, tools and equipment required to lower and control the groundwater levels and hydrostatic pressures to permit all excavation and construction specified under this contract to be performed in the dry. The control of all ice, snow and surface water shall be considered as part of the work under this Section.

B. The work under this Section shall include all costs of mobilization, supply, installation, operation, maintenance, supervision, and final dismantling and removal from the site of any and all dewatering equipment.

C. The CONTRACTOR or his dewatering subcontractor shall be currently and appropriately licensed by the State of Michigan to undertake the work covered under this Section and shall submit such information to the ENGINEER.

1.2 RELATED SECTIONS

A. Section 02300 – Earthwork.

1.3 SUBMITTALS

A. In accordance with Section 01330 – Submittal Procedures, the CONTRACTOR shall submit complete plans and a description of the overall dewatering system he/she proposes to use for the work under this Section for review by the ENGINEER, showing the details of the dewatering system prior to initiation of any excavation within 3 feet of the prevailing groundwater levels.

B. Review by the ENGINEER of the dewatering system proposed by the CONTRACTOR will be only with respect to the basic principles of the methods the CONTRACTOR intends to employ. Review by the ENGINEER of the dewatering system will be based on the demonstrated performance of the system to satisfy the requirements for dewatering as specified herein.

1.4 SITE CONDITIONS

A. The CONTRACTOR shall take all the steps that he considers necessary to familiarize himself with the site conditions, the ground conditions and the groundwater conditions. Copies boring logs s and a soils report are among the data available and a part of these Contract Documents. The data described above is furnished for information only, and it shall be expressly understood that the OWNER and/or the ENGINEER will not be held responsible for any interpretation or conclusions drawn therefrom by the CONTRACTOR.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 GENERAL

A. It is the intent of this Section that an adequate dewatering system shall be installed to lower and control the groundwater in order to permit excavation, grading, construction of the structures and the placement of the fill materials, all to be performed under dry conditions. The dewatering system shall be adequate to pre-drain the water-bearing strata above and below the bottom of the structure foundations, the drains, the sewers and all other excavations. In addition, the system to be used shall reduce the hydrostatic head in the water-bearing strata below the structure foundations, the drains, sewers, and all other excavations to the extent that the water level and piezometric water levels in the construction area are substantially a minimum of 3 feet below the prevailing excavation surface at all times. Appropriate screens and filters shall be used to prevent loss of soil through the dewatering equipment.

B. Prior to any excavation below the groundwater level, the dewatering system shall be placed into operation to lower the water levels as required and shall be operated continuously 24 hrs. per day, 7 days per week until all drains, sewers and structures have been satisfactorily constructed including placement of fill materials and no longer requiring dewatering. An adequate weight of fill material or of structure shall be in place to prevent buoyancy or flotation prior to discontinuing operation of the dewatering system.

C. The CONTRACTOR shall obtain written approval from the ENGINEER before discontinuing the operation of the dewatering system.

D. The CONTRACTOR shall be solely responsible for the arrangement, location and depths of the dewatering system necessary to accomplish the work described under this Section. The dewatering shall be accomplished in a manner that will reduce the hydrostatic head below any excavation to the extent that the water level and piezometric water levels in the construction area are substantially a minimum of 3 feet below the prevailing excavation surface, will prevent the loss of fines, seepage, boils, quick conditions or softening of the foundation strata, will maintain stability of the sides and bottom of the excavation and will result in all construction operations being performed in the dry.

E. The control of all surface and subsurface water, ice and snow is considered as part of the dewatering requirements. The control shall be adequate such that the stability of excavated and constructed slopes are not adversely affected by water, that erosion is controlled, and that flooding of excavations or damage to the existing and/or new structures or portions thereof does not occur. Surface water or roof runoff shall not be directed toward the excavations.

F. The CONTRACTOR shall dispose of all water removed from the excavations in such a manner as will not endanger public health, property, any portion of the work under construction or completed either by him or any other CONTRACTOR, shall not recharge the water bearing strata and shall be performed in such a manner as will cause no inconvenience whatsoever to the OWNER, ENGINEER, or to others engaged on work about the site. Water shall be conveyed in conduits or open water channels to avoid erosion in foundation areas. However, open channels adjacent to existing footings shall not be permitted.

G. The CONTRACTOR shall provide complete standby equipment, installed and available, for immediate operation as may be required, to adequately maintain dewatering on a continuous basis in the event that all or any part of the dewatering system may become inadequate or fail.

H. If the dewatering requirements are not satisfied due to inadequacy or failure of the dewatering system, loosening of the foundation strata or instability of the slopes or damage to the foundations or structures may occur. The supply of all labor, materials, and the performance of all work necessary to carry out any necessary additional work for the reinstatement of the structures or the foundations soils resulting from such inadequacy or failure shall be undertaken by the CONTRACTOR subject to the approval of the ENGINEER and at no additional expense to the OWNER.

3.2 OBSERVATION WELLS

A. If site conditions necessitate, the CONTRACTOR shall supply, install, take measurements and maintain the observation wells (piezometers) at various locations near existing structures to insure complete drawdown.

B. The observation wells shall be of a suitable design proposed by the CONTRACTOR and as reviewed by the ENGINEER.

C. The CONTRACTOR shall be responsible for installing and maintaining all observation wells and observing and recording the elevation of the groundwater and piezometric water levels in all the observation wells daily. A record of the information obtained shall be given to the ENGINEER each day. The CONTRACTOR shall also permit the ENGINEER to make his own observations. Any observation well that becomes inactive, damaged or destroyed shall be replaced within 24 hrs by the CONTRACTOR at no additional expense to the OWNER. If an observation well becomes inactive, damaged, or destroyed, and if in the opinion of the ENGINEER the observations from that observation well are critical, further excavation shall be suspended at the discretion of the ENGINEER and at no additional expense to the OWNER. Excavation shall not recommence until that observation well is repaired or replaced to the satisfaction of the ENGINEER and reliable observations can be obtained from that well or its replacement well.

D. The CONTRACTOR shall demonstrate by adding or removing water from all observation well risers that the observation wells are functioning properly.

E. All observation wells shall be satisfactorily installed and proven to be functioning properly prior to commencement of dewatering in any section of the site.

3.3 CONTROL OF GROUNDWATER LEVELS

A. The observation wells and test pits or holes shall be used as a primary basis of determining compliance with the requirements of this Section.

3.4 REMOVAL OF SYSTEM(S)

A. After all requirements of this Section are met, the CONTRACTOR shall remove all materials and equipment used during this operation. All holes, wells, and pits shall be filled immediately with suitable material.

END OF SECTION

SECTION 02300

EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. The CONTRACTOR shall perform all excavation and backfilling necessary to complete the work. This shall include the excavation of earth and rock, the removal and disposal of unsuitable material, dewatering, placement of suitable fill and backfill material, and the restoration and final grading for all earth surfaces.

1.2 RELATED SECTIONS

A. Section 02240 - Dewatering

B. Section 02370 – Erosion and Sedimentation Controls

1.3 REFERENCES

A. MDOT, 2012 Standard Specifications for Construction

1.4 PROJECT REQUIREMENTS

A. Work within rights-of-way.

1. Where the governmental bodies having jurisdiction of the streets or rights-of-way have specific specifications relating to the requirements for work within their jurisdiction, such requirements must be met as a minimum requirement, and if these Specifications impose further limitation on the work, they shall also be met as the required work standard.

2. During all operations of the CONTRACTOR in the streets and roadways, the CONTRACTOR shall maintain barricades, lights, and warning signs as required by the agency having jurisdiction.

1.5 EXISTING CONDITIONS

A. Soil boring results, are appended to these Specifications with locations noted. Boring logs are shown to be generally representative of the site and to assist in the design and construction of the work.

1.6 QUALITY ASSURANCE

A. The CONTRACTOR's independent testing firm shall provide the following:

1. Certify that the required soil bearing capacity of the prepared excavation meets proposed design criteria.

2. Certify that materials proposed by the CONTRACTOR meet specifications. Certification test reports shall be submitted to the ENGINEER.

3. Conduct compaction testing of engineered fill below footings, foundations, slabs and along backfill for utility trenches. The testing frequency shall be one test per lift per 400 square feet of fill.

4. Any area failing compaction testing shall be compacted and re-tested at the CONTRACTOR's expense.

PART 2 - PRODUCTS

2.1 BACKFILL MATERIAL

A. For areas not requiring "granular backfill" material, backfill shall be of the excavated material, with the exception that materials such as soft clay, topsoil, muck, cinders, vegetable matter, refuse, boulders and other objectionable and non-packing earth shall be excluded from the backfill and removed from the site. Stone larger than 3 inches in any dimension shall be excluded from the backfill and removed from the site by the CONTRACTOR.

B. Where "granular material" backfill is required as specified herein, backfill material shall be defined as a material meeting granular material Class II as defined in MDOT Section 902.

PART 3 - EXECUTION

3.1 GENERAL EXCAVATION

A. Excavation shall be performed by any practicable method consistent with the integrity and protection of the work and neighboring structures, workmen, and the public.

B. All excavation, except where necessary to tunnel, bore or jack under roads, railroads, tree roots and other obstructions within the limits indicated on the Plans, may be open cut from the surface. Tunneling or boring under trees shall be considered as incidental to construction and will not be considered as cause for request for additional payment.

C. Foreign material or unsuitable foundation material encountered such as wood, boulders, etc., which obstruct the excavation, shall be removed. Such materials found at the bottom of the excavation shall be removed and the foundation restored with approved materials.

D. If excess excavation is made or the material becomes disturbed so as to require removal beyond the prescribed limits, the resulting space shall be filled with selected material solidly tamped into place, in not more than 6-inch layers to the satisfaction of the ENGINEER, before the construction work proceeds. At the direction of the ENGINEER, the excess excavation may be filled with 2000 psi concrete at the CONTRACTOR's expense.

E. The excavation shall be kept dry during the work. Where water is encountered in the excavation, it shall be removed by pumping or well points. All necessary precautions shall be taken to prevent damage to existing wells and to completed or partially completed structures. The CONTRACTOR shall be responsible for all damages caused by him/her due to inadequate or improper protection.

3.2 EXCAVATION FOR SEWERS AND WATER MAINS

A. Trenches shall be excavated to the depth required with allowance for bedding the pipe. The trench shall be cut wider and deeper at each pipe joint location to provide for properly completing the pipe joint and to relieve the joint of all loadings.

B. The width of the trench at the top of a rigid pipe shall be sufficient to allow the pipe to be laid and jointed properly and shall provide for a minimum net clearance of 6 inches and a maximum net clearance of 12 inches on each side of the barrel of the pipe and to allow the backfill to be placed and properly compacted.

C. The width of trench at the top of a flexible pipe backfill when using concrete bedding shall be sufficient to allow the pipe to be laid and jointed properly with the minimum net clearance of 12 inches and a maximum net clearance of 18 inches on each side of the barrel of the pipe.

D. Where the conditions of the ground require, or where the work is in close proximity of existing structures, the sides of excavation shall be securely held by bracing and/or sheeting which may be removed in units when the level of the backfill has reached a point where it is safe to pull the sheeting without disturbing the protected feature. No sheeting, bracing, or other timber shall be left in the excavation upon the completion of the sewer/water main or other structures, except with the specific review and direction of the ENGINEER.

E. Other underground mains, sewers or structures encountered in the excavation shall be adequately supported during the CONTRACTOR's operations, and before backfilling, shall be given permanent support as directed by the ENGINEER to meet the standards or requirements of the owning utility or agency.

F. Water, sewer, gas and other utility services disturbed by the CONTRACTOR in his operations shall be repaired or replaced in a manner equal to the original condition by the CONTRACTOR at his own expense. Where these services are encountered and are undamaged, they shall be supported and/or protected by the CONTRACTOR at his expense against later settlement and/or damage after backfill. The CONTRACTOR shall consult the agency or the utility firm having jurisdiction over any duct line, gas main, etc., which may cross the excavation to determine method of supporting such duct or pipe.

G. All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways. Hydrants under pressure, valve manhole covers, valve boxes, curb stop boxes, fire and police call boxes, or other utility controls shall be left unobstructed and accessible until the work is completed. Gutters shall be kept clean, or other satisfactory provisions made for street drainage, and natural water courses shall not be obstructed except as otherwise provided for herein on a temporary basis.

3.3 EXCAVATION FOR STRUCTURES

A. Excavation for structures shall be extended sufficiently beyond the limits of the structure to provide ample room for form construction and for practicable construction methods to be followed.

B. Requirements for excavation of sewers and water mains shall also apply to this Section.

3.4 EXCAVATION FOR PAVED SURFACES

A. In excavating around manholes and catch basins or inlets, care shall be exercised to avoid removing the casings and pushing dirt into the structures. Dirt pushed into manholes, catch

basins or inlets by the CONTRACTOR's operations shall be immediately removed so that the dirt will not be carried into the sewer by the flow of sewage or storm water.

B. The CONTRACTOR shall take ample precautions to protect all trees and ornamental shrubbery not within the limits of the construction area, or within the construction areas shown on the Plan Set to be retained from injury by workmen, equipment, or any other agencies connected with the work, including subcontractors. Such protection shall be provided during the progress of the excavation, grading, or other phases of the work as necessary. Such trees or shrubbery shall be surrounded by protective posts or fencing before construction begins, when in the judgment of the ENGINEER, such precautionary measures are necessary. If, as a result of any phase of the work, trees are damaged or it is necessary to remove limbs in the way of construction, the repair of the damage and such limb removal shall be done by the CONTRACTOR as directed by the ENGINEER. All costs for the protective work shall be borne by the CONTRACTOR as incidental to the Contract work.

3.5 SHORING, SHEETING AND BRACING

A. Where sheet piling, shoring, sheeting, bracing, or other supports are necessary, they shall be furnished, placed, maintained, and except as shown or specified otherwise, removed by the CONTRACTOR.

B. All sheet piling, shoring, sheeting and bracing shall be designed by a professional engineer engaged by the CONTRACTOR with demonstrated competence and experience in such work. The sheeting system shall be designed to prevent bottom failure and hydrostatic uplift within the excavation. Provision shall also be made in the design for lateral pressures due to side slope and construction equipment or other surcharge loads, as applicable.

C. The CONTRACTOR shall provide to the ENGINEER for his review, design calculation and arrangement drawings of the sheeting system prior to ordering any materials for bracing, sheeting, etc., and prior to the commencement of the excavation.

D. All materials, except as otherwise specified, used for sheeting and sheet piling, lagging, braces, shores, and stringers, or waling strips shall be of approved quality and dimensions throughout.

E. Materials for sheeting systems shall be furnished and driven or set in place by the CONTRACTOR, where necessary or wherever ordered by the ENGINEER, whether the same is or is not considered necessary by the CONTRACTOR. If, in the opinion of the ENGINEER, the materials furnished by the CONTRACTOR are not of proper quality or sufficient size or not properly placed to ensure the safety of the work or of adjacent structures and property, the CONTRACTOR shall, upon notice from the ENGINEER to that effect, forthwith procure, furnish and set in place or drive other and satisfactory materials, or place the material in a satisfactory manner; and if he shall fail or neglect to do so, the ENGINEER may order all or any part of the work to be stopped until such materials so used are furnished and placed; and the CONTRACTOR shall not be entitled to claim, demand, or receive any compensation for larger size or better quality or different disposal of materials ordered by the ENGINEER, nor any compensation for allowance of any kind whatsoever for or on account of any damage or delay resulting from such stoppage of work.

F. Steel sheet piling may be either new or used. It shall be of adequate strength, straight and properly braced. Steel sheet piling shall be of the interlocking type. Friction in the interlocks shall not be assumed to contribute to the strength of the sheet piling.

G. The design, planning, installation and removal, if required, of all sheet piling, shoring, sheeting, and bracing shall be accomplished in such a manner as to maintain the required excavation or trench section and to maintain the undisturbed state of the soils below and adjacent to the excavation.

H. Steel sheet piling for the excavation shall be driven straight and in-line. The piling shall be supported aboveground, before driving, by a guide frame at least 20 ft high which will keep the piling accurately in the required position and vertical. Each piece of piling shall be driven only a few feet at a time and driving shall proceed continuously around the perimeter so that the piles shall reach their full penetration together.

I. Walers and bracing shall be supplied and installed as required to complete the sheeting system. Walers and braces shall be of adequate strength for the load imposed. Splices in walers shall develop the full strength of the member in bending, shear, and axial compression.

J. If bracing members are to be removed during construction, the timing and procedure for removal shall not induce excessive stresses in the permanent structures or in steel sheet piling and bracing members.

K. If the construction sequence of structures requires the transfer of bracing to the completed portions of any structure, the CONTRACTOR shall secure written acceptance of the ENGINEER prior to the installation of such bracing.

L. In trenching operations the use of horizontal strutting below the barrel of pipe or the use of the pipe as support for trench racing will not be permitted. The use of a traveling shield for sewer construction shall require that the device be approved for use by a professional engineer. Sheet piling and timbers in trench excavations shall be withdrawn in a manner so as to prevent subsequent settlement of the pipe or additional backfill loadings which might overload the pipe.

M. The neglect, failure, or refusal of the ENGINEER to order the use of sheeting, or sheet piling or steel, or to order the same to be left in place, or the giving or failure to give of any order or directions as to the manner or methods of driving or placing sheeting, sheet piling, bracing, shores, etc., shall not in any way relieve the CONTRACTOR of any or all obligations under this Contract. Sheeting left in place shall be cut off one (1) ft below existing grade.

N. The rules of the OSHA and the Michigan Department of Labor and Regulatory Affairs with respect to excavation and construction shall at all times be strictly observed.

3.6 BACKFILLING FOR SEWERS AND WATER MAINS

A. Backfilling shall consist of placement of the prescribed materials from a level 12 inches above the crown of the pipe. Placement shall be as follows:

1. Under pavements, curb, paved driveways, and sidewalks, the backfill shall be granular material compacted in layers not to exceed 12 inches loose thickness with backfilling carried up to subgrade. Compaction of backfill shall be such as to obtain 95% of the maximum unit density as determined at the optimum moisture content. After a period of about 60 days or less, if the backfill compaction is satisfactory to the ENGINEER, to provide for any slight settlement, the CONTRACTOR shall retrim neatly any broken edges of pavement and replace the top surface of the backfill within the pavement area with pavement surface equal to that surface which was

removed. The pavement shall be replaced in accordance with the standard specifications of the agency having jurisdiction.

2. Backfill around lift stations, or buried underground structures shall be granular material compacted in 12-inch lifts. Compaction of backfill shall be such as to obtain 95% of the maximum unit density as determined at the optimum moisture content.

3. For all other areas, backfilling shall consist of placing excavated material as defined in Paragraph 2.1.A. of this Section, in 12-inch lifts to finish grade. Compaction of backfill shall be such as to obtain 90% of the maximum unit density as determined at the optimum moisture content.

3.7 FILLING AND BACKFILLING FOR STRUCTURES

A. Embankments underlying structural footings, streets and drives, sidewalks and around structures shall be granular material meeting the requirements of the Michigan Department of Transportation for granular material compacted to 95% density.

B. In all other areas, material required for embankments and backfilling shall be soil or soil-rock mixture free of organic and other deleterious matter and shall contain no more than 15% rocks or lumps larger than 2-1/2 inches in the greatest dimension, compacted to 90% density.

C. Under all interior and exterior floor slabs, an 8-inch thick granular cushion shall be placed. This material shall be MDOT Class II granular material.

D. Where embankment material is placed to achieve a new surface elevation, the top 4 inches shall be approved topsoil either salvaged from the site or hauled in by the CONTRACTOR.

3.8 FILLING AND BACKFILLING FOR PAVED SURFACES

A. Embankments, including sand cushions and granular fills, shall be placed in successive layers not more than 6 inches in depth the full width of the cross section, each layer to be thoroughly compacted by means of vibratory compactors or by an approved pneumatic-tired roller or combination thereof, as required by the ENGINEER. Each layer shall be compacted to not less than 95% of the maximum unit density as determined at the optimum moisture content. All parts of the embankment shall be uniformly compacted and the CONTRACTOR shall so direct all earthmoving equipment used in the work so that the same shall be attained. Embankment or fill outside the limits of the subgrade where sand or gravel is not required shall be made with suitable material which is free from perishable organic matter, rubbish, stones, broken concrete, roots, or other foreign materials, at no additional compensation. Before any embankments are begun, the base shall be made firm and cleared of topsoil, sod or other perishable material. The sides of the embankment shall be neatly and evenly dressed to the slope shown on the Plans, or such other slope as the ENGINEER may direct.

B. Upon completion of the placing of the curbs, and after the concrete has cured sufficiently, forms shall be removed and the excavated space behind the curb shall be backfilled with a good quality of surface soil, free of rubbish, stone, broken concrete, roots or other foreign material. Where adequate acceptable material for backfill behind the curb is not available, granular fill conforming to 2012 MDOT 902.08, Class II, shall be used. Where the area behind the curb is in cut, it shall be trimmed from the top of the curb on the slope shown on the Plans. If the area is in embankment or fill, an earth berm shall be placed immediately adjacent to the top of the curb and then the embankment of fill shall be finished to the slope shown on the Plan Set. All trimming and finishing shall be done in a neat, workmanlike

manner. All excess concrete and debris shall be removed from the excavation behind the curb line before backfilling begins.

C. In construction of non-rigid pavements, backfilling back of curb and gutter shall be completed before placement and compaction of the base course of the roadway.

3.9 PREPARATION OF SUBGRADE FOR PAVED SURFACES

A. The bottom of the excavation for the pavement or top of the fill shall be known as the pavement subgrade and shall be smoothed, trimmed and compacted to the required line, grade and cross section to receive the road metal. It shall be thoroughly compacted by rolling with a roller of approved type weighing not less than 8 tons. The subgrade shall be compacted to at least 95% of the maximum density as designated by the test method AASHTO T-180. Inaccessible areas, where rolling is not practical, shall be thoroughly compacted by mechanical tampers capable of striking a blow equivalent to at least 250 foot-pounds per square foot. The subgrade thus formed shall be maintained in a smooth and compacted condition until the pavement has been placed. No base course, surfacing, curb, or curb and gutter, shall be placed until the subgrade has been reviewed by the ENGINEER. The subgrade shall be finished in an acceptable condition at least one day in advance of the pavement construction at all times. Six inches of compacted depth of granular material shall be used where uncompactable soil is encountered. The granular fill shall conform to the 2012 MDOT 902.08, Class II, compacted to 95% of its density.

B. Immediately prior to placing the pavement, the subgrade shall be tested for conformity with the cross section shown on the Plan Set by means of an approved template riding on the curb and gutter sections or on side forms. If necessary, materials shall be removed or added, as required, to bring all portions of the subgrade to the correct elevation. Corrected portions shall then be thoroughly compacted and again tested with the template. Pavement material shall not be placed at any portion of the subgrade which has not been tested for correct elevation.

C. The finished subgrade shall be maintained in a smooth and compacted condition until the pavement is placed. No storage piles of fine or coarse aggregate shall be placed directly upon the finished subgrade. Should the subgrade become rutted or disturbed in any manner, it shall be reshaped and recompacted.

3.10 GRADING

A. The CONTRACTOR shall grade the site to achieve the elevations as shown on the Plan Set. All disturbed areas beyond the grading limits shall be restored to prior condition.

B. Surplus excavated material not needed shall be disposed of by the CONTRACTOR. Headwalls, culverts, drains, sewers and appurtenances filled or damaged by the CONTRACTOR during the course of his operations shall be cleaned, repaired, or replaced at his/her expense.

C. All temporary earth changes shall be in conformance with the Soil and Erosion Control Act.

3.11 RESTORATION

A. Headwalls, culverts, and drainage systems filled or damaged by the CONTRACTOR during the course of his operations shall be cleaned, re-laid or rebuilt with new materials to a condition equal to the original state, and of thickness equal to the original structure and to the original line and grade at the CONTRACTOR's expense.

B. Where the excavation is located beside a ditch and/or where an existing ditch is filled or disturbed in the CONTRACTOR's operations, the CONTRACTOR shall clean, repair, or replace the ditch with properly pitched bottom and side slopes and of section and capacity not less than the original section.

C. Where excavation has been through lawn areas, the CONTRACTOR shall restore the disturbed area by placing topsoil and seeding or sodding over the final backfill material.

D. The CONTRACTOR shall remove excess dirt and other construction material from the site of the work and leave the site in a condition equal to its original state.

E. The final condition of the streets and roadways shall be subject to the approval of the governmental body having jurisdiction thereof, as well as review by the ENGINEER.

END OF SECTION

SECTION 02370

EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish all labor, materials, equipment and incidentals required and perform all installation, maintenance, removal and area cleanup related to sedimentation control work as shown on the Drawings and as specified herein. The work shall include, but not necessarily be limited to; installation of temporary access ways and staging areas, silt fences, inlet protection devices, sediment removal and disposal, device maintenance, removal of temporary devices, temporary and permanent seeding, mulching and fertilization, and final cleanup. All erosion control devices shall remain in place throughout construction and until approval of final site stabilization is given by local or state authorities.

B. The Contractor is responsible for implementing Best Management Practices (BMP's), as shown on the Contract Drawings and specified herein, to prevent and minimize erosion and resultant sedimentation in all cleared, grubbed, and active work areas during and after construction. This item covers the work necessary for the installation and maintenance of all structures and measures necessary for the prevention and control of soil erosion.

C. Construction on this site shall disturb less than 1 acre and is greater than 500 feet from water's edge. A grading/SESC permit is still required for this project, and the project is subject to the standards and responsibilities of City of Ann Arbor Code Chapter 63.

D. The following items from Rule 1709 promulgated under the authority of Part 91, Soil Erosion and Sedimentation Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, are particularly important:

1. Design, construct, and complete the earth change in a manner that limits the exposed area of disturbed land for the shortest period of time.

2. Remove sediment caused by accelerated soil erosion from runoff water before it leaves the site of the earth change.

3. Temporary or permanent control measures shall be designed and installed to convey water around, through, or from the earth change at a non-erosive velocity.

4. Install temporary soil erosion and sedimentation control measures before or upon commencement of the earth change activity and maintain the measures on a daily basis. Remove temporary soil erosion and sedimentation control measures after permanent soil erosion measures are in place and the area is stabilized. ("Stabilized" means the establishment of vegetation or the proper placement, grading, or covering of soil to ensure its resistance to soil erosion, sliding, or other earth movement.)

5. Complete permanent soil erosion control measures for the earth change within five (5) calendar days after final grading or upon completion of the final earth change. If it is not possible to permanently stabilize the earth change, then maintain temporary soil erosion and sedimentation control measures until permanent soil erosion control measures are in place and the area is stabilized.

E. Due to the nature of the work required by this Contract, it is anticipated that the location and

nature of the erosion and sedimentation control devices will be adjusted on several occasions to reflect the current phase of construction. The construction schedule adopted by the CONTRACTOR will impact the placement and need for specific devices required for the control of erosion. The CONTRACTOR shall develop and implement such additional techniques as may be required to minimize erosion and off-site sedimentation. The location and extent of erosion and sedimentation control devices shall be revised at each phase of construction that results in a change in either the quantity or direction of surface runoff from constructed areas. All deviations from the erosion and sedimentation control provisions shown on the Drawings shall have the prior acceptance of the ENGINEER.

1.2 RELATED SECTIONS

A. Section 02300 – Earthwork.

B. Section 02920 – Lawns and Grasses.

1.3 SUBMITTALS

A. Submit to the ENGINEER, in accordance with Section 01330 - Submittals, technical product literature for all commercial products to be used for sedimentation and erosion control.

1.4 QUALITY ASSURANCE

A. The CONTRACTOR shall be responsible for the timely installation and maintenance of all sedimentation control devices necessary to prevent the movement of sediment from the construction site to offsite areas or into the stream system via surface runoff or underground drainage systems. Measures in addition to those shown on the Drawings necessary to prevent the movement of sediment off site shall be installed, maintained, removed, and cleaned up at the expense of the CONTRACTOR. No additional charges to the OWNER will be considered.

1.5 REFERENCES

A. Chapter 63 – Stormwater Management and Soil Erosion and Sedimentation Control, of the City of Ann Arbor City Ordinance.

B. City of Ann Arbor Public Services Department Standard Specifications Manual, latest edition.

C. Michigan Department of Environmental Quality, Water Division Soil Erosion and Sedimentation Control Program, Soil Erosion and Sedimentation Control (SESC) Training Manual, 2004 Edition, or latest.

D. MDOT, 2012 Standard Specifications for Construction.

1.6 EROSION AND SEDIMENTATION CONTROL DEVICES

A. The following erosion and sedimentation control devices shall be incorporated into the work. Other devices, as necessary and acceptable to the ENGINEER shall be installed as required.

1. Temporary Sediment Traps shall be constructed at the locations shown on the Drawings, at the termination of all Temporary Diversions diverting sediment laden runoff, and at other locations indicated by the ENGINEER. Temporary Sediment Traps shall be constructed by excavating the appropriate size rectangular basin and constructing a rock-fill dam on the discharge end to form a sediment trap. Temporary Sediment Traps

shall be designed, installed and maintained in accordance with the requirements of Unit 4 of the SESC Training Manual.

2. Temporary Diversions shall be constructed at the locations shown on the Drawings, and at other locations indicated by the ENGINEER. Dimensions shall be as shown on the Drawings. All Diversions transporting sediment-laden runoff shall terminate in Temporary Sediment Basins. Temporary Diversions shall be designed, installed and maintained in accordance with the requirements of Unit 2 of the SESC Training Manual.

3. Silt Fence shall be constructed at the locations shown on the Drawings, and at other locations indicated by the ENGINEER. Silt Fence shall not be installed across streams, ditches, or waterways. Silt Fence shall be designed, installed and maintained in accordance with the requirements of Unit 4 of the SESC Training Manual.

4. Check Dams shall be constructed at the locations shown on the Drawings, and at other locations indicated by the ENGINEER. Check Dams shall be designed, installed and maintained in accordance with the requirements of Unit 2 of the SESC Training Manual.

5. Storm Drain Inlet Protection shall be constructed at the locations shown on the Drawings, and at other locations indicated by the ENGINEER. Storm Drain Inlet Protection measures shall be designed, installed and maintained in accordance with the requirements of Unit 4 of the SESC Training Manual.

6. Temporary and Permanent Channels shall be installed at the locations shown on the Drawings, and at other locations indicated by the ENGINEER. Channels, and Channel Linings, shall be designed, installed and maintained in accordance with the requirements of Unit 2 of the SESC Training Manual.

7. Rock Construction Exits shall be located at points where vehicles enter and leave a construction site, or at other locations indicated by the ENGINEER. Rock Construction Exits shall be designed, installed and maintained in accordance with the requirements of Unit 4 of the SESC Training Manual.

PART 2 -- PRODUCTS

2.1 MATERIALS

A. Materials for use in erosion and sedimentation control devices shall be in accordance with the City of Ann Arbor Public Services Department Standard Specifications Manual, latest edition, and the Michigan Department of Environmental Quality Soil Erosion and Sedimentation Control (SESC) Training Manual, 2004 Edition, or latest edition.

2.2 TEMPORARY DIVERSIONS

A. Temporary Diversions shall be constructed as shown on the Contract Drawings and as specified herein. Temporary Diversions shall be installed and maintained in accordance with Part 3 of this Section. The cost of Temporary Diversions shall include the excavation and all maintenance and restoration activities required.

2.3 SILT FENCE

A. Silt Fence shall be a woven geotextile filter fabric made specifically for sediment control. Filter fabric shall not rot when buried and shall resist attack from soil chemicals, alkalides and acids in the pH range from 2 to 13, and shall resist damage due to prolonged ultraviolet exposure.

Filter fabric shall be Type FX-11, as manufactured by Carthage Mills, Geotex 910SC as manufactured by Synthetic Industries, Inc., Amoco 2130 as manufactured by Amoco Fabrics & Fibers Co., or equal.

B. Filter fabric for the silt fence shall have the following minimum properties:

	Value	Test Method
Grab Tensile Strength	100 lbs	ASTM D 4632
Grab Elongation	15%	ASTM D 4632
Trapezoid Tear Strength	50 lbs	ASTM D 4533
Mullen Burst Strength	265 lbs	ASTM D 3786
Puncture Strength	58 lbs	ASTM D 4833
Retained Strength (500 hrs. accelerated UV exposure)	80%	ASTM D 4355
Filtration Efficiency	75%	VTM-51
Flow Rate	10 gal/min/ft^2	ASTM-D4491
Height	36 inches	

C. Posts for silt fence shall be steel and shall have the following properties:

ASTM Designation:	ASTM A702
Length:	5-Feet Long (T-Type)
Weight:	1.25#/Foot (min.)
Area of Anchor Plate:	14 Sq. In.

Note: Five (T) Fasteners shall be furnished with each post.

D. Wire Fabric for the silt fence shall have the following properties:

Wire Fabric Designation:	832-12-10-12.5 Class 1
Designation:	ASTM A116
Width:	32"
Number of Line Wires:	8
Stay Wire Spacing:	12"
Line and Stay Wires:	12.5 Ga.
Top and Bottom Wires:	10 Ga.
Wire Coating:	ASTM Class 1 Zinc Coating

E. Silt Fence shall be installed and maintained in accordance with Part 3 of this Section, and Unit 4 of the SESC Manual, to the satisfaction of the ENGINEER until the site has been stabilized. The cost of Silt Fence shall include the fabric, posts, wire fabric, excavation and all maintenance and restoration activities required.

2.4 STONE FOR EROSION CONTROL AND RIP RAP

A. Crushed stone for sediment filtration devices, access ways and staging areas shall conform to MDOT Sections 208 and 307.

B. Riprap shall meet the requirements of MDOT Section 916 for plain riprap.

2.5 STRAW WITH NET TEMPORARY ROLLED EROSION CONTROL MAT (RECM)

A. The CONTRACTOR shall place straw with net temporary RECM on all disturbed areas. The mat shall consist of clean wheat straw from agricultural crops made into a knitted straw mat that is machine assembled. The straw shall be evenly distributed throughout the mat. The mat shall be covered with a photodegradable synthetic mesh attached to the straw with degradable thread.

B. The CONTRACTOR shall place the straw with net temporary channel and slope RECM where directed immediately after the channel or slope has been properly graded and prepared, fertilized, and seeded. If the mat is of single net construction, the netting shall be on top with the straw in contact with the soil.

C. The CONTRACTOR will immediately repair or replace any section of straw with net temporary channel and slope RECM which is not functioning properly or has been damaged in any way until a stable growth of grass has been established.

D. Straw with net RECM shall be North American Green S150, American Excelsior Co. Curlex I, Contech SFB1, or equal with a minimum bare soil shear stress value of 1.5 lb/ft^2.

2.6 CURLED WOOD OR COCONUT FIBER ROLLED EROSION CONTROL MAT (RECM)

A. The CONTRACTOR shall place curled wood or coconut fiber RECM on all disturbed areas with slopes greater than 1 on 3. The mat shall consist of machine-produced mat of curled wood excelsior or coconut fiber with a majority of the fibers 6 inches or longer with consistent thickness and the fibers evenly distributed over the entire area of the mat. The top of the mat shall be covered with a biodegradable synthetic mesh. The mesh shall be attached to the curled wood excelsior or coconut fiber with photodegradable synthetic yarn.

B. The CONTRACTOR shall place the curled wood or coconut fiber channel and slope RECM where directed immediately after the channel or slope has been properly graded and prepared, fertilized, and seeded. If the mat is of single net construction, the mesh shall be on top with the fibers in contact with the soil.

C. The CONTRACTOR will immediately repair or replace any section of curled wood or coconut fiber RECM which is not functioning properly or has been damaged in any way until a stable growth of grass has been established.

D. Curled wood or coconut fiber RECM shall be American Excelsior Curlex II, North American Green C125, Contech EFB4 or equal matting with a minimum bare soil shear stress value of 2.0 lb/ft^2.

2.7 ROCK CONSTRUCTION EXITS

A. Rock construction exits shall be constructed as shown on the Drawings and as specified herein. Rock construction exit shall be maintained in accordance with Part 3 of this Section to the satisfaction of the ENGINEER until the site has been stabilized. The cost of temporary gravel construction entrances shall include the gravel and all maintenance activities required.

2.8 TEMPORARY SOIL STABILIZER

A. The temporary agent for soil erosion control shall consist of an especially prepared highly concentrated powder which, when mixed with water, forms a thick liquid such as "Enviroseal

2001" by Enviroseal Corporation, "Terra Control" by Quattro Environmental, Inc., or "CHEM-CRETE ECO-110" by International CHEM-CRETE Corporation, and having no growth or germination inhibiting factors. The agent shall be used for hydroseeding grass seed in combination with other approved amendments resulting in a highly viscous slurry which, when sprayed directly on the soil, forms a gelatinous crust.

2.9 STRAW MULCH

A. Straw mulch shall be utilized on all newly graded areas to protect areas against washouts and erosion. Straw mulch shall be comprised of threshed straw of oats, wheat, barley, or rye that is free from noxious weeds, mold or other objectionable material. The straw mulch shall contain at least 50 percent by weight of material to be 10-in or longer. Straw shall be in an air-dry condition and suitable for placement with blower equipment.

B. Latex acrylic copolymer, such as Soil Sealant with coalescing agent by Soil Stabilization Co., Merced, CA or equivalent shall be used as straw mulch tackifier.

C. An asphalt tackifier shall only be used when temperatures are too low to allow the use of a latex acrylic copolymer and only with prior written approval from the Engineer.

PART 3 – EXECUTION

3.1 INSTALLATION AND MAINTENANCE

A. Erosion and sedimentation control devices shall be established prior to or concurrent with the clearing operations in a given area. Where such practice is not feasible, the erosion and sedimentation control device(s) shall be established immediately following completion of the clearing operation.

B. The CONTRACTOR shall furnish the labor, materials and equipment required for routine maintenance of all erosion and sedimentation control devices. Maintenance shall be scheduled as required for a particular device to maintain the removal efficiency and intent of the device. Maintenance shall include but not be limited to 1) the removal and satisfactory disposal of accumulated sediment from traps or silt barriers and 2) replacement of filter fabrics used for silt fences and stone used in temporary sediment traps, stone filters, gravel construction entrances, etc.. Sediment removed from erosion and sedimentation control devices shall be disposed of in locations that will not result in offsite sedimentation as acceptable to the Engineer, at no additional cost to the OWNER.

C. The CONTRACTOR shall provide temporary sedimentation traps at all locations shown on the Contract Drawings and as per the approved SESC Plan for the settling of water pumped from the excavations or intercepted by drainage ditches for keeping water out of the excavations or to protect existing structures. The CONTRACTOR shall remove accumulated sediment from the traps as necessary to maintain their effectiveness or as indicated by the ENGINEER. Sediment material removed from the traps shall be disposed by the CONTRACTOR in locations that will not result in off-site sedimentation as acceptable to the ENGINEER, at no additional cost to the OWNER.

1. Inspect temporary sediment traps after each period of significant rainfall. Remove sediment and restore the trap to its original dimensions when the sediment has accumulated to one-half the design depth of the trap. Place the sediment that is removed in a designated disposal area and replace the contaminated part of the gravel facing.

2. Check the structure for damage from erosion or piping. Periodically check the depth of the spillway to ensure it is a minimum of 1.5 ft. below the low point of the embankment. Immediately fill any settlement of the embankment to slightly above design grade. Any riprap displaced from the spillway must be replaced immediately.

3. After all sediment-producing areas have been permanently stabilized, remove the structure and all unstable sediment. Smooth the area to blend with the adjoining areas and stabilize properly.

D. The CONTRACTOR shall provide temporary diversions at all locations noted on the Contract Drawings and as per the approved SESC Plan. All temporary diversions shall outlet at a temporary sediment trap or other appropriate structure.

1. Inspect temporary diversions once a week and after every rainfall. Immediately remove sediment from the flow area and repair the diversion ridge. Carefully check outlets and make timely repairs as needed. When the area protected is permanently stabilized, remove the ridge and the channel to blend with the natural ground level and appropriately stabilize it.

E. Silt fence shall be erected as shown on the Drawings, as per the approved SESC Plan and specified herein. Silt fence shall be erected and maintained to the satisfaction of the ENGINEER until a vegetative ground cover has been established. Replacement of the filter fabric, if required by the ENGINEER, will be at the CONTRACTOR's expense.

1. Silt fence shall be erected around all catch basins which are located downstream from any construction work. Should any catch basins be indicated to be relocated or modified, silt fence shall be utilized until work is completed on the catch basins. Upon completion of the modification, the area shall be rough graded, as shown on the Drawings, until the end of the project, at which time final grading shall occur.

2. Inspect silt fence at least once a week and after each rainfall. Make any required repairs immediately.

3. Should the fabric of a silt fence collapse, tear, decompose or become in-effective, replace it promptly.

4. Remove sediment deposits as necessary to provide adequate storage volume for the next rain and to reduce pressure on the fence. Take care to avoid undermining the fence during cleanout.

5. Remove all fencing materials and unstable sediment deposits and bring the area to grade and stabilize it after the contributing drainage area has been properly stabilized. Removal of any silt fence shall be permitted only with the prior approval of the ENGINEER, or the local governing agency.

F. Riprap shall be graded so that the smaller stones are uniformly distributed through the mass. The Contractor may place the stone by mechanical methods, augmented by hand placing where necessary or ordered by the Engineer. The placed riprap shall form a properly graded, dense, neat layer of stone. The placed riprap shall have a minimum depth of 24 inches. Type II Separator Geotextile, shall be used under all riprap unless otherwise noted.

G. Riprap and stone for erosion control shall be dumped and placed in such manner that the larger rock fragments are uniformly distributed throughout the rock mass and the smaller

fragments fill the voids between the larger fragments. Rearranging of individual stones by equipment or by hand shall only be required to the extent necessary to secure the results specified above, to protect structures from damage when rock material is placed against the structures, or to protect the underlying Separator Geotextile from damage during installation.

H. The CONTRACTOR shall provide gravel and riprap filter berm basins at all locations noted on the Contract Drawings and as per the approved SESC Plan.

1. Inspect gravel and riprap filter berm basins after each period of significant rainfall. Remove sediment and restore the basin to its original dimensions when the sediment has accumulated to one-half the design depth of the trap. Place the sediment that is removed in a designated disposal area and replace the contaminated part of the gravel facing.

2. Check the structure for damage from erosion or piping. Any stone or riprap displaced from the berm must be replaced immediately.

3. After all sediment-producing areas have been permanently stabilized, remove the structure and all unstable sediment. Smooth the area to blend with the adjoining areas and stabilize properly.

I. ENGINEER may direct the CONTRACTOR to place Straw with Net, Curled Wood or Coconut Fiber RECM's and Synthetic TRM's in permanent channels or on slopes at other locations not shown on Drawings.

1. All temporary and permanent channel and slope lining RECM's and TRM's shall be unrolled in the ditch in the direction of the flow of water. Temporary linings shall overlap the buried end of the downstream blanket by a minimum of 6 inches. Permanent linings shall overlap a minimum of 3 feet. All anchor and transverse trenches shall be a minimum of 12 inches deep. All mats shall be stapled as per manufacturer's specifications.

2. During the establishment period, check grass, RECM and TRM-lined channels after every rainfall event. For grass-lined channel once grass is established, check periodically and after every heavy rainfall event. Immediately make repairs. It is particularly important to check the channel outlet and all road crossings for bank stability and evidence of piping and scour holes. Give special attention to the outlet and inlet sections and other points where concentrated flow enters. Remove all significant sediment accumulations to maintain the designed carrying capacity. Keep the grass in a healthy, vigorous condition at all times.

J. The CONTRACTOR shall provide temporary slope drains at all location noted on the Contract Drawings, and as per the approved SESC Plan, and at other locations as may be directed by the Engineer.

1. Inspect the temporary slope drain and supporting diversion after every rainfall event and promptly make any necessary repairs. When the protected area has been permanently stabilized, temporary measures may be removed, materials disposed of properly, and all disturbed areas stabilized appropriately.

K. The CONTRACTOR shall provide temporary gravel construction entrances at all locations noted on the Contract Drawings, and as per the approved SESC Plan, and at all other locations as may be directed by the ENGINEER.

1. Maintain the gravel pad in a condition to prevent mud or sediment from leaving the construction site. This may require periodic topdressing with 2-inch stone. After each rainfall, inspect each construction entrance and clean out as necessary. Immediately remove all objectionable materials spilled, washed, or tracked onto public roadways.

L. The CONTRACTOR shall provide temporary or permanent ground cover adequate to restrain erosion on all disturbed areas that will be left unworked for periods exceeding 30 calendar days.

1. Reseed and mulch temporary seeding areas where seedling emergence is poor, or where erosion occurs, as soon as possible. Do not mow. Protect from traffic as much as possible.

2. Generally, a stand of vegetation cannot be determined to be fully established until soil cover has been maintained for one (1) full year from planting. Inspect seeded areas for failure and make necessary repairs and reseedings within the same season, if possible.

3. Reseeding – If a stand has inadequate cover, re-evaluate choice of plant materials and quantities of lime and fertilizer. Re-establish the stand after seedbed preparation or over-seed the stand. Consider seeding temporary, annual species if the time of year is not appropriate for permanent seeding.

4. If vegetation fails to grow, soil must be tested to determine if acidity or nutrient imbalance is responsible.

5. Fertilization – CONTRACTOR shall refertilize in the second growing season.

M. Additional Requirements

1. All storm sewer piping shall be blocked at the end of every working day until the inlet is constructed above grade.

2. All streets around the construction area shall be swept as necessary at the end of each day's work and after each rainfall event of ½-inch or greater to prevent accumulation of dirt and debris. Inlet protection shall be maintained on all stormwater inlets on site, in streets, or downstream of site until construction is complete.

3. The CONTRACTOR shall provide adequate means to prevent any sediment from entering any storm drains, curb inlets (curb inlet filter box), ditches, streams, or bodies of water downstream of any area disturbed by construction. Excavation materials shall be placed upstream of any trench or other excavation to prevent sedimentation of offsite areas. In areas where a natural buffer area exists between the work area and the closest stream or water course, this area shall not be disturbed.

4. CONTRACTOR shall provide adequate means to control dust on the site and prevent it from entering the process tanks on site.

5. The OWNER or ENGINEER may direct the CONTRACTOR to place any additional sediment and erosion control devices at other locations not shown on the Drawings.

3.2 INSPECTIONS AND MAINTENANCE

A. The CONTRACTOR shall designate a Certified Operator to perform inspections required by this Section. The following areas are to be inspected and maintenance performed, if needed, at least once every 7 calendar days and within 24 hours of a rainfall event that has a precipitation of 1/2 inch or greater:

1. Disturbed areas of the construction site that have not undergone final stabilization.

2. Erosion and sediment control structures, dust control measures .

3. All locations where vehicles enter or exit the site.

4. Material storage and construction laydown areas that are exposed to precipitation and have not been finally stabilized.

C. Immediate action will be taken to correct deficiencies to BMP's. The State or Local Authorities reserves the right to stop all construction activities not related to maintaining BMP's until such deficiencies are repaired.

D. In areas that have been finally stabilized, inspections and, if necessary, maintenance by CONTRACTOR will occur at least once per month for the duration of the contract or project, whichever is longer.

E. During inspections the following will be observed and appropriate maintenance procedures taken:

1. The conformance to specifications and current condition of all erosion and sediment control structures.

2. The effectiveness and operational success of all erosion and sediment control measures.

3. The presence of sediments or other pollutants in storm water runoff at all runoff discharge points.

4. If reasonably accessible, the presence of sediments or other pollutants in receiving waters.

5. Evidence of dust being transported to any process tank on site.

6. Evidence of off-site tracking at all locations where vehicles enter or exit the site.

3.3 TEMPORARY MULCHING

A. Apply temporary mulch to areas where rough grading has been completed but final grading is not anticipated to begin within 30 days of the completion of rough grading.

B. Straw mulch shall be applied at rate of 100 lbs/1000 sq ft and tackified with latex acrylic copolymer at a rate of 1 gal/1000 sq ft diluted in a ratio of 30 parts water to 1 part latex acrylic copolymer mix.

3.4 REMOVAL OF TEMPORARY SEDIMENT CONTROL STRUCTURES

A. At such time that temporary erosion and control structures are no longer required under this item, the CONTRACTORshall notify the ENGINEER of its intent and schedule for the removal of the temporary structures, and obtain the ENGINEER's approval in writing prior to removal. Once the CONTRACTOR has received such written approval from the ENGINEER, the CONTRACTOR shall remove, as approved, the temporary structures and all sediments accumulated at the removed structure shall be returned upgrade. In areas where temporary control structures are removed, the site shall be left in a condition that will restore original drainage. Such areas shall be evenly graded and seeded as specified in Section 02920 – Lawns and Grasses.

3.5 FINAL CLEANUP

A. Once the site has been fully stabilized against erosion and all sediment control measures have been removed, dispose of accumulated silt and waste materials in proper manner. Re-grade all areas disturbed during this process and stabilize against erosion with surfacing materials as indicated on the Drawings.

END OF SECTION

SECTION 02920

LAWNS AND GRASSES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fine Grading

B. Topsoil

C. Fertilizers

D. Seeding

E. Sodding

1.2 RELATED SECTIONS

A. Section 02300 - Earthwork

B. Section 02370 – Erosion and Sedimentation Controls

1.3 SUBMITTALS

A. Certification of grass seed from seed vendor for each grass-seed mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

B. Certification of each seed mixture for sod, identifying sod source, including name and telephone number of supplier.

C. Certification of all fertilizers.

D. Certified analysis of the topsoil from each source.

1.4 REFERENCES

A. MDOT, 2012 Standard Specifications for Construction.

B. American Sod Producers Association (ASPA)

C. ASTM D5268 - Topsoil Used for Landscaping Purposes

1.5 DESCRIPTION

A. The CONTRACTOR shall permanently prepare, fertilize, and seed or sod or riprap the areas designated on the Plan Set or disturbed by the CONTRACTOR. Sod shall be placed on areas having a slope of 3:1 (three horizontal and one vertical) or steeper. Grass seed shall be placed on areas having a slope flatter than 3:1. Sod may be placed in other areas at the CONTRACTOR's own option and expense. Riprap shall be placed where shown on the Plan Set or required by the ENGINEER.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Seed: Deliver seed in original sealed, labeled, and undamaged containers, bearing seed analysis and the date of the seed testing. The testing shall be within a period of six months prior to commencement of planting operations.

B. Sod: harvest, deliver, store, and handle sod according to the requirements of the ASPA "Specifications for Turfgrass Sod Materials and Transplanting/Installing".

C. Fertilizer: Delivered in bags or other convenient containers, each fully labeled, and conforming to applicable state fertilizer laws, bearing the grade and the trade name of the producer.

D. The CONTRACTOR is responsible for proper storage and security of all seeding materials.

1.7 PROJECT CONDITIONS

A. Weather Limitations: Proceed with planting only when existing and forecast weather conditions are suitable for work. At option and under full responsibility of CONTRACTOR, planting operations may be conducted under unseasonable conditions, but without additional compensation.

1.8 SCHEDULING

A. Planting Season: Sow seed and install sod during normal planting seasons and per project schedule. Optimal time for seed is between April 1 and June 1, and between September 1 and October 15.

1.9 MAINTENANCE

A. It is the responsibility of the CONTRACTOR to establish a dense lawn of permanent grasses, free from mound and depressions. Any portion of the sodded area that “browns-out” or does not firmly knit to the soil base, or any portion of a seeded area that fails to show a uniform germination, shall be re-sodded or re-seeded. Such re-sodding or re-seeding shall be at the CONTRACTOR’s expense and shall continue until a dense lawn is established.

B. The CONTRACTOR shall maintain all lawn areas until they have been accepted by the OWNER. Lawn maintenance shall begin immediately after the grass seed or sod is in place and continue until provisional acceptance.

1. Lawns shall be protected and maintained by watering, mowing, and re-seeding as necessary for one (1) year to establish a uniform weed-free stand of grasses and until specific lawn acceptance has been made. CONTRACTOR shall review lawn establishment on a minimum bi-weekly basis. Maintenance includes deposition of additional topsoil and re-sodding as may be required to correct all settlement and erosion until the date of final acceptance.

2. At the time of the first cutting the lawn shall be 2-1/2 to 3-1/2 inches high, and the mower blades shall be set at 2-1/2 inches high. All lawns shall receive at least six mowing’s, with a minimum of one (1) week between mowing, before acceptance.

3. Damage to seeded areas resulting from erosion shall be repaired by the CONTRACTOR at the CONTRACTOR’s expense. Scattered bare spots in seeded areas will not be allowed over three (3) percent of the area nor greater than 3” x3” in size.

4. OWNER will withhold $1,000 from final payment and will release up to $250 per quarter upon satisfactory completion of lawn and landscaping maintenance work.

C. When the above requirements have been fulfilled, the OWNER will accept the lawn.

PART 2 - PRODUCTS

2.1 TOPSOIL

A. Topsoil shall meet the requirements of ASTM D5268. Topsoil shall not be contaminated or excessively acidic or alkaline, and shall be free of stones one (1) inch or larger in any dimension. Topsoil shall consist of natural loam, sandy loam, silty loam, or clay loam humus-bearing soils adapted to sustain plant life.

B. Topsoil Source: Reuse surface soil stockpiled on the site. Verify suitability of surface soil to produce topsoil meeting requirements and amend when necessary. Supplement with imported topsoil when quantities are insufficient. Clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.

2.2 FERTILIZER

A. Fertilizer shall meet the requirements of the MDOT Section 917.

2.3 SEED

A. Permanent seed shall meet the requirements of the MDOT Section 917 for seed mixture THM, as follows:

1. 65% Kentucky Bluegrass, 98% pure with an 85% germination factor.

2. 25% Creeping Red Fescue, 97% pure with an 85% germination factor.

3. 10% Perennial Ryegrass, 96% pure with an 85% germination factor.

B. Temporary seeds, their spreading rates and dates of application shall be as follows:

1. April 1 to August 15:
   Spring oats or barley, at 2 lbs/1000 sq ft, or 3 bu/acre;
   Domestic rye grass, at .5 lb/1000 sq ft, or 20-25 bu/acre.

2. June - July:
   Sudangrass, at 1 lb/1000 sq ft, or 30-40 lbs/acre.

3. August 1 to October 15:
   Rye, at 1lbs/1000 sq ft, or 2-3 bu/acre; Perennial Ryegrass, at .5 lb/1000, or 20-25 lbs/acre.

4. September 20 to October 15:
   Wheat, at 3 lbs/1000 sq ft, or 2-3 bu/acre

2.4 SOD

A. Sod shall meet the requirements of the MDOT Section 917.

2.5 MULCH

A. Mulch shall meet the requirements of the MDOT Section 917 for straw mulch blankets.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to sodding, OWNER must approve condition of the seedbed. Inadequate seedbed preparation shall result in the reworking of the area to the complete satisfaction of the OWNER.

B. Do not proceed until unsatisfactory conditions have been corrected.

C. The CONTRACTOR is solely responsible to determine the quantity of cut and fill required to complete the work and to locate a suitable source and amount of topsoil.

3.2 TOPSOIL PLACEMENT

A. The application of topsoil shall occur only when conditions are favorable so as to minimize damage to the subgrade.

B. Where undesirable soils exist within the subgrade, it will be the responsibility of the CONTRACTOR not to contaminate the topsoil during the replacement or finishing process. All undesirable soils or objects will be removed from the topsoil seedbed at the cost of the CONTRACTOR.

C. Topsoil shall be placed and spread over the areas graded as shown on the plans in such a manner so that after compaction and natural settling the topsoil will conform to finished grades as shown.

D. Provide a smooth transition between adjacent existing grades and new grades.

E. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

3.3 FINE GRADING

A. Areas to be planted shall be finish graded to provide surface drainage.

B. Undulations and unsightly variations in grade which will not permit the use of normal mowing equipment without scalping shall be removed so that proper use of such equipment may be accomplished.

C. Limit preparation to areas that will be planted in the immediate future.

D. Loosen existing topsoil to a minimum depth of 4 inches. Remove stones, sticks, roots, rubbish, and other extraneous matter larger than 1 inch in any dimension.

E. Mix soil amendments and fertilizers with new topsoil per recommendations from soil report. Delay mixing fertilizer if planting does not follow placing of topsoil within a few days. Either mix soil before spreading or apply soil amendments and fertilizers on surface of spread topsoil and mix thoroughly into top 4 inches of topsoil before planting

3.4 TEMPORARY SEEDING AND MULCHING

A. The seedbed immediately before seeding shall be firm but not so compact as to prohibit covering seed, securing adequate germination, or root penetration. Tillage implements shall be used as necessary to provide at least a 3-inch depth of firm but friable soil, free of large clods and stones.

B. Seed may be broadcast by hand, by cyclone-type mechanical seeders or applied with a drill, cultipacker-seeder, or other suitable equipment. Seed should be covered approximately 2-inches deep either during seeding operation or by following broadcast application with cultipacker or similar tool.

C. Mulching shall be used with all seedings on disturbed soil areas and for temporary use without seeding during months unfavorable to seeding.

D. Immediately after seeding, mulch with unweathered small grain straw (preferably wheat) or hay spread uniformly at the rate of 1-1/2 ton per acre, or 100 lbs (2-3 bales) per 1,000 sq ft.

3.5 PERMANENT SEEDING AND SODDING

A. Topsoil shall be spread to a depth of 4 inches unless otherwise shown on the Plan Set. Placement of topsoil shall conform to MDOT Section 816.

B. All areas to be seeded or sodded shall be fertilized in accordance with MDOT Section 816. CONTRACTOR shall provide all necessary soil tests to determine fertilizer needs.

C. Permanent seeding shall conform to MDOT Section 816. Seeding rate shall be 300 lb/acre.

D. Fertilizing shall conform to all local restrictions.

E. Sodding shall conform to MDOT Section 816

3.6 MULCHING

A. Straw mulch blankets shall be applied to all seeded areas. Blankets shall be attached with biodegradable wooden pegs per the manufacturer's recommendations.

3.7 PROTECTION

A. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period until lawn is established.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Concrete work shall include the furnishing of all labor, materials, formwork, reinforcing, tools and equipment required to manufacture, transport, place, protect, repair, cure, and finish all concrete work for a complete and functioning installation in accordance with the Contract Documents.

B. The CONTRACTOR shall be responsible for all items (openings, rebar, sleeves, inserts, anchorages, etc.) shown on the Plan Set and those which may not be shown on the Plan Set but are required to be placed in the concrete work.

C. Progress of Work

1. If unacceptable concrete strength or air content occurs and additional testing or remedial actions or modifications are required, further concrete work will not be permitted until such testing has revealed the probable cause of the low strength or low air levels and a program of remedial actions or modifications has been implemented.

1.2 DEFINITIONS

A. The following supplemental definitions cover the meanings of certain words and terms as used in this Section.

1. Reviewed or Permitted: Reviewed by the OWNER and/or OWNER's REPRESENTATIVE.

2. Exposed Construction: Exposed to view. Situated so that it can be seen from eye level from any location after completion of the structure.

3. Normal Weight Concrete: Concrete for which density is not a controlling attribute, made with aggregates of the types covered by "Specification for Concrete Aggregates" (ASTM C-33), and having unit weights in the range of 135 to 160 lb/cu ft.

B. Other words and terms used in these specifications are defined in Cement and Concrete Terminology (ACI-SP-19).

1.3 STANDARDS

A. The latest edition of the standards from the American Society for Testing and Materials, American Concrete Institute, American Welding Society, and Concrete Reinforcing Steel Institute, referred to in these Specifications, are listed below with their serial designation and are declared to be a part of these Specifications, the same as if fully set forth herein, except as modified in this Specification.

1. American Society for Testing and Materials, 1916 Race St., Philadelphia, PA 19103:

A 82-85 Standard Specification for Cold-Drawn Steel Wire for Concrete Reinforcement

A 184-86 Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement

A 185-85 Standard Specification for Welded Steel Wire Fabric for Concrete Reinforcement

A 496-85 Standard Specification for Deformed Steel Wire for Concrete Reinforcement

A 497-86 Standard Specification for Welded Deformed Steel Wire Fabric for Concrete Reinforcement

A 615-87 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

C 31-87a (1980) Standard Method of Making and Curing Concrete Test Specimens in the Field

C 33-86 Standard Specification for Concrete Aggregates

C 39-86 Standard Method of Test for Compressive Strength of Cylindrical Concrete Specimens

C 42-84a Standard Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

C 94-86b Standard Specification for Ready-Mixed Concrete

C 109-86 Standard Method of Test for Compressive Strength of Hydraulic Cement Mortars (using 2-inch (50-mm) cube specimens)

C 138-81 Standard Method of Test for Unit Weight Yield, and Air Content (Gravimetric) of Concrete

C 143-78 Standard Method of Test for Slump of Portland Cement Concrete

C 144-87 Standard Specification for Aggregate for Masonry Mortar

C 150-86 Standard Specification for Portland Cement

C 172-82 Standard Method of Sampling Fresh Concrete

C 173-78 Standard Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method

C 192-81 Standard Method of Making and Curing Concrete Test Specimens in the Laboratory

C 231-82 Standard Method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method

C 260-86 Standard Specification for Air-Entraining Admixtures for Concrete

C 309-81 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

C 387-87 Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete

C 494-86 Standard Specification for Chemical Admixtures for Concrete

D 994-71 Standard Specification for Pre formed expansion Joint Filler for Concrete (Bituminous Type)

D 1751-83 Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)

E 329-77 Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction

2. American Concrete Institute, Box 19150, Redford Station, Detroit, Michigan 48219

SP-1 5 Field Reference Manual: Specifications for Structural Concrete for Buildings ACI 301-89 with Selected ACI and ASTM References, 1989.

ACI 116 Cement and Concrete Terminology.

ACI 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete

ACI 212.3 Chemical Admixtures in Concrete

ACI 214 Recommended Practice for Evaluation of Strength Test Results of Concrete (Reapproved for 1989)

ACI 302.1 Guide for Concrete Floor and Slab Construction

ACI 303 Guide to Cast-In-Place Architectural Concrete Practice

ACI 304 Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete (Revised 1982)

ACI 302 Placing Concrete by Pumping Methods

ACI 305 Hot Weather Concreting

ACI 306 Cold Weather Concreting

ACI 308 Standard Practice for Curing Concrete

ACI 309 Recommended Practice for Consolidation of Concrete

ACI 31 5 Details and Detailing of Concrete Reinforcement (Revised 1986)

ACI 318 Building Code Requirements for Reinforced Concrete (Revised 1987)

ACI 318.1 Building Code Requirements for Structural Plain Concrete

ACI 347 Recommended Practice for Concrete Formwork

ACI 350 Concrete Sanitary Engineering Structures

ACI 503 Use of Epoxy Compounds with Concrete

3. American Welding Society, 550 N.W. LeJenne Road, P.O. Box 351040, Miami, FL 33135; “Structural Welding Code - Reinforcing Steel” (AWS D1.4-79).

4. Concrete Plant Manufacturers Bureau, 900 Spring Street, Silver Spring, MD 20910: “Concrete Plant Mixer Standards of the Plant Mixer Manufacturer’s Division”.

5. National Ready Mix Concrete Association, 900 Spring Street, Silver Spring, MD 20910:
“Check List for Certification of Ready Mixed Concrete Production Facilities”.

6. Concrete Reinforcing Steel Institute, 228 North LaSalle Street, Chicago, Illinois 60601: “Placing Reinforcing Bars,” and “Reinforcement Anchorages and Splices,” latest editions.

B. Field Reference Manual

1. The CONTRACTOR shall keep at least one copy of “Specifications for Structural Concrete for Buildings (ACI 301) with Selected ACI and ASTM References “ACI Field Reference Manual SP-15, in the field office at all times.

1.4 SUBMITTAL REQUIREMENTS

A. Shop Drawings: Submit in accordance with the General Conditions, covering the items included under this Section.

1. Shop Drawings of Reinforcement: Submit original Shop Drawings for fabrication, bending, and placement of concrete reinforcement. Comply with Reinforcement Shop Drawing Checklist below as applicable:

a. Reinforcement Shop Drawing Checklist:

1) Specify ASTM number and grade of reinforcing on submitted Shop Drawings (e.g., ASTM A 615, Grade 60).

2) Specify clear coverages and bar support spacing per Placing Reinforcement Specification in Article 2.09.

3) Specify lap lengths as shown on the Structural Drawings.

4) Submit Bar Bending Schedule.

5) Use closed stirrups and ties with 135-degree hooks, unless noted otherwise in Drawings.

6) Specify major Contract reference Drawings on submitted detail sheets. Use same section cut numbers and letters when practical.

7) Show stirrup spacing.

8) Show details for additional reinforcing items. Examples are reinforcing around openings, control joints, equipment pads, masonry reinforcement.

9) Show numeric elevation references on sections shown on submitted Shop Drawings.

10) Locate expansion and control joints.

11) Organize and present sheets in logical sequence.

12) Submit "small" submittal packages when practical.

13) Show inside and outside or near face and far face on walls.

14) Show bar spacings and quantities on Shop Drawing submittals.

15) Immediately contact OWNER and/or OWNER's REPRESENTATIVE if Contract Documents are unclear.

16) For epoxy coated reinforcement, coating applicator must furnish written certification that the coated reinforcing bars were cleaned, coated, and tested according to ASTM D3963.99.

b. Mix Designs: Submit the following for all concrete classes:

1) Water/cement ratio (total gallons of water per cubic yard)

2) Brand, type, and quantity of cement

3) Type and quantity of aggregates

4) Type and quantity of admixtures

5) Unit weight (wet density)

6) History of composition strength based on 28-day compression test. Test reports shall be current and within 90 days of submittal. Concrete supplier must demonstrate a familiarity with his supplied mix.

7) Submit laboratory test reports and certification letters for concrete mix design, cement, aggregates (particularly deleterious materials in coarse aggregate), four (4) weeks before scheduled pouring.

B. Product Data: Submit data for proprietary materials and items, including admixtures, patching compounds, waterstops, joint systems, curing compounds, and other materials installed under this Section.

C. Submit samples of materials as requested by OWNER and/or OWNER's REPRESENTATIVE, including names, sources and descriptions.

D. Quality Assurance Submittals:

1. Submit written reports to ENGINEER documenting testing and inspection results.

2. Submit mill test reports on reinforcement.

3. Submit materials certificates in lieu of laboratory test reports on other materials. Manufacturer and CONTRACTOR shall sign material certificates certifying that each material item complies with, or exceeds, specified requirements. Submit certification from admixture manufacturers that chloride content complies with specification requirements.

4. CONTRACTOR shall be experienced with the placement, finishing, and curing of the specified concrete mixes and admixtures, and provide a minimum of five (5) reference projects.

1.5 PROJECT CONDITIONS

A. Protection against Freezing: Cover completed Work with sufficient temporary cover to protect against possibility of freezing. Provide supplemental heat and maintain cover for curing period or until temperatures cannot affect concrete.

B. Protect adjacent finish materials against spatter during concrete placement.

1.6 MANUFACTURERS

A. Subject to compliance with the specified requirements, manufacturers which may be incorporated in Work include:

1. Fiber Reinforcement:
    a. "Fiberstrand 100”, Euclid Chemical Co.
    b. "Fibermesh", Fibermesh Co.
    c. "Forta", Forta Corporation
    d. "Grace Fibers", W.R. Grace & Co.
    e. “Fibrasol F”, Axim Technologies
2. Air-Entraining Admixture:
    a. AEA 15, Sika Corp.
3. Corrosion Inhibitor and Bonding Agent:
    a. Armatech 110-EpoCem, Sika Corporation
4. Water-Reducing Admixture:
    a. "Plastocrete 161", Sika Chemical Corporation
5. High-Range Water-Reducing Admixture:
    a. ViscoCrete 2100, Sika Corporation
6. Water Reducing, Non-Chloride Accelerator Admixture:
    a. Sika Corporation
7. Water-Reducing, Retarding Admixture:
    a. Sika Corporation
8. Expansion and Isolation Joint Filler (excluding pavements):
    a. "Sealtight Sponge Rubber", W.R. Meadows
    b. "1300 Series Sponge Rubber", Williams Products
9. Expansion and Isolation Joint Sealant, one part polyurethane:
    a. "Vulkem 45 or 116", Mameco International
    b. "Sonolastic NP1", Sonneborn-Contech
    c. "Dynaseal W-517 or 907", Williams Products

10. Non-Shrink Grout:

    a. Dayton-Superior

    b. Euclid Chemical Co.

    c. Master Builders

    d. U.S. Grout Corporation

11. Chemical Hardener:

    a. "Burk-O-Lith", The Burke Co.

    b. "Day-Chem Hardener", Dayton-Superior

    c. "Surfhard", Euclid Chemical Co.

    d. "Mastertop CST", Master Builders

    e. "Lapidolith", Sonneborne-Rexnord

12. Moisture-Retaining Cover:

    a. Polyethylene-coated burlap.

13. Epoxy Anchors:

    a. “HIT HY150”, Hilti Systems

PART 2 - PRODUCTS

2.1 CEMENT

A. Cement shall be Portland cement Types I or III, and shall conform to ASTM C150 and contain less than 0.60 percent alkalies. Different cements shall not be used interchangeably in the same element or portion of the work.

2.2 ADMIXTURES

A. The following admixtures will be permitted or required in the concrete as stated.

1. Air-entraining admixture conforming to ASTM C260.

2. Water reducing, retarding and accelerating admixtures conforming to ASTM C494 will be permitted in concrete made with Type I Cement. Water reducing admixture conforming to ASTM C494 will be permitted in concrete made with Type III Cement.

3. Fly Ash

    a. Fly ash shall be Type Class C or F, meeting the requirements of ASTM C618 and the carbon content shall be less than one percent.

B. Admixtures used in the concrete shall be of the same composition as used in establishing the required concrete proportions (See paragraph 2.07 of this Section of the Specifications).

C. Calcium chloride or admixtures containing calcium chloride will not be permitted in the concrete work.

D. The name, manufacturer, and technical information for all admixtures shall be submitted for approval.

E. All admixtures shall be used in accordance with the manufacturer's instructions.

F. Admixtures shall be supplied by a single manufacturer to ensure compatibility.

2.3 WATER

A. Mixing water for concrete shall be fresh, clean, and free from injurious amounts of oil, acid, alkalies, salts, sewage, organic matter, or other deleterious substances and meet the requirements of ASTM C94.

2.4 AGGREGATES

A. Aggregates shall conform to ASTM C33. Coarse aggregates shall meet the grading requirements for size 67 for all concrete work unless noted otherwise.

B. Fine and coarse aggregates shall be regarded as separate ingredients. Each size of coarse aggregate, as well as the combination of sizes when two or more are used, shall conform to the appropriate grading requirements of the applicable ASTM specifications.

C. Aggregates shall be tested for reactivity. To minimize alkali-silica reactions, high alkali content shall not be permitted.

2.5 FIBER REINFORCEMENT

A. Polypropylene fibers designed as secondary reinforcing. Fibers to comply with ASTM C1116, Type III, not less than ¾-inch long.

2.6 STORAGE OF MATERIALS

A. Cement shall be stored in weather-tight buildings, bins, or silos which will exclude moisture and contaminants.

B. Aggregate stockpiles shall be arranged and used in a manner to avoid excessive segregation and to prevent contamination with other materials or with other sizes of like aggregates. To insure that this condition is met, any test for determining conformance to requirements for cleanness and grading shall be performed on samples secured from the aggregates at the point of batching. Frozen or partially frozen aggregates shall not be used.

C. Natural or manufactured sand shall be allowed to drain until it has reached relatively uniform moisture content before it is used.

D. To prevent excessive variations in moisture content, predampened aggregates must remain in the stockpiles for a minimum of 12 hours before use.

E. Admixtures shall be stored in such a manner as to avoid contamination, evaporation, or damage. For those used in the form of suspensions or non-stable solutions, agitating equipment shall be provided to assure thorough distribution of the ingredients. Liquid admixtures shall be protected from freezing and from temperature changes which would adversely affect their characteristics.

F. Moisture retaining covers shall be one of the following, complying with ASTM C17:

1. Waterproof Paper
2. Polyethylene Film, Burleen

2.7 PROPORTIONING

A. General

1. Concrete for all parts of the work shall be of the specified quality capable of being placed without excessive segregation. When hardened, concrete shall develop all characteristics required by these Specifications.

2. Use Portland Cement Type I or III.

3. Fly ash shall be used to partially supplant cement content in concrete. Replacement quantity shall be not less than 15%, nor more than 20% of cement content by weight.

4. Concrete shall not have less than one inch slump as determined by ASTM C143.

5. The nominal maximum size of the aggregate shall not be more than one-fifth of the narrowest dimension between sides of forms, one-third of the depth of slabs, nor three-fourths of the minimum clear spacing between reinforcing bars.

B. Design Mixes

1. Locations for concrete classes are attached at the end of this Section.

2. Properties for concrete classes are attached at end of this Section.

3. Adjustment of Concrete Mixes: Mix designs may be adjusted when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, when approved by ENGINEER, at no additional cost to OWNER. Submit laboratory test data for revised mix design and strength results to ENGINEER before using in work.

4. Admixtures:

a. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete for placement and workability.

b. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F (10 degrees C).

c. Add air-entraining admixture at manufacturer's prescribed rate to result in placed concrete having total air content specified.

d. Refer to the mix designs attached at the end of this section for other specific admixture usage.

2.8 FORMWORK

A. General

1. Forms shall be used to confine the concrete and shape it to the required dimensions. Forms shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete, and shall have sufficient rigidity to maintain specified tolerances.

2. Formwork shall conform to ACI 347.

3. Earth cuts may be used to form footings, trench footings, and mass footings provided that the cut is clean, reasonably straight, and meets the tolerances of this Section. Review by the ENGINEER is required in order to use earthcuts. If the earth cannot hold the shapes required by the Drawings these items shall be formed.

B. Design and Installation of Formwork

1. The design and engineering of the formwork, as well as its construction, shall be the responsibility of the CONTRACTOR.

2. The formwork shall be designed for the loads, lateral pressure, and allowable stresses outlined in ACI 347, Design of "Recommended Practice for Concrete Formwork" as well as for the design considerations, wind loads, allowable stresses, and other applicable requirements of the controlling local building code.

3. Requirements for facing materials are given in following items of this Section of the Specifications. The maximum deflection of facing materials reflected in concrete surfaces exposed to view shall be 1/240 of the span between structural members.

4. Forms shall be sufficiently tight to prevent loss of mortar from the concrete. Chamfer strips (1" x 1" x 1-1/2") shall be placed in the corners of forms to produce beveled edges on permanently exposed surfaces unless detailed otherwise. Interior corners on such surfaces and the edges of formed joints will not require beveling. Exposed surfaces include surfaces exposed to view or water in the finished construction.

5. Positive means of adjustment (wedge or jacks) of shores and struts shall be provided and all settlement shall be taken up during concrete placing operation. Forms shall be securely braced against lateral deflections. Formwork shall be cambered to compensate for anticipated deflections in the formwork prior to hardening of the concrete.

6. Temporary openings shall be provided at the base of column forms and wall forms and at other points where necessary to facilitate cleaning and observation immediately before concrete is placed.

7. Form accessories to be partially or wholly embedded in the concrete, such as ties and hangers, shall be of a commercially manufactured type. Non-fabricated wire shall not be used.

8. Form ties shall be constructed so that the end or end fasteners can be removed without causing appreciable spalling at the faces of the concrete. Form ties shall have cones on each end.

    a. Non-Exposed Concrete Work: After the ends or end fasteners of form ties have been removed, the embedded portion of the ties shall terminate not less than 2 diameters or twice the minimum dimension of the tie from the formed faces of concrete and in no case shall this distance be less than 3/4 inch.

    b. Exposed Concrete Work (this shall apply to areas where one or both faces of the work is exposed to view; i.e., retaining wall): Form, ties, assemblies for concrete exposed to water, influent, effluent, weather, freeze/thaw and similar exposures shall permit tightening of the forms and shall leave no metal or other material within 1-1/2 inch of the surface. The assembly should provide cone-shaped depressions at the form/concrete surface interface of at least one inch diameter and 1-1/2 inch deep to permit filling and patching. Tie shall be tight

fitting or tie holes shall be sealed to prevent leakage. Single rod ties shall be equipped with a tightly fitted washer at midpoint when part of the tie is to remain in concrete exposed to liquids.

c. Tie systems shall provide positive pressure at all joints to preclude mortar/grout leakage.

9. At construction joints, contact surface of the form sheathing for flush surfaces shall overlap the hardened concrete in the previous placement by not more than 1 inch. The forms shall be held against the hardened concrete to prevent offsets or loss of mortar at the construction joint and to maintain a true surface.

10. Wood forms for wall openings shall be constructed to facilitate loosening, if necessary, to counteract swelling of the forms.

11. Wedges used for final adjustment of the forms prior to concrete placement shall be fastened in position after the final check.

12. Formwork shall be so anchored to shores or other supporting surfaces or members that upward or lateral movement of any part of the formwork system during concrete placement will be prevented.

13. Runways for moving equipment shall be provided with struts or legs and shall be supported directly on the formwork or structural member without resting on the reinforcing steel.

14. Provide temporary openings at base of wall and column forms and other interior areas of formwork where it is inaccessible for cleanout, for observation before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

15. Provisions for other trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing these items. Accurately place and securely support items built into forms.

C. Tolerances

1. The formwork shall be constructed so that the concrete surfaces will conform to the tolerance limits listed below in Table 2.08.C.1.

Table 2.08.C.1
Tolerances for Formed Surfaces

(1) Variation from plumb:

a. In the lines and surfaces of columns, piers, walls, and in arises:

in any l0 ft of length	¼ - inch
maximum for entire length	1 inch

b. For exposed corner columns, control joint grooves and other conspicuous lines:

in any 20'- 0" length	¼ - inch
maximum for the entire length	½ - inch

(2) Variation from the level or from the grades specified in the Contract Documents:

a. In slab soffits, ceilings, beam soffits and in arises, measured before removal of supporting shores

in any 10 ft of length	¼ - inch
in any bay or any 20 ft length	⅜ - inch
maximum for entire length	¾ - inch

b. In exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines:

in any bay or in 20 ft length	¼ - inch
maximum for entire length	½ - inch

(3) Variation of the linear building lines from established position in plan and related position of columns, walls, & partitions:

in any bay	½ - inch
in any 20 ft of length	½ - inch
maximum for entire length	1 inch

(4) Variation in the sizes and location of sleeves, floor openings, & wall openings

± ¼ - inch

(5) Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls

minus	¼ - inch
plus	½ - inch

(6) Footings

a. Variations in dimensions in plan:

minus	½ - inch
plus	2 inches

b. Misplacement of eccentricity:

2% of footing width in direction of misplacement but no more than 2 inches

c. Thickness:

decrease in specified thickness	0 inch
increase in specified thickness	1 inch

(7) Variation in steps:

a. In a flight of stairs:

Rise	± ⅛ - inch
Tread	± ⅛ - inch

b. In consecutive steps:

Rise	± 1/16 - inch
Tread	± ⅛ - inch

2. The CONTRACTOR shall establish and maintain in an undisturbed condition and until final completion and acceptance of the project sufficient control points and bench marks to be used for reference purposes to check tolerances.

3. Regardless of the tolerances listed in Table 208.C.1, no portion of the building shall extend beyond the legal boundary of the project.

D. Preparation of Form Surfaces

1. All surfaces of forms and embedded materials shall be cleaned of any accumulated mortar or grout from previous concreting and of all other foreign material before concrete is placed in them. Local defects such as chipped plywood or kinks in steel forms will not be permitted.

2. Unless otherwise specified or approved, surfaces of forms shall be treated as follows:

   a. Before placing of either the reinforcing steel or the concrete, the surfaces of the forms shall be covered with an approved coating material that will effectively prevent absorption of moisture and prevent bond with the concrete, and will not stain the concrete surfaces. A field applied form release agent or sealer of approved type or a factory applied non-absorptive liner may be used.

   b. Excess form coating material shall not be allowed to stand in puddles in the forms nor shall such coating be allowed to come in contact with reinforcing steel or with hardened concrete against which fresh concrete is to be placed.

3. The CONTRACTOR shall submit the name of the form coating agent material proposed to be used with sufficient supportive documentation to the ENGINEER for review.

E. Removal of Forms

1. Forms shall be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations after review by the ENGINEER.

2. Top forms on sloping surfaces of concrete shall be removed as soon as the concrete has attained sufficient stiffness to prevent sagging. Any needed repairs or treatment required on such sloping surfaces shall be performed at once and be followed by specified curves.

3. Wood forms for wall openings shall be loosened as soon as this can be accomplished without damage to the concrete.

4. Formwork for columns, walls, sides of beams, and other parts not supporting the weight of the concrete may be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations.

5. Forms and shoring in the formwork used to support the weight of concrete in beams, slabs, arches and other structural members shall remain in place until the concrete has reached 28-day compressive strength.

6. When shores and other vertical supports are so arranged that the non-load-carrying form facing material may be removed without loosening or disturbing the shores and supports, the facing material may be removed at an earlier age as permitted by the ENGINEER.

F. Removal Strength

1. When removal of formwork is based on the concrete reaching a specified strength, the concrete shall be presumed to have reached this strength when the following conditions have been met:

a. When the concrete has been cured in accordance with the provisions of Article 3.06 for the same length of time as the age at test of laboratory-cured cylinders which reached the specified strength for form removal. The length of time the concrete has been cured in the structure shall be determined by the cumulative number of days or fractions thereof, not necessarily consecutive, during which the temperature of the air in contact with the concrete is above 50˚F and the concrete has been damp or thoroughly sealed from evaporation and loss of moisture.

2.9 REINFORCEMENT

A. General

1. Shop Drawings, showing all fabrication dimensions and locations for placing of the reinforcing steel and accessories shall be submitted for review in accordance with provisions in Article 1.04. Review shall be obtained before fabrication.

2. Details of concrete reinforcement and accessories not covered herein shall be in accordance with ACI 315.

B. Reinforcing Steel

1. All reinforcement shall be Grade 60 (fy = 60,000 psi) and shall conform to the appropriate Specification listed below, except as follows:

a. Yield strength shall be determined by testing of full size bars.

b. For bars, wire, or wire fabric with a specified yield strength fy exceeding 60,000 psi, fy shall be the stress corresponding to a strain of 0.35 percent.

2. Reinforcing bars shall conform to ASTM A615 Grade 60 and the supplementary requirement S1 shall apply.

3. All cutting, bending, fabrication, and erection of reinforcing steel shall conform to the "Manual for Concrete Structures". (ACI 315 latest edition).

4. All splicing of reinforcing steel shall conform to "Reinforcing Bar Splices" latest edition by the Concrete Reinforcing Steel Institute and the "Building Code Requirements for Reinforced Concrete" (ACI 318-99).

5. Mats: Bar and rod mats for concrete reinforcement shall be of the clipped type conforming to "Specification for Fabricated Steel Bar or Rod Mats for Concrete Reinforcement" (ASTM A 184).

6. The use of plain bars is not permitted.

7. Supports for reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar supports complying with CRSI specifications.

8. For slabs-on-grade, use supports with sand plates or horizontal runners where base material does not support chair legs.

9. For exposed-to-view concrete surfaces, where support legs are in contact with forms, use supports with legs which are plastic protected (CRSI, Class I) or stainless steel-protected (CRSI, Class 2).

C. Welding

1. When required or permitted, all welding of reinforcing bars shall conform to AWS D14. Unless otherwise accepted, welding of cross bars (tack welding) for assembly of reinforcement is prohibited. Reinforcing to be welded must be certified as weldable.

2. Welding of wire to wire, and of wire or welded wire fabric to reinforcing bars or structural steels, shall conform to applicable provisions of AWS D14 and supplementary requirements specified by the Architect/ENGINEER.

D. Fabricating and Placing Tolerances

1. Bars shall be fabricated in accordance with the tolerances given in ACI 315.

2. Reinforcement shall be placed to the following tolerances:

	Tolerances, In.
Clear distance	
To formed soffits	- ¼
To other formed surfaces	¼
Minimum spacing between bars	- ¼
Clear distances from unformed surface to top reinforcement	
Members 8 in. deep or less	¼
Members more than 8 in. deep but less than 24 in. deep	- ¼, + ½
Members 24 in. deep or greater	- ¼, + 1
Uniform spacing of bars, but the required number of bars shall not be reduced	2
Uniform spacing of stirrups and ties, but the required number of stirrups and ties shall not be reduced	1
Longitudinal locations of bends and ends of reinforcement	
General	2
Discontinuous ends of members	½ - 1½
Length of bar laps	- 1½
Embedded length	
For bar sizes No. 3 through 11	- 1
For bar sizes No. 14 and 18	- 2

3. Bars may be moved as necessary to avoid interference with other reinforcing steel, or embedded items. If bars are moved more than one bar diameter, or enough to exceed the above tolerances, additional reinforcing as directed by the ENGINEER may be required.

E. Placing

1. Minimum concrete cover for reinforcement, except for extremely corrosive atmosphere, other severe exposures, or fire protection, shall be as follows unless shown otherwise on the Drawings:

	Minimum cover, in.
Concrete deposited against the ground	3
Formed surfaces exposed to weather or in contact with the ground	
For bar sizes No. 6 or larger	2
For bar sizes No. 5 and smaller, and W31 or D31 wire and smaller	1½
Formed surfaces not exposed to weather or not in contact with the ground	
Beams, girders, and columns	1½
Slabs, walls, and joists	
For bar sizes No. 11 or smaller	¾
For bar sizes No. 14 and 18	1½

2. All reinforcement, at the time concrete is placed, shall be free of mud, oil or other materials that may adversely affect or reduce the bond. Reinforcement with rust, mill scale or a combination of both will be accepted as being satisfactory without cleaning or brushing provided the dimensions and weights, including heights of deformations, of a cleaned sample are not less than required by the applicable ASTM specification.

3. All reinforcement shall be supported and fastened together to prevent displacement by construction loads or the placing of concrete beyond the tolerances of Table 2.08C. On ground, where necessary, supporting concrete blocks may be used. Over formwork, metal, plastic or other approved bar chairs and spacers shall be used. All accessories within ½ inch of the formed concrete surface shall be plastic coated.

4. Vertical bars in columns shall be offset at least one bar diameter at lapped splices. To insure proper placement, templates shall be furnished for all column dowels.

5. All splices not shown in the Contract Documents shall be subject to review by the ENGINEER.

    A. Splicing shall be a minimum of 48 bar diameters (typ uno)

6. Reinforcement shall not be bent after being embedded in hardened concrete.

2.10 JOINTS AND EMBEDDED ITEMS

A. Construction Joints

1. Joints not shown in the Contract Documents shall receive prior review by the ENGINEER and shall be so made and located at least to impair the strength of the structure. In general, they shall be located near the middle of the spans of slabs, beams, and girders unless a beam intersects a girder at this point, in which case the joint in the girder shall be offset a distance equal to twice the width of the beam. Joints in walls and columns shall be at the underside of floors, slabs, beams, or girders and at the tops of footings or floor slabs. Beams, girders, brackets, column capitals, haunches, and drop panels shall be placed at the same time as slabs. Joints shall be perpendicular to the main reinforcement.

2. All reinforcement shall be continued across joints. Keys and inclined dowels shall be provided as directed by the ENGINEER. Longitudinal keys at least 1-1/2 in. deep shall be provided in all joints in walls and between walls and slabs or footings.

3. The surface of the concrete at all joints shall be thoroughly cleaned and all laitance removed prior to placing adjoining concrete.

4. Bond shall be obtained by roughening the surface of concrete in an approved manner which will expose the aggregate uniformly and will not leave laitance, loosened particles of aggregate or damaged concrete at the surface.

5. Construction joints shall be located as shown on the Contract Documents. In general, slab and wall pours shall not exceed 1200 sq ft surface area in one concrete placement between construction joints, the longer edge shall not be greater than twice the shorter edge for any one concrete pour between construction joints, and pour sequences shall be scheduled and located so that shrinkage and creep effects are minimized.

B. Expansion Joints

1. Reinforcement or other embedded metal items bonded to the concrete (except dowels in floors bonded on only one side of joints) shall not be permitted to extend continuously through any expansion joint.

2. Premolded expansion and isolation joint filler shall be of the type required and located by the Contract Documents and shall conform to the following specifications.

a. "Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)" (ASTM D 994), at intersections of walls and pavements unless otherwise shown.

b. "Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)" (ASTM D 1751), at pavements where pavement to pavement is jointed.

c. “Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction” (ASTM D1752 Type 1) at all expansion and isolation joints in structural concrete.

3. Expansion and Isolation Joint Sealant, one part polyurethane: Concrete gray color unless otherwise required by ENGINEER. Before applying, wipe surface clean with solvent supplied by manufacturer.

C. Other Embedded Items

1. All sleeves, inserts, anchors, and embedded items required for adjoining work or for its support shall be placed prior to concreting.

D. Placing Embedded Items

1. Expansion joint material and other embedded items shall be positioned accurately and supported against displacement. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable material to prevent the entry of concrete into the voids.

2. Set and build into Work anchorage devices and other embedded items required for other work that are attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of attachment items.

3. Conduits and pipes of aluminum shall not be embedded in structural concrete unless they are effectively coated or covered to prevent aluminum-concrete reaction or electrolytic action between aluminum and steel.

PART 3 - EXECUTION

3.1 PRODUCTION OF CONCRETE

A. Ready-Mixed Concrete

1. Except as otherwise provided in this Section, ready-mixed concrete shall be batched, mixed and transported in accordance with "Specification for Ready-Mixed Concrete" (ASTM C 94) and ACI 304. Plant equipment and facilities shall conform to the "Check List for Certification of Ready Mixed Concrete Production Facilities" of the National Ready Mixed Concrete Association.

2. Concrete produced by on-site volumetric batching and continuous mixing shall be batched and mixed in accordance with and shall conform to all requirements of ASTM C685.

B. Control of Admixtures

1. Air-entraining admixtures, and other chemical admixtures shall be measured by means of an approved mechanical dispensing device. The liquid shall be considered a part of the mixing water. Admixtures that cannot be added in solution may be weighed or may be measured by volume if so recommended by the manufacturer.

2. If two or more admixtures are used in the concrete, they shall be added separately to avoid possible interaction that might interfere with the efficiency of either admixture or adversely affect the concrete.

3. Addition of retarding admixtures shall be completed within 1 minute after addition of water to the cement has been completed, or prior to the beginning of the last three-quarters of the required mixing, whichever occurs first.

C. Tempering and Control of Mixing Water

1. Concrete shall be mixed only in quantities for immediate use. Concrete which has set shall not be retempered, but shall be discarded.

2. The addition of water at the construction site will not be permitted.

D. Weather Conditions

1. Cold Weather - Ambient Temperature 45^{o}F or below

a. In cold weather, the temperature of the concrete when delivered at the site of the work shall conform to the following temperature limitations:

Minimum Temperature °F	Minimum Concrete Temperature °F
30 to 45	60

15 to 30	65
below 15	no concreting permitted

b. If water or aggregate is heated above 100°F, the water shall be combined with the aggregate in the mixer before cement is added. Cement shall not be mixed with water or with mixtures of water and aggregate having a temperature greater than 100°F.

c. When the temperature of the surrounding air is expected to be below 40°F during placing or within 24 hours thereafter, special precautions for concrete, placing, and protection shall be followed as required by "Recommended Practice for Cold Weather Concreting" ACI 306 and modifications herein, see Article 3.6.

d. The CONTRACTOR shall provide all labor, equipment, and materials to meet the above cold weather requirements.

2. Hot Weather Ambient Temperature 90°F or Above

a. The ingredients shall be cooled before mixing, or flake ice or well-crushed ice of a size that will melt completely during mixing may be substituted for all or part of the mixing water if, due to high temperature, low slump, flash set or cold joints are encountered.

b. Concreting under hot weather conditions shall conform to "Recommended Practice for Hot Weather Concreting" ACI 305 and modifications herein. See Article 3.6. The use of an approved set retarder will be permitted under hot weather conditions.

3.2 PLACING

A. Preparation Before Placing

1. Hardened concrete and foreign materials shall be removed from the inner surfaces of the conveying equipment.

2. Formwork shall have been completed; snow, ice and water shall have been removed; reinforcement shall have been secured in place; expansion joint material, anchors, and other embedded items shall have been positioned.

3. Semi-porous subgrades shall be sprinkled sufficiently to eliminate suction and porous subgrades shall be sealed in an approved manner. See paragraph 3.05.B.4.

4. Concrete shall not be placed on frozen ground.

B. Conveying

1. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients and in a manner which will assure that the required quality of the concrete is maintained.

2. Conveying equipment shall be approved and shall be of a size and design such that detectable setting of concrete shall not occur before adjacent concrete is placed. Conveying equipment shall be cleaned at the end of each operation or workday. Conveying equipment and operations shall conform to the following additional requirements:

a. Truck mixers, agitators, and non-agitating units and their manner of operation shall conform to the applicable requirements of "Specification for Ready-Mixed Concrete" (ASTM C 94).

b. Belt conveyors shall be horizontal or at a slope which will not cause excessive segregation or loss of ingredients. Concrete shall be protected against undue drying or rise in temperature. An approved arrangement shall be used at the discharge end to prevent apparent segregation. Mortar shall not be allowed to adhere to the return length of the belt. Long runs shall be discharged into a hopper or through a baffle.

c. Chutes shall be metal or metal-lined and shall have a slope not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20 feet long and chutes not meeting the slope requirements may not be used.

d. Pumping or pneumatic conveying equipment shall be of suitable kind with adequate pumping capacity and shall conform to ACI committee report 304. Pneumatic placement shall be controlled so that segregation is not apparent in the discharged concrete. The loss of slump in pumping or pneumatic conveying equipment shall not exceed 1-1/2 inches. Concrete shall not be conveyed through pipe made of aluminum or aluminum alloy.

C. Depositing

1. General: Concrete shall be deposited continuously, or in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, construction joints shall be located as shown in the Contract Documents or as approved. Placing shall be carried on at such a rate that the concrete which is being integrated with fresh concrete is still plastic. Concrete which has partially hardened or has been contaminated by foreign materials shall not be deposited. Temporary spreaders in forms shall be removed when the concrete placing has reached an elevation rendering their service unnecessary. They may remain embedded in the concrete only if made of metal or concrete and if prior approval has been obtained. Communication between the batching plant and the point of delivery shall be such that concrete placement can proceed without interruption and without trucks waiting more than 15 minutes to make delivery.

2. Placing: Placing of concrete in supported elements shall not be started until the concrete previously placed in columns and walls is no longer plastic and has been in place at least two hours. Wall and column placement and consolidation shall be in approximately horizontal layers not exceeding 2 feet in height. Concrete shall not be allowed to drop freely more than 4 ft or through a reinforcing steel cage. Sections of walls between joints shall be placed continuously to produce a monolithic unit. At least 48 hrs shall elapse between casting of adjoining wall units.

3. Segregation: Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. Concrete shall not be subjected to any procedure which will cause segregation. Horizontal flow shall not exceed five feet. Where concrete placing operations involve dropping concrete freely more than 4 feet vertically, spouts or pipes shall be used. Such pipes or spouts shall be of suitable diameter for the large aggregate being used, shall be kept within 3 feet of the concrete, and shall have suitable hoppers on their upper ends. Temporary openings or portholes in wall or column forms may be used to limit concrete free-fall to less than 4 ft. The ports should be spaced no more than 6 to 8 ft apart to limit horizontal concrete flow.

4. Placement Time: Concrete shall be placed no more than 90 minutes after the cement is first introduced into the drum. The batch will be rejected and removed from the site if this limit is exceeded.

5. Consolidation: All concrete shall be consolidated by vibration, spading, rodding or forking so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into corners of forms, eliminating all air or stone pockets which may cause honeycombing, pitting, or planes of weakness. Internal vibrators shall have a minimum frequency of 8000 vibrations per min., and sufficient amplitude to consolidate the concrete effectively. They shall be operated by competent workmen. Use of vibrators to transport concrete within forms shall not be allowed. Vibrators shall be inserted and withdrawn at points approximately 18 inches apart. At each insertion, the duration shall be sufficient to consolidate the concrete but not sufficient to cause segregation. A spare vibrator shall be kept on the job site during all concrete placing operations. Where the concrete is to have an as-cast finish, a full surface of mortar shall be brought against the form by the vibration process, supplemented if necessary by spading to work the coarse aggregate back from the formed surface. Consolidation shall conform to "Recommended Practice for Consolidation of Concrete" (ACI 309).

D. Protection

1. Adhere to the requirements of:

    b. ACI 305 Hot Weather Concreting

    c. ACI 306 Cold Weather Concreting

2. Unless adequate protection is provided concrete shall not be placed during rain, sleet, or snow.

3. Rainwater shall not be allowed to increase the mixing water nor to damage the surface finish.

4. Placing Temperature: When the temperature of the surrounding air is expected to be below 40°F during placing or within 24 hours thereafter, the temperature of the plastic concrete, as placed, shall be no lower than 55°F. The temperature of the concrete as placed shall not be so high as to cause difficulty from loss of slump, flash set, or cold joints and shall not exceed 90°F.

E. Bonding

1. When specified, the surface of joints shall be prepared in accordance with one of the methods specified in paragraph 2.10.

2. The hardened concrete of wall construction joints and of construction joints between floor slabs shall be dampened (but not saturated) immediately prior to placing of fresh concrete.

3. The hardened concrete of joints in exposed work; joints in the middle of beams, girders, and joists; and horizontal joints in work designed to contain liquids shall be dampened (but not saturated) and then thoroughly covered with a coat of cement grout of similar proportions to the mortar in the concrete. The grout shall be as thick as possible on vertical surfaces and at least one inch (1") thick on horizontal surfaces. The fresh concrete shall be placed before the grout has attained its initial set.

3.3 REPAIR OF SURFACE DEFECTS

A. General

1. Surface defects, including tie holes, shall be repaired immediately after form removal.

B. Repair of Defective Areas

1. All honeycombed and other defective concrete shall be chipped down to sound concrete. The edges shall be perpendicular to the surface or slightly undercut. No feather edges will be permitted. The area to be patched and an area at least 6 inches wide surrounding it shall be dampened to prevent absorption of water from the patching mortar. A bonding grout shall be prepared using a mix of approximately 1 part cement to 1 part fine sand passing a No. 30 mesh sieve, mixed to the consistency of thick cream, and then well brushed into the surface.

2. The patching mixture shall be made of the same materials and of approximately the same proportions as used for the concrete, except that the coarse aggregate shall be omitted and the mortar shall consist of not more than 1 part cement to 2-1/2 parts sand by damp loose volume. The quantity of mixing water shall be no more than necessary for handling and placing. The patching mortar shall be mixed in advance and allowed to stand with frequent manipulation with a trowel, without addition of water, until it has reached the stiffest consistency that will permit placing. Use of latex bonding agent is required.

3. After surface water has evaporated from the area to be patched, the bond coat shall be well brushed into the surface. When the bond coat begins to lose the water sheen, the premixed patching mortar shall be applied. The mortar shall be thoroughly consolidated into place and struck off so as to leave the patch slightly higher than the surrounding surface. To permit initial shrinkage, it shall be left undisturbed for at least 1 hour before being finally finished. The patched area shall be kept damp for 7 days. Metal tools shall not be used in finishing a patch in a formed wall which will be exposed.

C. Tie Holes

1. After being cleaned and thoroughly dampened, the tie holes shall be filled solid with a non-metallic non-shrink patching mortar. The layout of tie holes and exterior finish of the tie holes on surfaces permanently exposed to view on the outside shall be submitted to the ENGINEER for review.

D. Proprietary compounds for adhesion or as patching ingredients may be used in lieu of or in addition to the foregoing patching procedures providing that prior review is done by the ENGINEER. The ENGINEER may require such compounds in certain patching locations.

3.4 FINISHING OF FORMED SURFACES

A. Finish on all surfaces shall be as cast finish as follows:

1. Smooth Form Finish: The form facing material shall produce a smooth, hard, uniform texture on the concrete. It may be plywood, tempered concrete-form-grade hardboard, metal, plastic, paper, or other approved material capable of producing the desired finish. The arrangement of the facing material shall be orderly and symmetrical, with the number of seams kept to the practical minimum. It shall be supported by studs or other backing capable of preventing excessive deflection. Material with raised grain, torn surfaces, worn edges, patches, dents, or other defects which will impair the texture of the concrete surface shall not be used. Tie holes and defects shall be patched. All fins, projections, and seams shall be completely removed.

B. Related Unformed Surfaces

1. Tops of walls or buttresses, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces shall be struck smooth after concrete is placed and shall be floated to a texture reasonably consistent with that of the formed surfaces. Final treatment on formed surfaces shall continue uniformly across the unformed surfaces.

3.5 SLABS

A. General

1. Concrete work for slab construction shall conform to "Recommended Practice for Concrete Floor and Slab Construction (ACI-302).

B. Preparation of Subgrade for Slabs on Ground

1. The subgrade shall be well drained and of adequate and uniform load bearing nature. The in-place density of the subgrade soils shall be at least the minimum required in the Specifications.

2. The subgrade shall be free of frost before concrete placing begins. If the temperature inside a structure where concrete is to be placed is below freezing it shall be raised and maintained above 50°F long enough to remove all frost from the subgrade.

3. The subgrade shall be moist at the time of concreting. If necessary, it shall be dampened with water in advance of concreting, but there shall be no free water standing on the subgrade nor any muddy or soft spots when the concrete is placed.

4. Floor slabs on granular fill shall be placed over a 6 mil polyethylene vapor barrier. Lap all joints of vapor barrier 12 inches minimum.

5. Soil Testing

a. The CONTRACTOR shall obtain and pay for, the services of a soils testing firm (acceptable to the ENGINEER) for the following:

1) Certify that materials proposed by CONTRACTOR meet specifications Certification test reports will be submitted by the CONTRACTOR.

2) Conduct compaction testing of engineered fill below footings and slabs and backfilling for utility trenches. The testing frequency shall be one test per lift per 400 square feet of fill.

3) Copies of test reports shall be furnished to the OWNER and distributed to parties designated by the OWNER, including the ENGINEER.

4) Any area falling compaction test shall be compacted and re-tested at the CONTRACTOR’s expense.

C. Edge Forms and Screeds

1. Edge forms and intermediate screed strips shall be set accurately to produce the designated elevations and contours of the finished surface and shall be sufficiently strong to support vibration. The concrete surface shall be aligned to the contours of screed strips by the use of strike-off templates.

2. When formwork is cambered, screeds shall be set to a like camber to maintain the proper concrete thicknesses.

3. Screeds shall be removed before initial concrete set and depressions immediately filled to form a smooth monolithic surface.

D. Placement

1. Mixing and placing shall be carefully coordinated with finishing. Concrete shall not be placed on the subgrade or forms more rapidly than it can be spread, straightedged, and darbied or bullfloated. These operations must be performed before bleeding water has an opportunity to collect on the surface.

2. To obtain good surfaces and avoid cold joints, the size of finishing crews shall be planned with due regard for the effects of concrete temperature and atmospheric conditions on the rate of hardening of the concrete. If construction joints become necessary, they shall be constructed as required in subparagraph 2.10.A of this Section.

E. Jointing

1. Joints in slabs on grade shall be located and detailed as indicated in the Contract Documents. If saw-cut joints are required or permitted, cutting shall be timed properly with the set of the concrete: cutting shall be started as soon as the concrete has hardened sufficiently to prevent aggregates being dislodged by the saw, and shall be completed before shrinkage stresses become sufficient to produce cracking.

F. Consolidation

1. Concrete in slabs shall be thoroughly consolidated. Internal vibration shall be used in beams and girders of framed slabs and along the bulkheads of slabs on grade. Consolidation of slabs shall be obtained with internal vibrators.

G. Finishes (See paragraph 3.5.H for Finishing Tolerance)

1. All concrete flatwork such as slabs on grade inside and outside of the building and supported slabs shall at first receive a "floated finish". After the concrete has been placed, consolidated, struck off, and leveled, the concrete shall not be worked further until ready for floating. Floating shall begin when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation. During or after the first floating, planeness of surface shall be checked by the CONTRACTOR with a 10-ft. straightedge applied at not less than two different angles. All high spots shall be cut down and all low spots filled during this procedure to produce a surface within Class B tolerance throughout. The slab shall then be refloated immediately to a uniform sandy texture. Additional finishing shall be required. See G.2 or G.3.

2. Outside sidewalk, ramp slabs, loading dock and walkway top slabs shall receive a broom or belt finish. Immediately after concrete has received the "float finish" as specified in 3.05.G.1 above, it shall be given a coarse transverse scored texture by drawing a broom or burlap belt across the surface.

3. A "troweled finish" shall be used for all concrete flatwork which does not receive a broom finish or which does not receive a grout finish. The surface shall first be float-finished as specified in item 3.05.G.1 above. It shall next be power troweled, and finally hand troweled. The first trowelling after power floating shall produce a smooth surface which is relatively free of defects but which may still show some trowel marks. Additional trowellings shall be done by hand after the surface has hardened sufficiently. The final trowelling shall be done when a ringing sound is produced as the trowel is moved over

the surface. The surface shall be thoroughly consolidated by the hand trowelling operations. The finished surface shall be essentially free of trowel marks, uniform in texture and appearance and shall be plane to a Class A tolerance, except tolerance for concrete on metal deck shall be Class B. On surfaces intended to support floor coverings, any defects of sufficient magnitude to show through the floor covering shall be removed by grinding.

H. Finishing Tolerances

1. Finishes with Class A tolerances shall be true planes within 1/8 inch in 10 ft as determined by a 10-foot straightedge placed anywhere on the slab in any direction.

2. Finishes with Class B tolerances shall be true planes within 1/4-inch on 10 ft as determined by a 10-foot straightedge placed anywhere on the slab in any direction.

3. Finishes with Class C tolerances shall be true planes within 1/4 inch in 2 ft as determined by a 2-ft straightedge placed anywhere on the slab in any direction.

3.6 CURING AND PROTECTION

A. General

1. Beginning immediately after placement, concrete shall be protected from premature drying, excessively hot or cold temperatures, and mechanical injury, and shall be maintained with minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete. The materials and methods of curing shall be in accordance with ACI 308 and subject to review by the ENGINEER.

B. Preservation of Moisture

1. For concrete surfaces not in contact with forms, ponding or continuous sprinkling shall be applied immediately after completion of placement and finishing and be continued for a minimum of three (3) days. After the initial 3-day period, one of the following procedures shall be applied:

    a. Ponding or continuous sprinkling;

    b. Application of absorptive mats or fabric kept continuously wet;

    c. Continuous application of mist spray;

    e. Application of other moisture-retaining covering as approved.

    f. The use of curing compounds shall not be permitted.

2. Moisture loss from surfaces placed against wooden forms or metal forms exposed to heating by the sun shall be minimized by keeping the forms wet until they can be safely removed. After form removal, the concrete shall be cured until the end of the time prescribed in 3.06.B.3 below by one of the methods of 3.06.B.1 above.

3. Curing in accordance with 3.06.B.1 and 2 above shall be continued for at least 14 days in the case of all concrete.

C. Temperature, Wind, and Humidity

1. Adhere to the requirements of:

a. ACI 305 Hot Weather Concreting

b. ACI 306 Cold Weather Concreting

2. Cold Weather: When the mean daily outdoor temperature is less than 40˚F, the temperature of the concrete shall be maintained between 50˚F and 70˚F for 14 days. Arrangements for heating, covering, insulating, and housing the concrete work shall be made in advance of placement and shall be adequate to maintain the required temperature without injury due to concentration of heat. Combustion heaters shall not be used during the first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gases.

3. Hot Weather: When necessary, provision for windbreaks, shading, fog spraying, sprinkling, ponding, or wet covering with a light colored material shall be made in advance of placement, and such protective measures shall be taken as quickly as concrete hardening and finishing operations will allow.

4. Rate of Temperature Change: Changes in temperature of the air immediately adjacent to the concrete during and immediately following the curing period shall be kept as uniform as possible and shall not exceed 5°F in any one hour or 50°F in any 24-hour period.

D. Protection from Mechanical Injury

1. During the curing period, the concrete shall be protected from damaging mechanical disturbances, such as load stresses, heavy shock, and excessive vibration. All finished concrete surfaces shall be protected from damage by construction equipment, materials, or methods, by application of curing procedures, and by rain or running water. Structures shall not be loaded in such a way as to overstress the concrete.

3.7 TESTING

A. General

1. Concrete materials and operations will be tested and inspected as the work progresses. Failure to detect any defective work or material shall not in any way prevent later rejection when such defect is discovered nor shall it obligate the ENGINEER for final review.

B. Testing Agencies

1. All testing agencies shall meet the requirements of "Inspection and Testing Agencies for Concrete and Steel as Used in Construction," (ASTM E329).

C. Testing Services

The following testing services shall be performed by the designated agency:

1. Review and test the CONTRACTOR's proposed materials for compliance with the Specifications.

2. Review and test the CONTRACTOR's proposed mix design as required by the ENGINEER.

3. Secure production samples of materials at plants or stock-piles during the course of the work and test for compliance with the Specifications.

4. Conduct strength tests of the concrete during construction in accordance with the following procedures:

    a. Secure composite samples in accordance with "Method of Sampling Fresh Concrete" (ASTM C 172). Each sample shall be obtained from a different batch of concrete on a random basis, avoiding any selection of the test batch other than by a number selected at random before commencement of concrete placement.

    b. Mold and cure four specimens from each sample in accordance with "Method of Making and Curing Concrete Test Specimens in the Field" (ASTM C 31). Any deviations from the requirements of this standard shall be recorded in the test report.

    c. Test specimens in accordance with "Method of Test for Compressive Strength of Cylindrical Concrete Specimens" (ASTM C 39). Two specimens shall be tested at 28 days for acceptance and one shall be tested at 7 days for information. The fourth cylinder shall be held as a spare specimen to be tested as directed by the ENGINEER. The acceptance "strength test" result shall be the average of the strengths of the two specimens tested at 28 days. If one specimen in a test manifests evidence of improper sampling, molding or testing, it shall be discarded and the strength of the remaining cylinder shall be considered the "strength test" result. Should both specimens in a test show any of the above defects, the entire test shall be discarded. When high early strength concrete is used, the specimens shall be tested with two specimens at 14 days and one specimen at 3 days. The acceptance will be based on the 14-day test.

    d. Make at least one "strength test" (mold four cylinders) for each 50 cubic yards, or fraction thereof, of each mix design of concrete placed in any 1 day.

5. Determine slump of the concrete sample for each strength test and whenever consistency of concrete appears to vary, using "Method of Test for Slump of Portland Cement Concrete: (ASTM C 143).

6. Determine air content of normal weight concrete sample for each strength test in accordance with the "Method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method" (ASTM C 231), "Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method" (ASTM C 173) or "Method of Test for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete" (ASTM C 138).

7. Determine temperature of concrete sample for each strength test.

D. Additional Services When Required

The following services shall be performed by the designated agency when required by the ENGINEER:

1. Inspect concrete batching, mixing and delivery operations to the extent deemed necessary by the ENGINEER.

2. Sample concrete at point of placement and perform required tests.

3. Other testing or inspection services as required by the ENGINEER.

E. Other Services as Needed

The following services shall be performed by the designated agency when necessary and costs of said services shall be borne by the CONTRACTOR:

1. Additional testing and inspection required because of changes in materials or proportions requested by the CONTRACTOR.

2. Additional testing of materials or concrete occasioned by their failure by test or inspection to meet specification requirements. (See Article 3.08)

3. Testing to determine strength for early form removal. (See paragraph 2.08.E and F.)

F. Duties and Authorities of Designated Testing Agency

1. Representatives of the agency shall inspect, sample and test the materials and the production of concrete as specified herein. When it appears that any material furnished or work performed by the CONTRACTOR fails to fulfill specification requirements, the testing agency shall report such deficiency to the ENGINEER and the CONTRACTOR promptly.

2. The agency shall report all test and inspection results to the ENGINEER and CONTRACTOR immediately after they are performed. All test reports shall include the exact location in the work at which the batch represented by a test was deposited. Reports of strength tests shall include detailed information on storage and curing of specimens prior to testing.

3. The testing agency or its representatives are not authorized to modify any requirement of the Contract Documents, nor to approve, accept, disapprove or reject any portion of the work.

G. Responsibilities and Duties of CONTRACTOR

1. The use of testing services shall in no way relieve the CONTRACTOR of the responsibility to furnish materials and construction in full compliance with the Contract Documents.

2. The CONTRACTOR shall submit to the ENGINEER the concrete materials and the concrete mix designs proposed for use with a written request for review. This submittal shall include the results of all testing performed to qualify the materials and to establish the mix designs. No concrete shall be placed in the work until the CONTRACTOR has received such approval in writing.

3. To facilitate testing and inspection, the CONTRACTOR shall provide and maintain for the use of the testing agency and ENGINEER adequate facilities for safe storage and proper curing of concrete test specimens on the project site for the first 24 hours as required by "Method of Making and Curing Concrete Test Specimens in the Field" (ASTM C 31). The CONTRACTOR shall provide labor, tools, and equipment to assist in the sampling and testing of concrete on the job. The CONTRACTOR shall advise the designated testing agency sufficiently in advance of operations to allow for completion of quality tests and assignment of personnel.

3.8 EVALUATION AND ACCEPTANCE OF CONCRETE

A. Evaluation of Test Results

1. Test results for standard molded and standard cured test cylinders shall be evaluated separately for each specified concrete mix design. Such evaluation shall be valid only if tests have been conducted in accordance with procedures specified in Article 3.7

B. Acceptance of Concrete

1. The following conditions must be met:

a. The strength level of the concrete will be considered satisfactory and acceptable so long as the average of all sets of three consecutive "strength test" results equals or exceeds the specified 28 day strength f'c and no individual "strength test" result falls below the specified 28 day strength f'c by more than 500 psi. The strength level of the concrete shall be measured at 14 days for high-early strength concrete. High-early strength concrete shall achieve the specified 28-day f'c at the age of 14 days.

b. The requirements described by paragraphs 3.09 Acceptance of Structure, A, B, C and D.

C. Testing of Concrete in Place

1. This Work shall be at the CONTRACTOR's expense.

2. Testing by impact hammer, sonoscope, or other non-destructive device may be permitted or required by the ENGINEER to determine relative strengths at various locations in the structure as an aid in evaluating concrete strength in place and for selecting areas to be cored, if the strength level of the concrete is not satisfactory. Such tests shall not be used as a basis for acceptance or rejection.

3. Core Tests: Required when paragraph 3.08.B specifications are not met.

a. Cores at least 2 inches in diameter shall be obtained and tested in accordance with "Methods of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete" (ASTM C 42). Cores shall be taken as soon as practicable after determining that the concrete strength level is unsatisfactory in accordance with paragraph 3.08.B. If the concrete in the structure will be dry under service conditions, other cores shall be air dried (temperature 60° to 80°F, relative humidity less than 60 percent) for 7 days before test and shall be tested dry. If the concrete in the structure will be more than superficially wet under service conditions, the cores shall be tested after moisture conditioning in accordance with ASTM C 42.

b. At least three representative cores shall be taken from each member or area of concrete in place that is considered potentially deficient. The location and number of cores shall be determined by the ENGINEER so as least to impair the strength of the structure and best represent the condition of the potentially deficient concrete. If, before testing, one or more of the cores shows evidence of having been damaged subsequent to or during removal from the structure, they shall be replaced.

c. Concrete in the area represented by the core test will be considered adequate and acceptable if the average strength of the cores is equal to at least 85 percent of, and if no single core is less than 75 percent of, the specified 28 day

strength f'c. If the above strengths are not met, the CONTRACTOR shall remove the deficient concrete.

d. Core holes shall be filled by the CONTRACTOR with low slump concrete or mortar. See Article 3.3, Repair of Surface Defects.

3.9 ACCEPTANCE OF STRUCTURE

A. General

1. Completed concrete work which meets all applicable specification requirements will be accepted without qualification.

2. Completed concrete work which fails to meet one or more of the specified requirements but which has been repaired to bring it into compliance will be accepted without qualifications.

3. If any concrete does not meet the specified strength levels in paragraph 03.08.B, Acceptance of Concrete, the ENGINEER will require additional material and other tests to determine the probable cause of the low strength levels. This may result in remedial actions or modifications being required in the methods or materials being employed. Such actions or modifications shall be at the CONTRACTOR's expense.

4. Completed concrete work which fails to meet the requirements of paragraph 03.08.C.2.c. will be rejected and the CONTRACTOR will be required to remove and replace the defective concrete. In this event, modifications will be required to assure that remaining work complies with the requirements.

B. Dimensional Tolerances

1. Formed surfaces resulting in concrete outlines smaller than permitted by the tolerances of Table 2.08C shall be considered potentially deficient in strength and subject to the provisions of paragraph 3.9.D.

2. Formed surfaces resulting in concrete outlines larger than permitted by the tolerances of paragraph 2.08.C may be rejected and the excess material shall be subject to removal. If removal of the excess material is required, it shall be accomplished in such a manner as to maintain the strength of the section and to meet all other applicable requirements of function and appearance.

3. Concrete members cast in the wrong location will be rejected.

4. Inaccurately formed concrete surfaces exceeding the limits of paragraph 02.08.C may be rejected and shall be repaired or removed and replaced as required by the ENGINEER.

5. Finished slabs exceeding the tolerances of paragraphs 03.05.H may be required to be repaired provided that strength or appearance is not adversely affected. High spots may be removed with a terrazzo grinder, low spots filled with a patching compound, or other remedial measures performed as reviewed by the ENGINEER.

C. Appearance

1. All concrete with defects which adversely affect the appearance or function of the specified finish may be repaired only by approved methods.

D. Strength of Structure

1. The strength of the structure in place will be considered deficient if it fails to comply with any requirements, which control the strength of the structure, including but not necessarily limited to the following conditions:

    a. Low concrete strength as designated in Article 03.08.

    b. Reinforcing steel size, quantity, strength, position, or arrangement at variance with the requirements of Article 02.09, Reinforcement, or the Contract Documents.

    c. Concrete which differs from the required dimensions or location in such a manner as to reduce the strength.

    d. Curing less than that specified.

    e. Inadequate protection of concrete from extremes of temperature during early stages of hardening and strength development.

    f. Mechanical injury as defined in paragraph 03.06.D, construction fires, accidents or premature removal of formwork likely to result in deficient strength.

2. Additional testing will be required when the strength of the structure is considered potentially deficient. Cost of this testing will be borne by the CONTRACTOR.

3. Core tests in accordance with paragraph 03.08.C.2 will be required when ENGINEER determines that the strength of the concrete in place is considered potentially deficient. Cost of coring and testing will be borne by the CONTRACTOR.

4. Concrete work judged inadequate by failure to meet the requirements of paragraphs 03.08B and 03.08.C.2 shall be removed and replaced at the CONTRACTOR's expense.

5. The CONTRACTOR shall pay all costs incurred in providing the additional testing and/or analysis required by these Specifications, or the Contract Documents.

6. The OWNER will pay all costs of additional testing and/or analyses which are made at its request and which are not required by these Specifications, or the Contract Documents.

3.10 CLEANING UP

A. At the completion of the concrete work to the satisfaction of and review by the ENGINEER, all extraneous concrete debris, materials and equipment shall be removed from the job site and the concrete shall be left clean and in first class condition.

MIX DESIGN SCHEDULE

Concrete Class	A
Locations	Interior Slabs & Housekeeping Pads
28-day Compressive Strength (psi)	4,000
Cement Content (per CYD of concrete)	594 (6 sack equivalent)
Coarse Aggregate	6AA (¾")
Water/Cement Ratio by Weight (maximum)	0.43
Air Content (% by volume)	2% ±
Slump at point of placement (inches)	4" – 6" (will vary based on location)
Fiber Reinforcement	Yes
Fly Ash (% of cement content; maximum)	15 – 20%
Silica Fume	No

Note: Provide hardener for interior slabs.

Concrete Class	B
Locations	Foundation
28-day Compressive Strength (psi)	4,000
Cement Content (per CYD of concrete)	594 (6 sack)
Coarse Aggregate	6AA (¾")
Water/Cement Ratio by Weight (maximum)	0.43
Air Content (% by volume)	6.0 +/- 1.0
Slump at point of placement (inches)	4" – 6" (will vary based on location)
Fiber Reinforcement	No
Fly Ash (% of cement content; maximum)	15 – 20%
Silica Fume	No

Concrete Class	C
Locations	Underground Duct Bank
28-day Compressive Strength (psi)	4,000
Cement Content (per CYD of concrete)	594 (6 sack equivalent)
Coarse Aggregate	6AA (¾")
Water/Cement Ratio by Weight (maximum)	0.43
Air Content (% by volume)	6.0 +/- 1.0
Slump at point of placement (inches)	4" – 6" (will vary based on location)
Fiber Reinforcement	Yes
Fly Ash (% of cement content; maximum)	15 – 20%
Silica Fume	No

Concrete Class	D
Locations	Sidewalk, Pavements and Exterior Slabs
28-day Compressive Strength (psi)	4,000
Cement Content (per CYD of concrete)	594 (6 sack equivalent)

Coarse Aggregate	½ “
Water/Cement Ratio by Weight (maximum)	0.43
Air Content (% by volume)	6.0 +/- 1.0
Slump at point of placement (inches)	4” – 6” (will vary based on location)
Fiber Reinforcement	Yes
Fly Ash (% of cement content; maximum)	15 – 20%
Silica Fume	No

END OF SECTION

SECTION 05500

METAL FABRICATIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Shop fabricated steel items.

1.2 REFERENCE STANDARDS

A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

C. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2015.

D. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

1.3 SUBMITTALS

A. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

PART 2 PRODUCTS

2.1 MATERIALS – STEEL

A. Pipe: ASTM A53/A53M, Grade B Schedule 40, hot-dip galvanized finish.

B. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

C. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.2 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.3 FABRICATED ITEMS

A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; galvanized and field painted finish.

2.4 FINISHES - STEEL

A. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

END OF SECTION

SECTION 06100
ROUGH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Structural dimension lumber framing.

B. Sheathing.

C. Concealed wood blocking, nailers, and supports.

D. Miscellaneous wood nailers, furring, and grounds.

1.2 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.

C. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.

D. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology, Department of Commerce; 2010.

1.3 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.

1. Species: Spruce-Pine-Fir (South), unless otherwise indicated.

2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

B. Lumber fabricated from old growth timber is not permitted.

2.2 DIMENSION LUMBER

A. Sizes: Nominal sizes as indicated on drawings, S4S.

B. Moisture Content: S-dry or MC19.

C. Stud Framing (2 by 2 through 2 by 6):

1. Grade: No. 2.

D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:

1. Lumber: S4S, No. 2 or Standard Grade.

2. Boards: Standard or No. 3.

2.3 CONSTRUCTION PANELS

A. Wall Sheathing: Glass mat faced gypsum, ASTM C1177/C1177M, 5/8 inch.

1. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

2. Edges: Square.

2.4 ACCESSORIES

A. Fasteners and Anchors:

1. Metal and Finish: Hot-dipped galvanized steel per ASTM A 153/A 153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.

3. Anchors: Expansion shield and lag bolt type for anchorage to solid masonry or concrete.

B. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.

PART 3 EXECUTION

3.1 PREPARATION

A. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.

3.2 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

3.3 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes.

E. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.4 INSTALLATION OF CONSTRUCTION PANELS

A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using screws.

3.5 CLEANING

A. Waste Disposal: Comply with the requirements of Section 01 74 19 - Construction Waste Management and Disposal.

1. Comply with applicable regulations.

2. Do not burn scrap on project site.

3. Do not burn scraps that have been pressure treated.

4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 09911
EXTERIOR PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

1.2 SUBMITTALS

A. See Section 01330 – Submittal Requirements.

B. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").

2. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Manufacturer's Instructions: Indicate special surface preparation procedures.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.4 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Paints:

1. Base Manufacturer: Benjamin Moore & Co.: www.benjaminmoore.com.
2. AkzoNobel; Devoe and Dulux products: www.akzonobel.com.
3. O'Leary Paint: www.olearypaint.com.
4. PPG Paints: www.ppgpaints.com.
5. Pratt & Lambert Paints: www.prattandlambert.com.
6. Sherwin-Williams Company: www.sherwin-williams.com.

B. Primer Sealers: Same manufacturer as top coats.

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.

1. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
2. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Primers: As required or recommended by manufacturer of top coats; where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Bollard Color: OSHA Yellow.

2.3 PAINT SYSTEMS - EXTERIOR

A. Specific products listed below are generally Benjamin Moore unless noted otherwise. Refer also to acceptable manufacturers listed above.

B. Galvanized Metals, Latex, 3 Coat:

1. One coat galvanize primer #P04.

2. Semi-gloss: Two coats of latex enamel; Super Spec #P29.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Galvanized Surfaces:

1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

2. Prepare surface according to SSPC-SP 2.

3.3 APPLICATION

A. Apply products in accordance with manufacturer's written instructions.

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance.

D. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.

3.4 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.5 PROTECTION

A. Protect finishes until completion of project.

END OF SECTION

SECTION 09912
INTERIOR PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

1.2 SUBMITTALS

A. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").

B. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.

1. Where sheen is specified, submit samples in only that sheen.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.4 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Paints:

1. Base Manufacturer: Benjamin Moore & Co: www.benjaminmoore.com.
2. AkzoNobel; Devoe and Dulux products: www.akzonobel.com.
3. O'Leary Paint: www.olearypaint.com.
4. PPG Paints: www.ppgpaints.com.
5. Pratt & Lambert Paints: www.prattandlambert.com.
6. Sherwin-Williams Company: www.sherwin-williams.com.

B. Primer Sealers: Same manufacturer as top coats.

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.

1. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
2. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Primers: As required or recommended by manufacturer of top coats; where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Colors: As indicated on drawings.

2.3 PAINT SYSTEMS - INTERIOR

A. Specific products listed below are generally Benjamin Moore unless noted otherwise. Refer also to acceptable manufacturers listed above.

B. Gypsum Board/Plaster, Latex, 3 Coat:

1. One coat of vapor barrier primer sealer; Ultra Spec N534.
2. Semi-gloss: Two coats of latex enamel; Ultra Spec N539.

2.4 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

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

1. Gypsum Wallboard: 12 percent.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

3.3 APPLICATION

A. Apply products in accordance with manufacturer's written instructions.

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

D. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.5 PROTECTION

A. Protect finishes until completion of project.

END OF SECTION

SECTION 13341

PRE-ENGINEERED BUILDING SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manufacturer-engineered, shop-fabricated wood post and truss building frame.

B. Metal wall and roof panels including soffits and gutters and downspouts.

C. Exterior doors and overhead doors.

D. Bid Alternate No. 2: Translucent wall panels (eave lights).

1.2 SUBMITTALS

A. Product Data: Provide data on profiles, component dimensions, fasteners.

B. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections; wall and roof system dimensions, panel layout, general construction details, anchorages and method of anchorage, installation; framing anchor bolt settings, sizes, and locations from datum, door opening locations; provide professional seal and signature.

C. Samples: Submit two samples of precoated metal panels for each color selected, 3 x 5 inch in size illustrating color and texture of finish.

D. Project Record Documents: Record actual locations of concealed components and utilities.

1.3 QUALITY ASSURANCE

A. Design structural components, develop shop drawings, and perform shop and site work under direct supervision of a Professional Structural Engineer experienced in design of this Work.

1. Design Engineer Qualifications: Licensed in the State in which the Project is located.

2. Conform to applicable code for submission of design calculations as required for acquiring permits.

3. Cooperate with regulatory agency or authority and provide data as requested.

B. Manufacturer Qualifications: Company specializing in the manufacture of products similar to those required for this project.

1. Not less than 5 years of documented experience

C. Erector Qualifications: Company specializing in performing the work of this section with minimum three years' experience.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Post Frame Buildings:

1. Basis of Design: Midwest Manufacturing, provided by Menards, Ann Arbor, MI.
2. The Pole Barn Company; www.thepolebarncompany.com
3. Sutherlands; www.sutherlands.com
4. Substitutions: See Section 01600 - Product Requirements.

2.2 METAL BUILDING

A. Size: As indicated on drawings.

B. Primary Framing: Wood frame of trusses and columns, braced end frames, and wind bracing.

C. Secondary Framing: Girts and Eave struts, and other items detailed.

D. Wall System: Preformed metal panels of vertical profile, with sub-girt framing/anchorage assembly, and accessory components.

E. Roof System: Preformed metal panels oriented parallel to slope, with sub-girt framing/anchorage assembly, insulation, and liner panels, and accessory components.

F. Roof Slope: 4.5 inches in 12 inches.

2.3 MATERIALS - WALLS AND ROOF

A. Steel Sheet: Manufacturer's standard, Pro-rib profile; colors to be selected by the OWNER. CONTRACTOR shall provide the OWNER with the Manufacturer's color selection charts for the walls, and roof.

B. Fasteners: Manufacturer's standard type, galvanized to comply with requirements of ASTM A153/A153M, with neoprene washers, finish to match adjacent surfaces when exterior exposed.

C. Trim, Closure Pieces, Caps, Flashings, Gutters, Downspouts, Fascia's: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

2.4 ACCESSORY COMPONENTS

A. Doors and Frames: Manufacturer's standard commercial grade; size indicated on drawings.
   1. Provide one (1) extra door to the OWNER.

B. Overhead Doors and Frames: Manufacturer's standard; size indicated on drawings.

C. Bid Alternate No. 2: Translucent wall panels (eave lights); manufacturer's standard size as indicated on drawings.

2.5 DESIGN CRITERIA

A. Design members to withstand dead load, applicable snow load, and design loads due to pressure and suction of wind calculated in accordance with applicable code.

B. Size and fabricate wall and roof systems free of distortion or defects detrimental to appearance or performance.

PART 3 EXECUTION

3.1 EXAMINATION

A. Contractor shall verify that foundation, utilities, and placed anchors are in correct position.

3.2 ERECTION - FRAMING

A. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing.

B. Do not field cut or alter structural members without approval.

3.3 ERECTION - WALL AND ROOF PANELS

A. Install in accordance with manufacturer's instructions.

B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.

C. Fasten cladding system to structural supports, aligned level and plumb.

D. Locate end laps over supports. End laps minimum 2 inches. Place side laps over bearing.

E. Use exposed fasteners.

F. Install sealant and gaskets, providing weather tight installation.

3.4 INSTALLATION - ACCESSORY COMPONENTS IN WALL SYSTEM

A. Install door frames, doors, and overhead doors in accordance with manufacturer's instructions.

B. Bid Alternate No. 2 – Install translucent wall panels (eave lights) in accordance with manufacturer’s instructions.

END OF SECTION

SECTION 15100

PROCESS PIPING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Under this Section the CONTRACTOR shall provide at his own expense all labor, materials, tools and equipment required to furnish and install all pipes, fittings, and accessories for the piping systems as shown on the Plan Set and specified herein.

B. Appended to this Section are individual pipe data sheets which specify pertinent pipe data for the various services.

1.2 RELATED SECTIONS

A. Section 15110 – Process Valves and Accessories

1.3 REFERENCES

A. Piping installations shall conform to:

1. All applicable Federal, State and local codes.

2. Applicable industry codes:

    a. ANSI - American National Standards Institute Code for Pressure Piping.

    b. ASME - Boiler and Pressure Vessel Code, Section 1, Power Boiler

3. OWNER's Drawings and/or Piping Specifications.

1.4 SUBMITTALS

A. Submittals shall be in accordance with Division 1 (Section 01330) of these specifications and shall include catalog cutsheets, manufacturers data and certification on all items in this section including but not limited to the following:

1. Ductile iron pipe and fittings.

2. Flanged, mechanical, coupled joints, restraining joints and sleeves.

3. PVC pipe, fittings, joints, solvents and adhesives.

4. Detailed scaled pipe layout showing dimensions of each component, their relationship with each other and other equipment and valves, pipe supports, anchors and other accessories.

1.5 ACCEPTANCE AT SITE

A. Prior to fabrication and/or installation, all piping, fittings, valves and equipment shall be inspected as required. Any materials not meeting the specifications, or obviously faulty material, shall be rejected by the ENGINEER and removed from the job site by the CONTRACTOR.

1.6 MATERIAL PREPARATION

A. All pipe, fittings and accessories shall be free of all foreign matter. Any accumulations of dirt, rust, scale, mud, etc., shall be removed prior to installation. All pipe ends shall be reamed and deburred to prevent loose particles from getting into the pipe line.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials that will potentially be in contact with the finished potable drinking water supply must be certified by Underwriters Laboratory (UL) or the National Sanitation Foundation (NSF) for use in a potable water system. These materials include pipe coatings, pipe metals, cement linings, and joint lubricants and gaskets.

2.2 DUCTILE IRON PIPE AND FITTINGS

NOT USED

2.3 POLYVINYL CHLORIDE PIPE AND FITTINGS

A. PVC Pipe

1. Schedule 80 PVC (ASTM D1785) pipe, Type 1.

2. Samples of pipe and physical and chemical data sheets shall be submitted to the ENGINEER for review and his/her approval shall be obtained before the pipe is purchased.

3. The pipe shall be homogeneous throughout and free from cracks, holes, foreign inclusions and/or other defects. The pipe shall be as uniform as commercially practical in color.

4. Pipe shall be jointed with solvent bell ends.

5. The workmanship, pipe dimensions and tolerances, outside diameters, wall thickness eccentricity, sustained pressures, burst pressures, flattening, extrusion quality, marking and all other requirements of Commercial Standards CS 256 shall be conformed within all respects.

6. The PVC pipe shall bear the National Sanitation Foundation (NSF-pw) seal of approval.

7. The pipe shall be shipped with one coupling factory applied. Pipe shall have a ring painted around the uncoupled end in such a manner as to allow field checking of setting depth of pipe in the socket. If belled-end pipe is specified, the same ring shall be painted around the male end of the pipe.

8. Pipe must be delivered to job site by means which will adequately support it, and not subject to it undue stresses. In particular, the load shall be so supported that the bottom rows of pipe are not damaged by crushing. Pipe shall be unloaded carefully and strung or stored as close to the final point of placement as is practical.

9. PVC pipe must be stored so as to be protected from prolonged heat or direct sunlight. Any protective covering may be used which will not absorb much heat and which will deflect the direct rays of the sun. Ventilation should be provided with any type of cover used.

B. PVC Fittings

1. Fittings shall be of the same material as the pipe, and in no case shall have thinner walls than that of the pipe furnished. All fittings must be made of NSF approved material.

2. Sample of each type fitting must be submitted for the ENGINEER's review and his review must be obtained before all fittings are used.

3. The dry fit of fittings and coupling sockets must be snug. If the fit is such that it is loose, the pipe and/or fittings will be rejected as faulty because of improper size. Building up the joint to overcome a loose fit with multiple layers of filler solvent will not be permitted.

4. PVC couplings - the 2" and 3/4:" PVC couplings may be of the molded type. The 1" through 8" shall be of the extruded type, designed to be interference fit for at least one-half of the socket depth. They shall have a beveled entrance to prevent the wiping off of the solvents on male end while being installed. The wall thickness of the PVC couplings shall be equal to the pipe SDR or shall be 0.10 of an inch thick, whichever is greater. Elbows shall be long radius bends with minimum walls equal to that of the pipe joining or shall be 0.10 of an inch thick, whichever is greater. Tapered welding sockets shall be equal to those required for couplings.

C. PVC Welding Solvents

1. The solvent cement should meet all the requirements of ASTM Tentative Specification for Solvent Cement for Polyvinyl Chloride (PVDC) Plastic Pipe and Fittings ASTM Designation: D2564.

2. PVC welding solvent shall be compounded to conform with the socket fit and the weather conditions at the time of installation and be such as to assure minimum installation cost and a weld of maximum strength.

3. Since PVC welding solvent is engineered and formulated to perform with a given joint design, all solvent must be purchased from the manufacturer of the pipe.

4. PVC solvent cements should be stored in a cool place except when actually in use at the job site. These cements have a limited shelf life when not stored in hermetically sealed containers.

PART 3 - EXECUTION

3.1 PIPE RECEIVING, HANDLING AND STORING

A. Cleanliness in all piping systems is of paramount importance and procedures used in receiving, handling and storing shall be directed toward assuring that all lines are clean and free of rust, scale, dirt, and all foreign material that can damage equipment or contaminate potable systems or processes. Similar precautions must be taken in handling and storing of fittings, valves, pumps and other equipment to insure a clean pipeline assembly.

B. Any pipe damage in transport or handling shall be rejected and removed from the job site by the CONTRACTOR.

C. Care shall be taken not to injure any pipe or pipe coating and no damaged or imperfect pipe shall be used in the work except that minor damage which may be repaired subject to the review of the ENGINEER.

3.2 INSTALLATION

A. General

1. Only personnel competent at installing the various types of pipe shall be employed on this phase of the work and complete suitable equipment necessary for the execution of same is required. Any incompetency observed by the ENGINEER must be removed at his request, and where improper equipment or lack of same appears to be impairing the quality or speed of the work, such adjustments in same shall be made to the ENGINEER's satisfaction.

2. Piping shall be installed straight and true, with approved offsets around obstructions as shown on the Plan Set or as required for satisfactory installation and operation. Horizontal piping shall be sloped to permit drainage. All vertical pipe shall be installed plumb and parallel with the building lines.

3. Piping shall be run in an orderly manner consistent with good operation, neatness of appearance and safety of operating personnel. Wherever possible interior piping will be grouped in banks with a change in elevation when a change in direction occurs. Provisions shall be made in establishing piping runs to allow for maximum accessibility for servicing. Space allowance shall be made for possible future changes or additions. Pockets which will prevent complete drainage of a line shall be avoided. Valves, gauges, controls, and other piping specialties shall be conveniently located for operating and servicing. Piping shall not be run through electrical control rooms or over electrical equipment.

4. Piping shall not be run in such a manner as to interfere with the operation, adjustment or maintenance of equipment. Piping shall not be located directly over pumps, motors, or equipment so as to impede their removal.

5. A minimum clearance of 8'-0" headroom shall be maintained over working areas, passageways and platforms.

6. Compressed air branch lines and air-hose connections shall be made off the top of the main header, unless the branch line is also intended to serve as a drain for the header.

7. Branch lines off main headers such as process, water and air shall have shut-off valves to permit maintenance on equipment or piping without disrupting service to other areas. Valves in sludge line branches shall be located close to the main line to present plugging ahead of the valve.

8. Where pipe sections are pre-fabricated, it shall be the CONTRACTOR's responsibility to check all dimensions and possible interferences in the field. Provisions shall be made to adjust for any discrepancies which may occur between routing and dimensions shown on the Plans to avoid possible interferences and to compensate for final field placement of equipment.

9. All cutting of the pipe shall be done in a neat workmanlike manner with the least amount of waste and without damage to existing or new lines. A fine tooth saw, tubing or pipe cutter or similar tool shall be used to cut the pipe. Cuts must be square and ragged edges removed with a burring tool and/or file.

10. After cutting bell and spigot or socket pipe, a stop mark shall be made with a pencil or crayon using dimensions as shown by the manufacturer's instructions or by using another pipe in the field as a guideline.

11. At the termination of pipe installation any open ends of pipeline shall be closed off by a suitable cover until installation operations are resumed.

12. All piping connections to equipment shall be aligned and supported in such manner that no load or thrust will be exerted upon the equipment by the piping at installation or in operating conditions.

B. Sleeves

1. Penetrations for all pipes passing through concrete or masonry structures shall be sleeved or formed as specified herein.

2. Sleeves for pipe sizes up to 24" diameter shall be molded non-metallic high density polyethylene Model CS Century-Line® sleeves as manufactured by PSI-Thunderline/Link-Seal®. Model CS sleeves shall have integrally formed hollow water stop sized having a minimum of four inches larger than the outside diameter of the sleeve itself and allowing 1/2" movement between wall forms to resist pour forces. Each sleeve assembly shall have end caps manufactured of the same material as the sleeve itself and installed at each end of the sleeve so as to prevent deformation during the initial concrete pour, and to facilitate attaching the sleeve to the wall forms. End caps shall remain in place to protect the opening from residual debris and rodent entry prior to pipe insertion.

3. For pipes 24 inches and larger, penetrations shall be formed using Cell-Cast® Hole Forming Disks as manufactured by PSI-Thunderline/Link Seal, per the manufacturer's installation instructions.

4. Link Seals with stainless steel hardware shall be provided on all penetrations.

5. The CONTRACTOR shall furnish the shop drawings of sleeves to the ENGINEER for his review.

C. Drains and Overflows

1. Provision shall be made for valved drain connections from low points of all piping systems to permit complete drainage after shutdown. Drains shall be provided where a pocket of liquid can form above a control or shut-off valve or other obstruction.

2. Overflow piping and drains from all tanks and vessels shall be provided to suitable drain or sewer and shall be visible to prevent unnecessary losses or contamination.

D. Miscellaneous Connections

1. Small size connections (for gauges, instruments, samples, etc.) to large size pipe or headers may be made with weld-o-lets, threaded-o-lets, couplings or half couplings

welded onto steel piping, tapped bosses on cast and ductile iron fittings, or tapping saddles.

E. Pipe Supports, Hangers, Guides, Anchors, Sway Bracing for Process Piping

1. Hangers for process piping will normally be clevis hangers with mild steel rod, and malleable or wrought steel beam clamps, with entire assemblies to be hot dip galvanized. Piping may be supported by the resting type of proper structural designed brackets or racks, as indicated in the Drawings. No welding to structural steel building members shall be permitted without review of the ENGINEER. Welding to auxiliary steel pipe support beams will be permitted. Suitable anchors, guides, sway braces, vibration dampeners, and flexible joints shall be provided to prevent excessive vibration or expansion forces on equipment. Heavy valves shall be supported to keep undue strain off of piping and adjacent equipment. Where supporting piping at valves, pumps, heat exchangers and equipment requiring periodic maintenance, support to allow easy removal of equipment with a minimum of temporary supports. Where pipe resting on beam supports to stanchions, is subject to linear or lateral movement, teflon slides or graphite pipe slides cemented to pipe and support members shall be used to eliminate abrasion and corrosion which commonly occurs at these points.

2. Hangers and supports shall be in accordance with the ANSI Code for Pressure Piping B31.1. These shall be the product of Plasti Fab, Inc., Grinnell Company, Power Piping Company, or equal.

3. Hanger rods shall be connected to beam clamps or concrete inserts. These devices shall be Underwriters' Laboratories approved. "C" clamps will not be allowed.

4. Concrete anchors shall be stainless steel epoxy set anchors, Hilti HY-150 or equal. Expansion anchors may not be used. Drilling of holes in concrete shall be made by rotary drill only - not by hammers of any kind.

5. Unless otherwise noted on the drawings, vertical piping shall be supported at each floor or grating level with approved riser clamps except where prohibited by piping flexibility requirements. Lateral movement of exposed vertical piping at building walls shall be restrained by anchor devices attached to walls except where prohibited by piping flexibility requirements. Riser clamps shall be Grinnell Figure 261, Power Piping Company, Figure 36, or equal. Provide retaining straps when clamps are used.

F. Piping Joints

1. Flanged joints or unions shall be provided at connections to equipment, valves, instruments, etc., as required for removal and/or servicing. Provisions must be made for removal and reinstallation of units located between flanged or union joints by providing flexibility in the piping, use of elbow connections, or other means approved by the ENGINEER.

2. Aside from connections at equipment, valves instruments, etc., joints in the pipe line shall be held to a minimum consistent with cleaning or servicing requirements. Flanged joints are preferred to union joints. Welded joints are preferred to screwed joint. Mechanical joints are preferred to caulked joints.

3. For welded pipe joints, pipe ends shall be square cut for pipe with wall thickness of 0.065 inch or less. For wall thickness over 0.065 inch the ends shall be beveled 37-1/2 degrees with a 1/16 inch thick land base. Use of welding rings shall be avoided.

4. Screwed joint compound shall be TFE tape or other ENGINEER reviewed material suitable for the particular service. Joint compound shall be applied only to the male thread. Care shall be exercised to prevent component from reaching the pipe interior.

G. Cleaning and Flushing

1. Unless special cleaning procedures are noted in the respective piping specifications, these general methods shall apply for cleaning lines before start-up. Installations of all piping shall be done with extreme care to insure clean pipe lines free of scale, rust, weld splatter or beads, sand, dirt, grease and all other impurities or foreign matter. All piping shall be installed to permit cleaning by flushing through all portions of the piping system with provisions made to open the lines at all low points to permit release of any accumulation of foreign material and to drain off the flushing fluid. Where this flushing operation may be detrimental to specialties and/or equipment, provisions must be made for isolation or removing these components from the system. When feasible, this flushing operation shall be done with the same medium that will normally be conveyed in the line, i.e., air for air or gas lines, water for water lines and liquids, oil for oil pipings, etc. At branch connections to operating equipment provision must be made to blow down through an open pipe line.

H. Testing

1. Field pressure testing the installed pipe line shall normally be done at a pressure as specified on the individual pipe data sheets at the end of this Section. Testing shall be by hydrostatic means. The pipe ends may be valved or blanked off and the test pressure shall be maintained a sufficient length of time to permit an inspection of all joints and connections for any leaks or failures. All pressure piping such as steam, water, oils and gasses shall be tested in accordance with latest ANSI B31.1 code for pressure piping. Provision shall be made for completely draining a pipe line after hydrostatic testing is completed. Testing of non-ferrous piping, plastics, fiberglass reinforced resin and other materials shall be made within the recommended limits of the manufacturer.

3.3 DISINFECTING

A. Chlorination

1. All new mains and pipe or any existing mains contaminated by the CONTRACTOR shall be chlorinated to a minimum residual chlorine concentration of fifty (50) parts per million with commercial liquid chlorine solution or approved equal. The chlorinated water shall be allowed to stand in the mains for 24 hours. The end of the 24-hour period the chlorinated water at all parts of the mains shall show a free available chlorine residual of not less than twenty-five (25) parts per million. If less than twenty-five (25) parts per million residual is shown at the end of the first 24 hours period, additional chlorine shall be added until a residual of not less than twenty-five (25) parts per million at all parts of the system is shown after a subsequent 24 hour period. The chlorinated water shall then be removed from the mains and the mains flushed with potable water for bacteriological testing by collecting two (2) consecutive samples in accordance with Section 3.3 A.1. below. No flushing shall take place between the two required bacteriological testing.

2. CONTRACTOR shall submit a flushing plan to the ENGINEER for review, which shall include the quantity of flushing water and location where the water will be discharged. If there is any possibility that the chlorinated discharge will cause damage to the environment, then a neutralizing chemical shall be applied to the water to neutralize the residual chlorine prior to discharge. Refer to Appendix C of AWWA C651 for information on neutralizing chemicals. Where necessary, Federal, State, County and local regulatory agencies should be contacted to determine special provisions for the disposal of heavily chlorinated water.

B. Bacteriological Testing

1. The CONTRACTOR shall coordinate and schedule with the ENGINEER to take bacteriological samples of the water in the mains for analysis at two different times. The CONTRACTOR is responsible for taking samples and transporting them to the OWNER's laboratory under the accompaniment and supervision of the ENGINEER. The OWNER shall provide sample testing services for two rounds of sampling per pipe section tested, any additional sample testing shall be at the CONTRACTOR's expense. The first samples will be taken 24 hours after the mains have been satisfactorily chlorinated, flushed and filled with potable water. The second sample will be taken 24 hrs later. No flushing shall be done during or between tests, unless supervised and approved by ENGINEER.

2. The CONTRACTOR shall provide a sufficient number of corporation cocks and copper tubing for taking samples. Samples shall not be collected from hoses or hydrants.

3. If analysis of any sample indicates that the water is unsafe for human consumption, the disinfection sampling and analysis procedures shall be repeated until samples obtained on two (2) consecutive days are found to be safe.

END OF SECTION

MATERIAL TO BE HANDLED:	Potable Water
SERVICE:	Utility sink and cleaning hose bib water supply piping.
TEMPERATURE RANGE:	32^{o}F - 100^{o}F
PRESSURE:	Operating 50 psig; Test 100 psig
PIPE:	PVC Schedule 80
LINE JOINT:	Solvent cement socket
FITTINGS:	Solvent cement socket
GASKETS:	-
BOLTING:	-
COLOR CODE:	-
LINE LABEL:	Underground warning tape for marking potable water lines
INSULATION:	-
LINING:	-
NOTE:	-

MATERIAL TO BE HANDLED:	Sanitary
SERVICE:	Sump pump discharge piping for utility sink drain sump
TEMPERATURE RANGE:	32^{o}F - 100^{o}F
PRESSURE:	Operating 25 psig; Test 100 psig
PIPE:	PVC Schedule 80
LINE JOINT:	Solvent cement socket
FITTINGS:	Solvent cement socket
GASKETS:	-
BOLTING:	**-**
COLOR CODE:	-
LINE LABEL:	Underground warning tape for marking sanitary lines
INSULATION:	-
LINING:	-
NOTE:	-

SECTION 15110

PROCESS VALVES AND ACCESSORIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Valve work shall include the furnishing, by the CONTRACTOR, of all labor, materials and services necessary for installing all the valves, valve operators, and necessary equipment shown on the Drawings and specified herein for a complete and functioning installation in accordance with the Contract Documents for process systems. This work does not include plumbing systems or underground buried valves.

1.2 STANDARDS

A. All valves and operators installed under this Specification shall conform to the applicable requirements of AWWA, ASTM, and ANSI standards governing materials of construction, dimensional tolerances and workmanship of the valves. Every valve and operator shall carry the name or trademark of the manufacturer. Each valve shall have a permanent position indicator easily readable from operating position.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Specification Section 15100, Process Piping

1.4 SHOP DRAWINGS

A. Shop drawings shall be submitted to the ENGINEER for his review in accordance with the requirements of Division 1 (Section 01330) of these Specifications.

1.5 INSTRUCTION MANUALS AND INSTRUCTIONS

A. The CONTRACTOR shall obtain from the manufacturer of all major valves Operations and Maintenance Manuals andinstruction manuals covering maintenance, service and lubrication of the valves, in accordance with the requirements of Division 1 of these Specifications.

B. The CONTRACTOR shall provide a competent field service representative to inspect the valve installation, make necessary adjustments and calibration of the valves and controls and instruct the Owner's personnel in the proper operation and maintenance of the specified valves, actuators, and associated controls.

PART 2 - PRODUCTS

2.1 PVC BALL VALVES

A. Valves 2-1/2 inches and larger shall have a polyvinyl chloride (PVC) body with a minimum non-shock W.O.G. working pressure rating as specified in the valve schedule. Seats shall be TFE easily removable for replacement. Stem shall be PVC with "O" ring viton seal or Engineer approved equal. Valves shall have a union and connector for ease in access to the ball and seats. Valves shall have ANSI 125 lb standard drill flat faced flanges and "T" handle operators unless otherwise specified or shown on the Plan Set.

B. Valves 2 inches and under shall have a polyvinyl chloride (PVC) body and ball with a minimum non-shock W.O.G. working pressure rating as specified in the valve schedule.

Seats shall be PTFE easily removable for replacement. Stem shall be PVC with "O" ring viton seal or ENGINEER approved equal. Valves shall have double union and connectors to allow body removal without disturbing the piping system. Valve ends shall be socket and operators shall be "T" handle unless otherwise specified or shown on the Plans.

2.3 PVC CHECK VALVES

A. Valves 2-1/2 inches larger shall be Schedule 80 PVC, full port, true union valves, designed for easy removal and plastic ball in elastomer square cut seat. End connections shall be ANSI 125 lb standard flat face flanges. Valve seal material shall be EPDM.

B. Valves 2 inches and under shall be Schedule 80 PVC, full port, true union valves, designed for easy removal and plastic ball in elastomer square cut seat. End connections shall be socket. Valve seal material shall be EPDM.

C. Valve manufacturer shall be Hayward, NIBCO or OWNER approved equal.

PART 3 - EXECUTION

3.1 VALVE SCHEDULE

A. Refer to the Plan Set for listing the size, type, function and general accessories of major valves to be furnished and incorporated in the Contract.

B. Miscellaneous valves, such as backflow preventers for extending the water system, valves for the plumbing system, stop valves and the like shall be furnished and installed under appropriate sections of the Specifications and are not included herein.

C. The Valve Schedule does not limit the CONTRACTOR's responsibility to install all valves and accessories which are to be provided under this section of the Specifications and as shown on the Plan Set. No consideration or allowance will be granted for failure to examine the Plan Set for any alleged misunderstanding of valves and accessories to be furnished and installed.

END OF SECTION

SECTION 15441

EJECTOR PUMP SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Under this Section the CONTRACTOR shall provide all labor, materials, and equipment necessary to furnish and install:

1. A new buried simplex ejector pump system to serve the Leslie Golf Course Golf Cart Storage Building future floor drains and new utility sink including fiberglass sump, submersible pump, level control floats, sump cover, control panel and related items.

1.2 RELATED SECTIONS

A. Section 15100 – Process Piping

B. Section 15110 – Process Valves and Accessories

D. Division 16 – Electrical

1.3 SUBMITTALS

A. Submit Shop Drawings and product data in accordance with Section 01330, Submittal Procedures: Manufacturer's literature, specifications and engineering data shall include the following:

1. Complete product data and catalog cut sheets on all pumps, motors, sumps and control components.

2. Performance data and curves showing overall pump efficiencies.

3. Installation details.

B. Submit operation and maintenance manuals in accordance with Section 01781, Operations and Maintenance Data.

PART 2 - PRODUCTS

2.1 SUMP PUMPS

A. Each pump shall be a submersible, centrifugal pump with bottom suction and vertical discharge.

B. Pump construction:

1. Pump Casing: Cast iron with epoxy coating.

2. Motor Housing: Stainless steel.

3. Impeller: Bronze – vortex or non-clog design
4. Shaft: Stainless steel with double carbon/ceramic seals

5. Discharge: 2” NPT

6. Floor Mount Style

7. All nuts, bolts and exposed metal parts shall be stainless steel.

C. Motor Construction

1. The pumps shall be directly driven by a high torque, capacitor start motor. The motor shall be minimum 115 volt, 60 Hertz, single phase. The motor winding shall incorporate a thermal breaker to protect the motor.

D. The pumps shall be manufactured by Zoeller, or approved equivalent.

2.2 ACCESSORIES

A. A heavy duty polyethylene sump cover shall be furnished for installation over the existing sump. The sump cover shall have no openings through which the pumps may be installed and withdrawn or which through which the floats can be accessed. The cover will need to be removed to access the pump or float. The discharge pipe (1), power cables (2), float cable (1), and the utility sink drain pipe shall pass through sealed connections in the side of the sump crock. Cover shall be corrosion resistant and capable of spanning the opening without deflection.

B. A heavy duty polyethylene basin of the size indicated in the drawings shall be installed for the new sanitary sump. The basin construction design shall incorporate ribs and be of suitable stiffness for future floor slab construction. The basin shall also be compatible with the basin access cover.

C. A polyethylene basin cover designed to fit the basin shall be furnished for installation with the new fiberglass basin. The hinged hatch shall allow for removal of each of the pumps and access to the floats. This cover shall have sealed penetrations for the discharge pipes (2), power cables (2), float cables and the hatch shall be gasketed. Entire assembly shall be gas-tight when hatch is closed.

D. All sump pumps shall be provided with stainless steel lifting cables and cable brackets.

E. Discharge piping shall be Schedule 80 PVC.

2.3 LOCAL CONTROL SYSTEM

A. Controls for both sump pump installations shall be fed with 120/240V, 60Hz, single phase power. Controls shall consist of (but not be limited to) the following:

1. NEMA 4X Enclosure

2. Main Disconnect

3. Circuit Breakers

4. HOA Switches

5. High sump alarm light and audible alarm
6. Pump run indicator light.

7. 2 Year Warranty

8. Wall mounted identification and pipe labels.

B. Local control system shall be provided with two (1) non-mercury float switches. Provide one (1) minimum level “on/off” switch, .and one (1) alarm level switch. Switches shall be mounted as shown in the details with stainless steel support brackets. Provide float switches by Zoeller, or approved equal.

C. Local control system enclosures shall be mounted as shown in the plans.

2.4 PUMP SCHEDULE

A. Utility Sink Sump Pump

1. Installation: Simplex dewatering system (1 pump)

2. Flow: 30 GPM

3. Total Head: 15 Feet

4. Motor Size: ½ HP (min)

5. Motor RPM: 3,345 RPM

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with the Drawings, approved Shop Drawings and recommendations of the manufacturer.

B. Inspect, calibrate, adjust, lubricate and otherwise prepare equipment for operation.

C. Install all piping, valves and appurtenances as required to provide a complete and fully operational system.

D. Provide check valves and shut-off valves on all pump discharge piping and as shown on the Drawings.

E. Support piping independent of pump.

F. Provide unions where shown on the Drawings and as required to facilitate pump removal.

G. Coordinate sump pump installation with sump pit size and sump pit cover.

END OF SECTION

SECTION 16010

ELECTRICAL SYSTEM GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Work Included

B. Codes and Standards

C. Drawings

D. Record Drawings

E. Operation and Maintenance Manuals

F. Site Examination

G. Utilities

H. Temporary Power

I. Storage at Site

J. Equipment and Materials

K. Workmanship and Completion of Installation

L. Cutting and Patching

M. Coordination

N. HVAC Equipment Wiring and Control

O. Miscellaneous

1.2 RELATED SECTIONS

A. The requirements set out in the Contract Documents, contract forms, general conditions, supplementary general conditions and general requirements apply to all work specified herein.

1.3 WORK INCLUDED

A. Refer to the entire set of contract documents to become familiar with the project. CONTRACTOR is responsible for all equipment mounting, conduit routing and incidental work which may be necessary because of construction requirements, whether or not they are shown on the electrical drawings.

B. The CONTRACTOR shall furnish all materials, labor, transportation, tools, permits, fees and incidentals necessary for the installation of a complete electrical system.

C. It is the intent of the Contract Documents to provide an installation complete in every respect. In the event that additional details or special construction are required for work indicated or specified, it shall be the responsibility of the CONTRACTOR to provide all materials and equipment which are usually furnished with such systems in order to complete the installation, whether mentioned or not.

1.4 PAYMENT RESTRICTIONS

A. Electrical equipment included in Division 16 shall be paid for in the following payment sequence:

1. Upon equipment delivery – 30% of the contract amount.

2. Upon completion of equipment installation – 30% of the contract amount.

3. Upon successful startup and testing – 30% of the contract amount.

4. Upon completion of system validation – 10% of the contract amount.

B. Retainage shall apply to the payment sequence.

1.5 CODES AND STANDARDS

A. All work shall be in compliance with all applicable portions of the edition recognized by the Authority Having Jurisdiction (AHJ) of the National Electrical Code (NEC), the National Electrical Safety Code (NESC) and all city and county codes and ordinances, which may or may not be specifically referenced in these contract documents. None of the terms or provisions of these contract documents shall be construed as waiving any of the rules, regulations or requirements of these authorities.

B. In any instance where these Contract Documents call for construction materials of a better quality or larger size than required by the codes, the provisions of the Contract Documents shall take precedence. The codes shall govern where violations are indicated in the construction documents. In any instance where there is a conflict between the drawings and specifications, the larger size, higher quantity or better quality shall be provided, unless the OWNER's REPRESENTATIVE directs otherwise.

1.6 DRAWINGS

A. The accompanying Drawings are intended to show the general arrangement and extent of the work. The exact location and arrangement of all parts shall be determined as the work progresses to conform in the best possible manner with the surroundings and as directed by the OWNER and/or ENGINEER.

B. If any departures from the drawings are deemed necessary by the CONTRACTOR, details of such departures and the reasons therefore shall be submitted to the OWNER's REPRESENTATIVE for review. No departures shall be made without prior written acceptance of the OWNER and/or ENGINEER.

C. Figured dimensions shall be followed without reference to scale. Where dimensions are not shown, measurements shall be scaled.

1.7 RECORD DRAWINGS

A. The CONTRACTOR shall maintain a set of electrical drawings at the job site neatly marked with all changes from the original contract drawings. This set of drawings shall not be used for construction purposes and shall be available to the Owner and/or Engineer at all times. Drawings shall be kept up to date as the job progresses and shall be delivered to the Owner and Engineer at the completion of the contract.

B. The CONTRACTOR shall maintain record drawing per the requirements of Division 1.

1.8 OPERATION AND MAINTENANCE MANUALS

A. The CONTRACTOR shall furnish of operation and maintenance manuals to the OWNER and/or ENGINEER per the requirements of Division 1.

1.9 SITE EXAMINATION

A. The CONTRACTOR shall be responsible for the coordination and proper relation of his work to the building structure and to the work of all trades. The CONTRACTOR shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, and verify all dimensions in the field. The CONTRACTOR shall advise the Owner's Representative of any discrepancy at least seven days prior to bidding. The submission of bids shall be deemed evidence of the CONTRACTOR's site visit, the coordination of all existing conditions and the inclusion of all considerations for existing conditions.

1.10 UTILITIES

A. The contract documents reflect the general location, voltage, capacity, size and manner of routing for all utilities known to be required on this project. It shall be the responsibility of the CONTRACTOR to visit the site and to meet with the local utility companies in order to coordinate and confirm the exact requirements for all electrical utilities, including, but not limited to, all facilities required to provide complete and operative electrical power and telephone services. The bid submitted by the CONTRACTOR shall include costs for all such coordinative work as well as any and all utility company charges and/or fees.

1.11 TEMPORARY POWER

A. The CONTRACTOR shall coordinate with the OWNER, and other trades involved to determine requirements for temporary power on this project. No additional charges shall be made to the OWNER for wiring, connections, poles, fixtures or devices required to facilitate construction.

B. The CONTRACTOR shall provide the necessary wiring, connections, service switches, poles, wiring protective devices, lighting fixtures, lamps, outlet devices, disconnect switches, etc., as required for temporary lighting. In addition, a similar system shall be provided for the distribution of single- and three-phase power of voltage levels and adequate ampacity as required to facilitate the construction of the project. These services shall be installed in accordance with requirements of the NEC and OSHA.

1.12 STORAGE AT SITE

A. The CONTRACTOR shall not receive material or equipment at the job site until ready for installation or until there is suitable space provided to properly protect equipment from rust, weather, humidity, dust and physical damage.

B. Store major electrical equipment (switchboards, panelboards, lighting fixtures, dry type transformers) sealed in original factory wrapping in a clean, dry and conditioned environment protected from the weather. Storage outdoors is not acceptable.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIAL

A. All materials shall be new and of high quality. All materials of a type for which the Underwriters' Laboratories, Inc. (UL) has established a standard shall be listed by UL and shall bear the UL label.

PART 3 - EXECUTION

3.1 WORKMANSHIP AND COMPLETION OF INSTALLATION

A. All work shall be performed by competent electricians, skilled in their trade, and shall be executed in a thorough and substantial manner.

B. The CONTRACTOR shall be held responsible for transportation of his materials to and on the job, and for their storage and protection until the final acceptance of the job.

C. The CONTRACTOR shall be held responsible for timely placing of all conduit and outlet boxes, cabinets and other wiring devices in the walls, ceilings, slabs, beams, etc., as construction progresses.

D. CONTRACTOR shall furnish all necessary scaffolding, tackle, tools and appurtenances of all kinds, and all labor required for the safe and expeditious execution of his contract.

E. All equipment shall be installed in a manner to permit access to parts requiring service. All electrical equipment shall be installed in such a manner as to allow removal for service without disassembly of other equipment, and shall have working clearances as required by NEC. Any large piece of apparatus which is to be installed in any space in the building, and which is too large to fit through finished openings, shall be placed before enclosing structure is completed. Following placement, such apparatus shall be completely protected from damage.

F. The CONTRACTOR shall, at all times, keep the premises free from accumulations of waste material and packaging debris. This debris shall be removed daily from the construction site.

3.2 CUTTING AND PATCHING

A. Where it becomes necessary to drill or cut through any floors, walls or ceilings to permit the installation of any work under this contract, or to repair any defects that may appear prior to the expiration of the warranty, such cutting shall be done under the supervision of the Owner's Representative by the CONTRACTOR. After the necessary work has been completed, the damage shall be repaired by the CONTRACTOR, who shall pay all costs of such cutting and repairing.

B. No joists, beams, girders or columns shall be cut by the CONTRACTOR without first obtaining written permission from the Owner's Representative.

C. All drilling for expansion bolts, hangers and other supports shall be done by the CONTRACTOR, subject to the approval of the Owner's Representative. Labor and materials required to replace

or rebuild parts cut or injured shall be furnished at the CONTRACTORs expense, subject to the satisfaction of the Owner's Representative.

D. All openings made in fire-rated walls, floors and ceilings shall be patched by the electrical contractor in a manner maintaining the original fire rating.

3.3 COORDINATION

A. The CONTRACTOR shall coordinate the work of the different trades so that interferences between piping, equipment, structural and architectural work shall be avoided.

B. The CONTRACTOR is responsible for ensuring that all conduit sleeves are timely installed and are sealed, flashed or caulked to the satisfaction of the Owner's Representative.

3.4 HVAC EQUIPMENT WIRING AND CONTROL

A. In general, the CONTRACTOR shall provide the low-voltage (less than 120 volts) control wiring from the heating, ventilation and air conditioning equipment (HVAC) to the mechanical furnished device (T-STAT, temperature control system, etc.). The electrical drawings will indicate only branch circuit power supplies to serve the HVAC equipment.

B. If substitution of controls or mechanical equipment for that specified requires any changes in the electrical work, any extra cost of the equipment or electrical work will be the responsibility of the CONTRACTOR.

3.5 MISCELLANEOUS

A. Each piece of floor-mounted equipment, such as switchboards, transformers, etc., shall be set on a concrete base. Bases shall not be less than 4 inches high and shall be pinned to the floor.

B. The CONTRACTOR shall furnish and install vibration isolation means for all equipment and materials furnished under this contract which may transmit perceptible noise or vibration, structure borne or air borne, to occupied areas.

C. All transformers and other equipment indicated shall be mounted on 1-inch-thick cork rib or rubber pads or steel spring isolator units properly sized, spaced and loaded, as specified herein, which in turn shall rest on a 4-inch minimum concrete base.

D. Electrical conduit shall be isolated from all dry type transformers and rotating or reciprocating machinery with flexible metal conduit. Use lengths approximately 10 diameters in length.

END OF SECTION

SECTION 16030

EQUIPMENT INSTALLATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This Section specifies receiving, unloading, storing, installing, connecting electrical circuits, and placing in operation all electrical equipment, including but not limited to the following:

1. Disconnect switches.
2. Dry-type transformers.
3. Low voltage motor controllers.
4. Panelboards.
5. Switchboards.

1.2 RECEIVING, STORAGE, AND HANDLING

A. Receiving: Receive, uncrate, and inspect equipment for defects or damage. If defective or damaged equipment is discovered take necessary action to repair or replace equipment. Notify OWNER/ENGINEER if project schedule will be affected.

B. Storage: Store equipment in dry, clean, and secure area until time of installation.

C. Handling: Handle equipment in accordance with manufacturer's instructions. Use lifting points where provided to move equipment. Protect painted and machined surfaces where exposed.

PART 2 - PRODUCTS

Not applicable

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

A. Grounding: Comply with Section 16450 for grounding requirements in addition to specific grounding methods covered in the following articles.

B. Identification: Comply with Section 16195.

C. Cleaning: Clean interior of enclosures prior to installation of components or pulling conductors.

D. Supports and Fastenings: Comply with Section 16190.

E. Enclosure Application:

1. NEMA 3R for indoor locations unless indicated otherwise on Drawings.

2. Alum NEMA 3R or stainless steel NEMA 4X for outdoor installations.

3.2 FLOOR OR PAD MOUNTED EQUIPMENT

A. General: Install floor sills, anchor bolts, shims, and hardware required to level, align, secure, and connect equipment components in accordance with manufacturer's instructions. Make electrical connections in accordance with Section 16121 for supply and load circuits and leave items in operating condition.

3.3 WALL MOUNTED EQUIPMENT

A. General:

1. Enclosures:

a. Mount enclosures plumb, level, and rigidly attached to structure.

b. Mount 1 inch off structure with top 6'-6" above finished floor.

c. Install supports in a manner to permit vertical flow of air behind enclosure.

d. Use steel supports fabricated from standard rolled structural steel shapes specified in Section 16190.

2. Wiring: Make electrical connections in accordance with Section 16121 for supply and load circuits.

B. Disconnect Switches: Install properly rated fuses.

C. Dry-Type Transformers:

1. Mounting: Refer to Section 16190 for proper support and anchorage.

2. Raceway Connections: Connect raceways to transformer enclosure using flexible conduit specified in Section 16111. Use lengths of flex approximately 10 diameters in length.

D. Panelboards:

1. Enclosure: Close unused circuit positions with blanking plates.

2. Wiring: Check buses for proper insulation resistance prior to energizing.

3. Circuit Breakers: Set circuit breaker instantaneous trip adjustments to minimum setting unless designated otherwise on Drawings.

4. Fusible Units: See section 16416 for fuse requirements.

5. Flush Mounted Panelboards: From each flush mounted panelboard extends into an accessible location a 3/4 inch empty conduit for every three spare branch circuits and spaces or as shown on Drawings.

6. Application:

    a. Power and Lighting and Receptacle Type Panelboards: As designated by Panelboard Schedules on Drawings.

    b. Ground Fault Circuit Interrupters: Provide for 120 volt circuits supplying 15 and 20 ampere receptacles installed outdoors or as shown on Drawings.

E. Molded Case Circuit Breakers: Set adjustable instantaneous trips to minimum, unless indicated otherwise on Drawings. On magnetic breakers in combination with starters, set trips at lowest value that will permit motor starting, but not higher than 13 times motor nameplate full-load current.

F. Low Voltage Motor Controllers and Contactors in Individual Enclosures:

1. On motor circuits, connect power circuits for proper phase rotation.

2. Set circuit breaker instantaneous trips at proper value and install correct size fuses and thermal overload heater elements.

3. Check interconnection and operation of control devices, interlocks, indicating lights, and control relays. Set timers and time delay relays for correct intervals. Check controller-operating coil for correct voltage rating. Program relay settings for exterior lighting controls per manufacturer's specification and coordinate time schedules with owner.

4. See Specification Section 16481 – Motor Starters

G. Self-Contained Emergency Power Pack: Connect each unit to equipment ground conductor by means of a crimped ring-type terminal connector secured to housing with a self-tapping screw.

END OF SECTION

SECTION 16112

PLASTIC CONDUIT AND FITTINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Schedule 80 (Sch. 80) poly-vinyl chloride conduit.

1.2 QUALITY ASSURANCE

A. Furnish conduit and fittings bearing UL labels.

B. Furnish conduit and fittings bearing label of a Nationally Recognized Testing Laboratory (NRTL) as defined in OSHA Regulation 1910.7.

C. PVC conduit is only approved below grade and enclosed in concrete.

PART 2 - PRODUCTS

2.1 CONDUIT

A. Sch. 80: NEMA TC 2 and UL 651 rigid poly-vinyl chloride rigid conduit.

2.2 FITTINGS

A. Plastic Fittings:

1. Sch. 80: NEMA TC 3 and UL 651.

B. Seals:

1. Enclosure Termination and Stub-ups Into Switchboards, Distribution Panels, and Other Similar Locations: OZ/Gedney "CSB" series sealing bushing.

2. "In-Line": Gasketed "C" conduit body, filled with Dow Corning "Fire Stop" sealant.

C. Sealing Hubs: Appleton "HUB" series or Thomas & Betts "370" series.

D. Miscellaneous Fittings: Locknuts, caps, plugs, reducers, rigid galvanized steel elbows, and other accessories required for a complete installation.

E. Conduit Cement: Conduit manufacturers recommended solvent cement.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Do not make unnecessary bends, offsets, or bend conduit through more than 90 degrees.

2. Use manufacturer's recommended heating units for making PVC field bends.

3. Clean inside of conduits and swab dry before installing conductors.

4. Support conduits in accordance with NEC.

5. Install conduits so that vertical runs are plumb and horizontal runs are level and parallel or perpendicular to principal structural features.

6. Maintain 6-inch clearance from steam lines, hot water lines, flues, and other heat producing lines or devices.

7. Provide PB max 200' in all UG ducts.

B. Bending Radius: Comply with NEC for minimum bending radius on field bends and factory bends.

C. Expansion Fittings: Install across building expansion joints where conduit is rigidly attached to building structure or rod supported within 18 inches of structure and where required to meet thermal expansion in accordance with NEC.

D. Conduit Terminations:

1. NEMA 12 Areas, Sizes 1 inch and below: PVC terminal adapter with one interior locknut and thermoplastic bushing.

2. NEMA 12 Areas, Sizes above 1 Inch: PVC terminal adapter with one interior locknut and thermosetting phenolic bushing.

3. Gasketed Enclosure Areas: PVC terminal adapter with one interior-sealing washer with appropriate type locknut and bushing.

4. Outdoor Areas: Use sealing hubs in enclosures.

E. Conduits Below Grade:

1. Circuits of 600 Volts or less: Direct burial not under load bearing concrete slabs and asphalt roadways.

2. Circuits of 600 Volts or less: 2-inch minimum concrete encasement under load bearing concrete slabs and asphalt roadways.

3. Conduit Bends: Make a transition to rigid steel conduit for elbows, offsets, and stub ups.

4. Long radius for Comm. Ducts.

F. Concrete Embedded: Anchor conduit to reinforcing in concrete; plug or cap open ends until concrete and masonry operations are completed.

G. Seals: Install seals where conduit passes from a conditioned space into an unconditioned space and in conduits entering structures from outside or underground.

3.2 APPLICATION

A. Sch. 80:

1. Below grade, under load bearing concrete slabs and asphalt roadways.
2. Do not use Sch. 80 conduit smaller than ¾ inch.
3. In concrete slabs and walls.
4. Duct banks.

END OF SECTION

SECTION 16121

LOW VOLTAGE COPPER WIRE AND CABLE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section specifies copper wire, cable, associated connectors, and termination hardware used on systems operating at 600 volts or less.

1.2 QUALITY ASSURANCE

A. Furnish wire, cable, associated connectors, and termination hardware bearing UL label.

B. Furnish wire, cable, associated connectors, and termination hardware bearing the label of, or listed by a Nationally Recognized Testing Laboratory (NRTL) as defined in OSHA Regulation 1910.7.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Soft drawn, annealed copper, Class "B" stranding.

2.2 POWER WIRE AND CABLE

A. Acceptable Manufacturers: Single source manufacture is required for power wire and cable specified in this Section.

B. General: Conform to UL 83 and NEMA WC 5.

1. Single Conductor: Type THWN-THHN (75^{o}C wet/90^{o}C dry) or XHHW (75^{o}C wet/90^{o}C dry) cable rated 600 volts.

2.3 SIGNAL CABLE

A. Type PLCC (Power Limited Control Cable):

1. General: Rated 300 volts, 90 deg. C, single pair (Pr.), triad (Tri.) or quad (Qd.).

2. Single Pr., Tri. Or Qd.: No. 16 AWG, stranded copper conductors, twisted and covered with a 100% aluminum-mylar shield, with drain wire and overall PVC jacket.

3. Multiple Pr., Tri. Or Qd.: Same as single construction except No. 20 AWG conductors and an overall aluminum-mylar shield in addition to individual shields.

4. Direct Burial Cable: Same as single or multiple constructions with addition of aluminum sheath and weatherproof outer jacket.

2.4 CONNECTORS AND TERMINALS

A. Insulated Crimp Type Connectors and Terminals: Nylon insulated, Burndy "INSULINK" and "INSULUG," or Thomas & Betts "Sta-Kon."

B. Split Bolts: High-conductivity copper alloy, Burndy "SERVIT" or Thomas & Betts "Split-Bolt."

C. Compression Terminals: Copper long barrel, Burndy "HYLUG" or Thomas & Betts "Color-Keyed," or aluminum alloy Buchanan "Cytolok CL500" series **.**

D. Bolted Terminals: Cast copper alloy, Burndy "QIKLUG" or Thomas & Betts "Locktite."

2.5 MISCELLANEOUS COMPONENTS

A. Tape:

1. Vinyl Plastic: 3M "Scotch 33+" or "Scotch 88."

2. Varnished Cambric (VC): 3M "Irvington 2920."

3. Friction: Black friction tape.

4. Color Coding: 3M "Scotch 35."

5. Fireproofing: 3M "Scotch 77."

6. High Temperature Glass Cloth: 3M "Scotch 69" (180ºC).

7. Electrical Insulation Putty: 3M "Scotchfil."

B. Splice Kits: 3M "Scotchcast 82 Series".

C. Pulling Lubricants: Ideal "Yellow 77" or Polywater "Type J."

D. Wire Markers:

1. Individual Wires: Write-on type with self-laminating vinyl overwrap, 3M "ScotchCode," Ideal "Write-On," or Thomas & Betts "WSL."

2. Multi-Conductor Cables or Groups of Wires as a Cable: Nylon tie on marker, Thomas & Betts "Nylon I.D. Ties Ty-Raps."

E. Wire and Cable Ties: Thomas & Betts "Ty-Raps."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Wire and Cable:

1. General:

a. Limit pulling tension to maximum values recommended by manufacturer.

b. Do not pull through boxes, fittings, or enclosures where a change of raceway alignment or direction occurs. Use of shieves is acceptable.

c. Do not cut strands from conductors to fit lugs or terminals.

d. Do not splice control or signal wiring.

B. Compression Connectors and Terminals: Install on wire and cable with approved tool and die to recommended compression pressure.

C. Bolted Connectors and Terminals:

1. Torque to manufacturer's recommended foot-pounds for size and class of connector.

2. Where manufacturer's published torquing requirements are not indicated, tighten connectors and terminals to comply with UL 486A torque values.

3. Use plated bolts and lock washers on terminal connections.

D. Wiring in Enclosures:

1. Form and tie conductors in panelboards, cabinets, control panels, motor controllers, wireways, and wiring troughs in a neat and orderly manner.

2. Use Thomas & Betts wire and cable ties of appropriate size and type.

3. Limit spacing between ties to not more than 6 inches.

E. Taping:

1. Above Ground and Dry Locations: Fill voids and irregularities with half-lapped layers of VC (two minimum) or electrical insulation putty. Insulate with three half-lapped layers of vinyl plastic and one half-lapped layer of friction tape.

2. Below Ground and Wet Locations: In lieu of taping protect connection with resin splicing kit.

3. Fireproofing: Same as specified for above ground and dry locations plus one half-lapped layer of fireproofing.

F. System Separation:

1. Control and Signal Wiring: Provide separate raceways or barriers in raceways to separate each of the following systems from other wiring:

a. 120 volt control wiring.

b. Analog 4-20 Milliamp.

c. Digital (Pulse).

3.2 APPLICATION

A. Wire and Cable:

1. THWN-THHN or XHHW for power wiring through No. 2 AWG, and control wiring in conduit. XHHW for sizes above No. 2 AWG in conduit.

2. Bare copper for ground conductors, which penetrate finished floor or grade and ground loops.

3. No. 12 AWG minimum for power circuits and No. 14 AWG minimum for control circuits unless noted otherwise on Drawings.

B. Connectors and Terminals:

1. Motor Terminations (Single Conductor Circuits): Insulated ring tongue crimp type connectors or compression terminals, connected back-to-back with plated bolt, nut and lockwasher, and then taped. Where strap screw devices are present use split tongue connectors in lieu of ring tongue connectors.

2. Motor Terminations (Parallel Conductor Circuits): Gang compression terminals on a 1/4-inch-thick copper bar.

3. Transformer Terminations: Split bolt connectors for pigtail connections. Compression terminals for all other connections.

C. Multiconductor Control Cable: 14 AWG conductors except 16 AWG may be used in control enclosures.

3.3 COLOR CODING

A. Power Wiring: Provide color coding for single and multi-conductor power circuits as follows:

Voltage	ØA	ØB	ØC	Neutral
240 volts and below	Black	Red	Blue	White
250 - 600 volts	Brown	Orange	Yellow	Natural Gray

1. For specified insulations and jackets not manufactured with integral colors, use conductors with black insulation or jacket and color coding tape.

2. Color code conductors entering boxes, troughs, cabinets, and other enclosures.

3. Color code conductors in wireways, trenches, and other locations where conductors are continuously accessible at intervals not exceeding 5 feet.

B. Insulated Equipment Ground: Green.

C. Control Cables:

1. Single Conductors: Red (AC), Blue (DC).

2. Multi-conductor: Comply with ICEA S-66-524, "Method 1", Table K-2.

D. Signal Cables: Comply with ICEA S-82-552, "Method 9", Table E-2. In addition, number multiple pairs, triads, and quads.

3.4 IDENTIFICATION

A. Cables: Attach nylon tie on markers on both ends of cable denoting cable type and number as noted on Drawings. Where a number of 1/C wires are identified as a single cable, group conductors using "Ty-Raps" and attach markers.

B. Conductor Identification: Attach conductor markers on both ends of wire and label as indicated on Drawings.

END OF SECTION

SECTION 16130

BOXES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section specifies electrical outlet, device, pull, junction boxes and wireways and installation.

1.2 DEFINITIONS

A. Outlet Box: A box used as a wiring enclosure that may be used as a device box with the addition of a plaster ring or special cover.

B. Device Box: A box designed to house a switch, receptacle or other wiring devices.

1.3 QUALITY ASSURANCE

A. Furnish boxes bearing label or listing of a Nationally Recognized Testing Laboratory (NRTL), as defined in OSHA Regulation 1910.7.

PART 2 - PRODUCTS

2.1 OUTLET AND DEVICE BOXES

A. General:

1. UL 514A and 514B for all boxes.

2. NEMA OS 1 for sheet steel boxes.

B. Cast Iron Boxes: Crouse-Hinds or Appleton "FS/FD" and "ALC" series.

C. Cast Aluminum Boxes: Crouse-Hinds “FS-SA”/”FD-SA” or Appleton “FS-A”/”FD-A” Series.

D. Sheet Steel Boxes: Pressed steel, galvanized, 4 inch octagonal or 4 inch square (or "gang") boxes, depth as needed to accommodate devices and associated wiring.

E. Accessories: Provide fixture studs, plaster rings, extension rings, and covers as required for application. Galvanized steel indoors and galvanized cast ferrous metal or cast aluminum with neoprene gaskets outdoors.

F. Floor Boxes;

1. Acceptable Products:

	Hubbell	Steel City
Single-gang box	B-2436	641
Two-gang box	B-4233	642
Three-gang box	B-4333	643
Duplex receptacle trim	S3625	P-64-DU
Telephone/Signal trim	S2425	P-64-3/4-2

2. Accessories: Provide necessary floor covering adapters, plugs, gaskets, nipples and sealing compound.

2.2 JUNCTION AND PULL BOXES

A. Boxes (6 Inch Minimum Dimension):

1. Welded galvanized sheet steel, of sizes required by NEC, without knockouts.

2. 14 gauge metal for boxes with maximum dimension of less than 24 inches, 12 gauge for boxes with maximum dimension of 24 to 35 inches, and 10 gauge for boxes with any dimension greater than 35 inches.

3. Provide removable, flame retardant, insulating cable supports in boxes with any dimension greater than 42 inches.

4. Comply with UL 50 for boxes over 100 cubic inches volume.

5. Provide screwed or bolted covers of same gauge as box.

B. Boxes (4-11/16 Inch Maximum Dimension): Pressed steel, galvanized, 4 or 4-11/16 inches square, 1-1/2 or 2-1/8 inches deep.

C. Weatherproof Boxes: NEMA 3R, continuously welded-seam, galvanized sheet steel enclosures with gasketed covers.

D. Watertight Boxes: Galvanized cast iron with gasketed, bolt-on covers, tapped holes in bosses or hubs for conduit entrances, and integrally cast mounting lugs.

2.3 WIREWAYS

A. Provide hinged cover NEMA 1 lay-in steel wireway assemblies of sizes indicated on Drawings.

B. Provide special lengths, telescope fittings, box connectors, elbows and other fittings as required for a complete system.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Mount boxes plumb and level and rigidly attach them to the structure.

2. Clean interiors before installing trim and cover.

3. Close unused openings with blanking devices or threaded plugs.

4. Install surface mounted units at least 1 inch off of walls with supports placed in such a manner to permit vertical flow of air behind the enclosure.

B. Wireways:

1. Assemble and erect system so that access covers are on top of horizontal runs

2. Do not mount wireways directly to building structure or machinery. Use a trapeze assembly to install wireways.

3.2 APPLICATION

A. NEMA 3R for outdoor installations.

B. NEMA 1 for all other areas unless indicated otherwise on the Drawings.

C. Cast iron "FS/FD" for use with surface mounted steel conduit unless noted otherwise on the Drawings or in other Specification Sections.

D. One-piece stamped steel boxes for installation in partitions, walls, and suspended ceilings.

E. Tile box, 3-½ inch deep for installation in poured concrete walls and concrete columns. 4-inch octagonal box with removable back cover for installation in overhead concrete slabs.

END OF SECTION

SECTION 16136

CLEANING UNDERGROUND CONDUITS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. Clean all new underground conduits following conduit installation and prior to the installation of conductors

2. Clean all existing conduits for which existing conductors are to be removed as indicated in the Drawings.

B. Related Sections:

1. Section 16010 Electrical System General Requirements

1.2 SUBMITTALS

A. Comply with the provisions and requirements of Section 01330, Submittal Procedures.

B. Following the cleaning of the existing and new underground conduits, provide the following Submittals:

1. Cleaning Report, to include the following information:

a. List locations, types and sizes of conduits successfully cleaned.

b. Status of conduits which cannot be successfully cleaned (type of conduits, problems encountered, cause of problem, and exact locations measured from 2 adjacent manholes).

c. Report general conditions of the ducts (rusting steel, fiber delaminating, etc.).

d. Report of Conditions Within Manholes:

(1) Unracked cables.

(2) Missing or broken parts on cable racks.

(3) Equipment that is not grounded to a rod electrode (manhole frame, channel racks, metal ladders, splice shields).

(4) Cable arc-proofing damaged or missing.

(5) Conduits without end bells.

(6) Broken manhole covers.

e. Comments on any items that require future corrections.

1.3 QUALITY ASSURANCE

A. Qualifications of Supervisor: The person supervising the Work of this Section shall be personally experienced in this type of Work and shall have been regularly employed by a company engaged in underground pipe or conduit cleaning for a minimum of 2 years.

B. Furnish to the OWNER and ENGINEER the names and addresses of 3 similar projects which the supervisor has worked on.

1.4 PROJECT CONDITIONS

A. Existing Conditions: The spare conduits are to be cleaned with all high voltage cables within the manholes and vaults energized.

B. Protection:

1. Provide electrical insulating blankets, sleeves, gloves, etc., to protect workmen from electrical hazards.

2. Provide heavy blankets, plywood or other devices to protect cables and equipment from physical damage.

PART 2 - PRODUCTS

2.1 DRAG LINE

A. Minimum 1/8" polypropylene monofilament utility rope:

1. American Synthetic Ropes' Flotorope.

2. Greenlee Tool Co.'s 2 ply Rope 431.

3. Ideal's Pro-Pull Rope 3/16.

4. Thomas Industries/Jet Line Products Rope 232.

2.2 CONDUIT SEALS

A. Wood or plastic plugs designed for the purpose or a contrasting color cement/sand mixture. Seals shall be removable for future use of conduits. Seals shall include waterproof tag stating "CONDUIT CLEANED" and date (month, year).

PART 3 - EXECUTION

3.1 PREPARATION

A. Dewater manholes.

B. Remove all debris from manholes.

C. Install protective devices on cables and equipment.

D. Methods used for performing the Work shall have prior approval from the OWNER and ENGINEER.

3.2 PERFORMANCE

A. Remove all dirt, scale, debris and projections by flushing, rodding, scrapping, wire brushing and swabbing the conduits with hand tools and power equipment designed for the purpose.

B. Demonstrate to the OWNER and ENGINEERthe condition of the cleaned conduits.

1. Use mandrel l/2" less in diameter than the conduit. Paint sheath of mandrel with black lacquer. Pull mandrel through conduit. Conduit will be considered successfully cleaned if there are no roller marks or scratches on the mandrel.

2. Other methods may be used to determine the status of cleaned conduits, if approved.

C. Demonstrate to the OWNER and ENGINEERany defect found in the conduits that cannot be satisfactorily eliminated.

D. Provide a drag line in each cleaned conduit.

E. Provide conduit seals at both ends of each cleaned conduit.

F. Remove all debris from conduits and manholes resulting from the work of this Project.

END OF SECTION

SECTION 16140

WIRING DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. The CONTRATOR shall provide all labor, materials, equipment and incidentals as shown on the Drawings, specified and required to furnish and install receptacles.

B. Related Sections: The CONTRATOR shall coordinate the requirements of this Section with the requirements of the Sections listed below.

1. Section 16130, Boxes.

2. Section 16121, Low Voltage Copper Wire and Cable.

1.2 QUALITY ASSURANCE

A. Comply with applicable provisions and recommendations of the following:

1. National Electrical Code.

2. UL Standard No. 1010, Electrical Receptacle - Plug Combinations for Use in Hazardous Locations.

1.3 SUBMITTALS

A. Comply with the provisions and requirements of Section 01330, Submittal Procedures.

B. Provide submittals for all Receptacles proposed for use.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Receptacles for Non-Hazardous Locations:

1. Duplex grounding receptacle, two pole, three wire, 125 volt AC, 20 amperes.

a. Product and Manufacturer: Provide one of the following:

(1) Catalog No. 5362, for dry indoor locations and Catalog No. 53CM62, for wet and corrosive locations, by Harvey Hubbell Incorporated.

(2) Catalog No. 5362, for dry indoor locations and Catalog No. 5362-CR, for wet and corrosive locations, by Arrow-Hart Incorporated.

(3) Or equal.

2. Single grounding receptacle, two pole, three wire, 125 volt AC, 20 amperes.

    a. Product and Manufacturer: Provide one of the following:

        (1) Catalog No. 53CM61, by Harvey Hubbell Incorporated.

        (2) Catalog No. 5361-CR, by Arrow-Hart Incorporated.

        (3) Or equal.

B. Ground Fault Receptacles:

1. Duplex receptacle, two pole, three wire, 125 volt AC, 20 amperes.

2. Product and Manufacturer: Provide one of the following:

    a. Catalog No. GF5362, by Harvey Hubbell Incorporated.

    b. Catalog No. GF5342, by Arrow-Hart Incorporated.

    c. Or equal.

C. Surge Suppression Receptacles:

1. Duplex grounding, surge suppression receptacle, two pole, three wire, 125 volt AC, 20 amperes, capable of absorbing a transient surge 6,000 volts minimum. Receptacle to include power on indicator light:

    a. Product and Manufacturer: Provide one of the following:

        (1) Catalog No. 5350S by Harvey Hubbell Inc.

        (2) Catalog No. 5380-GY by Leviton Manufacturing Company.

        (3) Or equal.

D. Power Receptacles: 480 volt interlocked receptacle with enclosed safety switch service outlet: Provide service outlets, quantity as shown on the Drawings for portable equipment.

1. Material: Copper free aluminum enclosure with operating handle, NEMA 4 with gasketed hinged door.

    a. Switch: Heavy duty, three pole, with visible blades, a quick make and break mechanism with reinforced, positive pressure type blade and fuse clips. Switch shall be mechanically interlocked with the receptacle. The switch cannot be closed until the plug is fully inserted and the plug cannot be withdrawn or inserted, unless the switch is open.

    b. Receptacle: As indicated on the drawings. Provide two matching plugs.

    c. Type WSR, and Type APS plugs by Crouse-Hinds Company or equal.

E. Power and Special Receptacles: Provide receptacles with number of poles and voltage and current rating as shown on the Drawings. Coordinate with equipment plugs. Provide matching plug for each receptacle.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install receptacles at locations as shown on the Drawings in outlet or device boxes in accordance with Section 16130, Boxes, in non-hazardous locations.

B. Install receptacles in PVC coated galvanized rigid steel conduit systems in hazardous locations.

C. Install receptacles with ground pole in the down position.

D. Mount receptacles 18-inches above finished floor, or in accordance with local building codes, in non-hazardous locations and 4 feet-6 inches above finished floor in hazardous locations, unless otherwise noted.

E. Identify each conductor with the circuit number and the lighting panel number. Identification shall conform to the requirements of Section 16121, Low Voltage Copper Wire and Cable.

F. Identify each receptacle with a permanent phenolic tag. The tags shall include the circuit number and the lighting panel number.

G. Installation shall conform to the National Electrical Code.

END OF SECTION

SECTION 16150

SNAP SWITCHES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown on the Drawings, specified and required to furnish and install snap switches for lighting and other systems.

B. Related Sections: CONTRACTOR shall coordinate the requirements of the work in this section along with the requirements of the sections listed below which include, but are not necessarily limited to, work that is directly related to this Section.

1. Section 16130, Boxes.

2. Section 16121, Low Voltage Copper Wire and Cable.

1.2 QUALITY ASSURANCE

A. Comply with applicable provisions and recommendations of the following, except where otherwise shown or specified.

1. National Electrical Code.

2. UL Standard No. 20, General Use Snap Switches.

1.3 SUBMITTALS

A. Comply with the provisions and requirements of Section 01330, Submittal Procedures.

B. Provide Submittals for all switches proposed for use.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Switches for Non-Hazardous Locations:

1. Single pole AC toggle switch, quiet type, 120/277 volt AC, 20 amperes, Ivory, specification grade.

a. Product and Manufacturer: Provide one of the following:

(1) Catalog No. 1221-I, by Harvey Hubbell Incorporated.

(2) Catalog No. 1991-I, by Arrow-Hart Incorporated.

2. Single pole, 3-way AC toggle switch, quiet type, 120/277 volt AC, 20 amperes, Ivory, specification grade.

    a. Product and Manufacturer: Provide one of the following:

        (1) Catalog No. 1223-I, by Harvey Hubbell Incorporated.

        (2) Catalog No. 1993-I, by Arrow-Hart Incorporated.

3. Two pole AC toggle switch, quiet type, 120/277 volt AC, 20 amperes, Ivory, specification grade.

    a. Product and Manufacturer: Provide one of the following:

        (1) Catalog No. 1222-I, by Harvey Hubbell Incorporated.

        (2) Catalog No. 1992-I, by Arrow-Hart Incorporated.

B. Switch Covers:

1. Indoor covers shall be Type 304, stainless steel.

2. Outdoor or wet location covers shall be weatherproof and corrosion resistant.

C. Key Operated On-Off Switches:

1. Key operated switches shall be complete with legend plate and NEMA 4 enclosure and two keys for each switch.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install switches at locations as shown on the Drawings in outlet or device boxes in accordance with Section 16130, Boxes, in non-hazardous locations.

B. Mount wall switches 4 feet-6 inches above finished floor unless otherwise noted.

C. Identify each conductor with the circuit number and the lighting panel number. Identification shall conform to the requirements of Section 16121, Low Voltage Copper Wire and Cable.

D. Install switches in conformance with National Electrical Code.

END OF SECTION

SECTION 16190

SUPPORTS AND FASTENERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Supports and hangers, anchors, and fastenings for mounting and anchoring electrical raceways, equipment, and fixtures.

B. Related Sections: Additional support requirements for specific items are specified elsewhere in Division 16.

PART 2 - PRODUCTS

2.1 FIELD FABRICATED SUPPORTS

A. Structural steel shapes and plates as specified in Division 05000. Hot-dipped galvanized for outdoor locations.

B. 3/8 inch minimum, continuous thread, plated, or galvanized hanger rod.

C. Prefabricated structural systems manufactured by American Electric Kindorf, Power-Strut, or Unistrut.

2.2 CONDUIT SUPPORTS

A. Clamps: Steel City or American Electric Kindorf "RC" and "PC" clamps.

B. Straps:

1. Conduit Straps: Plated steel or hot-dipped galvanized, "two-hole" straps.

2. Channel Straps: American Electric Kindorf "C-105," Power-Strut "PS-1300," or Unistrut "P1100" and "P1400."

C. Hangers:

1. Conduit Hangers: Steel City Series "6H" or Erico Products, Inc. Caddy "CD" series.

2. Lay-In Pipe Hangers: American Electric Kindorf "C-149," Power-Strut "PS-3200," or Unistrut "J1200."

D. Clips: Erico Products, Inc. "Caddy M" Series snap-lock conduit clip in combination with a "Caddy Universal" drive-on beam clamp or threaded rod.

2.3 ANCHORS

A. Toggle Bolts: Star "3000" series.

B. Plastic Anchors: Star "06" series with appropriately sized metal screws.

C. Lead Shields and Lag Bolts: ITW Ramset/Red Head "LS" series or Star "1800" series.

D. Hollow Wall Anchors: ITW Ramset/Red Head "WA" series or Star "2700" series.

E. Threaded Expansion Anchors: ITW Ramset/Red Head "J," "S" or "JS" series, or Star "3400" series.

F. Wedge Anchors: ITW Ramset/Red Head "WS" series or Star "3500" series.

2.4 FASTENERS

A. Bolts and Nuts: ASTM Grade 2, low carbon, plated or galvanized, hex head.

B. Beam Clamps: American Electric Kindorf "E-160" or "E-231," Power-Strut "PS800" and "PS2000," or Unistrut "P2600" or "P2700" clamps with retainers.

C. Channel/Angle Clamps: American Electric Kindorf "E-177" or equal.

2.5 GALVANIZING REPAIR PAINT

A. ASTM A 780.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Fabricate and install supports so that supported installation does not weaken or overload structure.

2. Do not impose weight of electrical equipment, raceways, or fixtures on supports provided for non-electrical systems unless indicated otherwise on Drawings.

3. Secure steel supports to structure by bolting or welding.

4. Use retaining device when making connections with setscrew-type beam clamps or C-clamps.

5. Maximum diameter of drilled holes in beam flanges shall not exceed 15% of width of flange.

6. Drill holes to leave minimum of 1/2 inch of steel from edge of member to edge of hole.

7. Support loads from bottom chord member of trusses or steel joists only where diagonal members attach to bottom chord.

8. Do not support loads from metal roof or floor decking.

9. Do not weld to steel joist.

B. Outdoor Supports: Coat bolted and field welded supports with galvanizing repair paint.

3.2 APPLICATION

A. Supports for Single Conduits:

1. Conduit in Direct Contact with Steel Framing: "RC" and "PC" clamps.

2. EMT, 1 Inch and Smaller in Direct Contact with Steel Framing: Conduit clips.

3. Suspended Conduit 1-1/4 Inch and Below: Hanger rod and conduit hanger.

4. Suspended Conduit 1-1/2 Inch and Above: Hanger rod and lay-in pipe hanger.

5. On Walls: Steel "one-hole" straps.

B. Supports for Multiple Parallel Conduits:

1. In Direct Contact with Steel Framing: Attach prefabricated 1-1/2 inch wide channel, of sufficient depth to support the load, directly to framing and attach conduits to channel straps.

2. Suspended: Assemble a "trapeze" hanger using prefabricated 1-1/2 inch wide steel channel of sufficient depth to support load, and two or more hanger rods. Attach conduits to channel using channel straps.

C. Wall Anchors:

1. Hollow Masonry Units: Support light loads such as one and two-hole straps, and outlet boxes with plastic anchors and screws. Support heavy loads such as panelboards, safety switches, and multiple conduit runs with toggle bolts.

2. Solid Masonry Units: Lead shields and lag bolts; use through-bolts for tension loads.

3. Gypsum Board: Hollow wall anchors.

D. Concrete Floor and Overhead Slabs:

1. For overhead equipment loads less than 400 lbs., use at least two (2) 3/8-inch minimum diameter threaded expansion anchors. For equipment loads in excess of 400 lbs., but less than 1,000 lbs., use at least two (2) 3/8-inch minimum diameter wedge anchors.

END OF SECTION

SECTION 16195

IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Identification and information signs and warning signs for electrical equipment.

B. Related Sections: Additional identification requirements for specific items are specified elsewhere in Division 16. See Specification Section 16121, Low Voltage Copper Wire and Cable for wire identification.

1.2 APPLICABLE STANDARDS

A. OSHA Subpart S.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Identification and Information Signs:

1. Rigid laminated phenolic, per owner specific color requirements.

2. Text size for equipment designations shall be as large as space allows, up to 1-1/2" maximum.

3. 1/2-inch minimum text size.

4. Contractor shall submit proposed lettering for approval by Owner.

5. The Contractor shall coordinate names, abbreviations, and other designations used in the electrical identification work with the corresponding designations shown, specified and scheduled. Provide numbers, lettering, and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of the electrical systems and equipment.

B. Warning Signs:

1. OSHA Subpart J - General Environmental Controls, Section 1910.145.

2. Signs provided with equipment are acceptable provided all necessary signs are issued with equipment.

3. Provide identical signs for each application.

4. High voltage warning signs to read "DANGER - HIGH VOLTAGE - KEEP OUT."

C. Panelboard Directories: Refer to Section 16470.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Identification and Information Signs:

1. Location: Place signs on the following equipment:

a. Power distribution switchboards.

b. Power distribution panels.

c. Panelboards.

d. Dry-type transformers.

e. Individually mounted motor controllers.

f. Control panels.

g. Safety/disconnect switches.

h. Junction boxes

2. Minimum Information on Sign: Include the following information:

a. Equipment Designation.

b. Operating Voltage.

c. Served From equipment designation.

d. For branch circuit panelboards, include color coding for phase, neutral, and ground conductors for each voltage system used in accordance with NEC paragraph 210-5(c).

3. Equipment Served Identification: Include Equipment Served on identification and information signs for the following equipment:

a. Dry-type transformers.

b. Individually mounted motor controllers.

c. Safety/disconnect switches.

B. Panelboard Directories. Provide fully completed typewritten circuit directory cards. Identify each circuit using descriptions contained in panelboard schedules on Drawings.

C. Mounting: Mount signs to clean, dry equipment surface with an epoxy adhesive.

END OF SECTION

SECTION 16200

LIGHTING SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install all lighting fixtures as shown and scheduled.

B. The CONTRACTOR shall furnish and install lighting fixtures complete with lamps for every lighting outlet scheduled on the accompanying drawings. Where a fixture type designation may have been omitted from the Drawings, it shall be the responsibility of the electrical bidder to contact the Owner's Representative prior to the bid opening and determine which fixture type is intended at the location in question. No allowance will be made on behalf of the CONTRACTOR who fails to comply with this requirement.

C. In general, if fixtures are being relocated, CONTRACTOR shall ascertain the number of new fixtures to be purchased, if any

1.2 SUBMITTALS

A. Comply with the provisions and requirements of Section 01330, Submittal Procedures.

B. Submit product data in accordance with Section 16010 for all fixtures scheduled on the plans, all lamps, ballasts, emergency battery pack ballasts, lighting poles and all associated mounting equipment related to this project. For all lighting system Submittals, include the manufacturer's name, catalog number, ballast type, type and size of lamp, and all ordering data.

1.3 RELATED WORK

A. The requirements of Section 16010, General Requirements for Electrical Work, and other sections govern the work specified in this section, where applicable.

1.4 SECTION INCLUDES

A. Fixtures

B. Emergency Battery Pack Ballasts

C. Lamps

D. Photocells

E. Lighting Contactors

F. Dimmers

G. Site Lighting Luminaries

H. Lighting Poles

PART 2 – PRODUCTS

2.1 All lighting fixtures shall be furnished complete with mounting accessories to suit the specific service intended. See architectural and structural plans for ceiling and construction details where fixtures are to be mounted. Coordinate final location with architectural and mechanical features.

2.2 Fixtures shown in the schedule to be recessed shall be complete with any accessories required to fit the fixture to the ceiling construction. See architectural plans for type of ceilings. Locate fixtures in regard to ceiling patterns, unless otherwise indicated on drawings.

2.3 Fixtures scheduled to be surface mounted shall be furnished and installed employing supports, toggle bolts and any other accessories which, in the opinion of the Owner's Representative, are required to adequately support the fixtures.

2.4 LED fixtures shall be furnished complete with lamps of the size called for. All LED lamps used during construction shall be replaced prior to occupation of the building by the OWNER. All incandescent lamps shall be inside frosted unless otherwise specified in the light fixture schedule.

2.5 EMERGENCY BATTERY PACK BALLAST

Emergency battery pack ballasts for LED lighting fixtures shall consist of an automatic power failure device, test switch, pilot light and fully automatic solid-state charger in a self-contained power pack furnished by the fixture manufacturer as an integral part of the fixture. Charger shall be either trickle, float, constant current or constant potential type, or a combination of these. Battery shall be no maintenance nickel cadmium type with capacity to supply power to one lamp for each fixture for 90 minutes minimum at 1,400 lumens. Parallel units shall not be accepted. Battery pack ballast shall be Bodine or equal as manufactured by Radiant or Emergi-Lite. Emergency battery pack ballasts shall be guaranteed for five-year full warranty including a $10 labor allowance.

2.6 TIME SWITCHES

Provide and install where shown on the drawings programmable electronic time clocks. Time clocks provided shall be two-channel, 16 ON/OFF events per channel, 24-hour clock format, 365-day calendar and daylight savings changeover capability. Time clocks shall operate on 120 volts, have two form "C" single pole, double throw, output relays and battery-operated power outage carry-over of 100 hours. Time clocks shall be wall mounted at +48 inches above finished floor to the top of the clock enclosure. Time clocks shall be Paragon Cat. No. EC72-D or approved equal.

2.7 PHOTOCELLS

A. Shall be Paragon, minimum 2,000 watts, 15 amperes at 120 volts, model PJ-201 or 1,800 watts model CW201, (or approved equivalent). Die-cast aluminum housing for 3/4-inch conduit threaded hub nipple. Directional lens. Photocell shall be mounted on roof facing north.

B. For 208- or 277-volt circuits, use locking type control, 1,800 watts. Provide Paragon Model PN-201-71 or CW-201-71 (or approved equivalent), respectively.

C. All photocells shall fail in the ON position **.**

2.8 LIGHTING CONTACTORS

A. Provide and install ASCO Bulletin 920, Square D, Class 8903 or General Electric, mechanically held, electrically operated contactors of capacities as shown on the drawings. All units shall be suitable for two-wire control. These contactors may be incorporated in various distribution or individual panels as shown on the drawings.

B. Lighting contactors shall be provided and installed with HOA switch in cover.

2.9 SITE LIGHTING LUMINAIRES:

A. Luminaires shall be mounted on poles as shown on the drawings and shall be of the type and manufacturers shown in the schedule, or equal. Luminaires shall be mounted flat and level, with no tilt or cant. Luminaires of one type shall be of one manufacturer and of identical finish and appearance.

B. Provide ballasts and mounting hardware required for a complete installation. Mounting hardware shall be completely compatible with, and designed for use with, the proposed pole.

C. Fixture finish shall match poles with no detectable difference under normal viewing conditions. Any minor damages to paint after delivery shall be touched up with paint provided by the manufacturer. Any major paint damage shall be repaired in the factory by the original process.

D. Submit a computer-generated layout of the site showing the illumination levels in footcandles that will result using all proposed fixtures, luminaires and poles. If designed lighting levels are not met, CONTRACTOR shall provide additional fixtures as necessary to meet these levels, at no additional cost to the OWNER.

E. Submit catalog cuts and data sheets for each type and wattage proposed. Submittals shall be bound with the pole submittals and shall include complete information on all ballasts, lenses and mounting hardware. Submit photometrics for each site lighting fixture. Site lighting fixture shall be full cut-off type with no light emitted above horizontal.

2.10 LIGHTING POLES:

A. Poles shall be of the type, configuration and height shown on the drawings.

B. Poles 10 feet or longer shall be designed to withstand when installed a wind load of 100 MPH with a gust factor of 1.3. Submittal shall include a statement or other evidence of compliance.

C. Luminaire mounting provisions shall be designed for complete compatibility with the luminaire to be installed.

D. Poles shall be one-piece square, steel with anchor bases welded to the shaft inside and out. Manufacturer shall furnish galvanized steel anchor bolts having an "L" bend. Bolts shall be complete with washers and hex nuts for leveling. Provide a base cover. Hardware up to 8 feet from the base shall be tamperproof. A gasketed handhole or access plate shall be located near the base and shall be reinforced as necessary.

E. Poles shall be painted to match luminaires as closely as possible if luminaires are anodized and shall be painted with the same color exactly if the luminaires are painted. Prime poles before painting and touch up as necessary after installation. Paint shall be two coats of exterior enamel

either shop-applied by the manufacturer or furnished by the manufacturer for field application. Touch-up paint shall be furnished by the manufacturer for field application.

F. Finish shall be electrostatically applied baked-on black enamel prime coat. Finish shall match luminaires with no detectable difference under normal viewing conditions. Any minor damages to paint after delivery shall be touched up with paint provided by the manufacturer. Any major paint damage shall be repaired in the factory by the original process.

G. Concrete foundations shall be round, of the size shown on the drawings. Concrete shall be cast at 3,000 psi with reinforcement steel conforming to ASTM A615. Concrete shall conform to ASTM C-33, and shall have a troweled finish with 1-inch chamfered edge.

H. Poles shall be aligned vertically true with luminaires installed and while no wind is blowing. Base nuts shall be tightened in this position. Bolts in foundations shall be installed in such a way that luminaires on the poles will be facing in the direction shown on the drawings. Luminaires shall be bolted to the poles and adjusted so that the luminaire's lens will be perfectly horizontal or tilted to the exact angle specified.

I. Take all necessary precautions against damaging existing and new surfaces, structures and other work on the site during handling and erection of poles. Provide barriers to keep others at a safe distance during excavation, erection and assembly.

PART 3 - EXECUTION

3.1 CLEANING

A. All fixtures shall be cleaned and left free of any dirt, dust, grease, etc., at the completion of the job.

3.2 WIRING

A. Where bodies of LED fixtures are used as raceways for branch circuit wiring, the wire shall be approved for such location, 90 degrees C and carefully and securely clamped within the fixture body to positively prevent contact of the wires with the ballast case.

3.3 ORDERING

A. CONTRACTOR shall not order any fixtures until submittals are approved.

3.4 COORDINATION

A. CONTRACTOR shall coordinate with other crafts for final location and openings for all recessed fixtures.

B. Coordinate exact location of all lighting fixtures in mechanical/electrical rooms with the work of the other trades to avoid conflicts.

3.5 FIXTURES

A. All exterior lighting fixtures shall be furnished complete with gaskets, cast aluminum weatherproof outlet boxes, labeled approved for damp locations, have lamp bases coated with a rust inhibitor to prevent base from corroding to the socket, and be solidly grounded.

3.6 EXTERIOR

A. All exterior grade-mounted fixtures shall be furnished and installed complete with concrete base, boxes, grounding, wire, conduit, control (photocell/time switch), trenching and backfilling, necessary for a finished installation.

B. All exterior lighting standards are to be grounded through a separately driven ground rod at the pole and through the system ground.

C. All exterior directional type light fixtures shall be aimed at night for maximum effective coverage of areas to be lighted.

3.7 SUPPORT

A. All fixtures shall be securely supported from the building structure. All lighting fixture installations shall comply with NEC Article 410.

END OF SECTION

SECTION 16416

FUSES

PART 1 - GENERAL

1.1 SUBMITTALS

A. Product Data: Catalog sheets, specifications and installation instructions. Comply with the provisions and requirements of Section 01330, Submittal Procedures

1.2 MAINTENANCE

A. Spare Parts:

1. Six spare fuses of each size and category, including any accessories required for a complete installation.

2. Special tools if required for installation or removal of fuses.

PART 2 - PRODUCTS

2.1 FUSEHOLDERS

A. Equipment provided shall be furnished with fuseholders to accommodate the fuses specified.

2.2 FUSES RATED 600V OR LESS

A. Fuses for Safety Switches (Motor Circuits) and Service Disconnects:

1. Cartridge Type (250 Volts, 600 Amperes or Less): Dual element time-delay, UL Class RK-5, 200,000 amperes R.M.S. symmetrical interrupting capacity:

   a. Cooper Industries Inc.'s/Bussman Div. Type FRN-R.

   b. Gould Inc.'s/Circuit Protection Div. (Shawmut) Type TR-R.

   c. Littlefuse Inc.'s Type FLN-R.

2. Cartridge Type (600 Volts, 600 Amperes or Less): Dual element time-delay, UL Class RK-5, 200,000 amperes R.M.S. symmetrical interrupting capacity:

   a. Cooper Industries Inc.'s/Bussmann Div. Type FRS-R.

   b. Gould Inc.'s/Circuit Protection Div. (Shawmut) Type TRS-R.

   c. Littlefuse Inc.'s Type FLS-R.

3. Cartridge Type (600 Volts or Less - Above 600 Amperes): Current limiting, UL Class L, 200,000 amperes R.M.S. symmetrical interrupting capacity:

   a. Cooper Industries Inc.'s/Bussmann Div. Type KTU.

b. Gould Inc.'s Circuit Protection Div. (Shawmut) Type A4BY.

c. Littlefuse Inc.'s Type KLP-C.

B. Fuses for Safety Switches (Lighting and Heating Circuits):

1. Cartridge Type (250 Volts): Single element, UL Class RK-1, 200,000 amperes R.M.S. symmetrical interrupting capacity:

a. Cooper Industries Inc.'s/Bussmann Div., Type KTN-R.

b. Gould Inc.'s/Circuit Protection Div. (Shawmut) Type A2K-R.

c. Littlefuse Inc.'s Type KLN-R.

2. Cartridge Type (600 Volts): Single element, UL Class RK-1, 200,000 amperes R.M.S. symmetrical interrupting capacity:

a. Cooper Industries Inc.'s/Bussmann Div. Type KTS-R.

b. Gould Inc.'s/Circuit Protection Div. (Shawmut) Type A6K-R.

c. Littlefuse Inc.'s Type KLS-R.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fuses in respective equipment.

END OF SECTION

SECTION 16440

DISCONNECT SWITCHES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section specifies fusible and non-fusible safety and disconnect switches, individually enclosed and group mounted or applied in combination with motor controllers/contactors in single or grouped installations.

1.2 QUALITY ASSURANCE:

A. Refer to Section 16010, Electrical System General Requirements for Codes and Standards.

B. In addition to the Codes and Standards summarized in Section 16010, disconnect switches shall comply with the requirements of NEMA 250, NEMA KS 1, and UL 98.

C. UL Labeling or Listing: Furnish switches bearing UL label.

D. NRTL Labeling or Listing: Furnish switches bearing label of a Nationally Recognized Testing Laboratory (NRTL) as defined in OSHA Regulation 1910.7.

1.3 SUBMITTALS

A. Submit Product Data on each switch showing ratings, overall dimensions, enclosure type, and accessories, in accordance with Section 01330, Submittal Procedures.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. General: Fusible and non-fusible "Heavy Duty" safety and disconnect switches with ratings as shown on Drawings and 75ºC or higher temperature rating.

B. Components:

1. Line terminal shields.

2. Visible blades.

3. Non-teasible, positive, quick-make, quick-break interrupter operating mechanism.

4. Reinforced Class R rejection-type fuse clips.

5. Handle whose position ("OFF" or "ON") is easily recognizable and can be multiple padlocked in "OFF" position.

6. Defeatable door interlocks that prevent door from opening when operating handle is in "ON" position.

7. Auxiliary control contact operated by handle mechanism to signal that switch is in the closed position where indicated on Drawings.

8. Factory installed ground lugs.

9. Factory installed cover mounted metal nameplate containing a permanent record of:

    a. Switch type.

    b. Catalog number.

    c. Horsepower ratings using both standard and time delay fuses.

D. Horsepower Ratings:

1. Horsepower rated switches for use as motor disconnecting means, with sizes in accordance with individual manufacturer's published ratings.

2. For applications in excess of switch ratings, provide non-automatic molded case circuit breakers rated not less than 125% of motor full load current.

E. Fuses: Current-limiting-type UL RK1 with a minimum interrupting rating of 200,000 RMS symmetrical amperes and of continuous current ratings as shown on Drawings.

F. Enclosures:

1. NEMA 1 for dry, indoor areas.

2. NEMA 3R for damp indoor or outdoor locations.

3. Others as noted.

G. Acceptable Manufacturers:

1. General Electric Company.

2. Square-D Company.

3. Siemens

PART 3 - EXECUTION

3.1 INSTALLATION

A. Enclosure:

1. Mount switch enclosure plumb and level and rigidly attach to structure.

2. Mount 1 inch off structure with top 6'-6" above finished floor.

3. Install supports in a manner to permit vertical flow of air behind enclosure.

4. Use steel supports fabricated from standard rolled structural steel shapes as specified in Section 16190.

B. Wiring: Install all incoming and outgoing power circuits.

C. Grounding: Refer to Section 16450.

D. Fuses: Install properly rated fuses.

3.2 IDENTIFICATION

A. Refer to Section 16195.

END OF SECTION

SECTION 16450

GROUNDING

PART I - GENERAL

1.1 SECTION INCLUDES

A. Section specifies grounding of electrical systems and equipment and grounding of conductive machine frames, enclosures, appliances, structures and other equipment for protection of life, equipment, circuits, and systems.

B. All switchboards, transformers, load break switches and metering shall be grounded per the Utility and NEC requirements.

1.2 QUALITY ASSURANCE

A. Refer to Section 16010, Electrical System General Requirements for Codes and Standards.

B. In addition to the Codes and Standards summarized in Section 16010, Grounding shall comply with the requirements of IEEE 142, NFPA 70 Article 250 and UL 467.

C. UL Labeling or Listing: Furnish grounding fittings bearing label of or listing by UL.

D. NRTL Labeling or Listing: Furnish grounding fittings bearing label of or listing by a Nationally Recognized Testing Laboratory (NRTL) as defined in OSHA Regulation 1910.7.

1.3 SUBMITTALS

A. Test Reports: Submit to ENGINEER two (2) copies of grounding system test report certified by testing technician and OWNER's Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Conductors: Copper, refer to Section 16121.

B. Exothermic Welding: Molds and charges by Erico Products, Inc. "Cadweld" or Continental Industries, Inc. "Thermoweld".

C. Ground Rods: (5/8)-inch diameter, 10 feet long copperclad sectional ground rods.

D. Grounding Clamps: O-Z/Gedney or Steel City "G" series.

E. Connectors, Terminals, and Tape: Refer to Section 16121.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install grounding system comprised of the following major components:

1. Steel reinforcing bars in column footings with Eufer ground bonded together as grounding electrodes to provide connection to earth.

2. Ground loop.

3. Driven rod at service entrances.

4. Continuous equipment grounding conductors in electrical raceways and cable runs to ensure a positive path for connection of equipment that must be grounded.

5. Water pipe electrode.

6. Continuous bond of all items listed above.Connection of Equipment to Framing

B. Steel:

1. General: Connect below grade and concealed conductors using exothermic welds. Connect above grade using mechanical connectors.

2. Transformer Neutrals: Connect 9 KVA and larger transformer neutrals to the grounding system using conductor sized in accordance with NEC Table 250.66 but no smaller than No. 2 AWG.

3. Distribution Equipment: Connect ground bus in switchgear assemblies, motor control centers, motor control panelboards, and power panelboards to the grounding system using a conductor sized in accordance with NEC Table 250.122 but no smaller than No. 2 AWG.

4. Motor Frames: Connect motor frames rated above 300 volts and located within 6 feet above finished floor to the grounding system using a conductor sized in accordance with NEC Table 250.122 but no smaller than a No. 2 AWG.

5. Tanks and Vessels: Provide No. 2 AWG conductor from each metal tank or vessel to the nearest grounding system.

6. Telephone Equipment: Provide No. 4/0 AWG conductor from the grounding system into each telephone equipment room or telephone service entrance terminal cabinet and terminate as directed by the telephone company.

C. Equipment Grounding:

1. Provide electrically continuous equipment grounding conductors sized per NEC Table 250.122, or as indicated on Drawings, in electrical raceways containing conductors rated higher than 30 volts.

2. Bond grounding conductors to grounding bushings, grounding locknuts, grounding lugs, equipment, fixtures, enclosures and transformer neutrals.

D. Flexible Metal Conduit: Provide an external grounding jumper on flexible conduit runs longer than 6 feet.

1. Spiral wrap the grounding conductor through a minimum of 360^{o} around outside of flexible conduit.

2. Terminate jumper and flex on each end with an insulated grounding fitting.

3. Size jumper same as equipment grounding conductor in the flexible conduit but no smaller than No. 6 AWG.

E. Expansion Joints: Provide No. 4/0 AWG jumper with 6 inches of sag across structure expansion joints.

1. Bond jumpers to framing steel on both sides of the joint using exothermic welds.

2. Provide a jumper every 50'-0" maximum along expansion joint with a minimum of two jumpers per expansion joint.

3.2 FIELD QUALITY CONTROL

A. Tests: After complete installation of grounding system, measure ground resistance using the three terminal "Fall-of-Potential" method.

1. Comply with IEEE 81.

2. Space electrodes so that the potential electrode is located from the reference starting point a distance equal to 62% of the sum of the distances from the reference starting point of the test object and the current electrode.

B. Testing Firm: Employ an independent testing firm using NETA certified testing technicians.

C. Test Values: Maximum resistance value of the ground electrode system is not to exceed 5 ohms. If test results exceed 5 ohms, proceed as directed by the ENGINEER.

END OF SECTION

SECTION 16461

DRY-TYPE TRANSFORMERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section specifies general purpose and specialty dry-type transformers with windings rated 600 Volts or less.

1.2 RELATED SECTIONS

A. Section 16010 Electrical System General Requirements

B. Section 16030 Equipment Installation

C. Section 16195 Identification

D. Section 16450 Grounding

1.3 QUALITY ASSURANCE

A. Refer to Section 16010, Electrical System General Requirements for Codes and Standards.

B. In addition to the Codes and Standards summarized in Section 16010, dry-type transformers shall comply with the requirements, ANSI/IEEE C57.12.01., NEMA ST 1. , NEMA ST 20., UL 506., and UL 1561.

C. UL Labeling or Listing: Furnish transformers bearing UL label.

D. NRTL Labeling or Listing: Furnish transformers bearing the label of a Nationally Recognized Testing Laboratory (NRTL) as defined in OSHA Regulation 1910.7.

1.4 SUBMITTALS

A. Submit Product Data on each transformer showing ratings, number of phases, winding configuration, kVA capacities, overall dimensions, and weight in accordance with Section 01330, Submittal Procedures.

B. Submit one copy of manufacturer's sound rating certification.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. General: Provide transformers with the following characteristics:

1. Ratings, Configurations, and Capacities: Primary and secondary voltage ratings, number of phases, winding configuration, and kVA capacities as shown on the Drawings.

2. Windings: Electrical Grade Copper, two windings per phase, totally enclosed, non-ventilated, self-cooled. Aluminum windings are not permitted.

B. Shielded isolation transformers shall be provided with an electrostatic shield between the primary and secondary windings.

C. Primary Taps:

1. Below 30 KVA: 2@ 5% FCBN.

2. 30 KVA and Above: 2@ 2-1/2% FCAN and 4@ 2-1/2% FCBN.

D. Insulation: BIL shall be a minimum of 10kV.

1. Below 30 kVA: Class 185.

2. 30 kVA and Above: Class 220.

E. Temperature Rise (Over 40^{o}C Ambient):

1. Below 30 kVA: 115ºC.

2. 30 kVA and Above: 150ºC.

F. Sound Rating: Do not exceed ANSI and NEMA maximum levels for specified kVA capacities. Sound levels shall be guaranteed by the manufacturer not to exceed the following.

1. 45db for transformers 15-50 kVA

2. 50db for transformers 51-300 kVA

3. 55db for transformers 301-500 kVA

G. Sound levels for transformers mounted in Hospitals, Schools, Office Areas and other sensitive areas shall be nominally 5 db below ANSI levels referenced in paragraph 2.1 F above. Note: “other sensitive areas” will be designated on the Drawings.

H. Enclosure: Suitable for indoor locations (NEMA 1) or outdoor (NEMA 3R) locations with the addition of weathershield kit and including a wiring compartment suitable for conduit entry. All transformers shall be provided with rodent screens. Transformers through 75 kVA shall be designed so they can be either floor or wall mounted. Above 75kVA they shall be of a floor mounted design.

I. The entire transformer enclosure shall be degreased, cleaned, phosphatized, primed and finished with grey, baked, enamel.

2.2 Buck/boost transformers shall be encapsulated type, suitable for 80ºC rise in 40ºC ambient. Secondary windings shall be rated 12/24V and/or 16/32V as indicated on the drawings.

2.3 Provide transformer with engraved nameplates with designation as indicated on the Drawings or as directed by the Owner's Representative in accordance with Section 16195 – Identification.

2.4 ACCEPTABLE MANUFACTURERS:

A. General Electric Company.

B. Square-D Company.

C. Siemens.

PART 3 - EXECUTION

3.1 INSTALLATION.

A. Mounting: Refer to Section 16190 for proper support and anchorage. Provide 4-inch tall concrete housekeeping pads when transformers are mounted in equipment rooms or areas subject to occasional moisture on the floor. In all outdoor locations concrete transformer pads are required.

B. Raceway Connections: Connect raceways to transformer enclosure using flexible conduit . Use pieces of flex approximately ten diameters in length.

C. Wiring: Terminate wiring connections in accordance with Section 16121.

D. Grounding: Refer to Section 16450.

E. Assure National Electrical Code clearances on all sides for adequate ventilation.

F. Transformers shall be installed in accordance with manufacturer's recommendations. In addition, all transformers shall be installed with Isomode, Aeroflex or Energy Kinetics vibration isolation devices under feet or contact points.

G. Adjust transformer taps for proper secondary voltage.

END OF SECTION

SECTION 16470

PANELBOARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section specifies circuit breaker and fusible panelboards for use in control and protection of lighting, receptacle, and general power loads rated 600 volts or less.

1.2 QUALITY ASSURANCE

A. Refer to Section 16010, Electrical System General Requirements for Codes and Standards.

B. In addition to the Codes and Standards summarized in Section 16010, panelboards shall comply with the requirements, NEMA PB 1, NEMA PB 1.1, and UL 67.

C. UL Labeling or Listing: Furnish panelboards bearing UL label.

D. NRTL Labeling or Listing: Furnish panelboards bearing the label of a Nationally Recognized Testing Laboratory (NRTL) as defined in OSHA Regulation 1910.7.

1.3 SUBMITTALS

A. Submit Product Data on each panelboard in accordance with Section 01330, Submittal Procedures, including:

1. Enclosure dimensions and type.

2. Voltage and number of phases.

3. Bus material, ampere rating, and bracing.

4. Overcurrent device frame designations, trip ratings, and interrupting rating.

5. Customer's panelboard designation.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. General: Conform to schedules and diagrams as shown on Drawings. Each schedule shall indicate:

1. Panelboard designation.

2. Arrangement diagram.

3. Current and voltage ratings for each component.

B. Acceptable Manufacturers: Single source manufacture is required. Provide factory-assembled panelboards as follows:

1. Power, Lighting and Receptacle Panelboards (PP & RP):

a. 480/277 Volt: Power Panelboard

Manufacturer	Type
General Electric Co.	AE
Square D Co.	NF
Siemens	S2

b. 208/120 or 120/240 Volt: Receptacle Panelboard (RP)

Manufacturer	Type
General Electric Co.	AQ
Square D Co.	NQOD
Siemens	S1

C. Bus Work: Copper bus bars, isolated neutral bar as indicated on schedules, and grounding bar. Bond grounding bar to panelboard enclosure.

D. Enclosure:

1. Minimum Widths:

a. Power Panelboards: 24 inches.

b. Lighting and Receptacle Panelboards: 20 inches.

E. Enclosure Doors and Trim:

1. Door Locks: Provide each door with a pin-cylinder type lock. Key locks alike.

2. NEMA 1 Door/Trim: Steel with primed and baked-on gray enamel and of "door-in-door" construction.

a. Hinge outer door to box so that access to wiring gutters is provided.

b. Hinge inner door to outer door so that dead-front access to the overcurrent device operators is provided.

3. NEMA 1 Door/Trim: Steel with primed and bake-on gray enamel.

a. Attach trim to box with rotating quarter-turn clamps or similar clamping system.

b. Hinge door to trim so that dead-front access to the overcurrent devices is provided.

4. NEMA 3R Door/Trim: Steel with primed and bake-on gray enamel.

    a. Hinge weatherproof, gasketed trim to side of box so that access to wiring gutters is provided.

    b. Hinge weatherproof, gasketed door to trim so that dead-front access to over current device operators is provided.

F. Circuit Breakers: Refer to Section 16475.

1. Trip ratings, frame sizes, and interrupting ratings are shown on Drawings.

2. Ground fault circuit interrupters with sensitivity trip level of 5 milliamperes, trip indication, and test button.

G. Fused Switches: Refer to Section 16440.

H. Panelboard Directory: Provide each panelboard with a circuit directory card mounted in a holder located on inside of door. The circuit directory shall have the same data fields as the panelboard schedules included in the project Plan Set. The CONTRACTOR shall revise and update all load data fields as necessary due to field changes and actual load data as specified on equipment nameplates.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Enclosure:

1. Mount enclosures plumb and level, 6'-6" to top, and rigidly attach to structure using materials and methods specified in Section 16190

2. Install surface mounted units in a manner to permit vertical flow of air behind cabinets and enclosures.

3. Clean interiors before installing trim.

4. Close unused circuit positions with blanking plates.

B. Wiring:

1. Install wiring in accordance with Section 16121.

2. Check buses for proper insulation resistance prior to energizing.

3. Connect grounding conductors and conduit bushing grounding terminals to panelboard grounding bar.

C. Circuit Breakers: Set circuit breaker instantaneous trip adjustments to minimum setting unless designated otherwise on Drawings.

D. Fusible Units: Provide full complement of fuses of designated class and ratings and 10% (minimum of 3) spare fuses of each size specified.

E. Flush Mounted Panelboards: From each flush mounted panelboard extend into an accessible location a 3/4 inch empty conduit for every three spare branch circuits and spaces or as shown on Drawings.

3.2 APPLICATION

A. Power, Lighting and Receptacle Type Panelboards: As designated by Panelboard Schedules on Drawings.

B. Enclosure:

1. NEMA 1 for indoor locations unless indicated otherwise on Drawings

2. NEMA 3R for outdoor installations.

C. Ground Fault Circuit Interrupters: Provide for all 120 volt circuits supplying 15 and 20 ampere receptacles installed outdoors or as shown on Drawings.

3.3 IDENTIFICATION

A. Refer to Section 16195.

END OF SECTION

SECTION 16475

MOLDED CASE CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section specifies molded case circuit breakers in individual enclosures, panelboards, combination motor starters, and control panels.

1.2 RELATED SECTIONS

A. Section 16010 Electrical System General Requirements

B. Section 01330 Submittal Procedures

C. Section 16030 Equipment Installation

1.3 QUALITY ASSURANCE

A. Refer to Section 16010, Electrical System General Requirements for Codes and Standards.

B. In addition to the Codes and Standards summarized in Section 16010, molded case circuit breakers shall comply with the requirements of:

1. NEMA AB 1.

2. UL 489.

C. UL Labeling or Listing: Furnish circuit breakers bearing UL label.

D. NRTL Labeling or Listing: Furnish circuit breakers bearing label of a Nationally Recognized Testing Laboratory (NRTL) as defined in OSHA Regulation 1910.7.

1.4 SUBMITTALS

A. Submit Product Data on each circuit breaker showing ratings, overall dimensions, enclosure type, and accessories in accordance with Section 01330, Submittal Procedures.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. General:

1. Voltage rating for the point of application, frame size, trip rating, and interrupting rating are noted on Drawings.

2. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism. Automatic tripping of the breaker shall be clearly indicated by handle position. Contacts shall be non-welding silver alloy and arc extinction shall be accomplished by means of arc chutes.

3. All breakers shall be “bolt on” type.

4. When used for switching lighting circuits, breakers shall be marked “SWD” (Switch Duty Rated).

5. All multi-pole breakers shall have common trip. Wires, pins, etc., between single pole breakers to form common trip will not be acceptable.

6. The use of “Pushmatic” or miniature “Quicklag” breakers shall not be permitted.

7. Provide individually enclosed and panelboard mounted circuit breakers of the thermal-magnetic type with inverse time and instantaneous trip characteristics rated for operation in a 40^{o}C ambient.

8. Provide breakers used in combination with motor starters with adjustable instantaneous trips.

9. Provide shunt trip devices, motor operators, interlocks, auxiliary contacts, bell alarm switches, and other modifications as noted on Drawings.

10. Do not use “trunk type” latches on enclosures.

B. Enclosures:

1. NEMA 1 for dry, indoor areas.

2. NEMA 3R for damp or outdoor locations.

3. Other ratings as noted.

C. Acceptable Manufacturers:

1. General Electric Company.

2. Square D Company.

3. Siemens.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Mounting: Refer to Section 16190. Mount individually enclosed circuit breakers with top of enclosure 6'-6" above finished floor unless indicated otherwise on Drawings.

B. Trip Settings:

C. Set adjustable instantaneous trips to minimum, unless indicated otherwise on Drawings.

D. On magnetic breakers in combination with starters, set trips at the lowest value that will permit motor starting, but not higher than 13 times the motor nameplate full-load current.

3.2 IDENTIFICATION

A. Refer to Section 16195.

3.3 TESTING

(NOT USED).

END OF SECTION

SECTION 16483

MOTOR CONTROL CENTERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section specifies standardized, freestanding, metal enclosed, plug-in, grouped, motor control equipment.

1.2 RELATED SECTIONS

A. Section 16010 Electrical System General Requirements

B. Section 01330 Submittal Procedures

C. Section 16030 Equipment Installation

D. Section 16121 Low Voltage Copper Wire and Cable

E. Section 16190 Supports and Fasteners

F. Section 16195 Identification

G. Section 16450 Grounding

1.3 QUALITY ASSURANCE

A. Refer to Section 16010, Electrical System General Requirements for Codes and Standards.

B. UL Labeling or Listing: Furnish motor control center standard structures and units bearing UL label.

C. NRTL Labeling or Listing: Furnish motor control center standard structures and units bearing the label of a Nationally Recognized Testing Laboratory (NRTL) as defined in OSHA Regulation 1917.

1.4 SUBMITTALS

A. Submit Product Data and Shop Drawings on each motor control center in accordance with Section 01330, Submittal Procedures. Submittals shall include but not be limited to:

1. NEMA Class and Type.

2. Dimensions, weights, and anchor bolt layout.

3. Shipping split locations.

4. Voltage and number of phases.

5. Bus material, ampere rating, and bracing.

6. Individual controller sizes, wiring diagrams, and accessories.

7. Overcurrent device frame designations, trip ratings, and interrupting ratings.

8. Customer's motor control center designation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. NEMA Class and Type: NEMA Class I, Type B.

1. All power cable shall be 600 volt copper Type SIS insulation for Type “B” and “C”, #12 AWG or larger. All control wiring shall be 600 volt copper Type SIS insulation, #14 AWG stranded minimum. Connect wiring in accordance with diagrams on Drawings

2. Horizontal wiring trough shall be provided at the top and bottom of the motor control center and shall extend the full length. Wiring trough at the top shall be protected from the horizontal bus bars by means of a steel barrier plate. Troughs shall be equipped with cable supports and shall be large enough to permit the installer to make bends in the power cables with a minimum radius of ten times the cable diameter. Provide increased wiring space where parallel conductors are used.

3. A vertical wiring trough shall be provided for the full working height of each section. The vertical wiring trough shall be equipped with cable clamps and shall be designed so as to allow installation wiring to control units with units in place.

B. Components: Refer to Drawings for additional requirements and Section 16481, Motor Starters for motor starter requirements. Motor Control Center shall be suitable for operation on a 480-volt, three phase, 3-wire 60-hertz system.

C. Assembly:

1. Arrange motor control units in accordance with cell assignments shown on Drawings, except where manufacturer's unit space requirements differ. In such cases, maintain order of units as close as possible and do not decrease number of blank units.

2. Arrange motor control center units so that a minimum number of vertical sections are required.

3. Do not install 2 separate motor control units in a single cell.

4. Position motor control units so that the disconnecting means operating handle does not exceed 6'-0" above finished floor or working platform when in its highest position.

5. Compartments labeled “SPARE” shall be equipped with a control unit of the size and type indicated on the Drawings, and those labeled “SPACE” shall be equipped to receive the largest unit which can be mounted in the allotted space.

D. Buswork:

1. Silver-plated copper untapered main and riser buses with continuous current ratings as shown on Drawings.

2. Braced for RMS symmetrical amperes as shown on Drawings.

3. Insulating barriers between buswork and unit cell interiors.

4. Full length copper ground bus sized in accordance with the latest edition of the National Electrical Code Table 250-122. Equip bus with clamp-type connectors for main feeder grounding conductor and each circuit originating in assembly. Drill bus for 1 future connector per blank cell. One clamp type ground connector shall be provided at each end of the motor control center for a connection of a bare #4/0 stranded copper ground cable. Six clamp type ground terminals suitable for #12 AWG to #2 AWG stranded copper shall be provided in each section for connection of ground cables, which serve as equipment grounds.

E. Assembly Enclosure:

1. NEMA 12 with removable lifting angles, steel base channels, and a nominal depth of 20 inches. Provide front aligned or back-to-back mounting as indicated on drawings.

2. Cell doors and vertical wiring trough covers with concealed hinges.

3. Prior to assembly, clean, phosphatize, and finish steel surfaces with 2 coats of manufacturer's standard baked enamel paint.

F. Terminal Blocks: Pull-apart type unit terminal blocks conforming to NEMA ICS 4, rated 600 volts, and suitable for Type "B" wiring in each individual starter unit.

G. Terminal Blocks: Non pull-apart track mounted terminal blocks conforming to NEMA ICS 4, rated 600 volts, and suitable for Type "C" wiring in top or bottom most unit space of each vertical section.

H. Internal Wiring: Minimum No. 14 AWG stranded copper with Type SIS insulation for Type "B" and "C" internal wiring assemblies. Connect wiring in accordance with diagrams on Drawings.

I. Acceptable Manufacturers: Single source manufacturer is required for principal components of switchboard assemblies. Minor components, such as wire, small fuses and terminal blocks, may be of different manufacturer. Provide factory-assembled units from one of the following:

1. General Electric Company: Base Bid

2. Rockwell: Alternate

3. Square-D Company: Alternate

4. Siemens : Alternate

J. The Motor Control Center manufacturer will be the same manufacturer as the Switchboard manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Install each motor control center using anchors sized and located in accordance with manufacturer's installation instructions.

2. Shim to ensure assembly is plumb and aligned.

3. Make mechanical and electrical connections between shipping splits.

4. Touch-up marred factory finishes, with matching factory furnished paint.

B. Raceways: Locate conduit entrances in correct vertical section, both bottom and overhead, within areas designated on Shop Drawings.

C. Wiring:

1. Install incoming and outgoing power and control circuits in accordance with Section 16121.

2. Connect power circuits for proper phase rotation.

3. Connect equipment ground conductors to ground lugs.

D. Overcurrent Protection: Set circuit breaker instantaneous trips at proper value and install correct size fuses and thermal overload heater elements.

E. Grounding: Connect ground bus to equipment ground grounding conductors and to grounding electrode system.

F. Controls: Check interconnection and operation of control devices, interlocks, indicating lights, and control relays. Set timers and time delay relays for correct intervals. Check controller-operating coil for correct voltage rating.

3.2 IDENTIFICATION

A. Refer to Section 16195.

3.3 TESTING

A. Comply with Section 16955.

END OF SECTION

SECTION 16485

ENCLOSED CONTACTORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. General purpose contactors.

B. Lighting contactors.

1.2 REFERENCES

A. Refer to Section 16010, Electrical System General Requirements for Codes and Standards.

B. In addition to the requirements of Section 16010, enclosed contactors shall comply with the following:

1. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

2. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.

1.3 SUBMITTALS

A. Comply with the provisions and requirements of Section 01330, Submittal Procedures.

B. Provide dimensions, size, voltage ratings and current ratings.

C. Include manufacturer's installation instructions.

D. Provide record drawings in accordance with Section 16010 and Section 01770, Closeout Proceedures . Record the actual locations of each contactor and indicate circuits controlled on project record documents.

1.4 QUALIFICATIONS

A. Manufacturer shall be a company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

1.5 REGULATORY REQUIREMENTS

A. Refer to Section 16010, Electrical System General Requirements for Codes and Standards.

B. Conform to requirements of NFPA 70.

C. Provide Products listed and classified by Underwriters Laboratories, Inc., as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2.1 GENERAL PURPOSE CONTACTORS

A. Manufacturers:

1. Square D Company.
2. General Electric.
3. ASCO.

B. Description: NEMA ICS 2, AC general purpose magnetic contactor.

C. Coil Voltage: 120 volts, 60 Hertz unless otherwise noted.

D. Poles: As indicated.

E. Size: As indicated.

F. Enclosure: ANSI/NEMA ICS 6, Type 1 for indoor installation and type 3R for outdoor installation.

G. Accessories: As shown.

2.2 LIGHTING CONTACTORS

A. Manufacturers:

1. Square D Company.
2. General Electric.
3. ASCO.

B. Description: NEMA ICS 2, magnetic lighting contactor.

C. Configuration: Electrically held 2 wire control.

D. Coil Voltage: 120 volts, 60 Hertz unless otherwise noted.

E. Poles: As indicated.

F. Contact Rating: As indicated.

G. Enclosure: ANSI/NEMA ICS 6, Type 1 for indoor installation and type 3R for outdoor installation.

H. Accessories: As shown.

PART 3 - EXECUTION

Not Applicable

END OF SECTION

ATTACHMENTS

CITY OF ANN ARBOR
PREVAILING WAGE DECLARATION OF COMPLIANCE

The "wage and employment requirements" of Section 1:320 of Chapter 14 of Title I of the Ann Arbor City Code mandates that the city not enter any contract, understanding or other arrangement for a public improvement for or on behalf of the city unless the contract provides that all craftsmen, mechanics and laborers employed directly on the site in connection with said improvements, including said employees of subcontractors, shall receive the prevailing wage for the corresponding classes of craftsmen, mechanics and laborers, as determined by statistics for the Ann Arbor area compiled by the United States Department of Labor. Where the contract and the Ann Arbor City Code are silent as to definitions of terms required in determining contract compliance with regard to prevailing wages, the definitions provided in the Davis-Bacon Act as amended (40 U.S.C. 278-a to 276-a-7) for the terms shall be used. Further, to the extent that any employees of the contractor providing services under this contract are not part of the class of craftsmen, mechanics and laborers who receive a prevailing wage in conformance with section 1:320 of Chapter 14 of Title I of the Code of the City of Ann Arbor, employees shall be paid a prescribed minimum level of compensation (i.e. Living Wage) for the time those employees perform work on the contract in conformance with section 1:815 of Chapter 23 of Title I of the Code of the City of Ann Arbor.

At the request of the city, any contractor or subcontractor shall provide satisfactory proof of compliance with this provision.

The Contractor agrees:

(a) To pay each of its employees whose wage level is required to comply with federal, state or local prevailing wage law, for work covered or funded by this contract with the City,

(b) To require each subcontractor performing work covered or funded by this contract with the City to pay each of its employees the applicable prescribed wage level under the conditions stated in subsection (a) or (b) above.

(c) To provide to the City payroll records or other documentation within ten (10) business days from the receipt of a request by the City.

(d) To permit access to work sites to City representatives for the purposes of monitoring compliance, and investigating complaints or non-compliance.

The undersigned states that he/she has the requisite authority to act on behalf of his/her employer in these matters and has offered to provide the services in accordance with the terms of the wage and employment provisions of the Chapter 14 of the Ann Arbor City Code. The undersigned certifies that he/she has read and is familiar with the terms of Section 1:320 of Chapter 14 of the Ann Arbor City Code and by executing this Declaration of Compliance obligates his/her employer and any subcontractor employed by it to perform work on the contract to the wage and employment requirements stated herein. The undersigned further acknowledges and agrees that if it is found to be in violation of the wage and employment requirements of Section 1:320 of the Chapter 14 of the Ann Arbor City Code it shall has be deemed a material breach of the terms of the contract and grounds for termination of same by the City.

_____
Company Name

_____
Signature of Authorized Representative Date

_____
Print Name and Title

_____
Address, City, State, Zip

_____
Phone/Email address

Questions about this form? Contact Procurement Office City of Ann Arbor Phone: 734/794-6500

CITY OF ANN ARBOR
LIVING WAGE ORDINANCE DECLARATION OF COMPLIANCE

The Ann Arbor Living Wage Ordinance (Section 1:811-1:821 of Chapter 23 of Title I of the Code) requires that an employer who is (a) a contractor providing services to or for the City for a value greater than $10,000 for any twelve-month contract term, or (b) a recipient of federal, state, or local grant funding administered by the City for a value greater than $10,000, or (c) a recipient of financial assistance awarded by the City for a value greater than $10,000, shall pay its employees a prescribed minimum level of compensation (i.e., Living Wage) for the time those employees perform work on the contract or in connection with the grant or financial assistance. The Living Wage must be paid to these employees for the length of the contract/program.

Companies employing fewer than 5 persons and non-profits employing fewer than 10 persons are exempt from compliance with the Living Wage Ordinance. If this exemption applies to your company/non-profit agency please check here [ ] *No. of employees* ___
The Contractor or Grantee agrees:

(a) To pay each of its employees whose wage level is not required to comply with federal, state or local prevailing wage law, for work covered or funded by a contract with or grant from the City, no less than the Living Wage. The current Living Wage is defined as $12.93/hour for those employers that provide employee health care (as defined in the Ordinance at Section 1:815 Sec. 1 (a)), or no less than $14.43/hour for those employers that do not provide health care. The Contractor or Grantor understands that the Living Wage is adjusted and established annually on April 30 in accordance with the Ordinance and covered employers shall be required to pay the adjusted amount thereafter to be in compliance (Section 1:815(3).

Check the applicable box below which applies to your workforce

[ ] Employees who are assigned to any covered City contract/grant will be paid at or above the applicable living wage without health benefits

[ ] Employees who are assigned to any covered City contract/grant will be paid at or above the applicable living wage with health benefits

(b) To post a notice approved by the City regarding the applicability of the Living Wage Ordinance in every work place or other location in which employees or other persons contracting for employment are working.

(c) To provide to the City payroll records or other documentation within ten (10) business days from the receipt of a request by the City.

(d) To permit access to work sites to City representatives for the purposes of monitoring compliance, and investigating complaints or non-compliance.

(e) To take no action that would reduce the compensation, wages, fringe benefits, or leave available to any employee covered by the Living Wage Ordinance or any person contracted for employment and covered by the Living Wage Ordinance in order to pay the living wage required by the Living Wage Ordinance.

The undersigned states that he/she has the requisite authority to act on behalf of his/her employer in these matters and has offered to provide the services or agrees to accept financial assistance in accordance with the terms of the Living Wage Ordinance. The undersigned certifies that he/she has read and is familiar with the terms of the Living Wage Ordinance, obligates the Employer/Grantee to those terms and acknowledges that if his/her employer is found to be in violation of Ordinance it may be subject to civil penalties and termination of the awarded contract or grant of financial assistance.

_____
Company Name

_____
Signature of Authorized Representative Date

_____
Print Name and Title

_____
Address, City, State, Zip

_____
Phone/Email address

Questions about this form? Contact Procurement Office City of Ann Arbor Phone: 734/794-6500

CITY OF ANN ARBOR
LIVING WAGE ORDINANCE

RATE EFFECTIVE APRIL 30, 2016 - ENDING APRIL 29, 2017

$12.93 per hour
If the employer provides health care benefits*****

$14.43 per hour
If the employer does **NOT** provide health care benefits*****

Employers providing services to or for the City of Ann Arbor or recipients of grants or financial assistance from the City of Ann Arbor for a value of more than $10,000 in a twelve-month period of time must pay those employees performing work on a City of Ann Arbor contract or grant, the above living wage.

ENFORCEMENT

The City of Ann Arbor may recover back wages either administratively or through court action for the employees that have been underpaid in violation of the law. Persons denied payment of the living wage have the right to bring a civil action for damages in addition to any action taken by the City.

Violation of this Ordinance is punishable by fines of not more than $500/violation plus costs, with each day being considered a separate violation. Additionally, the City of Ann Arbor has the right to modify, terminate, cancel or suspend a contract in the event of a violation of the Ordinance.

***** Health Care benefits include those paid for by the employer or making an employer contribution toward the purchase of health care. The employee contribution must not exceed $.50 an hour for an average work week; and the employer cost or contribution must equal no less than $1/hr for the average work week.

The Law Requires Employers to Display This Poster Where Employees Can Readily See It.

For Additional Information or to File a Complaint Contact:
Colin Spencer at 734/794-6500 or cspencer@a2gov.org

Vendor Conflict of Interest Disclosure Form

All vendors interested in conducting business with the City of Ann Arbor must complete and return the Vendor Conflict of Interest Disclosure Form in order to be eligible to be awarded a contract. Please note that all vendors are subject to comply with the City of Ann Arbor's conflict interest policies as stated within the certification section below.

If a vendor has a relationship with a City of Ann Arbor official or employee, an immediate family member of a City of Ann Arbor official or employee, the vendor shall disclose the information required below.

Certification: I hereby certify that to my knowledge, there is no conflict of interest involving the vendor named below:

1. No City official or employee or City employee's immediate family member has an ownership interest in vendor's company or is deriving personal financial gain from this contract.
2. No retired or separated City official or employee who has been retired or separated from the City for less than one (1) year has an ownership interest in vendor's Company.
3. No City employee is contemporaneously employed or prospectively to be employed with the vendor.
4. Vendor hereby declares it has not and will not provide gifts or hospitality of any dollar value or any other gratuities to any City employee or elected official to obtain or maintain a contract.
5. Please note any exceptions below:

Vendor Name	Vendor Phone Number
Conflict of Interest Disclosure *	
Name of City of Ann Arbor employees, elected officials, or immediate family members with whom there maybe a potential conflict of interest.	( ) Relationship to employee_____ ( ) Interest in vendor's company _____ ( ) Other

*Disclosing a potential conflict of interest does not disqualify vendors. In the event vendors do not disclose potential conflicts of interest and they are detected by the City, vendor will be exempt from doing business with the City.

I certify that the information provided is true and correct by my signature below:

Signature of Vendor Authorized Representative _____ Date _____ Printed Name of Vendor Authorized Representative

PROCUREMENT USE ONLY

☐ Yes, named employee was involved in Bid / Proposal process.

☐ No, named employee was not involved in procurement process or decision.

CITY OF ANN ARBOR
DECLARATION OF COMPLIANCE

Non-Discrimination Ordinance

The "non discrimination by city contractors" provision of the City of Ann Arbor Non-Discrimination Ordinance (Ann Arbor City Code Chapter 112, Section 9:158) requires all contractors proposing to do business with the City to treat employees in a manner which provides equal employment opportunity and does not discriminate against any of their employees, any City employee working with them, or any applicant for employment on the basis of actual or perceived age, arrest record, color, disability, educational association, familial status, family responsibilities, gender expression, gender identity, genetic information, height, HIV status, marital status, national origin, political beliefs, race, religion, sex, sexual orientation, source of income, veteran status, victim of domestic violence or stalking, or weight. It also requires that the contractors include a similar provision in all subcontracts that they execute for City work or programs.

In addition the City Non-Discrimination Ordinance requires that all contractors proposing to do business with the City of Ann Arbor must satisfy the contract compliance administrative policy adopted by the City Administrator. A copy of that policy may be obtained from the Purchasing Manager

The Contractor agrees:

(a) To comply with the terms of the City of Ann Arbor's Non-Discrimination Ordinance and contract compliance administrative policy.

(b) To post the City of Ann Arbor's Non-Discrimination Ordinance Notice in every work place or other location in which employees or other persons are contracted to provide services under a contract with the City.

(c) To provide documentation within the specified time frame in connection with any workforce verification, compliance review or complaint investigation.

(d) To permit access to employees and work sites to City representatives for the purposes of monitoring compliance, or investigating complaints of non-compliance.

The undersigned states that he/she has the requisite authority to act on behalf of his/her employer in these matters and has offered to provide the services in accordance with the terms of the Ann Arbor Non-Discrimination Ordinance. The undersigned certifies that he/she has read and is familiar with the terms of the Non-Discrimination Ordinance, obligates the Contractor to those terms and acknowledges that if his/her employer is found to be in violation of Ordinance it may be subject to civil penalties and termination of the awarded contract.

_____
Company Name

_____
Signature of Authorized Representative Date

_____
Print Name and Title

_____
Address, City, State, Zip

_____
Phone/Email address

Questions about the Notice or the City Administrative Policy, Please contact:
Procurement Office of the City of Ann Arbor
(734) 794-6500

CITY OF ANN ARBOR NON-DISCRIMINATION ORDINANCE

Relevant provisions of Chapter 112, Nondiscrimination, of the Ann Arbor City Code are included below. You can review the entire ordinance at www. a2gov.org/departments/city-clerk

Intent: It is the intent of the city that no individual be denied equal protection of the laws; nor shall any individual be denied the enjoyment of his or her civil or political rights or be discriminated against because of actual or perceived age, arrest record, color, disability, educational association, familial status, family responsibilities, gender expression, gender identity, genetic information, height, HIV status, marital status, national origin, political beliefs, race, religion, sex, sexual orientation, source of income, veteran status, victim of domestic violence or stalking, or weight.

Discriminatory Employment Practices: No person shall discriminate in the hire, employment, compensation, work classifications, conditions or terms, promotion or demotion, or termination of employment of any individual. No person shall discriminate in limiting membership, conditions of membership or termination of membership in any labor union or apprenticeship program.

Discriminatory Effects: No person shall adopt, enforce or employ any policy or requirement which has the effect of creating unequal opportunities according to actual or perceived age, arrest record, color, disability, educational association, familial status, family responsibilities, gender expression, gender identity, genetic information, height, HIV status, marital status, national origin, political beliefs, race, religion, sex, sexual orientation, source of income, veteran status, victim of domestic violence or stalking, or weight for an individual to obtain housing, employment or public accommodation, except for a bona fide business necessity. Such a necessity does not arise due to a mere inconvenience or because of suspected objection to such a person by neighbors, customers or other persons.

Nondiscrimination by City Contractors: All contractors proposing to do business with the City of Ann Arbor shall satisfy the contract compliance administrative policy adopted by the City Administrator in accordance with the guidelines of this section. All city contractors shall ensure that applicants are employed and that employees are treated during employment in a manner which provides equal employment opportunity and tends to eliminate inequality based upon any classification protected by this chapter. All contractors shall agree not to discriminate against an employee or applicant for employment with respect to hire, tenure, terms, conditions, or privileges of employment, or a matter directly or indirectly related to employment, because of any applicable protected classification. All contractors shall be required to post a copy of Ann Arbor's Non-Discrimination Ordinance at all work locations where its employees provide services under a contract with the city.

Complaint Procedure: If any individual has a grievance alleging a violation of this chapter, he/she has 180 calendar days from the date of the individual's knowledge of the allegedly discriminatory action or 180 calendar days from the date when the individual should have known of the alleged discriminatory action to file a complaint with the city's Human Rights Commission. If an individual fails to file a complaint alleging a violation of this chapter within the specified time frame, the complaint will not be considered by the Human Rights Commission. The complaint should be made in writing to the Human Rights Commission. The complaint may be filed in person with the City Clerk, by e-mail at aahumanrightscommission@gmail.com, or by mail (Ann Arbor Human Rights Commission, PO Box 8647, Ann Arbor, MI 48107). The complaint must contain information about the alleged discrimination, such as name, address, phone number of the complainant and location, date and description of the alleged violation of this chapter.

Private Actions For Damages or Injunctive Relief: To the extent allowed by law, an individual who is the victim of discriminatory action in violation of this chapter may bring a civil action for appropriate injunctive relief or damages or both against the person(s) who acted in violation of this chapter