Alameda - Contra Costa Transit District
Project Specifications for Construction of

Point Richmond Operator Restroom Project

Contract No. 2019-1461

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PREPARED BY
CHOW ENGINEERING INC.

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SELECTIVE SITE DEMOLITION

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes specifications for the demolition and removal of structures and foundations, including backfilling of resultant excavations and depressions, as indicated.

B. Extent of demolition work shall be as follows:
1. Removal of concrete slabs, sidewalks, and concrete and asphalt pavements as indicated on the Contract Drawings.
2. Removal and salvage of a trash can, bench, and porta potty as indicated on the Contract Drawings.
3. Removal and reconstruction of portions of irrigation sprinklers, valve boxes and piping.
4. Removal from the premises of all materials from the site each day.

C. The work includes restoration of existing structures and facilities to remain in place that are damaged by demolition and removal operations.

1.02 REFERENCE STANDARDS

A. American National Standards Institute (ANSI): ANSI A10.6 Safety Requirements for Demolition

B. "Greenbook" Standard Specifications for Public Works Construction, current Edition.

1.03 REGULATORY REQUIREMENTS

A. California Code of Regulations, Title 8, Chapter 4, Subchapter 4 - Construction Safety Orders.

1.04 PERMITS

A. The Contractor shall obtain all routine and all special permits including but not limited to recycling permit and licenses and give all notices required for performance and completion of the demolition and removal work, hauling, and disposal of debris.

1.05 SUBMITTALS

A. Permits: Submit copies of demolition, recycling, hauling, and debris disposal permits and notices for record purposes. Include description of proposed haul routes.

B. Overhead Power Line and Pole protection plan.

C. Existing Tree protection plan.

1.06 SITE CONDITIONS

A. Protection of Persons and Property:
1. Install temporary barriers around the area of work.
2. Contractor shall coordinate construction staging, temporary lay-down areas, and bus impacts with AC Transit prior to the beginning of construction.
3. Erect and maintain temporary lights, barricades, signs, and other measures as necessary to protect the public, workers, buses and adjoining structures from damage

from demolition work, all in accordance with applicable codes and regulations.

4. Open depressions and excavations occurring as part of this work shall be barricaded and posted with warning lights when accessible through adjacent areas or through public access. Operate warning lights during hours from dusk to dawn each evening and as otherwise required.
5. Protect utilities, pavements, and facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by demolition operations.
6. Do not obstruct travel ways or bus stop loading areas unless otherwise directed or approved. Contractor shall coordinate with the AC Transit Project Manager.

B. Protection of Utilities and Existing Site Features:
1. Protect in place active sewer, water, gas, electric, and other utilities, and drainage and irrigation lines indicated or, when not indicated, found or otherwise made known to the Contractor before or during demolition work. If utility is damaged, immediately notify the Owner's Representative and utility owner for corrective action.
2. Protect existing trees, vegetation, signs, facilities and other site features.

C. Noise and Dust Abatement:
1. Provide continuous noise and dust abatement as required to prevent disturbance and nuisance to the public and workers and to the occupants of adjacent premises and surrounding areas. Dampen or cover areas affected by demolition operations as necessary to prevent dust nuisance.

D. Unknown Conditions:
1. The Contract Drawings and related documents may not represent all surface or subsurface conditions at the site and adjoining areas. The known surface and subsurface conditions are as indicated and shall be compared with actual conditions before commencement of work.
2. Existing utilities and drainage systems below grade are located from existing documents.
3. If existing active services encountered are not indicated or otherwise made known to the Contractor and interfere with the permanent facilities under construction, notify the Owner's Representative in writing, requesting instructions on their disposition. Take immediate steps to ensure that the service provided is not interrupted, and do not proceed with the work until written instructions are received from the Owner's Representative.
4. Thickness and size of existing pavements, slab and other elements are from previous construction documents, and do not imply the actual depth or thickness of the element where it occurs. Remove 6" to 10" thickness of the element as required.
5. If existing conditions encountered are different than those indicated, and interfere with the work, notify the Owner's Representative or AC Transit Project Manager in writing prior to proceeding with the work.

PART 2 – PRODUCTS

2.01 MATERIALS, EQUIPMENT, AND FACILITIES

A. The Contractor shall furnish all materials, tools, equipment, devices, appurtenances, facilities, and services as required for performing the demolition and removal work.

PART 3 – EXECUTION

3.01 DEMOLITION

A. Perform demolition work in accordance with ANSI A10.6 and the California Code of Regulations, Title 8 and Title 24, as applicable.

B. Blasting will not be permitted. Saw cut concrete and asphalt where indicated on plans to full depth unless otherwise approved by the Engineer, with saw designed for cutting pavements. Cuts shall be straight and free of ragged edges

3.02 DISPOSAL OF DEBRIS

A. Dispose of removed materials, waste, trash, and debris in a safe, acceptable manner, in accordance with applicable laws and ordinances and as prescribed by authorities having jurisdiction.

B. Burying of trash and debris on the site will not be permitted. Burning of trash and debris at the site will not be permitted.

C. Remove trash and debris from the site at frequent intervals so that their presence will not delay the progress of the work.

D. Removed materials, trash, and debris shall become the property of the Contractor and shall be removed from the Owner's property and disposed of in a legal manner. Location of disposal site and length of haul shall be the Contractor's responsibility.

E. Remove all materials from the site at the end of each work day.

3.03 SALVAGE AND RECYCLING

A. Salvage existing bench and trash can as indicated on the Contract Drawings.

B. Repair, or replace with new material, salvaged material damaged or destroyed by Contractor’s activities.

C. Salvaged items which are not re-installed and not recycled in the Work shall remain the property of the Contractor.

D. The Contractor shall secure all permits, and make required arrangements prior to hauling salvaged or recycled material.

E. The Contractor shall provide proof of legal disposal or legal recycling.

3.04 RECONSTRUCTION

A. Existing structures or facilities that are to be reconstructed, re-laid, relocated, reset, or installed at existing or new locations shall conform to the design of the existing structures or facilities and shall be equal in all respects to the existing structures or facilities. The work or reconstruction shall be performed in accordance with the requirements of these specifications for new work of similar character, which apply to the type of facility to be reconstructed, adjusted, modified, remodeled, relaid, relocated, or reset.

B. Materials to be reused shall not be removed until their use is no longer required as determined by the Owner’s Representative.

C. Materials to be reused in the work shall be cleaned of all earth and other foreign materials. All adhering concrete shall be removed from materials to be reused in the work.

D. Materials shown on the Contract Drawings to be reused in the work that are damaged as a result of the Contractor’s operations shall be repaired by the Contractor, at the Contractor’s expense, to the satisfaction of the Owner’s Representative. Materials that are damaged beyond repair as a result of the Contractor’s operations shall be disposed of and replaced at the Contractor’s expense.

E. Materials from existing structures or facilities to be reused in the work that, in the opinion of the Owner's Representative, are unsuitable for use in the work shall become the property of the Contractor and shall be disposed of. The unsuitable material shall be replaced with material of a kind and quality equal to the best material in the existing facility. Furnishing of material to replace unsuitable materials as ordered by the Owner's Representative or AC Transit Project Manager will be paid for as extra work.

3.05 RESTORATION OF EXISTING STRUCTURES AND FACILITIES:

A. All damage to existing structures and facilities that are to remain in place shall be repaired to a condition equal to that existing prior to the beginning of demolition and removal operations. The cost of repairing existing structures and facilities damaged by the Contractor's operations shall be at the Contractor's expense.

END OF SECTION 02 21 20

SECTION 02 31 30

EARTHWORK

PART 1 GENERAL

1.01 SCOPE

A. Work included under this section shall include site grading and fill, excavation, backfill and compaction for foundations, slabs on grade and utility trenches.

1.02 REFERENCES

A. Standard Specifications - The latest edition of the publications listed below form a part of this specification to the extent referenced. References within the body of text refer to the basic specification designation only.
   1. ASTM D442 – Test Method for Particle-Size Analysis of Soils
   2. ASTM D1140 – Test Method for Amount of Material in soils Finer than the No. 200 (75-micrometer) Sieve
   3. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft3 (2,700 kN-m/m3))
   4. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil In-place by the Sand Cone Method
   5. ASTM D2922 – Standard Test Methods for Density of Soil and Soil-Aggregate In-place by Nuclear Methods (Shallow Depth).

1.03 SUBMITTALS:

A. The CONTRACTOR shall provide the following submittals:
   1. Results of laboratory gradation testing on off-site borrow materials. Gradation testing to be performed in accordance with ASTM D442 and D1140 at the rate of one test per 1000 cubic yards of material.
   2. Results of field density tests.
   3. Dust Control Plan.

PART 2 PRODUCTS

2.01 IMPORTED FILL MATERIALS

A. Materials imported and utilized for general fill shall be select non-expansive engineered fill. Engineered fill material shall be chemically inert, free of organic materials and conform to the following minimum criteria:
   1. Plasticity Index 15 or less
   2. Liquid Limit 35 or less
   3. Gradation per ASTM D442 and ASTM D1140:
   4. Sieve Size Percentage Passing
   5. 4-inch 100%
   6. ¾-inch 75%
   7. No. 200 8 to 40%

2.02 FOUNDATION BACKFILL MATERIALS

A. Backfill materials shall be 100% virgin Class 2 Aggregate Base.

2.03 PIPE BEDDING MATERIALS

A. Pipe bedding shall be defined as all material within 6 inches of the perimeter of the pipe. Backfill shall be classified as all material within the remainder of the trench. Material for bedding shall be as required by the Utility providing service or as required on the drawings. Unless otherwise specified, material for use as bedding shall consist of clean granular materials having a sand equivalent of not less than 30.

B. Backfill in areas outside of the bedding zone shall conform to the requirements specified in Section 2.02.

C. A colored detectable metallic foil core plastic tape, at least six (6) inches in width, shall be placed 12”-18” above the pipe wherever any utility lines are installed. The tape shall have printed on it the words “Caution: Sewer Buried Below” or other appropriate identifying utility name, ie. “Water”, “Communications”, etc.” The warning tape shall be utilized for all pipes and conduits (mains and laterals).

PART 3 EXECUTION

3.01 GENERAL

A. Conform excavation to the limits shown on drawings. Do not excavate beyond or below the specified grade except as directed. Where determined necessary by the DISTRICT’S representative, the CONTRACTOR shall extend the depth of excavation until such time as suitable supporting soils are encountered as determined by the DISTRICT’S representative

B. The CONTRACTOR shall be responsible for development and implementation of dust control measures during execution of the work. CONTRACTOR shall submit dust control plan for approval prior to commencing work. Apply water at such times and places as to minimize dust nuisance as directed. This is in addition to water required for compaction.

C. CONTRACTOR shall be responsible for locating all below ground utilities on or adjacent to the zone of construction. CONTRACTOR shall take necessary precautions to prevent damage to underground utilities, vaults, fire hydrants, overhead power lines or any other existing permanent installations.

D. Excavations remaining after installation of structures shall be refilled to the grading plane with structural backfill as shown on the drawings or as directed. The excavation to be backfilled shall be dry and cleaned of all forming or shoring materials, trash, spoil, or debris of any nature.

E. Backfill structural excavation fourteen days after structure installation, and trenches within three days after pipe has been installed, unless otherwise directed by the Inspector.

3.02 SITE PREPARATION

A. Strip site of vegetation and scarify exposed subgrade to a depth of 12 inches. Remove any existing obstructions exposed.

B. Moisture condition scarified areas to a level 2 to 4 percent over optimum moisture content and re-compact as specified in Section 3.3.3.

C. Excavate and re-compact subgrade supporting footings and slabs on grades where indicated on the plans to the depths specified.

3.03 STRUCTURAL FOUNDATION BACKFILL AND COMPACTION

A. Place structural backfill in uniform layers not exceeding 8 inches in loose thickness, at a

moisture content within 2 percent of the optimum determined by ASTM D 1557.

B. Backfill shall not be dropped directly upon any structure or pipe. Backfill shall not be placed around or upon any structure until the concrete has attained sufficient strength to withstand the loads imposed. Except for drain rock materials being placed in over-excavated areas or trenches, backfill shall be placed after all water is removed from the excavation.

C. Compaction Requirements: Compact each layer to not less than the percent relative compaction specified below as determined by ASTM D 1557, when tested in accordance with ASTM D 1556, or as otherwise shown on the drawings.
- Areas beneath paved roads, parking areas and grade supported foundations – 95%
- Areas beneath pile supported foundations – 90%
- Areas beneath graveled areas – 90%
- Vegetated areas – 85%

D. Flooding, ponding, or jetting shall not be used for compaction. Equipment weighing more than 10,000 pounds shall not be used closer to walls than a horizontal distance equal to the depth of the fill at that time. Hand operated power compaction equipment shall be used where use of heavier equipment is impractical or restricted due to weight limitations. Do not place backfill against concrete before concrete has attained sufficient strength to withstand the pressure of the compacted material (minimum 14 days) or as directed. Raise backfill uniformly around structures, columns, footings, or pipes.

3.04 UTILITY TRENCH BEDDING AND BACKFILL

A. Pipe bedding shall be placed in thin layers not exceeding 6 inches in loose thickness, conditioned to the proper moisture content for compaction and compacted to at least 90% relative compaction as defined in ASTM D1557.

B. Backfill materials outside of the bedding zone shall be compacted in 8 inch layers to a relative compaction as follows:
- Beneath paved roads and parking areas – 95%
- Beneath unpaved roads and parking areas – 90%
- Open areas – 85%

3.05 TESTS AND INSPECTIONS

A. Field density tests shall be performed in accordance with ASTM D2922 and the frequencies specified below or when requested by the Engineer:
- Structural Foundations and Backfill – At the excavated and compacted subgrade supporting structural foundations at the depths specified. The more frequent of once for every 250 cubic yards of material, or once per every 1600 square feet of lift, or once per lift, or once per work shift.
- Roads, Shoulders and Parking Lots – Once for every 650 cubic yards of material.
- General backfill – Once for every 1800 cubic yards of material.

B. In the event the tested area fails to meet the specified compaction requirements, two additional tests shall be performed for the area. If either of the two additional tests fails to meet the compaction requirements, the area shall undergo additional compaction and testing until the test results meet the minimum compaction requirements.

C. Gradation testing shall be performed for borrowed fill materials in accordance with ASTM D442 and D1140 at the rate of one test per 1000 cubic yards of material.

END OF SECTION 02 31 30

SECTION 02 41 40

AGGREGATE BASE

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for furnishing, spreading, compacting, and re-compacting aggregate base for pavement as indicated.

B. Aggregate base is designated as Class 2.

1.02 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM):
ASTM D2922 Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D3017 Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

B. State of California, Department of Transportation (Caltrans), Standard Specifications:
Section 17 Watering
Section 26 Aggregate Bases

C. State of California, Department of Transportation (Caltrans), Standard Test Methods:
Calif. Test 201 Method of Soil and Aggregate Sample Preparation
Calif. Test 202 Method of Tests for Sieve Analysis of Fine and Coarse Aggregates
Calif. Test 205 Method of Determining Percentage of Crushed Particles
Calif. Test 216 Method of Test for Relative Compaction of Untreated and Treated Soils and Aggregates
Calif. Test 217 Method of Method of Test for Sand Equivalent
Calif. Test 229 Method of Test for Durability Index
Calif. Test 301 Method of Test for Resistance "R" Value of Treated and Untreated Bases, Subbases and Basement Soils by the Stabilometer

D. “Greenbook” Standard Specifications for Public Works Construction, 2015 Edition

1.03 SUBMITTALS

A. Refer to the General Conditions for submittal requirements.

B. Submit independent laboratory test results that verify material properties of aggregate base to be used.

C. Test Reports: Submit certified test reports of all tests specified to be performed by the Contractor. Test reports shall be sealed and signed by a California registered civil engineer.

PART 2 - PRODUCTS

2.01 AGGREGATE BASE MATERIAL

A. Aggregate for the aggregate base at the time it is deposited on the prepared subgrade or subbase shall conform to the following requirements:

B. **Class 2 Aggregate Base**: Class 2 aggregate base shall be 100% virgin material and consist of gravel and crushed rock, and shall be free of vegetable matter and other deleterious substances. Class 2 aggregate base shall conform to the following grading, determined in accordance with

California Test Method No. 202:

Sieve Sizes	Percentage Passing Sieves
2-inch	100
1-1/2 inch	90-100
1 inch	5-40
3/4 inch	0-15
No. 4	-
No. 30	-
No. 200	0-2

2.02 SOURCE QUALITY CONTROL:

A. The Contractor shall perform sampling and tests of the aggregate base material in accordance with the California Test methods herein specified, to determine compliance with specified requirements. Samples shall be taken from material as delivered to the site, and shall be prepared in accordance with California Test Method No. 201.

PART 3 - EXECUTION

3.01 EXAMINATION

A. The subgrade or subbase to receive aggregate base course, immediately prior to spreading, shall conform to the compaction and elevation tolerances indicated for the material involved and shall be free of standing water and loose or extraneous material.

3.02 INSTALLATION STANDARDS

A. Aggregate base course shall be applied over the prepared subgrade or subbase and compacted to 95 percent relative compaction.

B. Aggregate base course shall be minimum uniform thickness after compaction of dimensions indicated. Where not indicated otherwise, compacted thickness shall be at least 12 inches.

C. All compaction expressed in percentages in this Section refers to the maximum dry density as determined by California Test Method No. 216.

3.03 SPREADING OF MATERIAL

A. Aggregate for base course shall be delivered as uniform mixture of fine and coarse aggregate and shall be spread in layers without segregation.

B. Aggregate base course material shall be free of pockets of large and fine material. Segregated materials shall be remixed until uniform.

C. Aggregate base material shall be moisture-conditioned to near optimum moisture content in accordance with the applicable requirements of Section 17 of the Caltrans Standard Specifications.

D. Aggregate base course 6 inches and less in thickness may be spread and compacted in one layer. For thickness greater than 6 inches, the base course aggregate shall be spread and

compacted in two or more layers of uniform thickness not greater than 6 inches each.

3.04 COMPACTING

A. Relative compaction of each layer of compacted aggregate base material shall not be less than 95 percent as determined by California Test Method No. 216.

B. Thickness of finished base course shall not vary more than 3/4 inch from the indicated thickness at any point. Base that does not conform to this requirement shall be reshaped or reworked, watered, and re-compacted to achieve compliance with specified requirements.

C. The surface of the finished aggregate base course at any point shall not vary more than 3/4 inch above or below the indicated grade.

3.05 FIELD QUALITY CONTROL

A. The Contractor shall perform tests in accordance with ASTM D2922 to determine compliance with specified requirements for density and compaction of aggregate base, and with ASTM D3017 to determine moisture content of the installed base course.

END OF SECTION 02 41 40

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes specifications for conveying and placing cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, curing, and finishes, as indicated on the Contract Drawings.

1.02 REFERENCE STANDARDS

A. American Concrete Institute (ACI):

ACI 116R	Cement and Concrete Terminology
ACI 117	Standard Tolerances for Concrete Construction and Materials
ACI 212.1R	Admixtures for Concrete & Guide Use of Admixtures
ACI 212.2R	Admixtures for Concrete & Guide Use of Admixtures
ACI 212.3R	Chemical Admixtures for Concrete
ACI 301	Specifications for Structural Concrete
ACI 302.1R	Guide for Concrete Floor and Slab Construction
ACI 304R	Guide for Measuring, Mixing, Transporting, and Placing Concrete
ACI 304.2R	Placing Concrete by Pumping Methods
ACI 305R	Hot Weather Concreting
ACI 306R	Cold Weather Concreting
ACI 306.1	Standard Specification for Cold Weather Concreting
ACI 308	Standard Practice for Curing Concrete
ACI 308.1	Standard Specification for Curing Concrete
ACI 309R	Guide for Consolidation of Concrete
ACI 318	Building Code Requirements for Structural Concrete
ACI 347	Guide to Formwork for Concrete
ACI 503.2	Specification for Bonding Plastic Concrete to Hardened Concrete with a Multi-Component Epoxy Adhesive

B. American Society for Testing and Materials (ASTM):

ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C42/42M	Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C94/94M	Standard Specification for Ready-Mixed Concrete
ASTM C143	Standard Test Method for Slump for Hydraulic-Cement Concrete
ASTM C143M	Standard Test Method for Slump for Hydraulic-Cement Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete

ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C881	Specification for Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C881	Specification for Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C1017	Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1059	Standard Specification for Latex Agents for Bonding Fresh To Hardened Concrete
ASTM C1064	Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
ASTM C1077	Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D1752	Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM E329	Standard Specification for Agencies Engaged in Construction Inspection and/or Testing
ASTM E548	Standard Guide for General Criteria Used for Evaluating Laboratory Competence
ASTM E1155	Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers

C. “Greenbook” Standard Specifications for Public Works Construction, 2015 Edition

D. American Association of State Highway and Transportation Officials (AASHTO): AASHTO M182 Burlap Cloth made from Jute or Kenaf

1.03 DEFINITIONS:

A. The words and terms used in these Specifications conform to the definitions given in ACI 116R.

B. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.04 SUBMITTALS

A. General: Refer to the General Conditions for submittal requirements.

B. Product Data: For each type of product indicated.

C. Qualification Data for testing agency.

D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
   1. Aggregates.
   2. Cementitious materials.
   3. Admixtures.

4. Form materials and form-release agents.
5. Steel reinforcement and accessories.
6. Curing compounds.

E. Field quality-control test and inspection reports.

F. Submit plans to the City for the foundation preparation and structural concrete pads and foundation supports for the Pre-Fabricated Restroom.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

E. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend a pre-construction meeting, including the following:
   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete manufacturer.
   d. Concrete subcontractor.
2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, curing procedures, forms and form removal limitations, anchor rod and anchorage device installation tolerances, steel reinforcement installation, and concrete protection.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Delivering and placing of concrete in hot weather and cold weather shall conform to the applicable requirements of ACI 305R and ACI 306R, respectively.

PART 2 - PRODUCTS

2.01 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
   1. Plywood
   2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
      a. High-density overlay, Class 1 or better.
      b. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.

D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
   1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
   1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.

2.02 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

2.03 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
   1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.04 CONCRETE MATERIALS

A. Cementitious Material: ASTM C150, Type II, low alkali, of the same type, brand, and source, throughout Project:

B. Normal-Weight Aggregates: ASTM C 33, uniformly graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
   1. Coarse-Aggregate: Uniformly graded from No. 4 to ¾-inch maximum size.
   2. Fine Aggregate: Uniformly graded from ¼-inch to fines, washed clean.

C. Water: ASTM C 94/C 94M, clean and potable, free of impurities detrimental to concrete.

2.05 ADMIXTURES

A. Contractor may include accepted concrete admixtures in the mix to improve the water-cement ratio or workability of the concrete, providing the strengths specified and other desirable characteristics of the concrete can be achieved and maintained. Admixtures require the Engineer's acceptance before they may be used, and shall be included in the design mix, introduced in solution form. Comply with ACI 212.1R, ACI 212.2R, and ACI 212.3R as applicable.
   1. Air-Entraining Admixture: ASTM C 260.
   2. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
      a. Water-Reducing Admixture: ASTM C 494.
      b. Plasticizing Admixture: ASTM C 1017.
   3. Pozzolanic Admixtures: ASTM C618
   4. Fly Ash: ASTM C 618, Class F, with weight loss on ignition limited to 3 percent.

2.06 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz. /sq. yd. when dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

2.07 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.08 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
   1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.

D. Admixtures: Use water-reducing or plasticizing admixture in concrete, as required, for placement and workability. Use admixtures according to manufacturer's written instructions.

2.09 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.01 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class B, 1/4 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer’s written instructions, before placing reinforcement.

3.02 REMOVING AND REUSING FORMS

A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

B. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

3.03 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.04 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
   2. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
   1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groove tool marks on concrete surfaces.
   2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

3.05 CONCRETE PLACEMENT

A. Notify the Owner’s Representative at least 24 hours in advance of placing concrete.

B. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.06 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.07 FINISHING SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power- driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces exposed to view.
2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
3. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-foot-long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/8 inch.

3.08 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Formed Surfaces: Cure formed concrete surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure all unformed surfaces.

D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Continuous water-fog spray.
   b. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surface and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
   b. Moisture cures or use moisture retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
   c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.09 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part Portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

5. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

6. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.10 FIELD QUALITY CONTROL

A. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

B. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
   a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.

Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31.
   a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
   a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive- strength test value falls below specified compressive strength by more than 500 psi.
8. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.
10. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Engineer.
11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate dos not comply with the Contract Documents.

C. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

END OF SECTION 03 30 00

SECTION 13 42 13

SPECIAL EQUIPMENT- PREMANUFACTURED RESTROOM BUILDING UNIT

PART 1 – GENERAL

1.01 SUMMARY

A. This section includes information about furnishing and installing the premanufactured restroom building unit. The contractor shall provide and install a premanufactured single-occupancy restroom as shown in the project documents. The contractor shall be responsible for the permitting, furnishing, shipping, placement, connection to utilities, and the a full functionality testing of the restroom structure.

HIGH VOLTAGE OVERHEAD LINES ARE PRESENT AT THIS SITE.

1.02 REFERENCES

A. Public Restroom Engineer/ Inspector. manuals, website and references.
Contact address: 2587 Business Parkway, Minden, NV 89423 ; Phone: 775-783-1200

1.03 PERFORMANCE REQUIREMENTS

A. Architectural Design/Engineering and Insurance Responsibility: The Supplier shall be responsible for architectural, engineering, and all applicable building, safety, health, fire, and accessibility code compliance. Final drawings of the restroom building unit shall be stamped by the supplier as required for local permitting (e.g., Professional Engineers in the State of California).

B. The prefabricated public restroom building requires coordination between the Contractor, who prepares the site pad and delivery access for the restroom building, and the Supplier, who completed the architectural design, engineering, off-site building construction, delivery and installation on site.

C. The premanufactured restroom building unit shall be as shown on the drawings and specified in this section. The drawings show a Public Restroom Engineer/ Inspector (Minden, NV) restroom building unit. If an “or equal” premanufactured restroom building unit is proposed, it must meet all the criteria and standards and be approved by the District.

D. Installation and maintenance shall be performed in accordance with this section and per the Manufacturer’s requirements.

E. The Supplier shall furnish a 20-year structure warranty and a 5-year component warranty.

F. Mat Engineered Concrete Building Slab/Foundation:
1. The mat engineered 8” thick slab/foundation shall be engineered and constructed to withstand the transportation weight of the building without cracking and to resist absorption from any liquids deposited on the surface. The concrete slab shall be constructed inside a steel angle curb, reinforced with dual mats (tension and compression,) and poured with a custom concrete formula with special admixtures to create a finished slab that is water proof for life.
2. Perimeter Steel Curb: 5/16” 50,000 kip steel 6” X 6” welded continuous angle.
3. Rebar Steel Mat: Two layers of 40,000 tensile steel rebar in varying sizes per engineers requirements, including a perimeter structural continuous grade beam design inside the exterior steel angle and at any other location deemed by the engineer of record as required for the use intended. In coastal locations or when required for corrosion

resistance rebar shall be epoxy coated or fiberglass to resist permanent corrosion. Rebar mats shall be wire tied to code with a minimum of three turns of the wire and overlaps shall be minimum of 15 diameters for any connection.

4. All slab openings shall be surrounded with two layers of steel collars as required by the engineer of record to stop corner cracking and to reinforce the openings for lifting.
5. 1" thick by 3" minimum length threaded nuts shall be welded to the steel perimeter frame with continuous ¼" fillet welds. Nuts shall be welded to common steel plates per the engineer of records design and attached to the interior steel rebar structural mats.
6. The engineer of record shall provide lifting locations with sufficient reinforcement to allow the safe lifting of the entire designed weight of the structure with dual 1" steel bolts and washers at each lifting location. The number of lifting locations with each location fitted with removable ¾" 8" X 8" 50,000 tensile strength steel angles shall be determined by the engineer of record.
7. The slab shall be poured over a 1" thick steel plate table. The concrete mix design shall not exceed a 3" slump and shall be stinger vibrated for maximum consolidation. All floors shall slope to any floor drains within each room and if no floor drain is present the floor should not slope. The surface shall be a very light broom that should meet a coefficient of friction on the surface of .06. Birdbaths shall be cause for rejection.
8. The steel perimeter angle will remain below the concrete surface by nominal two inches to prevent corrosion. After the site concrete sidewalks are poured, the joint shall be full flow sealed with self-leveling grey urethane caulk to prevent penetration of water into the joint.
9. The building shall be designed for future relocation and shall provide protection for the lifting openings in the mat slab so that the threaded openings will be available for future use if needed.
10. The building system shall be designed for placement on a general contractor site prepared class 2 building pad/and or footings as required by code, per the bid drawings, suitable for 1500 pounds soil bearing capacity minimum. Any soils survey (if necessary) shall be by owner or engineer of record.

G. Exterior & Interior Masonry Block Walls

1. The block walls shall be nominal 8" x 16" CMU. The building corners shall have special corner return block that matches the exterior finish and creates a uniform appearance. All CMU shall be custom fabricated with an enlarged interior hole for placement of the grout and vertical rebar. The exterior walls shall be 4" thickness per State of California codes or engineering for wind and seismic. The interior walls shall be 4" block to nominally 7'-4" above finished floor and framed with applicable required finishes above for pony and gable walls. A structural steel tubular .188 wall cap beam shall be welded to 5/16" 40,000 kip steel plate embeds, at intervals per the engineer of record, within the masonry wall. Cap beam shall be ZRC primed and painted, color to be selected by owner wall.
2. The 8" mat engineered concrete slab shall be cured a minimum of 7 days. Holes for vertical dowels shall be drilled into the mat engineered slab avoiding any grade beams or other structural reinforcement. Once the holes are drilled, blow out the remaining material and using two part structural epoxy, wet set the #3 or #4 vertical rebar (as specified on the engineering calculations into holes drilled to the depth per the engineer of record requirements. Each rebar shall be held vertical to allow equal epoxy support to each dowel during the drying period. Engineering calculations require that rebar shall be installed in each concrete block center void or every block hole. The engineered uplift on each rebar shall be sufficient to restrain any load imposed on the masonry block wall for vertical rebar pull out from the concrete mat engineered slab.

H. Roof System

1. The roof structure shall be 2" x 6" wood rafters at 24" on center with 5/8" OSB

sheathing, and ice and water shield membrane with 26 gauge standing seam metal roof panels, color selected by owner. The rake and fascia shall be 14 gauge formed steel painted in a color selected by owner.

2. Roof shall be designed per plans to reduce vandals climbing on roof and to obtain proper ventilation. Custom size openings for the gable vents to provide fan-free ventilation.
3. The restroom ventilation screens (described in a following section) shall be attached to the truss frames and non-removable by vandals.

I. Exterior Wall Finish, Masonry and Gable

1. The building exterior finish shall be precision 8" x 16" CMU to wall height with three sides stucco per the exterior elevations in the bid plans. The block shall be coated with 2-4 mil layers of special 7-day curing block fillers and painted with two additional layers of industrial high solids, gloss enamel to a 4 mil thickness. Color to be selected by Owner. The gable ends above the cap beam shall be surfaced with fiber-cement siding stucco in pattern, painted with industrial enamel, color to be selected by owner.

J. Interior Wall Finish:

1. Interior precision CMU block masonry walls (Restroom) shall be smoothed to a pebble grain finish with 2-4 mil layers of 7-day curing block fillers and painted with two additional 4 mil layers of industrial high solids (white) industrial grade enamel.

K. Gable Ventilation System (Restroom)

1. Shall be woven 1/4" X 1" X 1", 316T,stainless steel wire mesh set in welded stainless steel angles attached to the wall framing with vandal resistant stainless steel screws.

L. Doors:

1. The restroom entry doors shall be 7'-0" high, custom fabricated, 14 gauge steel; reinforced with 14 gauge steel ribs welded at 6" intervals on each face, concealed; reinforced with a welded plate for door closer mounting; hung on a single continuous, 1 million cycle, aluminum gear hinge with stainless steel vandal resistant screws at nominal 4" on center. The doors shall weigh nominally 176 lbs each for a 36" X 84" door. Custom fabricated 14-gauge steel door jambs with 4" steel heads shall be welded to the steel cap beam and be solid filled with 3000 psi masonry grout mix.
2. All exterior entry doors shall have a ¼" thick stainless steel "Z-shaped" anti-microbial pull handles and Schlage B-600 series commercial series dead bolts. Each exterior door shall have a Schlage Model 200 Activated Lock Set and conductive (transfer) hinge, fully pre-wired per manufacturers specifications.
3. The door closer (restroom entry doors only) shall be "LCN" heavy duty #4210 Series, fastened to a structural reinforced door plate per door manufacturer design.
4. Stainless steel vandal resistant fasteners shall be used on all hardware.

M. Specialties

1. All specialty washroom equipment shall be commercial grade stainless steel fastened securely to walls with vandal resistant stainless steel screws to avoid removal by vandals as follows:
2. Toilet paper holder shall be a covered three-roll, 18-gauge stainless steel. Toilet paper holders shall be attached to block walls with 4 epoxy bedded vandal resistant stainless steel fasteners.
3. Stainless steel grab bars to code shall be 1 ¼" minimum exposed fastener vandal resistant design and installed at each accessible water closet.
4. Hand dryer shall be a wall mounted Dyson "V-blade", adjacent to lavatory in the restroom.
5. Soap Dispensers shall be vandal resistant ASI #353 through the wall dispenser over lavatory with a behind the wall stainless steel tank located inside the utility chase for easy

maintenance.

6. A 24”x36” sheet of plywood shall be installed on the interior wall in the utility chase.
7. Junction boxes and minimum ¾” conduit capable of accommodating Cat 6 cable shall be installed at each exterior door leading to the plywood sheet in the utility chase.

N. Plumbing:

1. Building shall be fully compliant with the following codes:
   a. All applicable State of California Commercial Building Codes. Latest edition applicable.
2. GENERAL: All components and fabrications shall be designed to reduce life cycle maintenance, be compatible with current maintenance spare parts, and shall be listed in a spare parts/maintenance manual (two copies) delivered in utility chase of building.
3. WATER PIPING: shall be type L copper soldered per code above grade and type K with silver solder below grade. All water piping shall be designed and constructed with high and low point drain fittings. All piping shall be mounted on Uni-strut wall brackets with neoprene isolators, to code.
4. WATER PRESSURE GAUGE/VALVE COMBO: install three commercial grade industrial water pressure gauges, isolation ball valves, 150 PSI pressure regulator with wye strainer, check valve, and Keystone SR 40 240 water filter.
5. PLUMBING FAUCETS, ISOLATION VALVES AND ACTUATORS: All fixtures except those with flush valves shall be isolated with ball valves for each fixture, concealed antimicrobial impregnated flush handle valves, and metered push-button lavatory faucets.
6. DWV PIPING: DWV piping shall be concealed behind the wall. DWV piping shall be PVC DWV, solvent welded, for all concealed piping. A cast iron no hub DWV vent pipe with a cast iron roof mounted vandal cap vent shall be required, through the roof.
7. REMOVABLE PIPE TRAPS: all floor drain, sink drain, and waste traps shall be removable for maintenance. Floor drains shall be trapped behind the wall in the utility chase using a combination waste and vent system. Floor drains shall be increased two pipe sizes over standard to allow code use. Trap primers shall not be used as preferred method of cleaning shall be by hose down maintenance. All surface mounted utility chase piping shall be mounted on Uni-strut with plastic isolators to code. Sink drain traps shall be concealed behind the utility chase walls where maintenance staff can access all plumbing.
8. PLUMBING FIXTURES: Plumbing fixtures shall be 14-gauge 316 stainless steel manufactured by Acorn. Toilet shall be wall hung, rear discharge, with concealed anti-microbial lever flush valves. Toilet seat shall be black solid core plastic, non-flammable construction with continuous stainless steel concealed self-checking hinges. Lavatory shall have concealed remote traps behind the mechanical wall. Schedule of fixtures:
   a. Water Closets: Acorn Penal-Ware,1675-W-1-HET-1-FVBO-ADA-PFS
   b. Water Closet Flush Valve: Zurn Z6143AV-HET-BG-7L
   c. Lavatories: Acorn Penal-ware 1652LRB-1-DMS-03-M
   d. Urinal: Acorn Penal-Ware: 1709HEU-W-1-0.125-FVBO
   e. Urinal Flush Valve: Z-6195AV-ULF-BG-7L
9. FLOOR GRATES: Removable 350 lbs per square foot pultruded fiberglass non-skid floor grates shall be installed over every opening in the utility chase for OSHA protection/compliance.
10. HOSE BIB: There shall be one hose bib provided in the utility chase.
11. QUICK CONNECT VALVE: There shall be a ½” Quick Connect valve attached to the wall of the interior of the restroom firmly connected to the wall to the left of the sink. The water supply to this valve shall be the hot water service.

O. Electrical:
1. GENERAL: Electrical system and components shall be commercial grade or better and piping conduits shall be installed on commercial Uni-strut wall hangers. Interior and exterior electrical lighting fixtures in public areas shall provide lifetime manufacturer's warranty.
2. PANEL/WIRING: One 100 amp, 120/240v, Single-phase, industrial grade Panel Board, Square "D" QO series with 100 amp main circuit breaker, shall be mounted in the utility chase in the restroom building. All breakers shall be snap-on type, minimum 10,000 A.I.C. RMS (Sym). Wiring shall be copper wire #12 min in EMT piping with compression fittings.
3. PIPING: All piping shall be surface mounted to the masonry block walls with minimum of 2" fastener penetration. EMT conduit shall be compression type. Main panel shall maintain a 30" X 36" safety code required clear space, floor to 6' above finished floor.
4. SECURITY EMT PIPING: Piping shall be placed from the door card readers and the conductive hinges at both doors. The EMT piping from each door will each be terminated adjacent to the plywood panel in the Utility Chase Room in commercial spec grade terminal boxes.
5. EXTERIOR LIGHTING: Full-cutoff, hooded 2600K LED, vandal resistant, high-impact polycarbonate lens fixtures shall be installed in locations above doors per plans.
6. INTERIOR LIGHTING: Luminaire SWP1212 LED vandal resistant high-impact polycarbonate lens fixtures shall be installed in the restrooms per plans. The utility chase shall have one (1), 4' single-tube LED fixture, suitable for wet locations, with a single switch at door entry.
7. LIGHTING CONTROL: All interior restroom lighting shall be controlled by a motion sensor integral to the light fixture. The utility chase shall have 2 bypass switches (one for interior lighting and one for exterior lighting), so maintenance staff can check operation during daylight hours. A single photo cell, roof mounted, shall control all exterior lighting.
8. ELECTRICAL OUTLETS: One (1) commercial spec grade duplex 20 amp outlet shall be located in the utility chase adjacent to the wooden panel. One (1) commercial spec grade four-plex outlet shall be located in the utility chase adjacent to the electrical panel. One (1) commercial spec grade single 240V outlet shall be located on the interior wall of the utility room next to the water heater.
9. HAND DRYER: Shall be Dyson "V-blade" through the wall, one adjacent to each lavatory in the restroom.
10. WATER HEATER: Shall be tankless, 240V Stiebel DHC-E 8/10 to service the restroom lavatories.

1.04 SUBMITTALS

A. General: Refer to General Conditions for general submittal requirements.

B. Pre-Fabricated Structures: Pre-fabricated structures shall be fully designed, permitted, constructed, placed and installed by the contractor. The submittal procedure shall generally follow a three step process as described in the following

1. The Contractor shall prepare and submit fully developed design plans, calculations and specifications for review and comment by the owner prior to submittal to the City for permits.
2. Contractor shall then submit the design plans, calculations and specifications to the City of Richmond and apply for and obtain a building permit and encroachment permit from the

from the installation of the structure at the proposed site.

3. Contractor shall provide the owner with a full set of permitted and approved plans and copies of both the approved building and encroachment permits. The owner will review the approved plans for conformance to the project specifications.

C. Crane and Lift Permit. The contractor shall provide a Crane Lift and Safety Plan that is fully compliant with the provisions of the Cal OSHA 1926.1408 regulations, and all other State and Local requirements.

D. Overhead Utility Line and Utility Pole protection plan. The contractor shall prepare and submit a plan for the protection of the overhead lines and the wooden pole present at the site above the proposed restroom location.

1.05 DELIVERY, UNLOADING, LIFTING AND HANDLING

A. The contractor shall fully coordinate and have the restroom manufacturer deliver the unit to the site.

B. The Contractor shall be required to provide a Gradall-type lift or crane (if applicable) and fully licensed operator to place the unit.

C. The Contractor shall coordinate the delivery and placement of the restroom unit with AC Transit, Golden Gate Transit and the City of Richmond and provide a traffic safety plan for approval prior to placement.

PART 2 – PRODUCTS

2.01 MATERIALS

A. The restroom unit is a premanufactured single occupancy, uni-sex restroom with a utility closet. It shall be ADA accessible. It shall be an engineered block wall system with a metal roof and commercial grade, wall mounted plumbing fixtures. Interior and exterior lighting is required.

B. The Supplier shall provide final building design architectural drawings and engineering calculations under the responsibility of a licensed structural engineer, in compliance with all local, state, and federal codes. The Supplier shall construct the building offsite as a permanently relocatable building, transport it to the final required destination, and install the building turnkey, on the pad prepared by the Contractor per the drawings provided by the Supplier.

PART 3 – EXECUTION

3.01 SITE PREPARATION

HIGH VOLTAGE OVERHEAD LINES ARE PRESENT AT THIS SITE.

A. The Contractor shall be responsible for protecting the existing wooden high-voltage pole and overhead lines that are present at this site. The contractor shall prepare and submit a safety plan in compliance with the requirements of CalOSHA, PG&E and the City of Richmond in regard to the delivery, lifting and placement of the Pre-Fabricated restroom structure and the new Site Light (also see Section 13 42 13 1.04 SUBMITTALS).

B. The Contractor shall prepare the building subbase per details on the project plans. The Contractor shall furnish and install all utilities per bid site plans up to the specified points of

connection (POC) nominally 6' from the building lines. Coordinate locations and elevations of sewer, water, and electric utilities coming into the building with the Supplier.

C. The Contractor shall stub-out electrical, water, and sewer at the point of connection and at the proper elevation below grade for the project. The Contractor shall provide final hook up of the water from the building to the point of connection; sewer hook up to the point of connection; and electrical sleeve from building panels to the point of connection; communications line to the point of connection. Final utility connections shall be by the Contractor.

D. The Contractor shall flush the water lines thoroughly (a minimum of 30 minutes) before making the final water connection to the building.

3.02 INSPECTION

A. Inspection of the restroom unit and all parts contained in or shipped outside of the unit shall be inspected at time of delivery by the site Engineer/Inspector and the Contractor. Any non-conformance to approved drawings or damage to any part of the system shall be documented on the shipping ticket. Damage to the unit during and after unloading shall be corrected at the expense of the Contractor. Any necessary repairs to the restroom unit shall be made to the acceptance of the Engineer/Inspector.

3.03 INSTALLATION

A. The Contractor is responsible for unloading the restroom unit (lifting with equipment or a crane) and placing it on the prepared subbase or concrete pad.

B. The Contractor is responsible for utility connections and will make final connections to sewer, water, communications and power.

3.04 MAINTENANCE

A. The Supplier shall provide maintenance manuals for the building and components.

END OF SECTION 13 42 13

SECTION 22 10 00

PIPING, GENERAL

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Pipe materials and installation procedures shall be in accordance with the pipe manufacturer's recommendations unless otherwise specified in this Section, or in the specific Section of these Specifications for the particular pipeline material being used.

B. A current list of pipe, fittings and joint materials specifically approved by City of Richmond as conforming to these Specifications and allowed for use in sewer pipeline installations within City of Richmond boundaries, referred to as the "Approved Materials List," is on file and copies are available at City of Richmond’s office. Pipe, appurtenances and accessories not appearing on the Approved Material List shall not be used without prior written approval of City of Richmond.

C. Pipe sizes cited in these Specifications refer to the nominal diameter of the pipe in whole inches.

D. For a particular sewer installation, pipe and manufactured fittings connecting pipe between structures shall be of one and only one manufacturer's brand and of the same type, quality, class and size.

E. Joining of pipe dissimilar size should be joined using an eccentric sheer band coupler and matching the inverts of the pipes to be connected.

F. Where field cuts are required, the Contractor shall use tools and/or equipment recommended by the pipe manufacturer. No hammer and chisel cuts will be permitted.

G. All pipe and fittings delivered to the jobsite shall be marked by the manufacturer with such inventory and identification (Brand Name, Pipe Type, Strength Class, Batch Lot, Lengths, etc.) as to be properly identified in the field as meeting the requirements of these Specifications.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 4-1.06 - Shoring, Excavation Support and Protective Systems

B. Section 4-1.07 - Excavation, Bedding and Backfill

C. Section 4-1.19 - Pipeline Cleaning, Testing and Televising

D. Section 4-1.27 - Protective Coating and Painting

E. Section 4-1.31 - Reinforced Concrete Pipe (RCP)

F. Section 4-1.32 - Vitrified Clay Pipe (VCP)

G. Section 4-1.33 - Ductile Iron Pipe (DIP)

H. Section 4-1.34 - Polyvinyl Chloride (PVC) Pipe

I. Section 4-1.35 - High-Density Polyethylene (HDPE) Pipe

J. Section 4-1.36- Cast Iron Soil Pipe (CIP)

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Commercial Standards and Codes:
   1. ANSI/ASME B1.20. Pipe Threads, General Purpose (inch)
   2. ANSI/AWS D1.1 Structural Welding Code
   3. Cal/OSHA Construction Safety Orders

1.04 QUALITY ASSURANCE

A. Pipe shall be subject to inspection at the place of manufacture. During the manufacture of the pipe, City of Richmond shall be given access to all areas where manufacturing is in progress and shall be permitted to make all inspections necessary to confirm compliance with these Specifications.

B. Except where otherwise specified, all materials used in the manufacture of the pipe shall be tested in accordance with the applicable specifications and standards. The manufacturer shall perform all tests at its own cost.

C. All installed pipe shall be cleaned, tested and televised in accordance with Section 4-1.19 – Pipeline Cleaning, Testing and Televising of the COR Standard Specifications.

1.05 MANUFACTURER'S SERVICE REPRESENTATIVE

A. Where the assistance of a manufacturer's service representative is required, in order to obtain compliance for pipe joints, supports, or special connections, the Contractor shall arrange for such assistance.

1.06 MATERIAL DELIVERY, STORAGE AND PROTECTION

A. All piping materials, fittings, valves, and accessories shall be delivered in a clean and undamaged condition, and stored off the ground. All pipe and appurtenances shall be protected from damage by sunlight, moisture, corrosive materials, equipment and other sources. All defective or damaged pipe or appurtenances shall be removed from the jobsite and replaced with new materials.

PART 2 PRODUCTS

2.01 GENERAL

A. Pipes, fittings, and appurtenances shall be furnished in accordance with the requirements of the applicable Section of these Specifications for the particular pipeline material being used.

B. Application of pipe coatings shall be in accordance with the requirements of the applicable Section of these Specifications for the particular pipeline material being used and Section 4-1.27 - Protective Coating and Painting of the COR Standard Specifications.

2.02 BANDED COUPLINGS

A. Where banded couplings are used for joining of new pipe or repair of existing pipelines, only couplings listed in the Approved Materials List shall be allowed.

PART 3 EXECUTION

3.01 GENERAL

A. Sewer pipelines shall be constructed to the alignment and grade shown on the plans, and in compliance with the specified requirements of this Section and of the specific Section of these Specifications for the particular pipeline material being used.

3.02 SEWER INSTALLATION

A. Sewer pipelines shall have a minimum wall-to-wall horizontal clearance of three (3) feet and a minimum vertical clearance of twelve (12) inches from all other improvements and utilities unless otherwise shown on the plans as being allowed by City of Richmond under Special Approval.

B. Where sewer pipelines are to be installed in the vicinity of potable water pipelines, wall-to-wall sewer-to-water pipeline separation shall be in conformance with the minimum requirements shown on SS-13 of the Standard Drawings. Sewer pipeline installation in the area labeled "Special Permission," will not be allowed unless specifically approved in writing by the water utility.

C. Pipe cover for sewer pipelines shall be in conformance with the requirements showed in the Standard Drawings, unless otherwise shown on the plans as being allowed by City of Richmond under a Special Approval.

D. For main sewers and trunk sewers, the grade line shall be established by setting cut stakes and obtaining City of Richmond approval for cut sheets. During pipe installation, the Contractor shall continuously utilize an industrial-standard laser grade control system to confirm that the pipe is installed to the design grade, subject to the following requirements:
   1. The Contractor shall provide a properly calibrated laser instrument and an operator who is qualified and trained in the operation of the particular laser instrument being used. The operator shall adhere to the provisions of the CalOSHA Construction Safety Orders regarding the use of laser equipment.
   2. Laser control points shall be established bench marks or construction cut stakes identified on the City of Richmond approved cut sheets.
   3. Laser must contain a direct grade reading screen, which will allow the Inspector to verify the grade at all times.

E. Pipe shall not be laid when the Inspector determines that the condition of the trench is unsuitable.

F. If the sewer is to be laid in an area that is to be filled, and the cover prior to filling is less than the required minimum cover specified pipe material and type, the pipe shall not be laid until the area has been properly filled and compacted to a level at least equal to required minimum cover above the proposed pipe, unless otherwise authorized by the Inspector.

G. If field conditions in areas that are potentially unstable or subject to settlement warrant, the Inspector may require that the Contractor substitute a different pipe material/type for the pipe shown on the plans.

H. Pipe, fittings and appurtenances shall be carefully handled and protected against damage, impact shocks, and free fall. Pipe shall be stored in a manner which will protect it from damage at the trench site or elsewhere. The Contractor shall inspect each pipe and fitting prior to installation to determine that only undamaged material is installed.

I. Before placement of pipe in the trench, each pipe or fitting shall be thoroughly cleaned of any foreign substance and shall be kept clean at all times thereafter.

J. Sewer pipelines shall be laid upgrade from the point of connection to the existing sewer with the bell end at the upgrade end of each pipe length.

K. Layout of curves should not be allowed except by special variance from COR.

L. Non-marring slings shall be used for lowering each length of pipe into the trench (chains shall not be used). The pipe shall be laid on properly compacted bedding material as specified in Section 4-1.07 - Excavation, Bedding and Backfill. No blocking will be permitted and the pipe shall have full bearing for its entire length between bell holes excavated in said bedding material to prevent point loading at the bells or couplings and to allow for unobstructed assembly of all joints. Excavation shall be made as needed outside the normal trench section at field joints to permit adequate access to the joints for field connection operations and for application of coating on field joints. After jointing is completed, bell holes shall be backfilled with properly compacted bedding material, taking care not to damage, move, or lift the pipe from its bedding support.

M. Where it becomes necessary to modify the design pipe alignment to resolve conflicts with unforeseen obstructions or other causes, the Contractor shall propose a revised alignment to the Inspector who may allow installation per the revised alignment or may require that the revision be submitted to the Engineer for consideration. Such revision may be made by the deflection of joints, by the use of fittings or by forced bending of the pipe if permitted, however, in no case shall the deflection in the pipe or at any joint exceed the maximum deflection recommended by the pipe manufacturer.

N. Sewer pipes, branches, stubs, or other open ends which are not to be immediately connected, shall be plugged or capped.

O. The Contractor shall take all necessary precautions to prevent excavated or other foreign material from getting into the pipe during the laying operations. At all times when laying operations are not in progress and at the close of the day's work, the openings of all pipe and specials, whether in the trench or in storage, shall be protected with suitable bulkheads to prevent unauthorized access by persons, animals, water, or any undesirable substance.
P. The Contractor shall prevent the pipe from floating during and after its installation.

3.03 CONNECTIONS TO EXISTING SEWERS

A. Existing sewers are shown on the plans at the locations where new sewers are to be connected. It is the responsibility of the Contractor to determine the exact location and depth of the existing sewers prior to the installation of any sewer pipe. New pipe shall be plugged with mechanical plugs until further connection is necessary.

B. Connection of new main and/or trunk sewers to existing lines up to and including forty eight (48) inches in diameter shall be made at existing manholes or by constructing a new manhole

over the point of connection, or by removing an existing rodding inlet or plug and extending new pipe of the same diameter, material and class from the point of connection.

1. Where the connection is to be made into an existing manhole, the Contractor shall make the connection by core-drilling through the manhole shelf to the existing channel, installing the new pipe, finishing a new channel within the manhole and repairing any damage to the structure.
2. Where the connection is to be made by constructing a new manhole on an existing sewer, the manhole and new connection shall conform to the details shown in SS-1 through SS-2 & SS-5A & 5B of the Standard Drawings. The existing sewer shall be kept intact until immediately before the cleaning and flushing operation for the new sewer is to begin.
3. Where the connection is to be made at a removed rodding inlet or plug, the existing piping shall be cut square and ends properly prepared for the connection shown and an air test fitting shall be installed at the connection of new and existing pipelines.
4. All new pipe shall be plugged with an approved mechanical plug or brick/mortar until the line is completed and ready for testing.

C. Side Sewer Connections to Main Sewers:

1. Side sewer connections shall be made with fittings or adapters recommended by the manufacturer for use with the particular pipe and as listed on the Approved Materials List.
2. Side sewers equal in size to the main sewer shall be connected by installing a wye branch or tee fitting.
3. Connection and side sewer details shall conform to the requirements shown ON SS-16D of the Standard Drawings.
4. Side sewer or lateral connections to new or existing manholes shall be as detailed on SS-1 through SS-2, SS-5A, SS-5B & SS-6B of the Standard Drawings.
5. Side sewer connections where wyes, tees or laterals were not installed during main sewer construction, shall be made by installing a tap listed in the Approved Materials List, installing a main sewer repair spool (replacement pipe section) as specified in Subsection 3.5 below including a Section 4-1.30 – Piping, General new wye branch or tee fitting, or by core drilling through the barrel of an existing manhole at the top of the shelf or crown of mainline pipe. Installation of taps shall comply with the following requirements:
    a. Only pre-qualified Contractors shall be permitted to install tap and saddle connections on VCP, CIP, DIP, or RCP.
    b. Before commencing excavation for tap installation, the Contractor shall have sufficient Type I bedding and backfill material at the site to properly re-bed the main and lateral sewers, and backfill the excavation.
    c. The excavation for the tapping work shall be a minimum of two (2) feet in width, give enough length for work space, without under-cut sides and shall be properly shored in conformance with Section 4-1.06 - Shoring, Excavation Support and Protective Systems. A minimum clearance of three (3) inches below, six (6) inches on each side and twelve (12) inches each way along the main from the point of connection shall be provided for tap installation.
6. If the main sewer is damaged during excavation for or during installation of the tap, the Contractor shall install a main sewer repair spool (replacement pipe section) as specified in Subsection 3.5 below including a new wye branch or tee fitting.
7. The outer surface of the main in this exposed area shall be thoroughly cleaned prior to tapping.

3.04 REPAIRS TO EXISTING SIDE SEWERS AND MAINS

A. Repairs to main sewers and trunk sewers sixteen (16) inches or less in diameter shall be made

using pipe and fittings specified in Section 4-1.33 - Ductile Iron Pipe (DIP), or Section 4-1.34 - Polyvinyl Chloride (PVC) Pipe.

B. Repairs to side sewers shall conform to the requirements shown in SS-14 of the Standard Drawings, and shall be made using pipe and fittings specified in Section 4-1.33 - Ductile Iron Pipe (DIP); Section 4-1.34- Polyvinyl Chloride (PVC) Pipe; Section 4-1.35 - High-Density Polyethylene (HDPE) Pipe; or Section 4-1.36 - Cast Iron Soil Pipe (CIP).

C. When repair of a damaged section of pipe is required within eighteen (18) inches of a pipe joint, the replacement section shall extend to and include the joint.

D. Where repair couplings are permitted, only couplings listed in the Approved Materials List shall be used.

E. The Inspector may require replacement of broken, damaged or improper pipe or fittings discovered during sewer repair or replacement work.

3.05 REPAIRS TO NEW SEWER MAINS

A. If damage to the new main sewer pipe is identified during inspection, testing or televising, the Contractor shall repair the damage or replace the pipe as instructed by the Inspector. When repair of a damaged section of pipe is required within eighteen (18) inches of a pipe joint, the replacement section shall be extended to include the joint. Repair procedures shall comply with the following:

1. VCP and DIP SEWER MAINS – Manufacturer's recommended couplings shall be used. The damaged pipe shall be removed by squarely cutting out the damaged section. The replacement pipe shall be squarely cut approximately one-half (1/2) inch shorter than the missing section. The repair couplings shall be placed onto the pipe ends, the replacement assembly inserted into the gap, the repair couplings moved to be centered over each new joint, and the fasteners or bands tightened as required. The Contractor shall re-bed the pipe and backfill the excavation with properly compacted bedding and backfill material in accordance with SOR SS Section 4-1.07 - Excavation, Bedding and Backfill.
2. PVC SEWER MAINS - PVC double bell repair couplings shall be used. The damaged pipe shall be removed by squarely cutting out the damaged section, and the remaining ends shall be beveled. The replacement pipe shall be a minimum of three (3) feet in length and shall be squarely cut approximately one-half (1/2) inch shorter than the missing section, and its ends shall be beveled. Reference lines indicating the spigot stab distance required for centering the repair coupling shall be clearly marked on all cut ends. The repair couplings shall be placed onto the pipe ends, the replacement assembly inserted into the gap, the repair couplings moved to be centered over each new joint. The Contractor shall re-bed the pipe and backfill the excavation with properly compacted bedding and backfill material in accordance with SOR SS Section 4-1.07 - Excavation, Bedding and Backfill.

3.06 WARNING TAPE INSTALLATION

A. See Section 02 31 30 - Excavation, Bedding and Backfill for warning tape requirements.

END OF SECTION 22 10 00

SECTION 22 10 04

DUCTILE IRON PIPE (DIP)

PART 1 – GENERAL

1.01 SUMMARY

A. The Contractor shall furnish and install ductile iron pipe (DIP) and all appurtenances as specified, complete and in place, as shown on the plans, as specified in this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 22 04 13 – Piping, General.

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Commercial Standards:

ANSI/AWWA C110/A21.10 Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in. for Water and Other Liquids

ANSI/AWWA C111/A21.11 Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings

ANSI/AWWA C115/A21.15 Flanged Ductile-Iron and Gray-Iron Pipe with Threaded Flanges

ANSI/AWWA C150/A21.50 Thickness Design of Ductile-Iron Pipe

ANSI/AWWA C151/A21.51 Ductile-Iron Pipe, Centrifugally Cast

ANSI/AWWA C153/A21.53 Ductile-Iron Compact Fittings, 3 in. through 12 in. for Water and Other Liquids

AWWA C600 Installation of Ductile-Iron Water Mains and Their Appurtenances

1.04 QUALITY ASSURANCE

A. Except as modified in this Section, all materials used in the manufacture or installation of the pipe shall be tested in accordance with the requirements of the referenced standards.

B. Submittals and testing shall be done in compliance with Section 4-1.30 – Piping, General of these Specifications.

PART 2 – PRODUCTS

2.01 GENERAL

A. Ductile-iron pipe shall conform to the latest revision of ANSI/AWWA C150/A21.50 subject to the following supplemental requirements. The pipe shall be furnished complete with rubber gaskets, and all special fittings shall be provided as shown on the plans.

B. Bell and spigot joints are to be used for all underground applications. As an alternative to bell and spigot joints the use of mechanical and flanged joints will be permitted for above ground applications only.

2.02 PIPE

A. Ductile iron pipe shall be of the diameter indicated at a minimum class 52, and shall be manufactured with standard bell and spigot joints in accordance with the latest revision of ANSI/AWWA C151/A21.51.

2.03 LINING AND COATING

A. Pipe shall have standard asphaltic coating on the exterior and be epoxy lined on the interior with Protecto 401TM ceramic epoxy lining as manufactured by U.S. Pipe, or approved equal.

2.04 FITTINGS

A. Fittings shall be ductile iron at a minimum of class 52. Fittings shall conform to the latest revision of either ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53. Fittings and accessories shall be furnished with either Push-on or Mechanical Type Joints in accordance with ANSI/AWWA C111/A21.11.

B. Ductile-iron pipe and fittings shall be furnished with mechanical joints, push-on joints, flanged joints, and/or restrained joints, as required. Bolted joints shall not be used for underground installations.
   1. Mechanical and push-on bell and spigot joints shall conform to ANSI/AWWA C111/ A21.11, and be furnished complete with all necessary accessories.
   2. Flanged joints shall conform to ANSI/AWWA C115/A21.15.
   3. Restrained joints shall be per the Approved Materials List.

PART 3 – EXECUTION

3.01 GENERAL

A. Sewer pipelines shall be constructed in compliance with the requirements of this Section and of Section 22 10 00 and 22 13 00.

B. Work shall meet or exceed the requirements of these Specifications unless applicable requirements of an agency having jurisdiction (including the terms and conditions of an encroachment permit issued by a city or county) are greater, in which case the greater requirements shall govern.

3.02 INSTALLATION OF PIPE

A. All pipe shall be installed in accordance with ANSI/AWWA C600.

3.03 RUBBER-GASKETED JOINTS

A. Immediately before jointing pipe, the bell end of the pipe shall be thoroughly cleaned, and a clean rubber gasket, lubricated with an approved vegetable-based lubricant, shall be placed in the bell

groove. The spigot end of the pipe shall be carefully cleaned and lubricated with a vegetable-based lubricant. The spigot end of the pipe section shall then be inserted into the bell of the previously laid joint and pushed into its proper position. Tilting of the pipe to insert the spigot into the bell will not be permitted.

END OF SECTION 22 10 04

SECTION 22 10 05

POLYVINYL CHLORIDE (PVC) PIPE

PART 1 – GENERAL

1.01 SUMMARY

A. The Contractor shall furnish and install PVC pipe and all appurtenances as specified, complete and in place, as shown on the plans, as specified in this Section and of Section 22 10 00 and 22 13 00.

1.02 REFERENCE STANDARDS

A. Commercial Standards:

1. AWWA C900-07 Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm through 300 mm), for Water Transmission and Distribution
2. AWWA C905-08 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In. (350 mm Through 1,200 mm), for Water Transmission and Distribution
3. ASTM D 1784 Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
4. ASTM D 2241 Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR-Series)
5. ASTM D 2321 Practice for Underground Installation of Thermoplastic Sewer Pipe for Sewers and Other Gravity-Flow Applications
6. ASTM D 3034 Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
7. ASTM F 477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
8. ASTM F 1674 Test Method for Joint Restraint Products

1.03 SUBMITTALS

A. General: Refer to the General Conditions, for submittal requirements.

1.04 QUALITY ASSURANCE

A. Except as modified in this Section, all materials used in the manufacture or installation of the pipe shall be tested in accordance with the requirements of the referenced standards.

B. Submittals and testing shall be done in compliance with Section 22 10 00 Piping, General of these Specifications.

PART 2 – PRODUCTS

2.01 GENERAL:

A. All PVC pipe shall be continuously and permanently marked with the manufacturer's name, pipe size and pressure rating in psi.

2.02 PIPE

A. All PVC pipe shall be joined by compression, solvent-welded, thermo-fusion welded or mechanical restrained joints as shown on the Plans.

B. Polyvinyl chloride pipe (PVC) shall conform to the requirements of ASTM D 3034, SDR 26, or AWWA C900 or C905, Class 100, 150, 165, 200, 253, or 305. Material for PVC pipe shall conform to the requirements of ASTM D 1784 for Class 12454-B or 12454-C as defined therein.

C. Flexible rubber rings for compression type joints for PVC pipe and fittings shall conform to the requirements of ASTM F 477.

D. All sun-faded pipe or pipe with noticeable surface defects will be rejected and shall be replaced by the Contractor.

2.03 COUPLINGS AND FITTINGS

A. Couplings shall be as listed in the Approved Materials List.

B. All fittings for PVC pipe shall conform to the requirements of ASTM D 2241. The ring groove and gasket ring shall be compatible with PVC pipe ends.

C. The strength class of fittings shall be no less than the strength class of any adjoining pipe.

D. PVC fittings shall, at a minimum, conform to the requirements of ASTM D 3034 as they apply to type SDR 26 PVC Sewer Pipe using an Elastomeric Gasket Joint in a bell and spigot assembly system. Rubber sealing gaskets shall meet the requirements of ASTM F 477.

E. All PVC pipe entering or leaving a concrete structure shall have a rubber sealing gasket, as supplied by the pipe manufacturer, firmly seated perpendicular to the pipe axis, around the pipe banded and cast into the structure base or near the structure wall center as a water stop. Said water stop may also consist of a manhole coupling with rubber sealing rings cast into the structure base.

2.04 RESTRAINED JOINTS FOR C900 PVC PIPE

A. All restrained joints used in sanitary sewer applications shall meet or exceed the requirements of ASTM F 1674. All restrained joints shall be per the Approved Materials List.

PART 3 – EXECUTION

3.01 GENERAL

A. Sewer pipelines shall be constructed in compliance with the requirements of this Section.

B. Work shall meet the specified requirements of these Specifications unless the requirements of the local agency having jurisdiction are greater, in which case the greater requirements shall govern.

3.02 INSTALLATION

A. PVC pipe shall be installed in accordance with the requirements of ASTM D 2321; as specified herein and shown on the plans.

3.03 HORIZONTAL CURVES

A. Horizontal curves shall be installed in straight pipe segments by special variance from COR,

each a minimum of five feet in length and joint deflections or fittings in accordance with the requirements or with forced bends where the radius of the curve exceeds the minimums specified in the table below:

SDR 26 PVC Pipe (Forced Bends)				
Pipe Diameter	4"	6"	8"	10"
Minimum Radius	135’	200’	260’	322’

3.04 FIELD JOINTING

A. Each pipe compression type joint shall be joined with a lock-in rubber ring and a ring groove that is designed to resist displacement during pipe insertion.

B. The ring and the ring seat inside the bell shall be wiped clean before the gasket is inserted. A thin film of lubricant shall be applied to the exposed surface of the ring and to the outside of the clean pipe end. Lubricant other than that furnished with the pipe shall not be used.

C. Joints shall not be deflected either vertically or horizontally in excess of the printed recommendations of the pipe manufacturer.

END OF SECTION 22 10 05

SECTION 22 13 00

CONSTRUCTION OF SANITARY SEWER LINES

PART 1 – GENERAL

1.1 SCOPE

A. The CONTRACTOR shall furnish all labor, supervision, materials, and equipment required for installation of a new gravity sewer line as shown on the drawings.

1.2 GENERAL REQUIREMENTS

A. Construction of sanitary sewer lines shall be defined as the excavation, placing bedding and/or foundation, laying of new pipe, backfill, modifications to utilities at points of connections, and cleanup as required by the contract documents. Excavation, backfill and compaction shall be performed in accordance with Section 02 31 30.

1.3 REFERENCES

A. The following standards form a part of this specification.
1. ASTM C478 – Standard Specification for Precast Reinforced Concrete Manhole Sections
2. ASTM D1784 – Standard Specification for Poly Plastic Pipe, AWWA C900.
3. ASTM D1785 – Standard Specification for Poly Plastic Pipe, Schedules 40, 80 and 120.
4. ASTM D2665 – PVC Drain, Waste and Vent Pipe & Fittings
5. ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
6. ASTM D2564 – Solvent Cements for PVC Pipe and Fittings
7. ASTM D3350 – Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
8. ASTM D3034 – Standard Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings
9. ASTM F714 - Standard Specification for Polyethylene Plastic Pipe Based on Outside Diameter.
10. ASTM F477 – Standard Specification for Poly vinyl Chloride (PVC) Profile Pipe and Fittings Based on Diameter.
11. California Plumbing Code

PART 2 PRODUCTS

2.01 MATERIALS

A. PVC pipe and fittings for gravity sewer lines shall conform to the requirements of ASTM D1784, Type 1, DR-18, Grade 1 cell classification 12454 standards. Fitting Gaskets shall comply with ASTM F477 Standards.

B. Bedding material shall conform to Section 02200 shall be laid in accordance with the contract drawings

C. Cleanouts – Shall be 4” Cast Iron, no-hub “twin” cleanouts.

D. No-Hub Coupling – Shall be FERNCO RC 5000 adapter couplings with appropriately and correctly sized rubber bushings.

E. Manholes – Watertight precast concrete manholes conforming to ASTM C478 complete with

cast iron cover.

F. Cleanout Riser Overflow Device – Shall be as shown on the plans.

PART 3 – EXECUTION

3.01 PREPARATION

A. Remove scale, slag, dirt, and debris for both inside and outside of piping and fittings before assembly.

3.02 INSTALLATION

A. Installation of sewer lines shall be in accordance with the requirements of the California Plumbing Code and ASTM D2321.

B. Sequence - Construction of a sewer line or manhole shall follow the sequential order as listed below:
   1. Any existing sewer line or manhole involved in the new construction shall be isolated (normal flow rerouted if necessary by by-pass pumping or other means).
   2. The existing sewer line or manhole shall be excavated and completely uncovered at tie-in points. If wellpointing is required, then applicable methods for well-pointing shall be carried out.
   3. For pipe placement, the trench shall be shaped to conform to required slope and grade. As required by soil conditions, the trench shall be undercut as necessary for placement of pipe bedding as noted on the plans and as specified. The new sewer pipe shall then be laid in the trench.
   4. Manholes and pipe shall be tied in and the trench or excavation shall be backfilled.

C. General Laying Conditions for Pipe and Fittings
   1. Pipes and fittings shall be carefully inspected after delivery on the site of the work and will be rejected if in the opinion of the ENGINEER/ INSPECTOR they are defective in such a way as to endanger the strength of the sewer or the tightness of the joint. The installation of all pipe shall be in conformance with the respective manufacturer's guidelines except where specific procedures outlined therein are contrary to the specifications for this contract. Prior to beginning work, the CONTRACTOR shall verify the elevations of all existing inverts involved in the construction.
   2. No pipe shall be set in place and no joint shall be made with water standing in the trench or the bell hole. Whenever pipe laying is topped, either for the night or for any other cause, the end of the pipe shall be securely closed to prevent the entrance of water, mud, or other matter, and shall be secured in such a manner as to prevent the end pipe from being dislodged by sliding or other movement of the backfilling.
   3. The pipes and fittings shall be so laid in the trench that after the sewer is completed, the invert thereof, shall conform accurately to the grades and alignment required. At any stage of construction of a straight stretch between two consecutive manholes, the zero, or starting end of the pipe shall be clearly visible on looking through the pipe from the other end, with the full cross-section of the interior of the pipe in clear view. Pipe sections shall be laid such that flow enters the bell end of the pipe.

D. Backfilling
   1. Backfilling of sewer trenches shall begin as soon as the ENGINEER/ INSPECTOR is satisfied that the joints have been made properly and after any required inspection by representatives of the County. Pipe bedding material shall be placed in the trench in such a manner as not to disturb the pipe and thoroughly, but carefully, compacted under and

around the pipe as shown on the contract drawings. The backfill material placed above the bedding material shall be as specified in Section 02 31 30 and as shown in the contract plans.

2. Backfilling around manholes shall be done after installation of the manhole, connection of pipes and inspection by the ENGINEER/ INSPECTOR. Selected backfill material shall be structural fill and shall be placed and compacted as specified in Section 02 31 30.

E. By-Pass Pumping - For any existing sewer lines and manholes involved in the construction work under this contract (to be tied-in, etc.). The CONTRACTOR shall provide adequate pumping capacity, back-up pumps so as to avoid sewer overflows, suction/discharge hoses, roll-over ramps at all intersections where hoses may be traversed by vehicular traffic or construction equipment and a sewer overflow protection plan conforming to the requirements of the County.

3.03 INFILTRATION TESTING

A. The sewers shall be true and to line and grade and shall not have any infiltration of ground water. An infiltration measurement will be made by the CONTRACTOR to determine acceptability. The CONTRACTOR will be responsible for paying for any subsequent re-testing due to failure of the system to pass the initial test.

B. Infiltration rate shall be 0 (zero) gallons per inch per mile per 24 hours; any detectable leaks shall be repaired by the CONTRACTOR. The infiltration test is the responsibility of the CONTRACTOR and shall be witnessed by the ENGINEER/ INSPECTOR and a representative of the County Sewerage Department.

C. Provide a 60 degree V-notch sharp crested weir suitable for insertion in the collection lines for each pipe diameter used in the project, and shall provide such labor, plugs and pumps that are necessary for conducting such tests. The weirs shall be set vertical and in proper alignment and shall provide that no leakage occur between the periphery of the pipe and the outer edge of the weir. The depth of the V-notch shall be a minimum of 2 inches, and the lowest point of the notch shall be 2 inches above the invert of the pipe. For short lengths of pipe, 2,000 feet or less, provide a spout adaptable to the weir, and a one-gallon measuring pan.

END OF SECTION 22 13 00

SECTION 26 00 00

ELECTRICAL LIGHTING

PART 1 – GENERAL

1.01 SUMMARY

A. This section includes information about installation of the electrical service to the restroom building and light fixtures. Luminaires, materials and equipment shall be in accordance with applicable standards, codes, and regulations, and as shown on the drawings and specified.

HIGH VOLTAGE OVERHEAD LINES ARE PRESENT AT THIS SITE.

1.02 REFERENCES

A. The following standards form a part of this specification.
1. RAB Lighting RWLED2T150 150W LED, 3000K Roadway Fixture Universal Pole Adaptor Type IV Distribution, or equal
2. RAB Lighting, PS4-11-15WT light pole, or equal

1.03 APPLICABLE STANDARDS, CODES AND REGULATIONS

A. Unless noted otherwise and where applicable, the construction and testing of the systems shall be performed in accordance with the latest edition of the standards and codes. Latest revisions of the publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.
1. National Electrical Code (NFPA 70)
2. Underwriters Laboratories, Inc. (UL) 8750
3. Applicable state, county and city government

1.04 PERFORMANCE REQUIREMENTS

A. Installation and maintenance shall be performed in accordance with this section and per the Manufacturer's procedures.

1.05 SUBMITTALS

A. General: Refer to General Conditions for submittal requirements.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Luminaires shall be as shown on the drawings, and as specified. Luminaires shall be certified by the International Dark Sky Association (IDA) as Dark Sky Friendly. Luminaires shall have a light temperature rating of less than 3000K.

B. Poles shall be as shown on the drawings, and as specified. Poles shall be anchor-bolt type with a base cover that matches the pole in material and color to conceal the mounting hardware.

PART 3 – EXECUTION

3.01 INSTALLATION

HIGH VOLTAGE OVERHEAD LINES ARE PRESENT AT THIS SITE.

A. The Contractor shall be responsible for protecting the existing wooden high-voltage pole and overhead lines that are present at this site. The contractor shall prepare and submit a safety plan in compliance with the requirements of Cal OSHA, PG&E and the City of Richmond in regard to the delivery, lifting and placement of the new Site Light.

B. Install lighting in accordance with the NEC, as shown on the drawings, and in accordance with the manufacturer's recommendations. Ground noncurrent-carrying parts of equipment, including metal poles, luminaires, metal enclosures, etc. as necessary.

3.02 INSPECTION

A. Inspection of the new fixtures and associated material shall be inspected at time of delivery by the Contractor. Any non-conformance to approved drawings or damage to any parts shall be documented and replacement parts ordered and delivered to the site.

3.03 ACCEPTANCE CHECKS AND TESTS

A. Verify operation after installing luminaires and energizing circuits.

END OF SECTION 26 00 00