

DETAILED SPECIFICATIONS
and
PROPOSAL FORM

for the

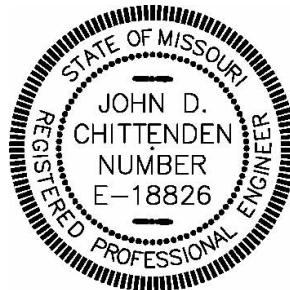
COLEMAN SUBSTATION DRAINAGE
IMPROVEMENTS

for the

SIKESTON BOARD OF MUNICIPAL UTILITIES

by

Waters Engineering, Inc.
Consulting Engineers
Sikeston, Missouri



A handwritten signature in black ink, reading "John D. Chittenden".

August 10, 2026

**PROPOSAL FORM
COLEMAN SUBSTATION DRAINAGE IMPROVEMENTS
SIKESTON BOARD OF MUNICIPAL UTILITIES**

Gentlemen:

THE UNDERSIGNED BIDDER, having examined the Plans, Specifications, General and Special Conditions and other proposed Contract Documents attached hereto and referred to herein, and any and all addenda thereto; the location, arrangements and construction of existing railways, streets, roads, structure and facilities which affect or may be affected by the proposed work, the topography and condition of the site of the work, and being acquainted with and fully understanding (a) the extent and character of the work covered by this Proposal; (b) the location, arrangement and specified requirements of and for the proposed new structures, and miscellaneous items of work appurtenant thereto; (c) the nature and extent of the excavation to be made and the type, character and general condition of the materials to be excavated; (d) the necessary handling and re-handling of excavated materials; (e) all existing and local conditions relative to construction difficulties and hazards, labor, transportation, hauling, trucking and rail delivery facilities, and (f) all other factors and conditions affecting or which may be affected by the specified work.

HEREBY PROPOSES: to furnish all required materials, supplies, equipment, tools and plant; to perform all necessary labor and to construct, install, erect and complete all work stipulated in, required by, and in accordance with the proposed Contract Documents hereto attached and the plans and other documents referred to therein (as altered, amended or modified by, and all addenda thereto) at the prices stated below.

The Bidder hereby agrees to commence assembling materials for the project upon issuance of the Notice to Proceed and to begin and prosecute the actual construction work on the site or sites and to fully complete the contracts within **90** consecutive calendar days after the issuance of the Notice to Proceed.

Bidder further agrees to pay \$500 as liquidated damages for each consecutive calendar day of delinquency for each of the above Completion Requirements.

Bidder hereby acknowledges the receipt of the following Addenda:

The proposal form uses several abbreviations, the definitions of those abbreviations are detailed as follows:

<u>Abbreviation</u>	<u>Meaning</u>	<u>Abbreviation</u>	<u>Meaning</u>
/	per	LS	lump sum
EA	each	SY	square yard
LF	linear foot	T	ton

**LIST OF ESTIMATED QUANTITIES AND UNIT PRICES
COLEMAN SUBSTATION DRAINAGE IMPROVEMENTS**

Item No.	Item Description	Estimated Quantity	Unit Price	Extended Price
1	18-inch Stormsewer	500 LF	\$ /LF	\$
2	Junction Box	1 EA	\$ /EA	\$
3	Type E Drop Inlet	1 EA	\$ /EA	\$
4	Type G Drop Inlet	2 EA	\$ /EA	\$
5	Tie to Existing Drop Inlet	1 EA	\$ /EA	\$
6	Removal & Plugging of Existing Stormsewer	1 LS		\$
TOTAL BID AMOUNT				\$

The undersigned hereby agrees to enter into contract on the attached contract forms and furnish the necessary bond and evidence that insurance of the kind and minimum limits specified is in force within ten (10) days from the date of your acceptance of this proposal, to begin assembly of materials and equipment within ten (10) days from receipt of executed copies of the contract, and to complete said work within the indicated number of consecutive calendar days from and after the date of receipt from the Owner of a written work order.

If this proposal is accepted, and should (I) (We) for any reason fail to sign the contract within ten (10) days, as above stipulated, the deposit which has been this day made with the Owner shall at the option of the Owner be retained by the Owner as liquidated damage for the delay and expense caused the Owner but otherwise it shall be returned to the undersigned in accordance with the provisions set forth herein.

Dated this _____ day of _____, 2026.

SIGNATURES:

If an Individual: _____
Signature of Individual

Doing Business as: _____
Printed Name of Individual & Business

If a Partnership: _____
Name of Partnership

By Member of Firm: _____
Signature of Partner

If a Corporation: _____
Name of Corporation

By Officer: _____
Signature of Officer, Title

(SEAL)

ATTEST TO SIGNATURE:

Signature of Attestee

Printed Name and Title of Attestee

Business Address of Bidder: _____

Phone Number of Bidder: _____

E-mail Address of Bidder: _____

If Bidder is a Corporation, supply the following information:

State in which Incorporated: _____

County in which Incorporated: _____

Name and Address of its President:

Name and Address of its Secretary (Ass't):

SECTION 1 SITE WORK AND GENERAL REQUIREMENTS

1. SCOPE.

This section applies to all items of work and all contracts for the Project, and covers the necessary clearing, grubbing and preparation of the site; removal and disposal of debris, protection of adjacent property, finished grading, seeding, order of construction, signing and other items necessary for the Project.

2. GENERAL.

The Contractor shall conduct his work in a manner to minimize the effect of the project on the public, especially in regard to public safety, public utilities and private property. The Contractor will be required to provide lighted warning signs whenever the construction is in an area subject to vehicular or pedestrian traffic. Any existing utilities damaged or disturbed by the Contractor shall be corrected as directed by the owner of the utility at the Contractor's expense.

3. CLEARING.

The area of the project where excavation is required shall be stripped with topsoil being saved and separated in a stockpile for later use as the finished earthen layer. Unsuitable rubble or debris must be removed from the project site and properly disposed of by the Contractor in compliance with all prevailing laws.

4. FINE GRADING AND SEEDING.

4.1 Fine Grading and Fertility Treatment.

All fill material must be completely free of gravel. Materials excavated from the existing roadway will not generally be acceptable for such fill. Surfaces to be sodded or seeded shall be raked smooth with gravel and deleterious material to be removed.

In all work under the contract grassed surfaces disturbed by the work shall be treated with lime and fertilizer which shall be worked into the soil by discing or harrowing and seed shall be applied by either mechanical or hydraulic means. After application the fertilizer shall be incorporated into the soil by shallow discing or harrowing.

Fertilizing shall be with 350 pounds of 12-12-12 grade or equivalent fertilizer per acre. Lime shall be with 85 percent Calcium or Magnesium Carbonate and shall be applied at 2,500 pounds per acre.

4.2 Seeding & Mulching.

Disturbed grass areas not to be sodded shall have seeding and mulching. Seed and fertilizer shall be incorporated into the soil by shallow discing or harrowing. Within 24 hours after completion of the seeding operation, the seeded area shall be covered with a MoDOT Section 802.2.2 mulch overspray. The mulch cover shall be maintained by the Contractor until a sufficient stand of grass is established to retard erosion.

Straw shall not be used for mulch.

Seeding shall be with 95 percent-pure, 85 percent germination Kentucky 31 Fescue applied at rate of 130 pounds per acre. No direct payment will be made for fine grading, seeding or mulching.

5. DRIVEWAY MAINTENANCE.

During the construction the Contractor shall maintain an all weather surface at all driveways adequate to allow use by the respective Owners. Such maintenance shall be done as incidental work.

6. EROSION CONTROL MEASURES.

The contractor shall exercise best management practices throughout the life of the project to control water pollution. Pollutants such as chemicals, fuels, lubricants, bitumen, raw sewage or other harmful material shall not be discharged from the project. Temporary pollution control measures shall be coordinated with permanent erosion control features specified in the contract to ensure economical, effective and continuous erosion control.

The erosion control measures shall include the items noted on the plans and otherwise required to prevent pollution from surface water. The components of the erosion control measures shall be in compliance with the following:

6.1 Silt Fence.

Silt fence shall be used for control of the migration of silt from a working area, for protection of area inlets and culvert inlets where noted on the plans.

Geotextile fabric for silt fence shall meet the physical and chemical requirements of AASHTO M 288. Posts for silt fence may be wood, steel or synthetic. Posts shall be sufficient length, not less than 4 feet, to ensure adequate embedment while fully supporting the silt fence and shall have sufficient strength to resist damage during installation and to support applied loads while in service.

All geotextile silt fence shall be supported either externally by wire or other approved mesh to a height of at least 24 inches or by a suitable designed-in support system capable of keeping the material erect. Either method shall be strong enough to withstand applied loads.

Silt fence construction shall be adequate to handle the stress from hydraulic and sediment loading. Fabric at the bottom of the silt fence shall be buried a minimum 6 inches so that no flow can pass under the barrier. The trench shall be backfilled and the soil compacted over the fabric. The fabric shall be spliced together only at a support post with a minimum 6-inch overlap. Any installation method acceptable to the engineer will be allowed as long as the effectiveness and intent of the silt fence is achieved.

Post spacing shall not exceed 5 feet. Posts shall be driven a sufficient depth into the ground or placed on closer spacing as necessary to ensure adequate resistance to applied loads.

The silt fence shall be fastened securely to the upslope side of the post. When wire support is used, the wire shall extend into the trench a minimum of 2 inches.

Prefabricated silt fence systems may be used provided they meet all of the above requirements.

6.2 Filter Logs.

Twelve-inch minimum diameter excelsior filter logs may be used for ditch checks and around area inlets.

6.3 Filter Socks.

Filter socks with ballast shall be used around drop inlets and grates. The filters socks shall be of a woven polymer material with a compost or mulch filler designed for the capture of sediment. The socks shall be a minimum of 4-inches high and shall have appurtenances to allow for anchorage and interconnection.

6.4 Maintenance.

The contractor shall maintain the integrity of the erosion control as long as they are necessary to contain sediment runoff. The contractor shall inspect all erosion control immediately after each rainfall and at least daily during prolonged rainfall. Any deficiencies shall be immediately corrected by the contractor. In addition, the contractor shall make a daily review of the location of erosion control in areas where construction activities have changed the natural contour and drainage runoff to ensure the erosion control is properly located for effectiveness. Where deficiencies exist, additional erosion control shall be installed as approved or directed by the engineer.

The contractor shall remove and dispose of sediment deposits when the deposit approaches one-half the height of the original height or sooner when directed by the engineer. Periodic sediment removal shall include removal and disposal of sediment in a location where it will not erode into construction areas or watercourses.

The erosion control measures shall remain in place until the engineer directs it to be removed. Upon removal, the contractor shall remove and dispose of any excess silt accumulations, grade and dress the area to the satisfaction of the engineer, and establish vegetation on all bare areas in accordance with the contract requirements. The erosion control material shall remain the property of the contractor and may be used at other locations, provided the material continues to meet the requirements of this specification, is sound and not weakened by exposure to the elements.

6.5 Measurement & Payment for Erosion Control Measures.

No direct payment will be made for erosion control measures.

7. MEASUREMENT & PAYMENT.

The Contractor must perform all work under the contract with direct payment to be made only for those items specifically listed in the Proposal Form. The work includes all items to be provided for under the terms of the complete contract documents, shown on the plans or otherwise required to complete and place the project into useful service.

Items noted in the Proposal Form to be provided on a "per linear foot", "per square yard" or "per ton" or similar measurable basis will be measured as the actual centerline length, area or weight shown on delivery tickets of that unit installed to the nearest whole unit. Items provided on a "per each" basis will be measured as the actual number of the units actually installed.

SECTION 2 STORM SEWER LINES & APPURTENANCES

1. SCOPE.

The work to be performed under this Section shall consist of furnishing all material, equipment, and labor for the construction of storm sewer lines and appurtenances as shown on the Plans and as specified herein.

2. LOCATION AND GRADE.

The line and grade of the sewer, as well as the location of inlets and all other appurtenances, will be as shown on the plans and as directed by the Engineer. The grade line as given on the profiles indicate the grade of the invert of the storm sewer pipe.

Bench marks and control points for inlets will be given by the Engineer. In the event of failure of the Contractor to protect the bench marks and control points set by the Engineer, the expense of replacing such bench marks will be charged to the Contractor and this amount deducted from the amount due on his final payment. All intermediate line and grade stakes shall be set by the Contractor with a copy of all field notes to be furnished to the Engineer.

The Engineer reserves the right to indicate which lines will receive priority in construction.

3. EXCAVATION.

Excavation shall include clearing the site of the work and removing and disposing of all materials, paving, sidewalks, existing drainage piping, culverts and appurtenances or structures necessary to carry on the construction in the proper manner and to complete the excavation of all materials encountered to the indicated or required depth. The excavation shall also include the sheeting, bracing, dewatering, draining and backfilling, the supporting of structures and the accommodation of utilities encountered above or below ground during construction, and all incidental work necessary for the excavation and backfilling of trenches to construct the lines as indicated on the plans and called for in these specifications.

The Contractor shall keep pipe laying as close to the excavation as possible. The Engineer reserves the right to stop excavation at any time when in his opinion, the excavation is opened too far in advance of the pipe laying.

Trenches shall be only of sufficient width to provide a free working space on each side of the pipe. To prevent excess pressures on the pipe, the maximum width of sewer trench at the top of the pipe shall not be greater the inside pipe diameter plus 2 feet. The contractor shall use shoring or a trench box on lines where the top width of an open trench would exceed 12 feet and to prevent damage to public or private property or as otherwise approved or directed by the Engineer.

The trenches shall be kept free from water until the backfill has been placed above the pipe.

All material excavated shall be placed so as not to interfere with public travel. Trenches shall be bridged in a secure manner to prevent any serious interruption of travel upon the street and sidewalk. Bridging shall also be provided to afford necessary access to public or private premises.

Existing utilities and fencing shall be protected during the construction period and shall be replaced or repaired in a workmanlike manner to the satisfaction of the Engineer if damaged or removed. This work shall be considered as part of excavation and will not be paid for as an extra.

4. DEWATERING.

The Contractor shall prevent the accumulation of water in both structural and trench excavation and will remove by well point system or by other means any water or other liquid waste which accumulates in the excavation. In case water is encountered in the excavation, and the Engineer so requires, the Contractor shall provide, install, and operate a suitable and satisfactory dewatering system. The ground water must be lowered to at least one foot below subgrade and the excavation or ditch must be maintained dry and firm during the period of pipe laying, placing structural concrete and/or bedding material and backfilling. No direct payment will be made for dewatering of any form, and no adjustments of contract time will be allow for handling of groundwater.

5. CRUSHED STONE BEDDING & BACKFILL FOR LINES IN TRAFFIC AREAS .

All lines laid beneath roadways, driveways and parking areas and other areas subject to vehicular traffic shall be provided with a crushed stone bedding and backfill consisting of MoDOT Type 1 or 5 aggregate base. The bedding material shall be laid from a minimum depth of 4 inches beneath the pipe to the adjacent pavement grade, and shall extend for the full width of the excavation.

The crushed stone shall be moved beneath the pipe by use of shovel or similar instrument used with a curved slicing action, and shall be mechanically compacted in 9-inch maximum lifts until there is no further sign of compaction.

6. BACKFILLING.

Lines not beneath roadways, driveways or parking areas shall be backfilled in accordance with this section. All trenches and excavations shall be backfilled immediately after the pipes are laid therein unless other protection of the pipe line is directed. The backfilling material shall be selected and deposited with sufficient reference to the future safety of the pipe. The intent of this Specification is to secure a condition where no detrimental settlement of trenches will occur after backfilling is completed.

6.1 Initial Backfill.

The backfill to 6 inches above all pipes shall be made with select clean native sand material free of plastic clayey material, debris, organic material, frozen material or stones or clods larger than 6 inches and shall be placed in layers not exceeding 9 inches in loose thickness and shall be hand placed and tamped to a point that no further appreciable compaction of the backfill material is observed. As directed by the Engineer, the Contractor shall use native sand from elsewhere on the project for initial backfill in areas where plastic soils are encountered in the trench excavation.

6.2 Final Backfill.

The final backfill of lines outside traffic areas may be placed in lifts not to exceed 18 inches in loose thickness and may be compacted by successive passes of heavy construction equipment to a point that no further appreciable compaction of the backfill material is observed.

6.3 Backfill Around Drop Inlets.

Wherever excavation is necessary beyond the external line of drop inlets, junction boxes, manholes and the like, these spaces shall be treated in the same fashion as backfilling trenches and shall required either crushed stone bedding and backfill or initial and final backfill as set out herein.

7. OPEN CUT PIPE INSTALLATION.

The laying of pipes in finished trenches will be commenced at the lowest point with ends abutting and true to line and grade. They shall be fitted and matched so that when laid in the work they will form a sewer with a smooth and uniform invert. Grade control must be by an approved self-leveling laser except for line segments of 60 feet or less.

8. STORMSEWER PIPE MATERIAL SPECIFICATIONS.

The plans call for the installation of storm sewer piping, and reference may be made thereon to "pipe" or "P". The intent of this designation is to allow the opportunity for a variety of materials to be used for the work. Unless noted otherwise on the plans, the contractor may opt to use any of the following approved types of pipe in the work. Where a specific type is referenced (such as DIP, RCP, HDPE, PVC etc.) that type must be used.

8.1 Reinforced Concrete Pipe (RCP).

Reinforced Concrete Pipe (RCP) shall be in compliance with C76, Class III, Wall B and may be used for all lines unless another pipe type is specifically noted to be required on the plans. Joints in RCP shall be made with a preformed sealer, Ram-nek or equal.

8.2 Corrugated Polypropylene (CPP).

Corrugated **Polypropylene** Pipe (CPP) with corrugated interior and smooth interior may be used for all lines noted as "pipe" unless another pipe type is specifically noted to be required on the plans.

Pipe with bell & spigot joints shall be in compliance with AASHTO-330. Gaskets shall meet the requirements of ASTM F477 and shall be factory installed and be protectively wrapped.

Crushed stone bedding consisting of a crushed and processed stone well graded and have 90 to 100% passing a 3/4 inch sieve and 0 to 10% passing a number 4 sieve (ASTM Size 67) will be required for all CPP.

The bedding material shall be laid from a minimum depth of 4 inches beneath the pipe to the crown of the pipe, and shall extend for the full width of the excavation. The crushed stone shall be moved beneath the pipe by use of shovel or similar instrument used with a curved slicing action.

8.3 Aluminized Corrugated Steel Pipe (CSP).

In certain locations the plans call for piping and end sections to be corrugated steel pipe (CSP) only in accordance with this paragraph. CSP shall only be used where specifically noted on the plans. Pipe noted to be CSP shall be Type 2 Aluminized corrugated steel pipe and shall be in accordance with AASHTO M-36 and with 2-2/3x1/2-inch corrugations in 14 gage.

Joints shall be made with annular re-rolled pipe ends and 12-inch aluminized bands with neoprene gaskets.

9. DROP INLETS & JUNCTION BOXES.

Drop inlets and junction boxes shall be built on the storm sewer at such points and to such depths as are indicated on the plans, and shall conform in all respects to the detailed plans for the type specified. The tops of castings and spillway inlets shall be brought to grade and indicated on the plans or as directed by the Engineer.

9.1 Construction of Drop Inlets.

Drop inlets shall be built of cast-in-place reinforced concrete.

9.2 Concrete & Reinforcing Steel.

Concrete for field use in drop inlets or concrete discharge pads shall be in compliance with Section 3 - Cast-in-Place concrete. Reinforcing steel shall be grade 40 deformed bars.

9.3 Castings.

Castings shall be of the type shown on the plans and shall weigh not less than the noted weights. Cast iron frames and covers shall conform with current specifications for "Gray Iron Castings", ASTM Designation A-48.

10. PROTECTION OF EXISTING IMPROVEMENTS.

10.1 Cleanup.

The contractor shall complete the cleanup, including seeding and mulching, as soon as possible after the completion of the installation.

10.2 Maintenance of Roadways.

The contractor shall maintain a smooth traversable gravel crossing where roadways have been cut until the final replacement pavement is replaced. The contractor must maintain a stockpile of replacement gravel and shall ascertain that before weekends and after rains that roadway cuts are in appropriate condition. No direct payment will be made for this work.

10.3 Driveway Maintenance.

The Contractor shall maintain a limestone surface at all driveways adequate to allow use by the respective Owners. Such maintenance shall be done as incidental work.

10.4 Protection of Vegetation.

Wherever it becomes necessary in excavating to cut fences or disturb lawns and shrubbery, the disturbed items shall be restored to original condition after the completion of backfilling.

11. ACCOMMODATION AND ADJUSTMENT OF UTILITIES.

11.1 Accommodation of Existing Water & Sewer Lines & Appurtenances.

The plans show the general location of certain utilities. These locations were determined based upon information from field surveys and maps provided by the Owner, and show probable locations of the features and are not represented to be accurate.

During the construction the Owner will mark upon the surface of the ground the probable location of water and sewer lines and appurtenances to the best of their ability, however, it shall not be the Owner's responsibility to excavate and locate existing utilities, and the Owner's marking of a probable location of a water or sewer line or appurtenance shall not relieve the contractor of any obligations to protect existing utilities.

It shall be the Contractor's responsibility to physically find, protect, and as required, repair existing utilities damaged during the construction of the project.

Repairs shall be effected immediately by the Contractor and in a workmanlike manner. The contractor shall maintain an inventory of water and sewer service and main repair products.

Water and sewer service lines may be repaired with Schedule 40 PVC piping of the same size as that damaged, using PVC compression fittings for water, and Fernco type coupler for sewer services. Water mains shall be repaired with stainless steel repair sleeves.

No direct payment will be made for repair of damage to existing utilities. Direct payment will be made for adjustment of water mains and sanitary sewer service lines if set out in the proposal form.

11.2 Water Service Line Adjustments.

Any require adjustments to existing water or sewer lines will be made by the Owner.

12. **EROSION & SEDIMENT CONTROL MEASURES.**

Erosion control measures as set out in Section 1 - Site Work and on the erosion control plan shall be required.

**SECTION 3
CAST-IN-PLACE CONCRETE**

1. SCOPE.

The work to be performed under this section shall be to furnish and install all cast-in-place concrete features of the project. The materials and methods outlined herein shall be employed unless otherwise specifically noted on the plans or elsewhere in these specifications. All materials, equipment and labor necessary to properly complete cast-in-place features shall be provided including, but not to be limited to, that specified herein or noted on the plans.

2. RELATED WORK SPECIFIED ELSEWHERE.

Site Work	Section 1
Stormsewers	Section 2

3. MATERIALS.

Materials shall be as follows:

- | | | |
|----|------------------------|---|
| a. | Cement | ASTM C150, Type I or II. |
| b. | Fine Aggregate | Clean natural sand, ASTM C33. |
| c. | Coarse Aggregate | Crushed rock, washed gravel, or other inert granular material conforming to ASTM C33, well graded nominal size, 3/4 inch. |
| d. | Water | Clean and free from deleterious substances. |
| e. | Air-Entraining Agent | ASTM C260. |
| f. | Reinforcing Steel | |
| | (1) Bars | ASTM A615, Grade 60, with Grade 40 used for specifically noted field bent dowel bars. |
| | (2) Welded Wire Fabric | ASTM A185 or A497. |
| | (3) Bar Supports | Department of Commerce, Product Standard PS7, fabricated from galvanized wire. |
| g. | Expansion Joint Filler | Premolded, ASTM D1751 or D1752 Strips 3/8 inch thick unless otherwise indicated. |
| h. | Joint Sealer | ASTM D1850. |
| i. | Forms | |
| | (1) Prefabricated | |
| | (2) Plywood | Department of Commerce, Product Standard PS1, water-proof, resin-bonded, exterior type, Douglas fir. |

- | | | |
|-----|----------|---|
| (3) | Lumber | Straight, uniform width and thickness, and free from knots, offsets, holes, dents, and other surface defects. |
| (4) | Form Oil | Light colored paraffin oil or other acceptable nonstaining material. |
- j. Waterproof Sheeting ASTM C171.
- k. Membrane Curing Compound ASTM C309, Type 2.

4. **PRELIMINARY REVIEW.**

The source and quality of concrete materials and the concrete proportions proposed for the work shall be submitted to the Engineer for review before any concrete is placed.

5. **LIMITING REQUIREMENTS.**

Concrete shall be controlled within the following limiting requirements.

5.1 Minimum Cement Factors.

The quantity of portland cement shall not be less than 6.7 bags (630 pounds) per cubic yard.

5.2 Aggregates.

The maximum total combined aggregate weight shall be 2930 pounds, and the maximum fine aggregate weight shall be 1200 pounds per cubic yard. The actual weights to be used shall be those necessary to produce concrete of proper consistency.

5.3 Total Water Content.

Total water content of concrete shall not exceed 33 gallons of water per cubic yard.

5.4 Slump.

Concrete slump shall be kept as low as possible consistent with proper handling and thorough compaction. Unless otherwise authorized by the Engineer, slump shall not exceed 5 inches.

5.5 Total Air Content.

The total volumetric air content of concrete after placement shall be between 4 and 7 percent.

5.6 Strength.

The minimum acceptable compressive strengths as determined by ASTM C39 shall be:

<u>Age</u>	<u>Minimum Strength</u>
7 days	2700 psi
28 days	4000 psi

6. QUALITY CONTROL TESTING.

6.1 General.

The Contractor's quality control program shall include the tests and certifications specified in this Section, all costs for concrete testing shall be borne by the Contractor. The number of tests specified are the minimum required. Additional tests shall be performed when there is reason to suspect nonconformance to the specified requirements. Testing entities shall be subject to the approval of the Engineer. All field tests must be observed by the Owner's resident project representative (RPR).

6.2 Aggregates.

Aggregates shall be sampled and tested as prescribed in ASTM C33. Tests shall be made on each size and results submitted for approval of sources well in advance of concrete placing. Gradation tests shall then be made on each size at intervals corresponding to each 250 cubic yards of concrete.

6.3 Concrete.

6.3.1 Concrete strength tests during the work.

Each set of test specimens shall consist of three specimens each taken from separate batches. One set shall be taken from each 50 cubic yards, or fraction thereof, of concrete placed, and at least one set shall be made in each 8-hour shift. Sampling shall conform to ASTM C172, and the preparation and handling of specimens shall conform to ASTM C31. Cylinders shall be cured in the laboratory and tested by ASTM C39. Field curing may be required when air temperatures below 40 F are anticipated. The standard age of test shall be 28 days, but 7-day tests may be used, on written approval, when the strength relationship between 7-day and 28-day tests has been established for a specific mix. Cylinders may be made by the Contractor in the presence of the RPR but must be strength tested by an approved independent laboratory. The strength of each set shall be reported.

6.3.2. Slump.

At least one slump tests shall be made and results recorded for each set of strength samples. Slump shall be determined by ASTM C143, and may be made by the Contractor in the presence of the RPR.

6.3.3. Entrained Air.

Content shall be determined immediately after discharge from the mixer by ASTM C231. Air content measurements shall be made no less frequent than that required for slump, and may be made by the Contractor in the presence of the RPR.

6.4 Materials Certifications.

Certificates of compliance shall be submitted for the following materials:

Sheet-type curing materials	Vapor Barrier
Premolded joint filler strips	Joint Sealer
Air entraining admixture	Mesh reinforcement
Membrane-forming curing compounds	Cement

6.5 Shop Detail Drawings.

Shop drawings for reinforcing steel shall be submitted.

7. STORAGE.

Accommodations shall be approved and easily accessible for inspection and identification of each shipment. Cement shall, upon receipt, be separately stored in a dry, weathertight, properly ventilated structure and protected from the absorption of moisture. Aggregates shall be stored to assure good drainage, to preclude inclusion of foreign matter, and to preserve the gradation.

8. FORMWORK.

Forms shall be designed, constructed, and maintained to provide finished concrete members with true surfaces free of waviness or bulges, conforming accurately to the indicated shapes, dimensions, lines, elevations, and positions. Surfaces in contact with concrete shall be thoroughly cleaned before each use. Studs shall be spaced to prevent visible deflection of form material. Forms and joints shall be tight to prevent leakage of grout and cement paste during the placing of concrete.

Concrete surfaces to be exposed or painted shall be formed with material that is nonreactive with concrete and will produce concrete surfaces equivalent in smoothness and appearance to those formed with new plywood panels, exterior type, Grade B-B.

Form ties shall be factory-fabricated, removable or snap-off metal ties designed to limit form deflection and not spall concrete upon removal. Solid backing shall be provided for each tie. Ties shall have devices to form a 1/2 to 1 inch diameter depression, deeper than its diameter, in the concrete surface. The portion remaining after removal of the exterior parts shall not project beyond the formed surface and shall be at least 1 inch back from any surface.

External corners, junctures with masonry, foundation walls projecting beyond overlying masonry, and other exposed external corners shall be beveled, rounded, or chamfered.

Forms shall be coated with form oil or form-release agent before reinforcement is placed. Form oil shall be an approved commercial formulation that will neither bond with, stain, or adversely affect concrete surfaces, nor impede subsequent treatments, curing or application of finishes.

Forms may be removed, except when concrete is soft enough to be damaged, after 24 hours. Forms used for curing shall not be removed before the expiration of the curing period except as specified in the paragraph "Curing." Care shall be taken to avoid damage to the formed surfaces and edges. Wood forms shall be completely removed.

9. REINFORCEMENT.

Reinforcement shall be fabricated to shapes and dimensions shown and placed where indicated. Reinforcement shall be free of any substance that would reduce or destroy the bond. After any substantial delay, steel left exposed shall be inspected and cleaned. Laps or splices shall be made in conformance with ACI Standard 318.

Reinforcement detailing and placement, including concrete protection for steel reinforcement, unless otherwise indicated, shall conform to ACI Standards 318 and 315.

Wire-mesh reinforcement shall be continuous between crack-control joints in slabs-on-grade. Laps shall be at least one full mesh, staggered in both directions, and secured with wire or standard clips. Wire mesh shall extend to within 2 inches of joints but not through joints.

Supports shall be installed and intersections and splices of reinforcement securely tied with 16 gage black annealed wire to limit displacement to the tolerances permitted by ACI Standard 315. The number, type, and spacing of supports shall conform to ACI Standard 315, unless otherwise indicated. Reinforcement for slabs-on-grade and for footings shall be supported on precast concrete blocks. Size and spacing of blocks shall be as required to provide firm support and clearances specified or indicated.

10. BATCHING AND MIXING.

Equipment and procedures for mixing and transporting concrete shall conform to ASTM C94, except as modified in this Section.

11. PLACING CONCRETE.

Concrete shall be transported without segregation or loss of ingredient as continuously and rapidly as practicable to the place of final deposit until completion of the approved unit.

Concrete shall be placed as nearly as practicable in final position, in uniform approximately horizontal layers not over 12 inches deep. Concrete splashed on forms or reinforcement shall be removed before placing subsequent lifts. A tremie or other approved means shall be used to limit the distance of free drop to 5 feet.

12. COLD WEATHER REQUIREMENTS.

Concrete shall not be placed without special protection when freezing temperatures can be anticipated within the specified curing period. Approval must be obtained for placement of concrete under low temperature conditions. When placed the concrete temperature shall be between 50 and 70 degrees F. The mixing water and/or aggregates shall be heated as required to provide the minimum concrete temperature. All methods and equipment shall be subject to approval.

13. HOT WEATHER REQUIREMENTS.

Except as modified in this Section, hot weather concreting shall comply with ACI 305. At air temperatures of 90 degrees F or above, concrete shall be kept as cool as possible during placement and curing. The temperature of the concrete when placed in the work shall not exceed 90 degrees F.

Plastic shrinkage cracking, due to rapid evaporation of moisture, shall be prevented. Concrete shall not be placed when the evaporation rate (actual or anticipated) equals or exceeds 0.2 pounds per square foot per hour, as determined by Figure 2.1.4 in ACI 305.

14. COMPACTION.

Compaction shall be by internal concrete vibrators supplemented by hand-spading, rodding, and tamping. Forms shall not be externally tapped or vibrated. Concrete shall not be transported inside forms by vibrators. Vibrators shall maintain 7,000 impulses or more per minute when submerged in concrete.

15. BONDING.

Set concrete surfaces to receive new concrete shall be clean and free of laitance, foreign matter, and loose particles. Forms shall be retightened. The surfaces shall be without free water when concrete is placed.

16. FINISHES OF CONCRETE.

Surface defects shall be remedied as specified within 24 hours of form removal. Fins and loose material shall be removed. Honeycomb, aggregate pockets, voids over 1/2-inch in diameter, and holes left by the tie rods or bolts shall be cut out to solid concrete, thoroughly wetted, brush-coated with neat cement grout, and filled with mortar. Mortar shall be a stiff mix of 1 part blended portland and white cements to 2 parts fine aggregate and a minimum amount of water. Patchwork rubbed to match adjacent surfaces and shall then be damp cured for a minimum of 72 hours.

All exterior flatwork shall be given a light broomed finish. All interior flatwork shall be given a slick power trowel finish.

17. CURING.

Concrete and surface treatments shall be protected against moisture loss and rapid temperature change for 7 days. Concrete shall be maintained in a moist condition and above 50 degrees F throughout the period. Concrete shall be protected from rapid temperature change and rapid drying for 24 hours after protection is removed. Curing activities shall be started as soon as possible after placing and finishing. Formed surfaces may be moist cured in the forms for the full curing period or by other approved means. Curing shall be accomplished by any of the following methods or combination thereof, as approved, except that surfaces with a smooth rubbed finish and building floor slabs must be moist cured.

17.1 Moist Curing.

Surfaces shall be covered with mats or two layers of burlap, wetted before placing, overlapped at least 6 inches, and then kept continually wet and in intimate contact with the surface.

17.2 Impervious-Sheet Curing.

All surfaces shall be thoroughly wetted and covered with the specified materials. Covering shall be lapped at least 12 inches or at least 4 inches if taped to form continuously closed joints. Sheets shall be weighted to prevent displacement or billowing from winds. Sheets with tears or holes shall be immediately repaired.

17.3 Membrane Forming Compound Curing.

The compound shall be applied as soon as the moisture film has disappeared. The curing compound shall be applied in strict conformance with directions furnished by the manufacturer. Surfaces subsequently damaged within the curing period or subjected to heavy rainfall within 3 hours of application shall be recoated. Membrane curing compound shall not be used on construction joints.

18. REPAIRING DEFECTIVE CONCRETE.

Defects in formed concrete surfaces shall be repaired within 24 hours, to the satisfaction of the Engineer, and defective concrete shall be replaced within 48 hours after the adjacent forms have been removed. All concrete which is honeycombed or otherwise defective shall be cut out and removed to sound concrete with edges square cut to avoid feathering.

Concrete repair work shall conform to Chapter 9 of ACI 301 and shall be performed in a manner that will not interfere with thorough curing of surrounding concrete. Repair work shall be rubbed to match adjacent surfaces and shall be moist cured for a minimum of 72 hours.

19. FINISHING FORMED SURFACES.

Fins and other surface projections shall be removed from all formed surfaces, except exterior surfaces that will be in contact with earth backfill and are not specified to be dampproofed. A power grinder shall be used, if necessary, to remove projections and provide a flush surface. Surfaces to be dampproofed shall have fins removed and tie holes filled, but no additional finishing will be required.

Tie holes in all formed surfaces shall be cleaned, wetted, and filled with patching mortar. Patches shall be finished flush and shall be rubbed to match the texture of the adjacent concrete.

20. WATERSTOPS.

Waterstops shall be provided at all concrete construction and control joints where a watertight joint is required. Waterstops shall be PVC of the ribbed type with center bulbs and split where practicable. Dimensions shall be a minimum of 8 inches in width for walls 12 inches thick and larger and 6 inches for walls less than 12 inches all with a 3/8-inch web. Methods for splicing and making fittings shall be subject to the approval of the Engineer.

21. NON-SHRINK GROUT.

Non-shrink grout shall be used for the patching of connections to existing concrete structures as required on the plans shall be in compliance with Corp's of Engineers' Specification CRD-C621-83 for non-metallic, non-shrinking and high-strength grout.

22. TOLERANCES.

Tolerances for formed surfaces shall be as specified in ACI 301 and 347 except as modified in this Section. In case of conflict, ACI 347 shall govern.