

SECTION III

PART I

CITY OF ST. CHARLES

SUBSTATION NO. 3 12KV MAINS – CIVIL WORK 2015

SPECIAL CONDITIONS AND INSTRUCTIONS TO BIDDERS

1.0 SUBMITTAL OF PROPOSAL

Sealed proposal for the construction, including the supply of necessary labor, materials and equipment, of an electrical project of the City of St. Charles (hereinafter called the “Owner”) to be known as the CITY OF ST. CHARLES SUBSTATION NO. 3 ADDITION– CIVIL WORK 2015 shall be received before **10:00 AM, Wednesday, August 5th, 2015**. For the purpose of these specifications, the term “Bidder” and Contractor” may be regarded as interchangeable to refer to the party or Agency responding to the Owner’s request for bids under this Project.

Interested Bidders shall “register” with Mike Shortall and provide name, phone number, and e-mail address.

Any questions shall be submitted to both Erika Drennan (Engineer) and Mike Shortall (Purchasing) via e-mail to the following e-mail addresses:

edrennan@stcharlesil.gov

mshortall@stcharlesil.gov

before 5:00 PM Monday, July 27th, 2015

Upon receipt of questions prior to July 27th, the bidder shall receive a reply e-mail acknowledging the receipt of the question. Response to the question shall be as soon as practical. Should the question result in a clarification that requires addenda, such addenda will be issued to all registered bidders as soon as practical.

Note – Engineer will be unavailable for questions during the week of July 13th. Technical questions submitted during that week will be acknowledged by Mike Shortall, but response will likely not be until the week of July 20th.

Questions submitted after July 27th, 2015 shall not be acknowledged or answered. Bidder shall take all necessary steps to propose questions prior to July 27th.

City reserves the right to extend the due date. Should an extension be necessary, communication of such shall be e-mailed to all registered bidders.

2.0 DESCRIPTION OF WORK

Under the project scope of work, the Contractor shall construct eight (8) new 10” X 8’6” concrete Pier foundations as outlined on the attached project plans and drawings. All the material is to be provided by the contractor unless otherwise indicated on the drawing.

The new Piers will be installed inside City of St. Charles, Substation No. 3 at the following address:

300 N. Riverside Ave, Saint Charles, IL

3.0 PROJECT INCLUDES FOLLOWING DRAWINGS

- i. SCMEU Dwg 3G-1 – General Civil –Structural Notes
- ii SCMEU Dwg 3C-11A –Substation 3 2015 addition
- iii Sub 3 2015 – Substation 3 civil addition map

4.0 PROJECT RELATED SPECIAL CONDITIONS

- 4.1 Contractor shall have approved General contracting License to work with City of St. Charles.
- 4.2 Contractor shall follow all State of Illinois prevailing wage laws.
- 4.3 Contractor shall provide the list of Subcontractor to the Electric Department if applicable.
- 4.4 Contractor shall receive “Notice to Award” and “Notice to Proceed” from City of St. Charles.
- 4.5 Contractor shall provide Insurance to the City of St. Charles.
- 4.6 Substation will be live and active during the time of construction.
- 4.7 Contractor shall provide all safety devices to all workers this includes but is not limited to FR rated upper body outer layer and hardhats.
- 4.8 Contractor will not be allowed to use any heavy equipment without prior approval from City of St. Charles. Contractor shall hand dig inside the aggregate paved surface area of the energized substation.
- 4.9 Contractor shall hand dig inside the surface area of the energized substation.
- 4.10 Contractor shall provide digital color pictures for all major activities in their proper sequence (particularly those which will be covered up).

5.0 PRICING AND CHANGES:

- 5.1 Contractor shall provide a lump sum proposal for the work.

END OF SECTION

SECTION III

PART II

CITY OF ST. CHARLES

SUBSTATIONS NO. 3 ADDITION – CIVIL WORK 2015

TECHNICAL SPECIFICATION

1. SCOPE OF WORK

1.1 General

Contractor will construct eight (8) “Piers” for breaker supports. ONLY hand excavation will be permitted in the substation. Contractor shall remove a minimum of 12 inches of material including the aggregate base course and place porous granular material underneath the “Pier” foundations, and compact it to ASTM Standard requirement. Contractor shall hand dig piers inside the energized substation area.

1.2 Specific Tasks

Install eight (8) Pier foundations (Item C) per attached drawings

1.3 Requirements

In general Contractor and Subcontractors shall be responsible for safety and security of all the workers inside the substation compound. All City of St Charles safety requirements will be followed. Contractor shall keep responsible foreman or party leader for supervision of safety and security at each substation during any kind of work in progress.

2. COORDINATION WITH CITY OF ST. CHARLES

1. City of St. Charles will provide material and installation of new or damaged ground grid and equipment grounding.
2. Contractor shall coordinate with City of St. Charles for existing ground grid, equipment grounding and embedded conduits.
3. Contractor shall remove unusable rocks and bituminous pavement material from the site as guided by the City of St. Charles and dispose of at the City’s facility. Contractor shall replace all unsuitable excavated material by approved aggregate fill.
4. Contractor shall provide **lump sum** proposal for the work.

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END OF SECTION

SECTION 02100

SITE PREPARATION

PART 1 GENERAL

1.1 JOB CONDITIONS

- A. Notify "J.U.L.I.E." (1-800-892-0123) at least 72 hours (not including Saturdays, Sundays, and legal holidays) prior to commencement of operations. Notify respective owners of utilities encountered during excavation operations. Cease operations or proceed with due caution as appropriate to provide Utility ample time to examine utility encountered and determine repair, replacement, abandonment, and relocation procedures as appropriate. Also notify Public Works Department at the City and Electric Engineering office for more assistance and coordination.
- B. Cap or remove utilities in accordance with instructions by owners of utilities.
- C. Protect, support, and maintain remaining utilities.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 CLEARING AND GRUBBING

- A. Remove unsuitable material from site as directed by OWNER.
- B. Wherever possible, existing aggregate paved surface to be preserved.
- C. No holes to be left open in pavement or parkway over holiday, weekend or after 5:00 p.m., on day preceding holiday or weekend.

END 02100

SECTION 02220

EARTHWORK

PART 1 – GENERAL

1.01 SCOPE

- A. Work under this section consists of furnishing all tools, equipment, labor services, materials, and measures necessary to perform all stripping, excavation, backfilling, compacting, testing, site drainage and dewatering, disposal of excess excavated material and grading of all areas as shown on the Drawings, or to match the existing ground in the compound.
- B. The Contractor shall be responsible for investigation of underground utilities prior to excavation and shall take all necessary precautions to avoid damaging the underground utilities in the process of his work. Any damage to utilities shall be repaired and made good by the Contractor at his expense.

1.02 RELATED WORK

Section 02100 Site Preparations

1.03 APPLICABLE STANDARDS

Contractor must comply with the latest editions of the following:

- A. AASHTO T-99, The Moisture-Density Relations of Soils Using a 5.5 lb. Rammer and a 12-in. Drop.
- B. Illinois Department of Transportation Standard Specifications (IDOT Specifications).
All references shall be those in effect as of the date of these specifications.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. **TRENCH BACKFILL MATERIAL**
Trench backfill material shall conform to IDOT FA-24 gradation.
- B. **SELECT BACKFILL MATERIAL**
Select backfill material shall consist of sandy soil or granular material excavated from the required excavation and shall be unfrozen, free of organics, free of debris, free of rocks or clay lumps greater than 1-inch in diameter, and approved by the Engineer prior to placement in the trench. Material meeting the requirements of IDOT gradations CA-8 or FA-24 with rocks, stones or clay lumps up to 1-inch in diameter shall be allowable. Engineer shall approve the gradation requirements, may be met by screening or selecting the material from the site. If

- select backfill material is unavailable or not approved by the Engineer, trench backfill material shall be used.
- C. **NATIVE BACKFILL MATERIAL**
Native backfill material excavated from the required excavation shall be unfrozen, free of organics, free of debris, free of rocks greater than 12-inches in diameter, and approved by the Engineer prior to placement in the excavation. If native backfill material is unavailable or not approved by the Engineer, trench backfill material shall be used instead.

PART 3 – EXECUTION

3.01 SAFETY AND PROTECTION OF PROPERTY

- A. The Contractor shall ensure a safe work place and carry out excavation, dewatering and installation of bracing in such a manner as to protect existing structures or previously completed work from damage. Design, placement, and removal of the necessary bracing systems shall be the Contractor's responsibility.
- B. Existing utilities, fencing, curbing, property line markers and other structures that are disturbed or damaged shall be reported to the Engineer and repairs shall be made immediately at the Contractor's expense. The Contractor shall notify the utility companies for relocation of utilities and for temporary service until permanent facilities can be restored in the areas requiring continuous uninterrupted service.
- C. The Contractor shall not use nor operate equipment with tracks or wheels on pavement that can be damaged by their use without prior approval of the appropriate agency having jurisdiction over the pavement and traffic control and unless the Contractor commits to repair such damage and protect traffic until repairs are completed.

3.02 EXCAVATION

- A. **OPEN EXCAVATION**
1. Excavation shall be accomplished either by hand, power shovel, dozers, rippers or other earth moving equipment without continuous and systematic blasting. Excavation shall be made to the widths and depths necessary for constructing all structures included in the Contract. The Contractor shall organize the excavation procedure so that no sloughing, sliding or cave-in occurs due to the excavation.
- B. **AUTHORIZED ADDITIONAL EXCAVATION**
1. In case the materials encountered at the elevations shown are not suitable, or in case it is found desirable or necessary to go to an additional depth and/or width, the excavation shall be carried to such additional depth and width as the Engineer may direct in writing. The Contractor shall refill such excavated space with either 2,500 psi strength concrete or compacted granular materials as ordered.

Authorized additional excavation so ordered shall be paid for under the appropriate Unit Price Items or where no such items exist, only pursuant to an approved change order.

C. UNAUTHORIZED EXCAVATION

1. Wherever the excavation is carried beyond or below the lines and grades shown, except as specified in the subsection headed “Authorized Additional Excavation”, all such excavated space shall be refilled at the Contractor’s expense with 2,500 psi strength concrete or compacted granular materials, as selected by the Engineer, to insure the stability of the associated structures.

D. TOPSOIL STRIPPING

1. The entire area within the limit of construction boundaries shown on the General Site Plan drawing shall be stripped of the top 12-inches of topsoil. The topsoil shall be stockpiled in approved areas for later replacement. The Engineer must approve other measures for topsoil replacement.

E. PROTECTION OF EXCAVATED SURFACES

1. The Contractor shall protect excavated surfaces from damage by erosion, traffic, or any other cause and shall repair any damage to surfaces until final acceptance of the Work.

F. REMOVAL OF WATER

1. At all times during the excavation period and until completion and acceptance of the Work at final inspection, water entering excavations shall be disposed of in a safe and suitable manner approved by Engineer.
2. The excavation shall be kept dry. No water shall be allowed to rise over or come in contact with masonry and concrete until the concrete and mortar have attained a set satisfactory to the Engineer and, in any event, not sooner than 12 hours after placing the masonry or concrete.
3. Water shall be pumped or drained from the Work hereunder and shall be disposed of in a safe and suitable manner, in accordance with federal, state and local requirements, without damage to adjacent property or streets or to other work under construction. Water shall not be discharged onto streets without prior approval of the transportation authority having jurisdiction and without adequate protection of the surface at the point of discharge. No water shall be discharged into sanitary or storm sewers without prior approval from the agency having jurisdiction. No water containing settleable solids shall be discharged into storm sewers. The Contractor shall promptly repair any and all damages caused by dewatering the Work.

3.03 MATERIAL STORAGE

- A. Excavated soil suitable for backfilling or bedding that has no immediate use shall be stored separately onsite in areas approved by the Engineer. All excavated material, except that required for backfill or bedding, shall be removed immediately from the site.

3.04 DISPOSAL OF WASTE MATERIAL

- A. The Contractor shall remove from the site and dispose of excess excavated and waste material. Disposition of waste material shall comply with all Federal, State and local laws and regulations.
- B. The Contractor shall obtain a written agreement with the Owner of the proposed disposal site. The agreement shall state that the Owner of the disposal site gives the Contractor permission to enter and dispose of the waste material on the site. This agreement shall be submitted to the Engineer for review and approval. Material shall not be disposed outside of the limits of work without prior approval.

3.05 BRACING

- A. The Contractor shall furnish and install all bracing as needed, to maintain safe working conditions and to permit efficient installation of all items of the work. “Bracing” shall mean and include any or all sheeting, shoring, trench jacks, poling boards, sheet piling, lagging, walkers, tie backs, struts, boxes, and all other devices for maintaining the shape and safety of excavations. Items which might be disturbed during the progress of the work shall be shored up or otherwise protected at the Contractor’s expense. The Contractor will be held liable for any damage that may result to neighboring property from excavation or construction operations. The Contractor shall comply with all Federal, State and local codes regulating the design and construction of bracing.
- B. Lumber used for sheeting may consist of any species that will satisfactorily stand driving. It shall be sawn, or hewn, with square corners, be free from wormholes, loose knots, windshakes, decayed or unsound portions, or other defects that might impair its strength or tightness, and have a minimum thickness of 2-inches.
- C. Steel sheet piling shall conform to requirements of ASTM A328 and be of the continuous interlocking type. Struts, bracing and all other accessories required for the sheet piling system shall meet requirements of ASTM A36.
- D. The bracing shall be removed as the work progresses in such a manner as to prevent the caving in of the sides of the excavations or any damage to construction. All voids left by withdrawal of the sheeting shall be carefully filled with fine sand and rammed by special tools as approved by the Engineer.

3.06 BRACING LEFT IN PLACE

- A. Bracing for open trenches and excavations may be ordered left in place by the Engineer when, in the Engineer's opinion, such is necessary for the purpose of preventing injury to the structures, pipelines or to other property or to persons. Bracing left in place shall be cut off at the elevation ordered. In general however, such cut offs shall be at least 18 inches below the final ground surface. Bracing remaining in place shall be driven up tight. The right of the Engineer to order bracing left in place shall not be construed as creating any obligation on his part to issue such orders. Bracing left in place by written order of the Engineer shall be paid for pursuant to an approved change order.

3.07 BACKFILLING OF EXCAVATIONS

- A. Unless specified elsewhere in the specifications, all excavations shall be backfilled as follows:
1. Excavations shall be backfilled with native backfill or approved backfill material from the top of the bedding to the subgrade of the pavement in paved areas and to 6-inches below final grade in unpaved areas. The native backfill material shall be placed in 12-inch layers and compacted to 95% Standard Proctor as defined by AASHTO T-99. Should settlements occur in excess of 1-inch below the final design grade, the Contractor shall furnish and install additional material to maintain the surface at final design grade.
- B. Compaction of all backfill materials shall be achieved by mechanical means

PART 4

4.1 MEASUREMENTS AND PAYMENT

Payment for the excavation will be made on a cubic yard basis for the area covered. No allowance will be made for over excavation, drainage trenches or cutoff trenches. Payment shall be considered full compensation for all labor, materials, equipment and other items necessary and incidental to completion of the work.

END 02220

SECTION 02221

SPOIL STOCKPILING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Temporary stockpile excavated spoil including soil, rock, and drill cuttings, except for materials generated by dredging and excavation of the oil containment pit. Contractor shall remove and dispose spoil stockpiling in an approved off-site disposal area or approved for re-use in the work by the Engineer.
- B. Containment and collection of water, petroleum hydrocarbons, and other liquids from spoil stockpiled on-site.

1.2. RELATED SECTIONS

Section 02100	Site Preparation
Section 02220	Excavation
Section 02305	Contaminated Spoil Removal and Disposal

1.03 DEFINITIONS

- A. Spoil: Earth, rock and drill cuttings from excavation and drilling.
- B. Spoil Drainage: Groundwater contained in the spoil, liquid naturally-occurring petroleum hydrocarbons contained in the spoil, and other liquids including among others construction water for dust control, drill flushing, that freely drain from the stockpiled spoil.

1.04 SYSTEM DESCRIPTION

- A. Excavated spoil drainage and disposal shall be employed when excavated spoil containing sufficient amounts of saturated water to allow visible drainage from the rock during a period of time less than or equal to 10 minutes of undisturbed condition. Spoil shall be so drained before transport and disposal.
- B. The containment and collection areas shall be constructed to protect the ground and groundwater at the containment site from leakage of drainage from the spoil into the ground and/or groundwater.

- C. Drainage water containing suspended solids shall be treated to remove such solids to levels complying with the requirements of the discharge permit for disposal of drainage water to the Gary Sanitary District sewers.
- D. Drainage water containing visible oil sheen shall be collected and treated in an on-site treatment system to remove the oil to levels complying with the requirements of the discharge permit for disposal of drainage water.
- E. Drainage water containing cement, accelerators, additives, polyester resin and other deleterious materials shall be treated to remove such materials to levels complying with the requirements of the discharge permit for disposal of drainage water.
- F. Spoil containment and water collection areas shall be constructed within the Contractor's work area.
- G. Containment and collection pit shall be constructed to contain the spoil to be drained to the "Dry" state, ready for transport to final disposal site.
- H. Containment and collection pit shall be of concrete or multi-layer geomembrane construction.
- I. Collection pit shall be constructed of a minimum of two layers of geomembrane separated by at least 6 inches of sand with a geotextile fabric separating the top 6 inches of sand from a minimum of 12-inch gravel top upon which the rock spoil will be placed. Geomembrane containment and collection pit shall be shaped to drain collected drainage to the Transformer oil containment tank and shall be provided with an 8 inches perforated HDPE pipe.
- J. Each containment and collection pit shall have a sufficient void in the aggregate to contain 24 hours of storm drainage and oil contained in the transformer.
- K. Walls penetrations at Transformer#2 for piping shall be sealed so that no leakage occurs through the penetrations.
- L. Two pumps shall be employed to pump the collected water to the on-site treatment system. One pump shall be a backup to the main pumping unit, which shall be capable of pumping the maximum drainage collection rate to the disposal truck.

1.05 SUBMITTAL

- A. Submit in accordance Section 01300.
- B. Plan for stockpiling excavated materials and for loading onto trucks for disposal offsite.
- C. Design of Containment and Collection System for spoil drainage.
- D. Information on proposed off-site disposal areas for permanent disposal of the materials in accordance with Section 02305.

1.06 QUALITY ASSURANCE

- A. Perform all work required by and in accordance with all applicable federal, state and local government regulatory agencies after acquiring all required permits and licenses.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 GENERAL

- A. Construct spoil containment and stockpiling areas, associated drainage containment and collection systems, and water treatment systems prior to starting excavation at the site.
- B. Temporary On-Site Stockpiles
 1. Temporary stockpile areas for excavated materials at the project sites shall have proper drainage and lining as required by the federal regulation, state regulation and as specified in this Section.
 2. Spoil contaminated with petroleum hydrocarbons, whether naturally-occurring or introduced by construction activities, as determined by the Engineer shall be segregated from other stockpiled materials and shall not be allowed to be stockpiled at the construction site without appropriate time for drainage of liquids from the spoil.
 3. Excavated materials approved by the Engineer for backfill shall be stockpiled separately from materials to be wasted.

3.02 Loading of Spoil

- A. Provide transport containers for water-laden spoil that are water tight while transporting any water-laden spoil on the surface from the Transformer to the stockpiles on the containment and collection pit.
- B. Contractor shall ensure that all loaded disposal products for off-site transportation have been accurately identified and are in compliance with appropriate state and federal regulations.
- C. All vehicles leaving the site shall be inspected by the Contractor to ensure that no disposal material adheres to its wheels or undercarriage.
- D. Contractor shall cleanup all waste spilled during operations, regardless of anybody responsible for the spillage of the waste.
- E. Contractor shall at least once per week sweep and clean laydown area and main street parking lot entrance to substation.

3.03 Duration

- A. Contractor shall stockpile all spoil in a water containment and collection area until all noticeable water is drained from the spoil. Noticeable drainage of water shall

mean no water noticed on the spoil surface or leaking from the spoil surface for a period of ten minutes in an undisturbed condition.

3.04 Maintenance

- A. Maintain spoil containment and collection pit and sumps on a daily basis to insure that no spoil drainage seeps into the ground outside the containment and collection cell.
- B. Repair containment pit or replace crushed aggregate and geotextile when geotextile or sand is found damaged while removing spoil after draining.

3.05 Treatment for Collected Water

- A. Provide treatment of collected water from the spoil containment and collection system in accordance with the requirements of this Section and Section 02240 prior to discharge from the site.

3.06 Removal of Spoil Disposal System

- A. Contractor shall remove stockpiling of spoil after obtaining the approval from the Engineer. Remove all remaining spoil from the stockpile areas, demolish and remove the spoil drainage containment and collection systems, dispose of the remaining spoil and demolition debris offsite in accordance with regulations and finish the sites in accordance with the Drawings and Specifications.

PART 4

4.1. MEASUREMENT AND PAYMENT

Payment for the Spoil Stockpiling will be made on a cubic yard basis for the area covered. Payment shall be considered full compensation for all labor, materials, equipment and other items necessary and incidental to completion of the work.

END 02221

**SECTION 02305
CONTAMINATED SPOIL REMOVAL AND DISPOSAL**

PART 1 - GENERAL

1.01 SUMMARY

- A. Furnish all labor, materials and equipment necessary to remove and haul all excavated rock containing naturally occurring petroleum hydrocarbons from the construction site or from the excavation of oil containment pit to an approved and *Permitted Solid Waste* Landfill.
- B. Engineer will determine which portion of spoil is to be disposed of in a *Permitted Solid Waste* Landfill as the excavation proceeds.

1.02 RELATED WORK

- A. Section 02221 Spoil Stockpiling

1.03 QUALITY ASSURANCE

- A. Do all work required by and in accordance with all applicable federal, state and local government regulatory agencies after acquiring all required permits and licenses.

1.04 SUBMITTALS

- A. Submit the following information on each landfill to be used for disposal:
 - 1. Name of landfill and location
 - 2. Locally approved operating hours on weekdays, Saturdays, Sundays, and Holidays
 - 3. Proprietors name and address
 - 4. Head of company holding the operating license
 - 5. 24-hour telephone number
 - 6. Federal license or permit number
 - 7. State license or permit number
 - 8. Local license or permit number
- B. Submit the name and location of each non-contaminated spoil (including among other materials, all demolition materials, debris, excavated soil and rock, shaft drill cuttings, and excess/waste dredge material) off-site disposal area to be used. The Contractor shall obtain a written agreement with the Owner of the proposed disposal site. The agreement shall state that the Owner of the disposal site gives the Contractor permission to enter and dispose of the waste material on the site. This agreement shall be submitted to the Engineer for review and approval.

- C. Material shall not be disposed outside of the limits of work without prior approval from Engineer.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.01 GENERAL

- A. Method of loading contaminated rock
 - 1. The Contractor shall ensure that all contaminated rock loaded for off site transportation has been accurately identified and is in compliance with appropriate state and federal regulations.
 - 2. All vehicles leaving the site shall be inspected by the Contractor to ensure that no soil adheres to its wheels or undercarriage.
 - 3. The Contractor shall be responsible for all cleanup activities involving waste spilled during operations.

3.02 TRANSPORT OF CONTAMINATED ROCK

- A. Vehicles hauling contaminated spoil to disposal site shall be covered.
- B. Vehicles shall be licensed *to transport Special Waste* and *shall* conform to all applicable laws and licensed under the regulations.

PART 4

4.1. MEASUREMENT AND PAYMENT

Payment for the Contaminated Spoil Removal and Disposal will be made on a cubic yard basis for the area covered. Payment shall be considered full compensation for all labor, materials, equipment and other items necessary and incidental to completion of the work.

END 02305

SECTION 03100

CONCRETE FORMWORK

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes formwork for cast-in-place concrete, complete with furnishing, preparation, installation, coating, protection, adjustment, removal and accessories.

1.02 RELATED WORK

- A. Section 03200, Concrete Reinforcement
- B. Section 03300, Cast-In-Place Concrete

1.03 REFERENCES

- A. ACI 117, Standard Specifications for Tolerances for Concrete Construction and Materials.
- B. ACI 301, Standard Specifications for Structural Concrete.
- C. ACI 347, Guide to Formwork for Concrete.
- D. DOC PS 1, Voluntary Product Standard - Construction and Industrial Plywood.
- E. All other applicable local building codes for the design, fabrication, erection, and removal of formwork and similar structures.

1.04 SUBMITTALS

- A. Submit manufacturer's literature on form coating.
- B. Submit formwork layout plans, design data and procedures.

1.05 QUALITY ASSURANCE

- A. The formwork shall be designed for the loads, lateral pressure, and allowable stresses outlined in ACI 347 and for design considerations, wind loads, allowable stresses and other applicable requirements of the local building code. The design and construction of the formwork shall be the responsibility of the Contractor.
- B. The formwork shall be true in every respect to produce hardened concrete to the required shape, size, grade and alignment as indicated on the Plan, within the tolerances limits set forth herein, and of sufficient strength, bracing, and rigidity

to maintain their position and shape under the loads and operations incidental to placing and curing the concrete, as well as all other forces resulting from the movement of the forms. The forms shall be mortar-tight at the time concrete is placed in them and shall be so constructed that the surfaces of the finished concrete will be reasonably free from ridges, fins, offsets, or similar defects. Adequate and suitable means for removing the forms without injury to the surfaces or edges of the finished concrete shall be provided.

1.06 STORAGE AND HANDLING

- A. Store and handle forms in manner such that surfaces that will be in contact with fresh concrete will not be damaged. Discard damaged forms.
- B. Store and handle form coating to prevent contamination of coating in accordance with manufacturer's recommendations.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Form Surfaces:
 - 1. Lumber: Use straight, uniform width and thickness, free from knots, offsets, holes, dents, warpage and other surface defects.
 - 2. Plywood: Use DOC PS 1, waterproof, resin-bonded, exterior-type Douglas Fir, face adjacent to concrete Grade B or better.
 - 3. Metal: Use smooth metal plate free of surface irregularities.
- B. Chamfer Strips: Use clear white pine, with surface against concrete planed, or rigid plastic, 1 x 1 inch bevel width.
- C. Form Coating: Use nontoxic, odorless, tasteless, colorless form oil or mineral oil that will be suitable for contact with potable water and will not stain concrete, absorb moisture, nor otherwise injuriously affect the concrete.
- D. Form Ties: Use permanently embedded body type with removable end cones on outer ends, permanently embedded portion 1.5 inches back from concrete face.
- E. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

2.02 FABRICATION

- A. Forms: Use forms that conform to ACI 347. Fabricate with facing materials that produce the specified tolerance requirements of Paragraph 3.07 of this Section;

produce true surfaces, sharp corners and true lines; and produce finish free of offsets, ridges, bulging, waves and concave or convex areas as required in Paragraph 3.05 of Section 03300, Cast-In-Place Concrete.

- B. Layout: Use regular and uniform pattern; long dimension of panels vertical; joints horizontal, vertical and aligned; form ties uniformly spaced and aligned in horizontal and vertical rows.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Forms shall not be reused if there is any evidence of surface wear and tear or defects, which would impair the quality of the surface. All surfaces of forms and embedded materials shall be cleaned of any mortar from previous concreting and of all other foreign material or water before coating is placed in them.
- B. Forms shall be coated in accordance with manufacturer's recommendations before the form or reinforcement is placed in final position. Surplus coating on form surfaces, or any coating on reinforcing steel and construction joints shall be removed before placing concrete.
- C. Sequence installation of formwork with the Work of Section 03200, Concrete Reinforcement; and Section 03300, Cast-In-Place Concrete. Provide openings where required for pipes, conduits, sleeves, and other work to be embedded in and passing through concrete members.
- D. Verify lines, levels, and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 ERECTION OF FORMWORK

- A. Erect formwork, shoring, and bracing in accordance with requirements of ACI 347 and ACI 301, except as otherwise specified herein or directed by the Engineer.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
- C. Arrange and assemble formwork to permit dismantling, stripping, and removal of formwork and shoring.
- D. Align joints and make watertight. Keep form joints to a minimum.
- E. Earth cuts shall not be used as forms.

3.03 FORM CLEANING

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.
- C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
- D. During cold weather, remove ice and snow from within forms. Do not use deicing salts. Do not use water to clean out forms, unless formwork and concrete construction are protected within heated enclosure. Use compressed air or other means to remove foreign matter.

3.04 FIELD QUALITY CONTROL

- A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.
- B. Do not reuse wood formwork more than 2 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.05 REMOVAL OF FORMWORK

- A. Do not remove forms, shores, or bracing until concrete has gained sufficient strength to carry its own weight and imposed construction and design loads. Formwork for concrete not supporting its own weight shall be permitted to be removed when the concrete has attained sufficient strength to resist damage from the removal operation, but not less than 24 hours after the concrete placement. Verify strength of concrete by compressive test results.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. When finishing is required, remove formwork as soon as removal operations will not damage concrete.

3.06 ADJUSTMENT AND RESHORING

- A. Adjustment:
 - 1. General: Positive means of adjustment shall be provided to permit realignment or readjustment of shores if excessive settlement occurs.
 - 2. Wedges: A pair of wedges may be used at the top or bottom of shores, but not at both ends, to facilitate vertical adjustment, to correct uneven settlements, or to facilitate dismantling of the formwork.

3. Shoring: Screw jacks for pipe shores or scaffold-type shoring may be used at both top and bottom so long as they are secured by the shore or scaffold leg against loosening or falling out, to avoid lateral deflections.
 4. During and After Concrete Placement: During and after concreting, but before initial set of the concrete, the elevations, camber, and plumb of formwork systems shall be checked, using telltale devices. Appropriate adjustments shall be promptly made where necessary. If, during construction, any weakness develops and the formwork shows any undue settlement or distortion, the work shall be stopped, the affected construction removed if permanently damaged, and the formwork strengthened.
- B. Reshoring: When removing forms before structural members are strong enough to carry dead load and/or construction loads, reshores shall be installed to assure safe distribution of loading. Reshoring operations shall be planned in advance and shall be subject to the Engineer review. During reshoring, no construction loads shall be permitted on the new construction. Reshores shall be placed as soon as practicable after form removal, but in no case later than the end of the working day on which form removal occurs, and shall remain in place until the concrete has acquired the required strength.

3.07 TOLERANCES FOR FORMED SURFACES

- A. Variation from plumb:
1. In the lines and surfaces of columns, piers, walls, and in arises:
 - a. In any 10 foot of length 1/4 inch
 - b. Maximum for the entire length 1 inch
 2. For exposed corner columns, control joint grooves, and other conspicuous lines:
 - a. In any 20 feet length 1/4 inch
 - b. Maximum for the entire length 1/2 inch
- B. Variation from the level or from the grades specified in the contract documents:
1. In slab soffits, ceilings, beam soffits, and in arises, measured before removal of supporting shores
 - a. In any 10 foot of length 1/4 inch
 - b. In any bay or in any 20 feet length 3/8 inch

c. Maximum for the entire length 3/4 inch

C. Variation of the linear building lines from established position in plan; and the distance between columns, walls, and partitions:

1. In any bay 1/2 inch

2. In any 20 feet of length 1/2 inch

3. Maximum for the entire length 1 inch

D. Footings:

1. Variations in dimensions in plan:

a. Minus 1/2 inch

b. Plus 2 inches

2. Misplacement or eccentricity: 2 percent of the footing width in the direction of misplacement but not more than 2 inches.

3. Thickness:

a. Decrease in specified thickness 5 percent

b. Increase in specified thickness No limit

END 03100

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to general civil structural notes on drawing C-01.
- B. Reinforcing steel bars, wire fabric and accessories for cast-in-place concrete.

1.02 RELATED SECTIONS

- A. IDOT Section 03100 - Concrete Formwork.
- B. IDOT Section 03300 - Cast-in-Place Concrete.

1.03 REFERENCES

- A. ACI 301 - Structural Concrete for Buildings.
- B. ACI 318 - Building Code Requirements For Reinforced Concrete.
- C. ACI SP-66 - American Concrete Institute - Detailing Manual.
- D. ANSI/ASTM A82 - Cold Drawn Steel Wire for Concrete Reinforcement.
- E. ANSI/ASTM A184 - Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
- F. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
- G. ANSI/ASTM A496 - Deformed Steel Wire Fabric for Concrete Reinforcement.
- H. ANSI/ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
- I. ANSI/AWS D1.4 - Structural Welding Code for Reinforcing Steel.
- J. ANSI/AWS D12.1 - Reinforcing Steel Welding Code.
- K. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
- L. ASTM A616 - Rail Steel Deformed and Plain Bars for Concrete Reinforcement.
- M. ASTM A617 - Axle Steel Deformed and Plain Bars for Concrete Reinforcement.

- N. ASTM A704 - Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.
- O. ASTM A706 - Low-Alloy Steel Deformed Bars for Concrete Reinforcement.
- P. ASTM A767 - Zinc-Coated (Galvanized) Bars for Concrete Reinforcement.
- Q. ASTM A775 - Epoxy-Coated Reinforcing Steel Bars.
- R. ASTM D3963 - Epoxy-Coated Reinforcing Steel.
- S. AWS D12.1 - Welding Reinforcement Steel, Metal Inserts and Connections in Reinforced Concrete Construction.
- T. CRSI - Concrete Reinforcing Steel Institute Manual of Practice.
- U. CRSI 63 - Recommended Practice For Placing Reinforcing Bars.
- V. CRSI 65 - Recommended Practice For Placing Bar Supports, Specifications and Nomenclature.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop Drawings: Shop drawings shall be of sufficient detail to permit installation of reinforcing without reference to the Contract Drawings. Shop Drawings shall not be prepared by reproducing the plans and details indicated on the Construction Drawings but shall consist of completely redrawn plans and details as necessary to indicate complete fabrication and installation of all reinforcing steel [ACI SP-66]
- C. Manufacturer's Certificate: Certify that products meet or exceed all specified requirements.
- D. Product Technical Data: All rebar number, sizes, spacing, dimensions, locations, mark numbers, lap splice lengths and locations, concrete cover and rebar supports as well as manufacturers installation instructions must be included.
- E. Qualifications: Qualifications of all welding operators, welding processes, and procedures must be shown.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI SP-66, ASTM A184, ASTM A496.
- B. Maintain one copy of each document on site.
- C. Submit certified copies of mill test report of reinforcement materials analysis.

1.06 QUALIFICATIONS

- A. Design reinforcement under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Illinois.

1.07 COORDINATION

- A. Coordinate with placement of formwork, formed openings and other Work.

PART 2 PRODUCTS

2.01 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615, 60 ksi yield grade; deformed billet steel bars.
- B. Welded Steel Wire Fabric: ASTM A185 Plain Type or ASTM A497 Welded Deformed Type.

2.02 ACCESSORY MATERIALS

- A. Tie Wire: Minimum 16 gage annealed type.
- B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor barrier puncture.
- C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed or wet Concrete Surfaces: Plastic coated steel type; size and shape as required.

2.03 FABRICATION

- A. Fabricate concrete reinforcing in accordance with [ACI SP-66, ACI 318 and ANSI/ASTM A184.
- B. Weld reinforcement in accordance with ANSI/AWS D1.4 or ANSI/AWS D12.1

PART 3 EXECUTION

3.01 PLACEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Do not displace or damage vapor barrier.
- C. Accommodate placement of formed openings.

D. Maintain concrete cover around reinforcing as follows unless otherwise indicated on the Drawings:

1. Concrete deposited against earth: 3 IN.
2. Formed surfaces to weather: 2 IN. for #6 or larger
1 1/2 IN. less than #6.
3. Formed surfaces exposed to or located above any liquid: 2 IN. for all rebar sizes.
4. Interior Surfaces: 1 1/2 IN. for Beams, and 3/4 IN. for slabs.

3.02 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Section 01400.

PART 4

4.1 MEASUREMENT & PAYMENT

Rebars will not be measured separately. Payment for rebar will be consider as a part of Cast In Place Concrete cost.

END 03200

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

- A. The work includes all cast-in-place concrete including, but not limited to, footings, columns, pier, beams, walls, slabs, pipe saddles, equipment pads, lean concrete, and grouting.

1.02 RELATED WORK

- A. Section 02220 - Earthwork
- B. Section 03100 - Concrete Formwork
- D. Section 03200 - Concrete Reinforcement

1.03 REFERENCES

- A. ACI 211.1, "Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete."
- B. ACI 212.3, "Chemical Admixtures for Concrete."
- C. ACI 301-96, "Standard Specification for Structural Concrete."
- D. ACI 302.1, "Guide for Concrete Floor and Slab Construction."
- E. ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete."
- F. ACI 304.2R, "Placing Concrete by Pumping Methods."
- G. ACI 305, "Hot Weather Concreting."
- H. ACI 306, "Cold Weather Concreting."
- I. ACI 308.1, "Standard Practice for Curing Concrete."
- J. ACI 309, "Guide for Consolidation of Concrete."
- K. ACI 318/ 318 R, "Building Code Requirements for Structural Concrete and Commentary."
- L. ACI 347, "Guide to Formwork for Concrete."

**CITY OF ST. CHARLES, IL
SUBSTATION NO. 3 ADDITION – CIVIL WORK**

TECHNICAL SPECIFICATION

M. ACI 350 R, “Environmental Engineering Concrete Structures.”

1.04 SUBMITTALS

A. Submit proposed mix design prepared by an approved independent testing firm for each class of concrete. Proportions shall be selected according to ACI 211.1, ACI 301, and Paragraph 2.02 herein. No concrete shall be placed until approval is obtained from the Engineer.

B. Submit certifications for the following:

1. Cement.
2. Aggregates.
3. Admixtures.
4. Bonding Agent.
5. Curing Compound.

C. Submit source of water.

D. Submit proposed method of conveying concrete to and within the project area according to paragraph 3.03.B herein.

E. Submit provisions for protection of fresh concrete during conveyance, placement, and curing from damage according to paragraph 3.03.D herein.

F. Submit proposed structural repair methods and procedures in accordance with paragraph 3.04 herein.

G. Submit proposed methods of curing in accordance with paragraph 3.07 herein.

1.05 QUALITY ASSURANCE

A. Cast-in-place concrete shall be accurately and properly formed, placed, finished, and cured in conformance with the requirements of ACI 301, standard specifications for structural concrete, except as modified by the requirements of the contract drawings and as specified herein.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete:

1. Cement shall conform to ASTM C150 Type I or Type II, or ASTM C595. Maximum fly ash and pozzolan content shall be 20% of the total cementitious material by weight. All cement used in exposed concrete shall be of the same brand from the same mill.
2. Coarse aggregate shall conform to ASTM C33 class designation 4s size number 67 (MSA 3/4 inch), number 57 (MSA 1 inch), or number 467 (MSA 1 1/2 inch) as specified in paragraph 2.02 herein.
3. Fine aggregate shall conform to ASTM C33.
4. Mixing water shall be clean, fresh, and potable.
5. Admixtures, if used, shall conform to the appropriate specifications listed below:
 - a. Air-entraining admixtures: ASTM C260.
 - b. Pozzolanic admixtures: ASTM C618, type f, except that loss on ignition shall not exceed 4%.
 - c. Water reducing admixture: the admixture shall conform to ASTM C494, type a and not contain more chloride ions than are present in municipal drinking water.
 - d. High range water reducing admixture (superplasticizer): the admixture shall conform to ASTM C494, type F or G, and not contain more chloride ions than are present in municipal drinking water.
 - e. Water reducing, retarding admixture: the admixture shall conform to ASTM C494, Type D and not contain more chloride ions than are present in municipal drinking water.
 - f. Non-corrosive, non-chloride accelerator: the admixture shall conform to ASTM C494, Type C or E, and not contain more chloride ions than are present in municipal drinking water.
6. Prohibited admixtures: Calcium chloride, thiocyanates, or admixtures containing more than 0.05% chloride ions are not permitted.
7. Materials used in the work shall be of the same composition as used in establishing the mix design.

B. Reinforcement: Section 03200

- C. Accessories: Sections 03100 and 03200
- D. Vapor barrier: 6 mil clear polyethylene film, below grade application.
- E. Bonding and repair materials:
 - 1. Bonding agent: the compound shall be a polyvinyl acetate, repeatable type. Use only in areas not subject to moisture.
 - 2. Epoxy bonding adhesive: the compound shall be a two (2) component, 100% solids, 100% reactive compound suitable for use on dry or damp surfaces.
 - 3. Bonding admixture: the compound shall be a latex, non-rewettable type.
 - 4. Under layment compound: Free flowing, self-leveling, pumpable cementitious base compound.
- F. Curing compounds:
 - 1. Curing and sealing compound: the compound shall be nontoxic, odorless, tasteless, clear styrene acrylate type that will be suitable for contact with potable water, 30% solids content minimum, conforming to ASTM C309, type 1, and federal spec. TT-C-800A.
 - 2. Dissipating resin curing compound: the compound shall be a dissipating resin type compound, conforming to ASTM C309, type 1. The film must chemically break down in a two-to-four week period.
 - 3. Sodium silicate compounds are prohibited.
- G. Sealer/dustproofers: the compound shall be a water-based acrylic latex system, 20% solids content minimum with a maximum moisture loss of 0.034 gm/cm² suitable for use with paragraph 3.07.C herein.
- H. Non-slip finish: aluminum oxide or granite type. The aggregate shall be graded in standard no. 8 - no. 30 size suitable for use with paragraph 3.06.F herein.
- I. Approved manufacturers:
 - 1. Euclid Chemical Company, Cleveland, Ohio.
 - 2. L & M Construction Chemicals, inc., Omaha, Nebraska.
 - 3. Master Builders, inc., Cleveland, Ohio.
 - 4. Sika Corporation; Lyndhurst, New Jersey.
 - 5. W. R. Meadows, inc., Hampshire, Illinois.

2.02 PROPORTIONING CONCRETE

- A. Proportions shall be selected in accordance with ACI 211.1, ACI 301, schedule A, specification requirements for concrete herein.

Schedule A

Specification Requirement for Concrete

Type of Construction	28 Day Compressive Strength (psi)	Water/Cement Ratio, max.	Max. Size Aggregate (inches)
Lean concrete	3,000	0.55	1 1/2
Footings, columns, beams, walls, slabs, pipe saddles, and equipment pad	4,000	0.45	3/4

- B. If the contractor proposes to use a concrete mix different from the designs listed in schedules A, then the contractor shall submit the mix design to the engineer for approval.
- C. Air content at the point of delivery shall be 6 +/- 1 percent for coarse aggregate size no. 67 (MSA 3/4 inch) and 5.5 +/- 1 percent for coarse aggregate size no. 467 (MSA 1 1/2 inch). Air content shall be determined in accordance with ASTM C 173 or C 231. All structural concrete shall be air-entrained.
- D. Slump shall be consistent with the proportions to permit concrete to be worked readily into forms and reinforcement under the conditions of placement to be employed.
- E. If the contractor intends to place concrete by pumping, the mix design shall be prepared in accordance with these specifications and the recommendations of ACI 304.2R

PART 3 - EXECUTION

3.01 EMBEDDED ITEMS

- A. Accurately locate and set in-place items that will be cast directly into concrete.
- B. Coordinate work of other sections and cooperate with trade involved in forming and/or setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts. Do not perform work unless specifically indicated on drawings or approved prior to installation.

- C. Install all concrete accessories in accordance with drawings and manufacturer's recommendations. Ensure items are not disturbed during concrete placement.
- D. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with a readily removable material to prevent entry of concrete into the voids.
- E. No aluminum items shall be embedded in concrete.
- F. Placement tolerances: Anchor bolts:
 - 1. Locate accurately, $\pm 1/8$ inch horizontal tolerance, $\pm 1/4$ inch vertical tolerance. Positioning templates shall be used to set all anchor bolts.
 - 2. Secure to prevent displacement during concrete pours.
 - 3. Replace all bolts not placed to the above tolerance, by chipping out, resetting, and grouting with non-shrink grout.

3.02 CONCRETE PRODUCTION

A. General:

- 1. All ready-mixed concrete batch shall be mixed and transported in accordance with "specifications for ready-mixed concrete" (ASTM C94). 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 shall be mixed only in quantities for immediate use. Batch-to-discharge time shall not exceed 60 minutes. Concrete that has set shall not be retempered, but shall be discarded.
- 3. When concrete arrives at the project with slump below that suitable for placing, water may be added provided that the maximum specified water-cement ratio is not exceeded. The water shall be incorporated by additional mixing equal to at least half of the total mixing required. An addition of water above that permitted by the limitation on water-cement ratio shall be accompanied by a quantity of cement sufficient to maintain the allowable water-cement ratio. Such addition shall be accomplished only upon authorization of the engineer. Additional slump may only be achieved with the use of the specified high-range water-reducing admixture (superplasticizer).

B. Cold weather:

- 1. In cold weather, the temperature of the concrete when delivered at the site of the work shall conform to the following minimum temperature limitations.

Air Temperature °F	For Section with Least Dimensions	
	Less than 12 inches	12 in. or greater
30° to 45°	60°	55°
0° to 30°	65°	60°
Below 0°	70°	65°

2. If water or aggregate is heated above 100 degrees 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 degrees f.
3. Cold weather concreting shall follow the recommendations of ACI 306, except as otherwise specified herein or directed by the engineer.

C. Hot weather:

1. 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.
2. Hot weather concreting shall follow the recommendations of ACI 305, except as otherwise specified herein or directed by the engineer.

3.03 PLACING CONCRETE - GENERAL

A. Preparation:

1. Hardened concrete and foreign materials shall be removed from the inner surfaces of the conveying equipment.
2. Form work shall have been completed; snow, ice and water shall have been removed; reinforcement shall have been secured in place; and expansion joint material, anchors, and other embedded items shall have been positioned.

B. Conveying:

1. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods that will prevent segregation or loss of ingredient sand in a manner that 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 operation shall conform to the following additional requirements:

- a. Truck mixers, agitators, and nonagitating units and their manner of operation shall conform to the applicable requirements of "specifications for ready-mixed concrete" (ASTM c94).
- 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 (aluminum is not permitted) 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 be used provided they discharge into a hopper before distribution.
- d. Pumping or pneumatic conveying equipment shall be of suitable kind with adequate pumping capacity. 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 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 (maximum 2 feet) 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. No interruption shall exceed 45 minutes. 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 that is being integrated with fresh concrete is still plastic. Concrete that 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.
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.

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 that will cause segregation. Maximum vertical drop shall be 5 feet.
 4. 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 honey-combing, pitting, or planes of weakness. Consolidation shall begin within 10 minutes of placement. Internal vibrators shall have a minimum frequency of 8000 vibrations per minute and sufficient amplitude to consolidate the concrete effectively. Competent workmen shall operate them. 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, generally from 5 to 15 seconds. 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.
 5. Retempering of concrete after initial set shall not be permitted.
- D. Protection:
1. Unless adequate protection is provided and approval is obtained, concrete shall not be placed during rain, sleet, or snow.
 2. Rainwater shall not be allowed to increase the mixing water and to damage the surface finish.
 3. Placing temperature: when the temperature of the surrounding air is expected to be below 40 degrees f during placing or within 24 hours thereafter, the temperature of the plastic concrete, as placed, shall be no lower than 55 degrees f for sections less than 12 inches in any dimension nor 50 degrees f for any other sections. 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 should not exceed 90 degrees f. When the temperature of the concrete exceeds 90 degrees f, precautionary measures approved by the engineer shall be put into effect. When the temperature of the steel is greater than 120 degrees f, steel forms and reinforcement shall be sprayed with water just prior to placing the concrete.
- E. Bonding:

1. The surface of construction joints, between new concrete and existing concrete, shall be prepared to attain bonding in accordance with one of the following methods:
 - a. The use of an approved bonding agent. Use epoxy-bonding agent in joints exposed to moisture or below grade. Use latex bonding agent in other applications.
 - b. Roughening the surface of the concrete in an approved manner that will expose the aggregate and will not leave laitance, loosened particles of aggregate, or damaged concrete at the surface.
2. The hardened concrete of construction joints and of joints between footings and walls or columns, between walls or columns and beams or floors they support, joints in unexposed walls and all others not mentioned below 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, joists, and slabs; and 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 1/2 inch thick on horizontal surfaces. The fresh concrete shall be placed before the grout has attained its initial set.
4. When the bonding agent will be used on construction joints, the joints shall be prepared and the bonding agent shall be applied in accordance with the manufacturer's recommendations prior to placing of fresh concrete.

3.04 REPAIR OF SURFACE DEFECTS

- A. Surface defects, including tie holes, unless otherwise specified by the contract documents, shall be repaired immediately after form removal.
- B. Repair of defective areas:
 1. All honeycombed and other defective concrete shall be removed down to sound concrete. If chipping is necessary the edges shall be perpendicular to the surface or slightly undercut. No feathered 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 mortar 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. White Portland cement shall be substituted for a part of the gray Portland cement on exposed concrete in order to produce a color matching the color of the surrounding concrete, as determined by a trial patch. 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.
 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 watershed, 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 one 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 that will be exposed to view.
- C. Tie holes: After being cleaned and thoroughly dampened, the tie holes shall be filled solid with patching mortar.
- D. All structural repairs shall be made with prior approval of the engineer as to method and procedure.
- E. If permitted or required, proprietary compounds for adhesion or as patching ingredients may be used in lieu of or in addition to the foregoing patching procedures. Such compounds shall be used in accordance with the manufacturer's recommendations.

3.05 FINISHING OF FORMED SURFACES

- A. For all unexposed concrete, provide a rough form finish: no selected form facing materials shall be specified for rough form finish surfaces. Tie holes and defects shall be patched. Fins exceeding 1/4 inch in height shall be chipped off or rubbed off. Otherwise, surfaces shall be left with the texture imparted by the forms.
- B. For all exposed concrete, provide a smooth form finish: the form facing material shall produce a smooth, hard, uniform texture on the concrete. Form facing material shall be one of those specified in paragraph 2.01 of section 03100, concrete formwork, 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. Studs or other backing capable of preventing excessive deflection shall support it. Material with raised

grain, torn surfaces, worn edges, patches, dents, or other defects that will impair the texture of the concrete surface shall not be used. Tie holes and defects shall be patched. All fins shall be completely removed.

- C. 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.
- D. When concrete will be coated or painted, provide a grout cleaned finish on a smooth form finish. No cleaning operations shall be undertaken until all contiguous surfaces to be cleaned are completed and accessible, however cleaning, as the work progresses shall not be permitted. Mix one part Portland cement and one and one-half parts fine sand with sufficient water to produce a grout having the consistency of thick paint. White Portland cement shall be substituted for a part of the gray Portland cement in order to produce a color matching the color of the surrounding concrete, as determined by a trial patch. Wet the surface of the concrete sufficiently to prevent absorption of water from the grout and apply the grout uniformly with brushes or a spray gun. Immediately after applying the grout, scrub the surface vigorously with a cork float or stone to coat the surface and fill all air bubbles and holes. While the grout is still plastic, remove all excess grout by working the surface with a rubber float, sack, or other means. After the surface whitens from drying (about thirty minutes at normal temperatures), rub vigorously with clean burlap. The finish shall be kept damp for at least 36 hours after final rubbing.

3.06 PLACING AND FINISHING CONCRETE SLABS

A. Preparation of sub-grade for slabs on ground:

1. The sub grade shall be well drained and of adequate and uniform load bearing nature. The in-place density of the sub grade soils shall be at least the minimum required in the specifications. The bottom of an undrained granular base course shall not be lower than the adjacent finished grade.
2. The sub-grade shall be free of frost before concrete placing begins. If the temperature inside a building where concrete is to be placed is below freezing it shall be raised and maintained above 50 degrees f long enough to remove all frost from the sub-grade.
3. The sub-grade 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 sub-grade nor any muddy or soft spots when the concrete is placed.

B. 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 vibrating screeds or roller pipe screeds if the nature of the finish specified requires the use of such equipment. The concrete surface shall be aligned to the contours of screed strips by the use of strike-off templates or approved compacting type screeds.
2. When formwork is cambered, screeds shall be set to a like camber to maintain the proper concrete thickness.

C. Placement:

1. Mixing and placing shall be carefully coordinated with finishing. Concrete shall not be placed on the sub-grade or forms more rapidly than it can be spread, straight edged, and or bull floated. 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.

D. Jointing: 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.

E. Consolidation: 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 vibrating screeds, roller pipe screeds, internal vibrators, or other approved means.

F. Finishes:

1. When type of finish is not specified otherwise in the contract documents, the following finishes shall be used as applicable:
 - a. Floated finish: for surfaces intended to receive roofing, waterproofing membranes, or sand bed terrazzo.
 - b. Troweled finish: for floors intended as walking surfaces or for reception of floor coverings.
 - c. Broom or belt finish: for sidewalks and garage floors and ramps.

- d. Nonslip finish: for exterior platforms, steps, and landings; and for exterior and interior pedestrian ramps.
2. Finishing tolerances:
 - a. Finishes with class a tolerances shall be true planes within 1/8 inch in 10 feet as determined by a 10-foot straightedge placed anywhere on the slab in any direction.
 - b. Finishes with class b tolerance shall be true planes within 1/4 inch in 10 feet as determined by a 10-foot straightedge placed anywhere on the slab in any direction.
 3. Descriptions:
 - 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 watersheen has disappeared and when the surface has stiffened sufficiently to permit the operation. During or after the first floating, plainness of surface shall be checked with a 10-foot straightedge applied at not less than 2 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.
 - b. Troweled finish: the surface shall first be float-finished. It shall next be power troweled, and finally hand troweled. The first troweling after power floating shall produce a smooth surface that is relatively free of defects but which may still show some trowel marks. Additional troweling shall be done by hand after the surface has hardened sufficiently. The final troweling 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 troweling operations. The finished surface shall be essentially free of trowel marks, uniform in texture and appearance and shall be planed to a class a tolerance. On surfaces intended to support floor coverings, any defects of sufficient magnitude to show through the floor covering shall be removed by grinding.
 - c. Broom or belt finish: immediately after the concrete has received a float finish. It shall be given a coarse transverse scored texture by drawing a broom or burlap belt across the surface.
 - d. Non-slip finish: where the contract documents require a non-slip finish, the surface shall be given a "dry shake" application, as specified above, of crushed ceramically bonded aluminum oxide or other specified selected abrasive particles. The rate of application of such material shall be not less than 25 pounds per 100 square feet.

3.07 CURING AND PROTECTION

- A. 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 subject to approval.
- B. For concrete surfaces not in contact with forms, one of the following procedures shall be applied immediately after completion of placement and finishing:
 - 1. Ponding or continuous sprinkling.
 - 2. Application of absorptive mats or fabric kept continuously wet.
 - 3. Application of waterproof sheet materials, conforming to "specifications for waterproof sheet materials for curing concrete" (ASTM C171).
 - 4. Application of other moisture retaining covering as approved.
 - 5. Application of specified curing and sealing compound. The compound shall be applied in accordance with the recommendations of the manufacturer immediately after any water sheen, which may develop after finishing has disappeared from the concrete surface. It shall not be used on any surface against which additional concrete or other material is to be bonded. On these areas use the specified dissipating resin curing compound.
- C. Apply a coat of the specified clear sealer/dust-proofing compound to all exposed interior concrete floors where indicated on the drawings. The compound shall be applied in strict accordance with the directions of the manufacturer and just prior to completion of construction.
- D. Moisture loss from surfaces placed against wooden forms or keeping the forms wet until they can be safely removed shall minimize metal forms exposed to heating by the sun. After form removal the concrete shall be cured until the end of the time prescribed in section 3.07.e by one of the methods of sections 3.07.b or 3.07.c.
- E. Curing in accordance with sections 3.07.b.1 or 3.07.b.2. Shall be continued for at least 7 days in the case of all concrete except high-early-strength concrete for which the period shall be at least 3 days. Alternatively, if tests are made of cylinders kept adjacent to the structure and cured by the same methods, moisture retention measures may be terminated when the average compressive strength has reached 70 percent of the specified strength. If one of the curing procedures of paragraphs 3.07.b.1 or 3.07.b.2, is used initially, it may be replaced by one of the other procedures of paragraph 3.07.b anytime after the concrete is 1 day old provided the concrete is not permitted to become surface dry during the transition.

- F. Cold weather: when the mean daily outdoor temperature is less than 40 degrees f, the temperature of the concrete shall be maintained between 50 degrees and 70 degrees f for the required curing period of paragraph 3.07.e. When necessary, arrangements for heating, covering, insulating, or 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, which contain carbon dioxide.
- G. 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.
- H. 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 degrees f in any 1 hour or 50 degrees f in any 24-hour period.
- I. 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. Self-supporting structures shall not be loaded in such a way as to over stress the concrete.

3.10 FIELD QUALITY CONTROL

- A. Field inspection is to be performed by the Engineer or City of St. Charles. When testing of materials or concrete is necessary to meet specification requirements, the contractor shall be responsible for the cost of testing.
- B. Provide access to all portions of the work and any necessary assistance in obtaining and handling samples at the project or other material sources. Three concrete test cylinders will be taken for every 50 cubic yards, or fraction thereof, for each class of concrete placed in any one day. One additional cylinder will be taken during cold weather concreting and be cured on the project site under the same conditions as the concrete it represents. One slump test will be taken for each set of cylinders taken.

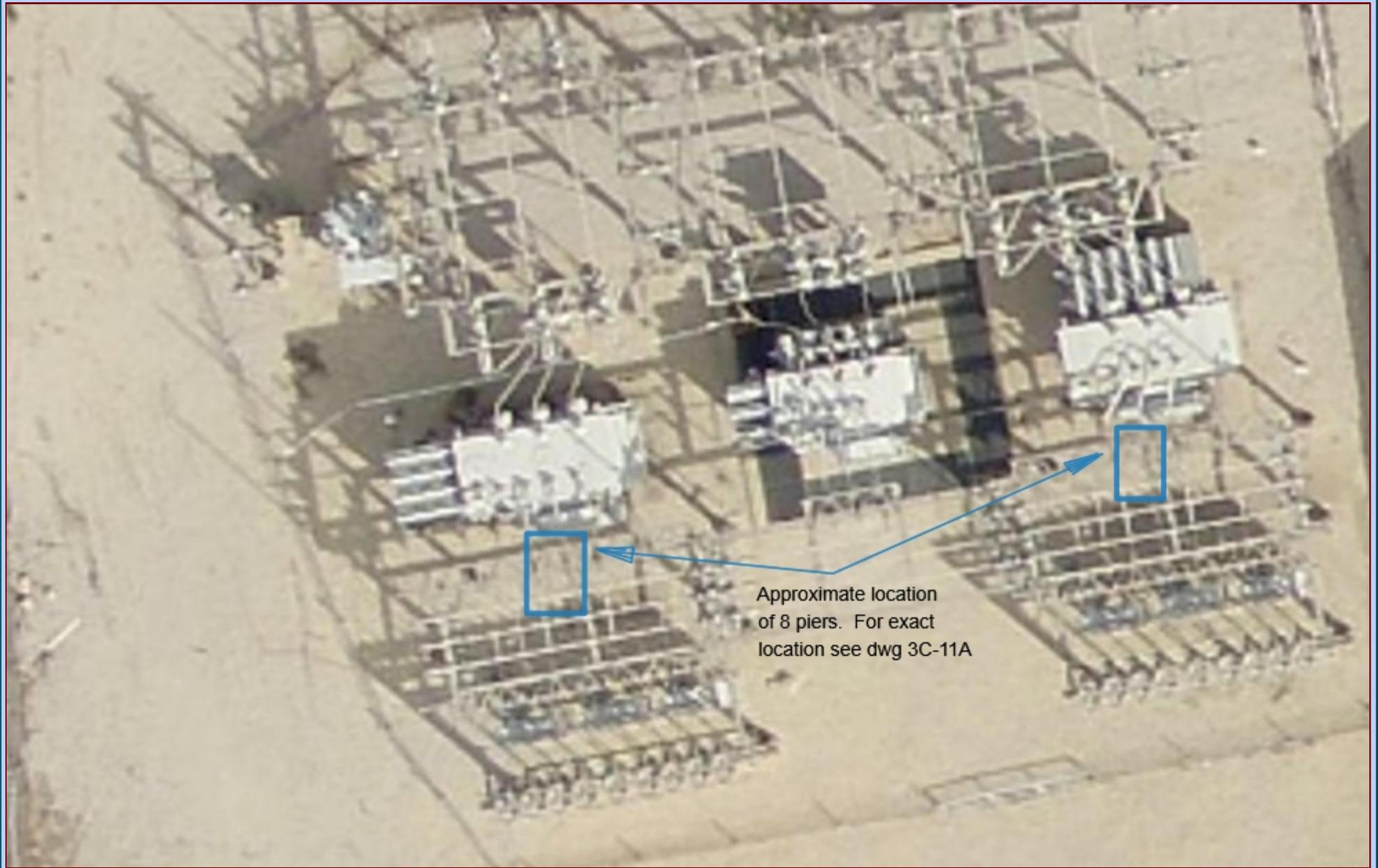
PART 4

4.1. MEASUREMENT AND PAYMENT

Contractor shall submit the separate unit cost for the concrete and concrete duct. Payment for concrete will be made on a cubic yard basis AND concrete duct will be made on a linear foot basis for the area covered. The unit costs will be used for the compensation of the change order due to the change in the

alignment of the concrete duct. No allowance will be made for concrete reinforcement and concrete formwork separately. Payment shall be considered full compensation for all labor, materials, equipment and other items necessary and incidental to completion of the work.

End 03300



Approximate location
of 8 piers. For exact
location see dwg 3C-11A



Data Source:
City of St. Charles, Illinois
Kane County, Illinois
DuPage County, Illinois
Projection: Transverse Mercator
Coordinate System: Illinois State Plane East
North American Datum 1983
Printed on: June 24, 2015 02:42 PM



0 5 10 Feet

Substation 3 civil addition map - Piers for 12KV main feeders

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