EAST SIDE UNION HIGH SCHOOL DISTRICT

INDEPENDENCE HIGH SCHOOL
IH GHKL Modernization (Exterior Court & Fencing)
PROJECT NO. Z-065-603

Volume #2 of #2

TECHNICAL SPECIFICATIONS

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SECTION 02 41 13

SITE DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Demolish and remove portions of existing site facilities as described in Contract Documents.

B. Related Sections:
   1. Section 32 00 01 - General Exterior Site Construction Requirements
   2. New and replacement work specified in appropriate specification Section.

1.2 PRICE AND PAYMENT PROCEDURES

A. If the project contains a Lump Sum price for demolition, all demolition activities shall be included under that bid price and not individual remove and replace items.

B. If the project contains Unit Prices for various items such as “Remove Roots Under Repairs”; the cost of removal shall be included in the item of work.

C. If the project is bid as a lump sum, no additional payment will be made for site demolition work.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination
   1. **Contractor shall contact an Underground Service Alert entity 48 hours in advance of work, and have all utilities marked prior to Preconstruction Meeting or ground disturbance.**
   2. Contractor shall request access to owner’s water service controls.
   3. Contractor shall coordinate with affected utilities, transportation agencies, schools, waste disposal companies, and any other pavement users.
   4. Contractor shall coordinate with other contractors working on the site.
   5. Contractor shall us**e** approved trucking routes from the municipalities on project haul routes.

B. Preconstruction Meeting
   1. Contractor shall schedule a preconstruction meeting prior to initiating work.
   2. Attendees at the preconstruction meeting shall include but not be limited to:
      a. Owner’s Representative
      b. Contractor’s **Project Manager and General Superintendent**
      c. **Subcontractor Representatives** (if applicable)
      d. QA Representative
      e. QC Representative
      f. Other pavement users or affected parties as applicable.

C. Sequencing
   1. Contractor shall sequence the work to minimize disruption to existing project users.
   2. Contractor shall sequence the work to prevent demolition operations from damaging

new and existing sitework features.

3. Contractor shall not commence demolition until all Storm Water protection BMPs have been installed.

D. Scheduling
   1. Include on Construction Schedule detailed sequence of individual site demolition operations.
   2. Coordinate with Owner for equipment and materials to be removed by Owner, if necessary.

1.4 SUBMITTALS

A. Upon Project Closeout - Identify abandoned utility and service lines and capping locations on record drawings.

1.5 CLOSEOUT SUBMITTALS

A. Provide Owner documentation of disposal and recycling of site demolition material.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine site to determine extent of work necessary to separate work to be removed from work to remain. If separation procedure is unclear, request clarification from Owner's Agent at least 5 working days in advance of demolition.

3.2 PREPARATION

A. Notify corporations, companies, individuals, and local authorities owning conduits running to property.
   1. Protect and maintain conduits, drains, sewers, pipes, and wires that are to remain on the property.
   2. Arrange for removal of wires running to and on property. Remove pipes and sewers in accordance with instructions of above owners.
   3. Mark locations of all underground utilities encountered including abandoned, damaged, repaired or unknown facilities on Record Drawings.

B. Contractor shall be responsible for protecting soil stability underlying facilities during demolition.

C. Contractor shall be responsible for protecting existing facilities.

3.3 PERFORMANCE

A. Execute work in an orderly and careful manner, with due consideration for neighbors and the public. **Control dust.**

B. Carefully remove, disassemble, or dismantle as required, and store in approved location on site, existing items to be reused in completed work.

C. Concrete and Paving Removal
1. Full depth saw cut joints between material to be removed and material to remain.
2. Existing concrete site elements or pavement damaged during demolition or work shall be resawcut and replaced at Contractor's expense.

D. Site Clearing
1. Tree and Brush Removal
a. Cut off trees, shrubs, brush and vegetative growth 12 inches maximum above ground.

b. Remove stumps and roots 12 inches below original ground surface or until stump and all roots 1 inch or larger are removed.

c. Entirely remove roots of plants which normally sprout from roots as identified by Owner's Agent.

2. Root Pruning and Removal
a. Hand excavate trench one foot wide and 20 inches deep along concrete or paving to be removed.

b. Cut roots encountered with saw, axe, or pruners. Do not cut roots with excavating equipment.

c. Remove roots under concrete and paving to 12 inches below top of base or native subgrade.

3. Stripping
a. Strip existing vegetation layer 2 inches and remove from site prior to stripping topsoil for storage and reuse if necessary.

b. After stripping existing vegetation layer, strip existing topsoil 4 additional inches. Store onsite for reuse if necessary.

E. Excavation
1. Use excavation equipment and methods which do not cause or increase subgrade instability.
2. Use methods which preclude tracking of soils or debris off site or onto streets, etc.

F. Disposal
1. Immediately remove from site all trees, shrubs, stumps, vegetative layer, asphalt concrete, removed concrete site elements and surface debris.
2. Do not bury or burn waste.
3. Comply with all local, state, and federal disposal and recycling regulations.
4. If hazardous materials are encountered refer to the General Conditions.

G. Site Maintenance
1. Broom clean all remaining surfaces immediately after demolition and removal of debris. Maintain broom clean condition.
2. Maintain all storm water protection measures.

3. Provide continuous dust control measures until work is complete.

END OF SECTION

SECTION 02 41 15

SITE UTILITY REPAIR

PART 1 GENERAL

1.1 SUMMARY

A. Includes But Not Limited To
   1. The contractor shall identify the location of the existing utilities for the site using existing plans, obvious surface features, locations of facilities, locator services and other practical means **48 hours prior to ground disturbance**.
   2. At locations where identified site utilities may conflict with the planned construction, the contractor shall pothole the utility 5 days in advance of the work to ascertain if a conflict exists. If a conflict does exist, the contractor shall notify the Owner and Engineer immediately.
   3. Repair of existing utilities damaged during the course of construction.

1.2 PRICE AND PAYMENT PROCEDURES

A. Payment for Repairs
   1. A Utility Repair Allowance is included in the project Bid Schedule. The contractor shall include this amount in his total bid.
   2. Payment for site utility repairs shall be made as follows:
      a. Damaged due to Contractor's error or negligence - paid by Contractor
      b. Damage due to unidentifiable or unknown conditions – paid through Site Utility Repair Allowance.
         1) Subcontractor markup limited to 5%
         2) Own forces markup 15%
         3) "Greenbook" and Cal Trans Force Account rules do not apply to this project. Only equipment, material and personnel directly associated to repair shall be considered "extra work" by project owner.
         4) No compensation for delays related to site utility repairs.

B. Remaining monies in the Site Utility Repair Allowance at completion of job shall be credited back to owner by a change order.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination
   1. Contractor shall coordinate with affected utilities.
   2. Contractor shall coordinate with other contractors working on the site.
   3. Coordinate with site landscape maintenance company.

B. Preconstruction Meeting
   1. Contractor shall schedule a preconstruction meeting prior to initiating work.
   2. Attendees at the preconstruction meeting shall include but not be limited to:

a. Owner's Representative
b. Contractor's **General Foreman**
c. Subcontractors (if applicable)
d. QA Representative
e. QC Representative
f. Other site users or affected parties as applicable.

C. Scheduling
1. The location of underground facilities shall be included as an initial schedule activity.
2. Potholing of potential conflicting utilities shall be performed within 48 hours after the conflict is identified.

1.4 SUBMITTALS

A. The workman or subcontractors to perform the repairs shall be identified prior to the initiation of work and telephone number made available to the Owner's Representative.
1. The contractor shall have the resources available to immediately and expeditiously repair damaged utilities, without impact to the schedule, including:
a. site lighting
b. irrigation lines and wires
c. water services
d. electrical lines

1.5 CLOSEOUT SUBMITTALS

A. Provide Owner with record drawings indicating site utility repairs with related information including photographs.

PRODUCTS

1.6 MATERIALS

A. The materials used for repairs shall be compatible and similar with the site utility to be repaired.

B. Minimum thickness of plastic pipe for irrigation repairs shall be Schedule 40.

C. Utility Boxes: Traffic-rated box and lid in pavement areas; Plastic or composite box in landscape areas.

D. Wire Connectors: 3M AY type connectors shall be used for wire splices.

PART 2 EXECUTION

2.1 PROTECTION

A. The contractor is responsible for protecting existing site utilities identified or which should have been identified by compliance with these specifications.

2.2 CONSTRUCTION

A. Repair of damaged lines or wiring due to the contractor's failure to adequately identify or protect existing utility lines shall be the contractor's responsibility.

B. Damaged utilities which were not able to be identified or protected shall be repaired by the contractor.
   1. The contractor shall make all repairs in accordance with the applicable codes. Care shall be exercised to avoid further damage to existing facilities during repairs.
   2. The repaired lines or wiring shall be tested prior to backfilling.
   3. The contractor shall be responsible for any damage to the completed work due to improper repairs of existing site utilities.
   4. Electrical splices:
      a. Damaged electrical lines shall be replaced from existing pull boxes or facilities. Splices shall only be made with the express permission of the Owner.
      b. Damaged irrigation wiring may be spliced with wire connectors. Splices in wiring run shall have a utility box placed over the splice.

END OF SECTION

SECTION 03 30 53

SITEWORK CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Includes But Not Limited To
   1. Removal of existing concrete and related materials.
   2. Compact subgrade for cast-in-place concrete site elements as described in Contract Documents.
   3. Furnish and install granular base for cast-in-place concrete site elements as described in Contract Documents.
   4. Furnish and install cast-in-place concrete site elements as described in Contract Documents.

B. Related Sections
   1. Section 02 41 13 - Site Demolition
   2. Section 03 90 05 - Concrete Joint Sealant
   3. Section 31 23 00 - Excavation, Grading & Backfill
   4. Section 32 00 01 - General Exterior Site Construction Requirements

1.2 PRICE AND PAYMENT PROCEDURES

A. Detectable Warning Surface – measured and paid for on a square foot basis as listed in the bid schedule.

B. Stair Treads – included in the bid price for stair construction and no separate payment will be made.

C. Joint Sealant - concrete joint sealant shall be included in the various items of work.

D. All other items of sitework concrete to be measured and paid for as listed in the bid schedule and shall be considered full compensation for all labor, equipment, and materials required to perform the work as described herein.

E. If sample panel(s) is required it shall be included in the unit cost of the work.

1.3 REFERENCES

A. American Society For Testing And Materials (Most recent version)
   1. ASTM D 1751, 'Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)'
   2. ASTM A 615, ‘Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement’
   3. ASTM C 33, ‘Standard Specifications for Concrete Aggregates’
   4. ASTM C 94, ‘Standard Specifications for Ready-Mixed Concrete’
   5. ASTM C 150, Standard Specifications for Portland Cement’

B. 2010 Caltrans Standard Specifications immediately connected to concrete work

C. California Building Code. (2013 or most recent version)

D. American Disabilities Act including most recent rulings

E. Applicable latest Caltrans Standard Details if applicable to the work (either because within Caltrans Right of Way or by municipal reference)

1.4 DELIVERY, STORAGE, AND HANDLING

A. Reinforcing steel shall be free of mud, heavy rust scales or flakes, or other coating at time of delivery and placing. Properly protect rebar on site after delivery.

1.5 SUBMITTALS

A. Concrete Mix Designs

B. Aggregate Base

C. Safety Treads

D. Detectable Warning Surface

E. Concrete Joint Primer and Sealant

F. Concrete Color

G. Concrete Stamp Patterns

1.6 ACTION SUBMITTALS

A. Delivery Tickets - Require mix plant to furnish delivery ticket for each batch of concrete. Keep delivery tickets at job-site for use of Owner or representatives. Tickets shall show following:
   1. Name of ready-mix plant
   2. Serial number of ticket
   3. Date and truck number
   4. Name of Contractor
   5. Name and location of Project
   6. Specific class or designation of concrete in conformance with the specifications. Class or designation shall match mix approved mix design.
   7. Amount of concrete
   8. Time loaded
   9. Type, name, and amount of admixtures used.
   10. Amount and type of cement
   11. Total water content
   12. Sizes and weights of sand and aggregate
   13. Fiber additive

1.7 QUALTIY ASSURANCE

A. Quality Assurance (QA) Inspection and/or Testing.
   1. Owner may, at their option, have independent quality assurance inspection and testing.

a. Inspections may be made during or after the work.
b. QA Inspection and testing is for the sole purpose of providing the Owner a greater degree of assurance that the requirements of the contract have been met. QA inspection and testing does not relieve the Contractor of any responsibility to comply with or perform in accordance with the Contract documents.

2. All QA concrete testing laboratories shall be CCRL, ACI or other wise qualified under ASTM C1077-14.

B. Notification Required - **Allow Owner's Agent to verify grades and elevations or to schedule QA personnel, notify Owner's Agent 48 hours minimum prior to placing concrete.**

PART 2 PRODUCTS

2.1 MATERIALS

A. Formwork
1. Material: Wood, metal or plastic
2. Size
a. Straight Runs - 2 inch nominal thickness minimum.
b. Curves - laminated to 3/4 inch thickness minimum.
c. Depth - Within 2 inches of specified depth.
3. Staking - 2 foot maximum spacing.

B. Aggregate Base -
1. 3/4 inch Class 2 Aggregate per Section 26 of Caltrans Standard Specifications.
2. Onsite Recycled Base per Section 32 12 16.
3. Grindings from cold planing less than 2 inches in maximum dimension.

C. Expansion Joints
1. Manufactured commercial fiber type meeting requirements of ASTM D 1751 and 1/2 inch thick.

D. Concrete Reinforcing Steel
1. Grade 40 deformed bars.

E. Concrete
1. Type I/II Cement
2. All concrete except swales and PCC pads for dumpsters:
a. 1" maximum aggregate size.
b. 5 sack minimum.
c. 2,500 psi in 28 days.
d. 4 inch maximum slump.
e. Fibermesh Polypropylene Fibers, or equivalent, 3/4" minimum length @ 1.5 lbs/cy (0.01% by volume).
3. Concrete swales and PCC pads for dumpsters:
a. 1" maximum aggregate size.
b. 6 sack minimum.
c. 2,000 psi in 7 days.
d. 3,500 psi in 28 days.
e. 4 inch maximum slump.
f. Fibermesh Polypropylene Fibers, or equivalent, 3/4" minimum length @ 3.0

lbs/cy (0.02% by volume).

4. Omit Fibermesh on colored and/or textured concrete.

F. Safety Treads - Wooster Products Inc. Type 231 complying with latest addition of UBC for placement and color.
   1. Warning strip on top and bottom steps to differ in color from intermediate stair treads.

G. Detectable Warning Surface -
   1. Tactile warning dots per Section 1133B.8.5 of the most recent edition of the California Building Code.
      a. 36” Minimum width.
      b. Durable, slip resistant material with a surface texture composed of raised, truncated domes in a staggered pattern with a diameter of nominal 0.9” at the base tapering to 0.45” at the top, a height of nominal 0.2”, and a center spacing of nominal 2.35”.
      c. Color as specified on plans. If no color is specified, color shall be Safety Yellow.
      d. “Set-in-concrete’ system required (No glued & screwed mat systems installed after finished concrete)
   2. Acceptable Products (in safety yellow color):
      a. “Wet-Anchor Box” by Disability Devices, Inc. http://www.disabilitydevices.com/Offset_Dome_Tactile_Warning_Mat.html
      b. “Cast-in-Place System” by Armor-Tile. http://www.armor-tile.com/truncateddomes/surface-applied-systems.htm
      c. Approved equal by Owner’s Agent prior to bidding.

H. Concrete Joint Sealant
   1. Pourthane SL Product 773-A by W. R. Meadows/SealTight
   2. Sikaflex Self-Leveling Sealant
   3. Or equal

PART 3 EXECUTION

3.1 PREPARATION

A. Survey and stake sitework concrete to indicate location and elevations required by the Contract Documents. **Notification to Owners Representative of grades set by contractor Required - Allow Owner’s Agent to verify grades and elevations 48 hours minimum prior to placing concrete.**

B. Subgrade
   1. Fine grade to elevations required by Contract Documents with allowances for required concrete and aggregate base thickness.
   2. Compact native soils to 90 percent relative compaction at optimum moisture +/- 2 percent.

C. Aggregate Base
   1. Where required, place required thickness.
   2. Fine grade to elevations required by Contract Documents with allowances for required concrete and aggregate base thickness.
   3. Compact to 90 percent relative compaction at optimum moisture +/- 2 percent.

D. Sidewalk sample for specified finishes (not including broom-finished concrete)
   1. Prior to placing any concrete for sidewalks, Contractor shall prepare a 4 foot by 4 foot sample with the specified finish(s) for approval by the Owner's Representative.
      a. Approved sample shall remain on site for the duration of the concrete work, and shall be disposed of at the completion of the final concrete pour.
      b. Approved sample work shall not be a part of the finished work product.

E. Protection of Existing Facilities
   1. All vertical surfaces within 10 feet of the work shall be covered to a height of 3 feet with sheet plastic
   2. Existing hardscape surfaces shall be protected with tape and plastic sheeting.
   3. Any damage to adjacent finishes shall be repaired to the satisfaction of the owner. Repainting shall extend across the entire plane from corner to corner.
   4. Horizontal surfaces shall be protected from graffiti or other damage.

3.2 INSTALLATION

A. Site Tolerances
   1. Vertical
      a. Subgrade - 0.00 feet high.
      b. Aggregate Base - 0.00 feet high.
      c. Finish Concrete +/- 0.02 feet.
   2. Horizontal
      a. General Finish Concrete - +/- 0.10 feet.
      b. Required Widths - 0.00 to +0.10 feet.
   3. Layout
      a. Horizontal dimensions shall be within +/- 0.10 feet.
   4. Exterior Accessible Travel Paths
      a. Landings, Ramps, Crosswalks, Sidewalks, and other Pedestrian Travel Paths Cross slopes - 2 percent or less.
      b. Sidewalks - 5 percent or less longitudinal slope.
      c. Ramps - 8.33 percent or less longitudinal slope.
      d. Maximum vertical distance between landings - 30 inches.
   5. Variations in stairs
      a. Consecutive steps-
         1) Treads -1/4 inch, 11 inch minimum width.
         2) Risers - 1/4 inch, 4 inch minimum, 7 inch maximum.
      b. Flight of stairs -
         1) Treads -3/8 inch.
         2) Risers - 3/8 inch.
   6. Landings at Doorways -
      a. 1/4 inch maximum differential between top of threshold and surface of landing.
   7. Forms
      a. Vertical surfaces shall be formed to within 2 inches of subgrade.
      b. Gaps between forms shall not exceed 1/4".

B. Joints
   1. Align joints of sidewalk and curb and gutter.
   2. Expansion Joints with joint material -

a. Spacing -
   1) Sidewalks, Curbs, and Curb & Gutter - 50 feet on center.
   2) Mow Strips - 10 feet on center.
   3) Flat Drainage Structures - 50 feet on center.
   4) Retaining Walls - 36 feet on center.
b. Full depth of sidewalk, curbs, gutters, pads, etc.
c. If reinforcement required, rebar to extend through expansion joint material.
d. Place at corner of curb and curb & gutter.
e. Install so top of expansion joint material is 1/4 inch below finished concrete surface.
f. No expansion joint required between curbs and walks parallel to curb.
g. Provide expansion joint at end of walks perpendicular to and terminating at curb.
h. Provide expansion joint between concrete work and buildings. Expansion joint shall be 1/2" below finished concrete surface. Caulk per Section 30 90 05.

3. Contraction Joint Spacing -
   1) Sidewalks, Curbs, and Curb & Gutter - 10 feet on center.
   2) Mechanical Pads, Dumpster Enclosures, etc. - 12 feet on center.
   3) Flat Drainage Structures - 10 feet on center.
   b. Contraction Joint Depth
      1) 1 inch minimum depth.
      2) 1/4 to 1/3 concrete thickness.
   c. Location
      1) Align sidewalk and curb and/or gutter.
      2) If placing on existing concrete, align with underlying contraction joints and cracks if feasible.
      3) Place at all inside corners.
      4) At square utility boxes, place contraction joints at each corner.
      5) At round utility boxes, place joint through center to nearest edges of concrete.
      6) Spacing may be increased or decreased to 12 feet to accommodate utility boxes.
   d. Type
      1) Tooled joint up to 6" concrete depth. Tooled joint required for all sidewalks. Sawcuts not allowed. Tooled joint may be deepened with sawcut within 24 hours of concrete placement if necessary.
      2) Sawcut or parting strip for concrete depths over 6 inches. All sawcuts shall be made within 24 hours of concrete placement.
4. Inserts, Stair Treads, etc. - Precut and place prior to concrete placement where practical.
5. Crack Repair - Cracks resulting from failure to comply with requirements will require removal and replacement of entire panel or section of concrete to adjacent contraction joints.

C. Finish
1. Curb, Gutter, Slabs, Mow Strips, Flat Drainage Structures, And Miscellaneous
   a. Light Broom finish.
   b. Round edges including edges formed by expansion joints.
   c. Remove edger marks.
2. Sidewalk – Unless specified otherwise on plans, sidewalks shall have a light broom finish with the following requirements:
   a. Washed, Fine Aggregate surface (3/8” max. size aggregate).
   b. Round edges including edges formed by expansion joints.
   c. Remove edger marks.
3. Curb Faces -

a. Remove forms as soon as practical.
b. Fill voids with fresh concrete if necessary.
c. Finish face full depth with smooth steel trowel finish.
d. Remove any excess concrete beyond form line at bottom of curb face at time of finishing.

4. Walls -
   a. Immediately after removing forms, remove joints, marks, bellies, projections, loose materials, and cut back metal ties from surfaces to be exposed.
   b. Point up voids with cement mortar, 1:2 mix, and rub exposed surface with carborundum to smooth, even surface.
5. Ramps -
   a. Medium broom finish transverse to direction of travel on ramp.

D. Special Requirements
1. Form vertical surfaces full depth. Do not allow concrete to flow out from under forms in any degree. Remove any excess concrete beyond form face immediately after forms removed.
2. Sidewalks, Exterior Stairs, And Landings -
   a. Slope to drain.
      1) Slope sidewalks with cross slope of 1 percent minimum to 2 percent maximum in direction of intended drainage.
      2) Slope sidewalks away from building one percent minimum.
   b. Dusting with cement not permitted.
   c. Adding water during finish not permitted.
3. At Channel Iron over Rainleaders -
   a. Grout space between pipe and channel iron at curb face and sidewalk edge.
   b. Grind 1/4 inch bevel on sawcut edge if applicable prior to concrete placement. Round over concrete edge of fresh concrete.
4. Light Pole Bases

E. Detectable Warning Surfaces -
1. Layout -
   a. 36 inch minimum width, length per plan.
   b. Surface flush with adjacent concrete.
2. Install warning surface in accordance with manufacturer’s recommendations.

F. Concrete Joint Sealant
1. Cleaning
   a. Remove all contaminants including dirt, paint, curing compounds, grease, oil or other non-compatible substances or compounds.
   b. Do not use any oil based cleaning compounds.
   c. After cleaning, vacuum thoroughly.
2. Sealant
   a. Cure new concrete a minimum of 28 days prior to sealing.
   b. Application
      1) Surface of sealant shall be 1/16" to 3/16" below the concrete surface.
      2) Clean all sealant off adjacent concrete surfaces.
   c. Protection
      1) Protect sealed joints until sealant is fully set.

3.3 FIELD QUALITY CONTROL

A. Formwork Dimensions and Grades
1. Contractor shall verify that the formwork conforms to the required dimensions and

elevations prior to placement of concrete.

B. Contractor shall verify ADA travel path slopes and cross slopes
   1. Check formwork prior to concrete placement
   2. Check placed concrete during finishing
   3. Check completed work prior to placing curing compound

C. Concrete Drainage Structures
   1. Contractor shall water test flowlines of drainage structures such as gutters, swales and v-ditches during the finishing process to eliminate high or low areas and any areas of ponding.

END OF SECTION

SECTION 06 15 40

HEADERBOARDS

PART 1 GENERAL

1.1 SUMMARY

A. Includes But Not Limited To
   1. Providing and installing headerboards as described in Contract Documents.

B. Related Sections
   1. Section 32 00 01 - General Exterior Site Construction Requirements

PART 2 PRODUCTS

2.1 MATERIALS

A. Wood
   1. Headerboard
      a. 2x4 or 2x6 nominal size as specified construction-heart grade redwood for straight runs.
      b. 1/2x4 or 1/2x6 resawn construction heart laminated with 3 layers per detail for curved sections.
   2. Stakes -
      a. Joints - 2x6 x 18" construction heart redwood.
      b. Field
         i. 1x3x18" construction heart redwood.
         ii. 2x4x18" construction heart redwood.

B. Fasteners
   1. Screws - galvanized No. 8 minimum
      a. 2" for 1" stakes.
      b. 2-1/2" for 2" stakes.
      c. 1-1/4" for laminating benderboard.
   2. Nails - **NOT ACCEPTED**

PART 3 EXECUTION

3.1 PERFORMANCE

A. Demolition
   1. Remove all previous headerboard and stakes in entirety.
   2. Remove asphalt concrete and/or base as necessary.

B. Placement and Alignment
   1. Top of new headerboard to match design elevation or surface of new paving.
   2. **Finished elevations shall be reviewed by owners representative prior to final grading and asphalt placement.**
   3. Align top to conform to required grade breaks for drainage.
   4. Place as designated in Contract Documents
   5. Straight alignments shall be within +/- 1/4" of stringline after paving or installation of

landscape materials.

6. Curved alignments shall be true arcs within +/- 2" of a true arc or designed alignment.
7. All joints shall be square and true. Maximum gap at joints of 1/4 inch.
8. No chain saw cuts allowed.
9. 12 foot minimum between joints on straight runs. Straight runs 20 feet or less shall be made with one piece.
10. Individual curved joints shall be staggered a minimum of 32 inches. 12 foot minimum individual board lengths. If curve radius is 12 feet or less, no joints allowed.

C. Staking
1. Stakes to be plumb, square and flush with back of headerboard.
2. Drive stakes to refusal without breaking. Replace broken or misaligned stakes.
3. Trim off top of stakes with a 20-30 degree downward slope from the headerboard outward. Do not damage headerboard. **Top of stakes shall be recessed to ¼ inch below top of headerboard.** No chain saws allowed for cutting.

D. Fastening
1. Two fasteners at each field stake.
2. Two fasteners on each piece for 2x4 stake. Three fasteners on each piece for 2x6 stake.
3. Laminated benderboard shall be fastened at 12" centers with a fastener top and bottom. Fasteners shall be 1" +/- 1/4" from edges.

PART 4 PAYMENT

A. Headerboards shall be included in the bid schedule and paid for by the lineal foot, and shall be considered full compensation for all labor, equipment, and materials required to perform the work as described herein.

END OF SECTION

SECTION 31 23 00

EXCAVATION, GRADING & BACKFILL

PART 1 GENERAL

1.1 SUMMARY

A. Includes But Not Limited To
1. Perform rough and finish grading work required to prepare site for construction as described in Contract Documents.
2. Perform trench excavation and backfill for site utilities.
2. Perform excavating and compacting included in Project not covered under other Sections.

B. Related Sections
1. Section 02 41 13 - Site Demolition
2 Section 32 00 01 - General Exterior Site Construction Requirements

1.2 QUALITY ASSURANCE

A. Investigation
1. Contractor shall schedule a pre-construction meeting with Owners Representative to discuss designed grades specific to this phase of project.
2. Identify benchmark to be used in establishing grades and review Contract Document requirements for grades, fill materials, and topsoil.
3. Examine site to pre-plan procedures for making cuts, placing fills, and other necessary work.

B. Proof Rolling
1. Contractor shall proof roll keyways, fills and subgrades when requested to do so by Owner's representative.

C. Compaction Testing
1. Contractor shall schedule compaction testing with Owner's Agent at least 48 hours prior to required testing.
2. Contractor shall provide construction equipment to prepare testing sites. Minimum equipment shall be a rubber tired backhoe or equivalently weighted rubber tired machine.
3. Contractor shall recompact all test locations if necessary.

PART 2 PRODUCTS

2.1 MATERIALS

A. Site Material - Existing excavated material on site which has been identified as not being unsuitable as defined by Section 32 00 01 is suitable for use as fill material or backfill where allowed.

B. Imported Fill/Backfill

1. Equal to or greater than quality of onsite material in terms of "R" Value, but not less than R=25.
2. Plasticity Index less than 15 or no expansion pressure per CTM 301.

C. Imported Topsoil
   1. Fertile, loose, friable soil meeting the following criteria:
      a. pH between 5.5 and 7.7
      b. Soluble Salts - less than 2.0 mmhos/cm
      c. Sodium Absorption Ration (SAR) - less than 3.0
      d. Organic Matter - greater than 1 percent
   2. Physical Characteristics:
      a. Gradation as defined by USDA triangle of physical characteristics as measured by hydrometer.
         Sand - 15 to 60 percent
         Silt - 10 to 60 percent
         Clay - 5 to 30 percent
      b. Clean and free from toxic minerals and chemicals, noxious weeds, rocks larger than 1-1/2 inches in any dimensions, and other objectionable materials.
      c. Soil shall not contain more than 2 percent of particles measuring over 2.0 mm in largest size.

D. Trench Backfill – CLSM per Section 32 00 01

E. Drain Rock
   1. Drain rock material shall meet the following gradation requirements:

Screen Size	Percentage passing
1-1/2"	100
3/4"	5 (max.)
No. 200	2 (max.)

PART 3 EXECUTION

3.1 PREPARATION

A. Before making cuts, remove topsoil over areas to be cut and filled that was not previously removed by stripping. Stockpile this additional topsoil with previously stripped topsoil.

B. Keyways for Fills
   1. Prepare keyway at toe of fills.
   2. Keyways shall extend a minimum of 1.5 feet below adjacent undisturbed ground.
   3. Keyways shall be a minimum of 6 feet in width.
   4. Keyways shall slope between 0 and 4 percent toward the fill.
   5. The bottom of the keyway shall be scarified, moisture conditioned and compacted to 90 percent relative compaction a minimum depth of 6 inches.
   6. Proof roll for unstable or unsuitable soils.

3.2 PROTECTION

A. General: Open excavations, trenches, and the like shall be protected with fences, covers, or railings as required to maintain safe pedestrian and vehicular traffic passage.

B. Erosion of newly backfilled areas shall be prevented during construction. Settlement or washing that occurs in backfilled areas shall be repaired and grades reestablished to the required elevations.

C. Contractor shall comply with all local, state and federal storm water protection regulations.

3.3 PERFORMANCE

A. Tolerances
1. Maximum variation from indicated grades for rough grading shall be **+/- 0.05 foot**.
2. Grading shall not vary from the negative to positive tolerances within 50 feet.
3. Make proper allowances for final finish grades of pavement, top soil, planting areas or other structures.

B. When existing grade around existing plants to remain is higher than new finish grade, perform regrading by hand. Do not expose or damage existing shrub or tree roots.

C. Excavation
1. Maximum cut slopes shall be 2H:1V or as shown on plans.
2. Round off top 3 feet of cut slopes
3. Do not overcut slopes by more than 0.5 feet measured perpendicularly from the cut slope.
4. Protect existing trees and improvements from equipment damage.
5. Finish slopes shall be graded smooth.
6. Drainage: Ensure proper drainage in and around excavation area. Do not allow water to accumulate in excavated areas. Water in excavation areas shall be removed by pumps or other means.
7. Excavated material becomes property of the contractor.
   a. When fill is required elsewhere on site, Contractor shall use excavated material first prior to importing additional material, unless excavated material is deemed unusable by the Owner's Agent.
   b. If not called for reuse elsewhere on the site, excavated material will be disposed of by the Contractor in a legal manner.

D. Over-excavation
1. Excavations below indicated depths will not be permitted, except to remove unsuitable material as identified in Section 32 00 01 of these Specifications.
2. Satisfactory material removed below the depths indicated without specific direction from the Owner's Agent shall be replaced at no additional cost to the Owner to the indicated excavation grade. Replacement material shall be approved by Owner's Agent prior to performing the work.

E. Trenching
1. Excavate to depth and alignment as shown on plans.
2. Bottom of trench shall be accurately graded to provide required slope and shall be stabilized if necessary, to provide a firm pipe bed.
   a. Recesses shall be excavated to accommodate bells so that the pipe will be uniformly supported for the entire length.
3. Rock, where encountered, shall be excavated to a depth of 6 inches below the bottom of the pipe and the void backfilled with clean fill sand.
4. No joint trenching is allowed unless otherwise shown on drawings.

5. Provide shoring as required by Cal OSHA.
6. Trench width shall equal pipe width plus 6 inches unless otherwise shown on plans.

F. Subgrade Preparation

Site Tolerances

1. Maximum variation from indicated grades for rough grading shall be **+/- 0.05 foot**.
2. Grading shall not vary from the negative to positive tolerances within 50 feet.
3. Make proper allowances for final finish grades of pavement, top soil, planting areas or other structures.
4. If soft spots, water, or other unusual and unforeseen conditions affecting grading requirements are encountered, stop work and notify Owner's Agent.

G. Fill Construction

1. Uniformly moisture condition fill material to between optimum plus 3 percent optimum moisture prior to placing in fill.
2. Place fills in maximum loose lifts of 8 inches.
3. Compact fills to 90 percent relative compaction under concrete flat work areas; compact to 95 percent relative compaction under asphalt concrete paving. In landscape areas, compact to 85 percent relative compaction (do not over-compact).
4. Correct any unstable areas.
5. Compact fill slopes after trimming with 3 passes of a sheepsfoot roller or track roll.
6. No fill or backfill material shall be placed during adverse weather conditions that will alter the moisture content to above optimum level.
   a. Approved compacted subgrades that are disturbed by adverse weather or by the Contractor's actions shall be scarified and re-compacted to the required density prior to further construction thereon.

H. Trench backfill

1. CLSM or Cement Slurry per Section 32 00 01 of these Specifications, and as shown on Plans.
2. Do not perform any trench backfill until lines have been inspected and/or tested by Owner's Agent and authorization has been given to proceed by said Agent.

I. Finish Grading

1. Do not start finish grading until rough grading tolerances are met.
2. Prior to finish grading or adding topsoil to planters, dig out weeds by roots and remove rocks, concrete, asphalt, wood, forming material, wire, rubble, sticks, etc.
3. Prior to placing topsoil, remove aggregate base down to native soil in planting areas.
4. Excavate planting areas to provide the following minimum topsoil depths below adjacent concrete or finish surfaces:
   a. Lawn and Groundcover Planting Areas - 7 inches minimum
   b. Shrub Planting Areas - 14 inches minimum.
5. Redistribute approved existing topsoil stored on site from stripping per Section 02 41 13.
6. Add imported topsoil as necessary to provide required topsoil depth.
7. Fine grade topsoil 1 inch minimum to 2 inches maximum below top of concrete or finish surfaces, unless shown otherwise on plans. Rake smooth and remove all lumps, rocks, etc.
8. Provide a minimum of 8 inches clearance from finish floor at buildings or wood structures.

9. Slope away from buildings at ½ inch per foot for a minimum of 5 feet.
10. Fill low spots and pockets with topsoil and grade to drain.

J. Clean up
   1. Upon completion of the work under this section, Contractor shall remove from the premises all surplus materials, tools, equipment, trash, rubbish, left-over material and debris resulting from the work at his own expense and leave the site in a clean and neat condition satisfactory to the Owner's Agent.

PART 4 PAYMENT

A. Unless specified otherwise in the bid schedule, excavation, off haul, grading and backfill shall be paid for as a part of the various items of work and no separate payment shall be made.

END OF SECTION

SECTION 32 00 01

GENERAL EXTERIOR SITE CONSTRUCTION REQUIREMENTS

PRIOR TO, DURING AND POST CONSTRUCTION

PART 1 GENERAL

1.1 SUMMARY

A. Includes But Not Limited To
   1. General procedures and requirements for Site Work.
   2. Accessibility Requirements

1.2 REFERENCES

A. American Society For Testing And Materials (most recent revisions)
   1. ASTM D 1557, 'Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort'
   2. ASTM D 2216, 'Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock'
   3. ASTM D 2487, 'Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)'4
   4. ASTM D 6938, 'Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)'
   5. ASTM D 2950, ‘Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods’

B. Caltrans Test Methods (most recent revisions)
   1. CTM 216, ‘Method of Test for Relative Compaction of Untreated and Treated Soils and Aggregates.
   2. CTM 301, ‘Method of Test for Determination of the Resistence “R” Value of Treated and Untreated Bases, Subbases and Basement Soils by the Stabilometer’
   3. CTM 304, ‘Method of Preparation of Bituminous Mixtures for Testing’
   4. CTM 308, ‘Methods of Test for Bulk Specific Gravity and Weight per Cubic Footof Bituminous Mixtures’

1.3 DEFINITIONS

A. Standard Specifications - Caltrans Standard Specifications **directly associated to the work.**

B. Relative Compaction
   1. Ratio of field dry density as determined by ASTM D 2922 and ASTM D 3017 or 2216, and laboratory maximum dry density as determined by ASTM D 1557 or CTM 216F.
   2. Ratio of maximum field density as determined by ASTM D 2922 and the laboratory maximum density as determined by CTM 216G.

C. Differing Subsurface or Physical Conditions
   1. Any subsurface or physical condition at or contiguous to the site that is uncovered or revealed either:

a. Is of such a nature as to establish that any “technical data” on which Contractor is entitled to rely as provided herein is materially inaccurate, or
b. Is of such a nature as to require a change in the Contract Documents, or
c. Differs materially from that shown or indicated in the Contract Documents, or

d. Is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents.

2. If Contractor believes that a differing subsurface or physical condition exists, Contractor shall promptly, after becoming aware thereof and before disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency), notify Owner's Agent in writing about such conditions. Contractor shall not further disturb such conditions or perform any Work in connection therewith until receipt of written order to do so.

D. Unsuitable Material
1. Soil or aggregate of such unstable nature as to be incapable of being compacted to specified density using ordinary methods at optimum moisture content; or
2. Too wet to be properly compacted and circumstances not resulting from the Contractor's action or inaction prevent suitable in place drying prior to incorporation into the work; or
3. Otherwise unsuitable for the planned use.

E. Unstable - visible deflection or movement either horizontally or vertically under loading of construction equipment or while being proof rolled.

F. Proof Rolling - Using a loaded 10-wheel dump truck, water truck, or equivalent to load soil by driving slowly over areas designated by the Owner's Agent to check for unstable areas.

1.4 QUALITY ASSURANCE

A. Owner will pay for all testing required by the project specifications.

B. Contractor shall pay for cost of all non-complying testing.

PART 2 PRODUCTS

A. Controlled Low Strength Material (CLSM)
1. Contains maximum of 94 lbs of cement per cubic yard.
2. Compressive strength between 75 and 150 psi at 28 days.
3. Fly ash is permitted.
4. Air entrainment additives for workability.

B. Cement Slurry - Conforms to Section 19-3.062 of Caltrans Standard Specifications.

PART 3 EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions
1. 48 hours minimum prior to performing any work on site, contact Underground Service Alert (USA) to arrange for utility location services. If USA will not respond to the project site, the Contractor shall be required to provide a private locating service.
2. Perform minor, investigative excavations to verify location of various existing underground facilities at sufficient locations to assure that no conflict with the

proposed work exists and sufficient clearance is available to avoid damage to existing facilities.

3. Perform investigative excavating 10 days minimum in advance of performing any excavation or underground work.
4. Upon discovery of conflicts or problems with existing facilities, notify Owner's Agent by phone or fax within 24 hours. Follow telephone or fax notification with letter and diagrams indicating conflict or problem and sufficient measurements and details to evaluate problem.

3.2 PREPARATION

A. Protection
   1. Spillage -
      a. Avoid spillage by covering and securing loads when hauling on or adjacent to public streets or highways.
      b. Remove spillage and sweep, wash, or otherwise clean project, streets, and highways.
   2. Dust Control -
      a. Take precautions necessary to prevent dust nuisance, both on-site and adjacent to public and private properties.
      b. Correct or repair damage caused by dust.
   3. Existing Plants and Features - Do not damage tops, trunks, and roots of existing trees and shrubs on site which are intended to remain. Do not use heavy equipment within branch spread. Interfering branches may be removed only with permission of Owner's Agent. Do not damage other plants and features which are to remain.

B. If specified precautions are not taken or corrections and repairs made promptly, Owner may take such steps as may be deemed necessary and deduct costs of such from monies due to Contractor. Such action or lack of action on Owner's part does not relieve Contractor from responsibility for proper protection of the Work.

C. Contractor shall comply with all local, state, and federal storm water protection regulations.

3.3 SURVEYING & LAYOUT

A. Benchmark – Project Plans will provide either a permanent or temporary benchmark.

B. Contractor shall provide all surveying and layout.

C. Contractor shall provide 2 personnel as requested by the Owner's Agent to perform quality assurance testing including stringlining of subgrades and verification of grades. Stringline and engineers level (or laser level) shall be provided by the Contractor and be available at all times during site work.

3.4 REPAIR / RESTORATION

A. Adjust existing covers, boxes, and vaults to grade.

B. Replace broken or damaged covers, boxes, and vaults.

C. Independently confirm size, location, and number of covers, boxes, and vaults which require adjustment.

D. Advise Owner's Agent of damage to underground site utilities. Address utility repairs per Section 02 41 15 "Site Utility Repair".

E. Site Cleaning Immediately Prior To Acceptance
1. All surfaces shall be broom clean and free from any accumulation of debris.
2. Clean tack coat on concrete surfaces. Tack coat within 1 inch of pavement on curbs or gutter is not required to be cleaned.
3. Remove all traffic control devices, excess materials, debris and signage from site.
4. Remove all debris and sediment from the existing storm drain structures.
5. Clean existing through-curb drain pipes using ordinary methods such a garden hose with extension pipes.
6. Bring clogged or damaged storm drain pipes or structures to attention of Owner's Agent.
7. Replace any disturbed landscaping. Backfill planters with clean topsoil and replace surface dressing or mulch in kind.
8. Remove all concrete debris and splatter.

3.5 ACCESSIBILITY REQUIREMENTS

A. Work shall comply with the following code requirements:
1. Title 24, CCR: California Building Code.
2. Latest Edition of Uniform Building Code including California Amendments.
3. American with Disabilities Act.
4. Code requirements shall supercede plans or specifications.

B. Coordination of Work
1. Coordinate work elements to provide code compliance.

C. Accessible Travel Paths
1. Includes unloading zones, crosswalks, and sidewalks.
2. Excludes ramps and landings.
3. Maximum cross slope of 2 percent.
4. Maximum longitudinal slope of 5 percent.

D. Ramps and Landings
1. Includes all travel paths between 5 and 8.33 percent.
2. Provide handrails.
3. Provide wheel curbs or wheel rails.
4. Provide landings at beginning, end and every 30 inches of vertical rise. Landings shall be a minimum of 72 inches long, the width shall match the travel path, and the maximum cross slope shall be 2 percent.

E. Curb Ramps
1. Longitudinal slopes shall be between 6.7 and 8.33 percent.
2. Cross slopes shall be less than 2 percent.
3. Concrete score marks per code.
4. Provide positive drainage.
5. Detectable Warnings per ADA and codes.

F. Door Landings
1. Extend landing 42 inches beyond door swing, 24 inches beyond latch side of door.
2. Maximum slope in any direction shall be 2 percent.
3. Maximum drop at doorways of 1/4 inch from finish floor to landing.

G. Accessible Parking Stalls and Unloading Zones
   1. Maximum slope in any direction of 2 percent.
   2. Unloading Zone shall be minimum 5 feet in width, 8 feet for Van Accessible Stalls.
   3. 6 foot Parking Bumpers shall be used to protect signs and overhang into accessible sidewalk as necessary to provide a 4 foot minimum sidewalk width.

H. Signage
   1. Signage shall include required entrance signs and stall signage.
   2. Signage location preference shall be building first, landscape area second, and in pavement third.

3.6 FIELD QUALITY CONTROL

A. If work has been interrupted by weather, scheduling, or other reason, notify Owner's Agent 24 hours minimum prior to intended resumption of work.

B. Owner reserves the right to require additional testing to re-affirm suitability of completed work including compacted soils or aggregate bases which have been exposed to adverse weather conditions.

PART 4 PAYMENT

A. Payment for all work described in this section shall be included in the various items of work and no separate payment shall be made.

END OF SECTION

SECTION 32 11 23

AGGREGATE BASE

PART 1 GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Prepare pavement sub-grade as described in Contract Documents to receive pavement base and paving.
   2. Furnish and install pavement base in playground, driveway and parking areas as described in Contract Documents.

B. Related Sections
   1. Section 32 00 01 - General Exterior Site Construction Requirements
   2. Section 31 23 00 - Excavation, Grading & Backfill
   3. Section 32 01 26.72 - Cold Planing

1.2 REFERENCES

A. Caltrans Standard Specifications, Section 26, 2010

1.3 SUBMITTALS

A. Product Data - Manufacturer's published product data on soil sterilant.

B. Quality Assurance / Control
   1. Copies of test results from tests conducted to assure compliance to Contract Document requirements.
   2. Certificate of Compliance for Aggregate Base

1.4 PROJECT CONDITIONS

A. Project Environmental Requirements
   1. Do not perform work during following conditions:
      a. Presence of free surface water or damp pavement.

PART 2 PRODUCTS

2.1 MATERIALS

A. Aggregate Base
   1. New Aggregate Base - 19mm (3/4") Class 2 aggregate base in conformance with Section 26 of the Caltrans Standard Specifications.
   2. Onsite Recycled Aggregate Base
      a. By the contract documents or by approval from Owners Representative, pulverized existing asphalt concrete pavement mixed uniformly with existing aggregate base.

b. Conform to following gradation

Sieve	Percent by Weight Passing Sieve
2-1/2 inch	100
1-1/2 inch	95 - 100
3/4 inch	60 - 100
No. 200	2 - 12

c. Quality Requirements as established by testing
   1) R-value - 78 minimum

PART 3 EXECUTION

3.1 PREPARATION

A. Survey and stake paving surfaces to indicate grading required by Contract Documents.

B. Sub-Grade
   1. Finish grade surface area to grades required by Contract Documents.
   2. In pulverized areas where grading will match existing, regrade onsite recycled base to match approximate grade of previous surface.
   3. Compact as follows:
      a. Under sitework concrete, concrete swales, concrete pads or concrete pavement - compact to 90 percent relative compaction at optimum moisture +/- 2 percent.
      b. Under HMA pavements, compact to 95 percent relative compaction at optimum moisture +/- 2 percent.
   4. Proof roll completed subgrade prior to compaction testing and stringlining to verify subgrade stability. Proof roll with full water truck or equivalent vehicle. Repair unstable, soft or yielding areas.

3.2 APPLICATION

A. Site Tolerances
   1. Sub-Grade - 0.00 inches high. Measure using stringline from curb to curb, gutter, flat drainage structure, or grade break.
   2. Base - The average base thickness shall be equal or greater than the design thickness after compaction. The minimum base thickness shall be equal to the design thickness minus **0.03 ft** The surface shall be graded to a finished tolerance of plus or minus 1/4 inch in 10 feet. Measure using stringline from curb to curb, gutter, flat drainage structure, or grade break.

B. Aggregate or Onsite Recycled Base
   1. Grade to specified tolerances.
   2. Compact as follows:
      a. Under sitework concrete, concrete swales, concrete pads or concrete pavement - compact to 90 percent relative compaction at optimum moisture +/- 2 percent.
      b. Under HMA pavements, compact to 95 percent relative compaction at optimum moisture +/- 2 percent.
   3. Remove and replace segregated areas.
   4. Remove or repair improperly prepared areas as directed by Engineer.

C. 1.. Overlay Transitions -

a. Prepared per Section 32 01 26.72 “Cold Planing”.
b. Place base course paving in full-depth transitions prior to overlay.

END OF SECTION

SECTION 32 12 16

HMA PAVING

PART 3 GENERAL

3.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install Hot Mix Asphalt for areas as described in Contract Plans and Documents.

3.2 REFERENCES

A. Caltrans Standard Specifications, Section 39, 2010 (Unrevised)

3.3 SUBMITTALS

A. HMA Submittals are due at Pre Construction Meeting

B. Product Data - Manufacturer's published product data on soil sterilant.

C. Quality Assurance / Control
   1. Mix design of hot-mix asphalt mixture.
   2. Copies of test results from tests conducted to assure compliance to Contract Document requirements.
   3. Current verified **CEM 3513 including TSR value**

3.4 PROJECT CONDITIONS

A. Project Environmental Requirements
   1. Do not perform work during following conditions:
      a. Ambient, base, or pavement temperature below 50 degrees F.
      b. Over-saturated base and sub-base materials.
         1) Base and sub-base to be wheel-rolled by loaded water truck to determine if any yielding occurs under the loading. If deflection is observed, do not perform paving until grade is stable and unyielding.

PART 4 PRODUCTS

4.1 MATERIALS

A. Pavement
   1. Asphalt Binder - PG 64-10
   2. Aggregates

a. 3/4” Type A used for HMA base courses of 2-1/2 inches or thicker.

b. 1/2” Type A used for base courses less than 2-1/2 inches, but greater than or equal to 1-3/4 inches and surface course in vehicle traffic areas.

c. 3/8” Type A used for leveling courses and surface courses in playgrounds and other pedestrian areas.

B. Tack Coat

1. Tack coat shall be utilized and will be emulsified asphalt Grade RS-1, RS-1h, SS-1, or SS-1h and shall conform to Section 94, ‘Asphaltic Emulsions’, of the Standard Specifications.

4.2 MIXES

A. Current verified and **PEI approved CEM 3513**

1. Mix voids targeted at 3.5%.
2. TSR to be minimum 70 in accordance with CTM 371.

PART 5 EXECUTION

5.1 PREPARATION

A. HMA Paving

1. **Use self-propelled laydown machine for all surface courses. Laydown machine for finish course shall be equipped with automated depth and grade control.** Base courses for digouts or stabilization areas may be placed by other mechanical means that will not destabilize subgrade.
2. Heat joints if laid more than 3 hours previously.
3. Compaction

a. Modify 39-2.03A Testing as follows:
“Quality Characteristic: Percent of maximum theoretical density (%) for HMA Type A to 92% to 96%. Retain footnotes e & f. Add the footnotes k through m to this requirement:

k. Perform testing in accordance with CT 375 for acceptance, except CT 309 shall replace TMD testing.

l. Maximum lot size shall be 500 tons

1) Minimum 3 test sites per location, 1 test for each 50 tons thereafter.
2) Each street segment or pavement area shall be an independent lot(s).
3) Compaction will be the average compaction for the street or pavement area.

m. **Failing tests shall be verified by coring**. If requested by the Contractor. Contractor obtains cores at locations randomly determined by Engineer. Engineer tests cores.
1) If requested by the Contractor and approved by the Engineer, non-nuclear gauges may be substituted for use in CT 375.

b. If cores are passing, Engineer pays cost of core sampling and core testing. If

cores are failing, Contractor pays for testing and core sampling. If the core density testing produces both passing and failing cores, the cost will be prorated between the Owner and Contractor.

c. The table for deductions indicated in the referenced Caltrans Section 39 shall apply to individual cores. The following table shall apply to deductions for average compaction of a lot:

Reduced Payment Factors for Percent of Maximum Theoretical Density			
HMA Type A Percent of Maximum Theoretical Density	Reduced Payment Factor	HMA Type A Percent of Maximum Theoretical Density	Reduced Payment Factor
92.0	0.0000	96.0	0.0000
91.9	0.0125	96.1	0.0125
91.8	0.0250	96.2	0.0250
91.7	0.0375	96.3	0.0375
91.6	0.0500	96.4	0.0500
91.5	0.0625	96.5	0.0625
91.4	0.0750	96.6	0.0750
91.3	0.0875	96.7	0.0875
91.2	0.1000	96.8	0.1000
91.1	0.1125	96.9	0.1125
91.0	0.1250	97.0	0.1250
90.9	0.1375	97.1	0.1375
90.8	0.1500	97.2	0.1500
90.7	0.1625	97.3	0.1625
90.6	0.1750	97.4	0.1750
90.5	0.1875	97.5	0.1875
90.4	0.2000	97.6	0.2000
90.3	0.2125	97.7	0.2125
90.2	0.2250	97.8	0.2250
90.1	0.2375	97.9	0.2375
90.0	0.2500	98.0	0.2500
< 90.0	Remove and Replace	> 98.0	Remove and Replace

d. Field compaction testing performed in accordance with CTM 375 with a minimum of five tests per lot and one test per 50 tons.

e. Roll with powered equipment capable of obtaining specified density and smoothness.

f. **Execute initial compaction rolling prior to mix cooling below 250 degrees**. Complete finish rolling so visibility of joints is minimized as soon as possible after intermediate rolling and while asphalt paving is above 120 deg F surface temperature.

g. **HMA that arrives at the job site at 260 degrees or below shall be rejected.**

Finish

a. Surface shall be uniform with no 'birdbaths'. Leave finished surfaces clean and smooth. Variations from specified grades shall not exceed 1/2 inch. When tested with 10 foot straight edge, surface of complete work shall not contain irregularities in excess of 1/4 inch.

b. Completed surface shall match the texture of the machine laid mat. Areas worked by raking shall have coarse aggregate removed rather than pushed back onto the mat. Any areas of coarse or segregated surface shall be remedied immediately and prior to finish rolling. **Failure to comply with this provision shall cause all paving to stop until mat surface corrections are performed.**

4.Thickness Tolerances

a. Total HMA thickness less than or equal to 4 inches.
   1) Minimum thickness shall be equal to or greater than design thickness

b. Total HMA thickness greater than 4 inches.
   1) Minimum thickness shall be equal to or greater than design thickness

PART 6 PAYMENT

Payment for HMA paving shall be included in the various items of work in the Bid Schedule, including but not limited to digouts, overlays, pavement removal and replacement, base course paving in full-depth transitions, and other items of work, and no separate payment will be made.

END OF SECTION

SECTION 32 12 16.05

HMA PAVEMENT REPAIR

PART 1 GENERAL

1.1 SUMMARY

A. Includes But Not Limited To
   1. Remove and replace paving and/or base in specific areas as described in Contract Documents.

B. Related Sections
   1. Section 32 00 01 - General Exterior Site Construction Requirements
   2. Section 32 01 26.72 - Cold Planing
   3. Section 32 12 16 - HMA Pavement

PART 2 PRODUCTS

2.1 MATERIALS

A. Base -3/4" Class 2 Base for below grade fill in accordance with Section 26 of the Caltrans Standard Specifications.

B. **HMA 3/4" for Base course in digouts, 1/2" for finish course in streets or parking areas, 3/8" finish course in Playground Areas** Type A per revised Section 39 of the Caltrans Standard Specifications.

PART 3 EXECUTION

3.1 PERFORMANCE

A. Repair Of Deteriorated Pavement Areas
   1. Cut edges of pavement in rectangular shape and for one foot minimum beyond damaged material. Make vertical cuts using pavement saw or cold planer.
   2. Base - Construct per plans and Section 32 12 16.
   3. Apply emulsion tack coat to vertical edges of existing asphalt and sitework concrete to be paved against.
   4. Paving -Lifts
      i. Under overlays, place in single lift if less than 4 inch in depth.
      ii. If over 4 inches in depth, place in two lifts. Minimum lift thickness including top lift shall be 1-3/4 inches in thickness.
      b. Longitudinal bituminous joints shall be vertical, and properly tack coated if not paved same day. Transverse joints shall always be tack coated if not paved same day. Heat all cold joints on adjacent existing paving if previous mat was placed over 3 hours prior to placement of current mat.

c. Compaction -
   i. Compact per Section 32 12 16 HMA Paving.
   ii. Roll with powered equipment capable of obtaining specified density. Vibratory plate compactor may be used for areas too small for large power equipment.

d. Surface shall be uniform with no 'birdbaths'. Leave finished surfaces clean and smooth. Variations from adjacent surface shall not exceed 1/8 inch.

3.2 CLEANING

A. Upon completion of repair operations, clean up and remove debris.

PART 4 PAYMENT

A. HMA pavement repair shall be measured and paid for on a square foot basis for “Digouts” and “Remove and Replace HMA” as listed in the bid schedule and shall be considered full compensation for all labor, equipment, and materials required to perform the work as described herein.

END OF SECTION

SECTION 32 17 23

PAVEMENT MARKING

PART 1 GENERAL

1.1 SUMMARY

A. Includes But Not Limited To
   1. Furnish material and apply pavement and curb markings as described in Contract Documents.
   2. Remove existing pavement markings in sealcoat areas which will conflict with new striping layout.

B. Related Sections
   1. Section 32 00 01 - General Exterior Site Construction Requirements

1.2 QUALITY ASSURANCE

A. Regulatory Requirements - Paint accessible parking spaces to conform to ADA Standards and local code requirements.

B. **Notify Owners Representative 48 hours in advance of paint application to allow for review of layout.**

1.3 SUBMITTALS

A. Manufacturers Product Datasheet

1.4 PROJECT CONDITIONS

A. Project Environmental Requirements
   1. Apply only on dry surfaces, during favorable weather, and when damage by rain, fog, or condensation not anticipated.
   2. Latex Paint -
      a. Atmospheric temperature above 50 degrees F.
      b. When temperature is not anticipated to drop below 50 degrees F during drying period.
   3. Alkyd Paint -
      a. Atmospheric temperature above 40 degrees F.
      b. When temperature is not anticipated to drop below 40 degrees F during drying period.

PART 2 PRODUCTS

2.1 MATERIAL

A. Paint
   1. Non-reflectorized.
   2. Types - Either Acrylic or Latex
   3. Colors -
      a. Yellow - Parking stripes, crosswalk stripes, and safety markings.
      b. Blue And White - Accessible Parking space markings.
      c. Red - Fire lanes and no parking zones.
   4. Acceptable Products And Manufacturers -
      a. 442XX Traffic Marking Paint by Devoe, Louisville, KY (800) 654-2616Set-Fast Traffic Marking Paint by Sherwin-Williams, Cleveland, OH (800) 321-8194.
      b. Equal as approved by Owner's Agent before installation.

PART 3 EXECUTION

3.1 PREPARATION

A. Do not apply paint until hot-mix asphalt has cooled below 120 degrees F for at least one hour.

B. Surfaces shall be dry and free of grease and loose dirt particles. Scrape and wire brush chipped or damaged paint on existing curbs. Power wash curbs after paving but prior to painting with 3500 psi minimum pressure.

C. Perform layout with chalk or lumber crayon only. No blackout paint allowed.

3.2 APPLICATION

A. Site Tolerances
   1. General - Make parking lot lines parallel, evenly spaced, and with sharply defined edges.
      a. Line Widths - Parking Spaces 4 inch. Playground markings shall match existing layout and width prior to sealcoat or current plan if on new pavement.
      b. Plus or minus 1/4 inch variance on straight segments.
      c. Plus or minus 1/2 inch variance on curved alignments.

B. Provide complete coverage in **one** application at 75 sq ft per gallon, or **two** coat application, each coat with maximum coverage of 150 sq ft per gal. Do not apply second coat within three hours minimum or until first coat is thoroughly dried, whichever is longer.

C. The underlying surface shall not be visible through newly applied paint.

D. **Failure to produce satisfactory paint markings may require contractor to provide a pavement coating to entire surface prior to the repainting of pavement markings.**

3.3 CLEANING

A. Remove drips, overspray, improper markings, and paint material tracked by traffic by sand blasting, wire brushing, or other method approved by Owner's Agent prior to acceptance.

PART 4 PAYMENT

A. Parking lot striping shall be paid for on a lump sum basis for "Pavement Markings" as listed in the bid schedule and shall be considered full compensation for all labor, equipment, and materials required to perform the work as described herein.

B. All work associated with cleaning and painting curbs, including placement of legends on curb faces, shall be included in the lump sum price for "Pavement Markings" unless otherwise listed in the bid schedule.

END OF SECTION

SECTION 32 93 07

ROOT BARRIERS

PART 1 GENERAL

1.1 SUMMARY

A. Includes But Not Limited To
   1. Furnishing and installing root barriers as described in the contract documents and as specified on the plans.

B. Related Sections
   1. Section 32 00 01 - General Exterior Site Construction Requirements

1.2 SUBMITTALS

A. Contractor shall submit a cut sheet for each type of root barrier specified for the Project.

1.3 SCHEDULING

A. Contractor shall contact the Owner a minimum of 48 hours in advance of backfilling operation to allow for Owner or representative to visually inspect placement of root barrier.

B. **Ensure existing irrigation system has been tested for function by owner and shut down prior to beginning planned work. Obtain emergency contact information for maintenance personnel.**

PART 2 PRODUCTS

A. Fabric type barriers
   1. Water permeable fabric 19” minimum width, with nodules spaced at 1.5 inches apart containing slow release trifluralin.
   2. Acceptable product: Typar Biobarrier Root control system, or approved equal prior to installation.
      a. Note: this product does not require certification for handling or installlation.

B. Panel type barriers
   1. Polypropylene panel, 0.08 inch thickness minimum, 12 inch height, 24 inch minimum width.
   2. Rounded edges, and double top edge.
   3. 90 degree support ribbing, with ground locking to prevent breakage or lifting.
   4. Acceptable product: LB 12-2 12” Linear Barrier by Deeproot Landscape Products, or approved equal.

PART 3 EXECUTION

A. Preparation

1. Identify underground utilities by Underground Service Alert or locator service.
2. Pothole at potential conflicts to confirm depth to underlying utilities. Notify Owner immediately of any conflicts.

B. Excavation
1. Excavate narrow trench to dimensions specified by manufacturer.
2. In areas adjacent to existing trees, shrubs or plant material to remain, perform excavation by hand to avoid damage to plant material. Trim and remove roots less than 2 inches in diameter encountered within limits of trench.
   a. Notify Owner of roots encountered in the trench measuring 2 inches or more in diameter. Do not remove unless directed to do so by Owner or Owner's Representative.

C. Installation
1. Backfill –
   a. Topsoil as specified in Section 31 23 00 around panel systems.
   b. Sand or other material as directed by Manufacturer for fabric systems.
2. Damaged portions of root barrier systems, including cracked panels or ripped fabrics, will be rejected and shall be replaced by the Contractor at no additional cost to the Owner.

PART 4 PAYMENT

A. Fabric type root barriers shall be measured and paid for on a lineal foot basis for "Install Root Barrier" as listed in the bid schedule and shall be considered full compensation for all labor, equipment, and materials required to perform the work as described herein.

B. Panel type root barriers shall be paid for on a unit price basis for "Install Root Panel Barrier" as listed in the bid schedule and shall be considered full compensation for all labor, equipment, and materials required to perform the work as described herein.

END OF SECTION

SECTION 26 00 00

ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 CONDITIONS AND REQUIREMENTS

A. Refer to the General Conditions, Supplementary Conditions and Division I - General Requirements, and the drawings. The Contractor, shall read the conditions and be responsible for, and governed by, all requirements thereunder. This Condition applies to all Sections of Specification Division 26.

1.2 CORRELATION, INTERPRETATION AND INTENT OF CONTRACT DOCUMENTS

A. It is the intent of this Specification and the Drawings to describe complete, safe, operating systems and the materials and installation work to be performed under the Contract.

B. The Contract Documents are complementary; what is called for by one is binding as if called for by all. If the Contractor finds a conflict, error or discrepancy in the Contract Documents, he shall call it to the Architect's/Engineer's attention in writing before proceeding with the work affected. Any work that may reasonably be inferred from the Specifications or Drawings as being required to produce the intended result shall be supplied whether or not it is specifically called for. Work, materials or equipment described in words which so applied have a well-known technical or trade meaning shall be deemed to refer to such recognized materials or work. The Contractor assumes full responsibility for familiarizing himself with the nature and extent of the Contract Documents, work, locality and local conditions that may in any manner affect the work to be done.

C. The Drawings are, in general, drawn to scale and the Contractor may obtain approximate distances and dimensions by scaling the Drawings. It is distinctly understood, however, that he does so entirely on his own responsibility. The accuracy of the Drawings is not guaranteed. Refer to Architect's Drawings, Specifications and Room Schedules for construction details which will affect this work and equipment. Examine the Plumbing, Heating and Ventilating Drawings and Specifications to ensure that the Electrical work does not conflict with the above trades. Mechanical and Electrical Drawings are largely diagrammatic and, therefore, do not necessarily represent the exact installations; it is the Contractor's responsibility to cover all conditions on his prepared Shop Drawings and by arrangement with other trades in the field.

1.3 REGULATIONS

A. The Contractor shall give required notices to the building inspectors, the Engineer and the Owner and comply with laws, ordinances, rules and regulations applicable to the work and safety. Authorities include, but are not limited to:

1. The latest revision of the State of California, Electrical Code.
2. The applicable Rules and Regulations of the National Fire Protection Association.
3. State Fire Marshall.
4. The National Electric Code.
5. Underwriters Laboratories.

6. Any other applicable Federal, State, County or City Codes or Regulations, including O.S.H.A.

B. Nothing in these Drawings or Specifications shall be construed to permit work not conforming to the above Regulations and Codes.

1.4 SAFETY AND INDEMNITY

A. The Contractor shall be solely and completely responsible for conditions of the job site, including safety of persons and property during performance of the contract. This requirement shall apply continuously and not be limited to normal working hours.

B. No act, service, drawing review or construction review by the Owner, the Architect, the Engineers or their Consultants is intended to accept responsibility for the adequacy of the Contractor's safety measures, in, on, or near the construction site.

1.5 DRAWINGS AND SPECIFICATIONS

A. Drawings and Divisions of these specifications shall be considered as a whole, and work shown anywhere herein shall be furnished under this Division.

B. Drawings are diagrammatic and indicate the general arrangement of equipment and wiring. Exact requirements shall be governed by architectural, structural and mechanical conditions of the job. Consult other drawings in preparation of the bid.

C. Right is reserved by the Owner to make changes of up to ten feet in location of any outlet or equipment prior to roughing-in without increasing contract cost.

1.6 EXAMINATION OF SITE

A. The Contractor shall examine the site and the existing conditions and make allowances for them in preparing his proposal. In the event of discrepancies between existing conditions and the Drawings, the Contractor shall report such discrepancies prior to bid and bid the conditions necessary to complete the job and to provide a fully operable and acceptable systems.

B. Extra charges will not be allowed for work that must be provided when it was apparent from a pre-bid inspection of the premises, even though the work is not shown on the drawings or called for in the Specification.

1.7 RECORD DRAWINGS AND SYSTEM OPERATION AND M A I N T E N A N C E

A. Submit one (1) copy of red lined record drawing indicating deviations from Contract Drawings. Show major changes only in location for any outlet, device or equipment, and hidden installations - such as feeders to architect for approval.

B. Submit within thirty (30) days after the date of architect's acceptance, one (1) complete electronic file and three (3) complete sets as the Record of Electrical Construction. Contracot shall be responsible to generate electronic drawing files in AutoCAd 2007 version or better.

1.8 GUARANTEE

SECTION 26 05 00

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Supporting devices for electrical components.
   2. Cutting and patching for electrical construction.
   3. Touchup painting.

1.3 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.

   1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

C. Coordinate electrical service connections to components furnished by utility companies.

   1. Coordinate installation and connection of exterior underground services, including provision for electricity-metering components.
   2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch diameter slotted holes at a maximum of 2 inches o.c., in webs.

   1. Channel Thickness: Selected to suit structural loading.

A. Materials and equipment furnished under this Specification and/or Drawings shall be guaranteed in writing for a period of one (1) year from the date of final acceptance against defective material, design and workmanship. The Contractor shall guarantee, in writing, that the systems shall be free of defects, and shall operate perfectly, and in accordance with their individual Specifications.

B. Upon receipt of notice from the Owner of failure of material, equipment or section of the system, during the guaranty period, the Contractor shall make necessary corrections promptly, without expense or inconvenience to the Owner.

PART 2 -PRODUCTS

2.1 MATERIAL APPROVAL

A. The design, manufacture and testing of electrical equipment and materials shall conform to or exceed latest applicable NEMA, IEEE, ANSI, and U.L. Standards.

B. Materials shall be new and bear Underwriters Laboratories (UL) label or other accepted testing laboratory certification. Materials that are not labeled by U.L. shall be tested and approved by an independent testing laboratory or a governmental agency acceptable to the Engineer, Owner and code enforcing authority.

2.2 SHOP DRAWINGS AND MATERIALS LIST

A. Submittals shall be required for the following:

1. Materials: A list identifying electrical items proposed for installation, including manufacturers names, part numbers, finishes, colors, materials, shape and dimensions. Items shall include wiring devices, boxes, conductors and cables, conduit, raceways, and fittings.
2. Lighting fixtures: Catalog cuts and ETL photometric data.

2.3 OPERATING AND MAINTENANCE MANUALS

A. Submit three (3) sets of Operating and Maintenance Manuals of equipment.

B. Operating manuals and parts list are required for the following equipment:

1. Lighting fixtures and lighting control systems.

2.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Receive, store and handle materials in a manner to prevent damage. Costs of damage shall be borne by the Contractor.

B. Protect equipment from weather (rain, sunshine, winds), water vapors, theft, and vehicular traffic.

PART 3 - EXECUTION

3.1 WORKMANSHIP AND CONTRACTOR'S QUALIFICATIONS

A. Installation of parts and connection of parts into systems shall be completed by skilled electrical journeymen. Material assemblies and installation work shall be securely fastened to structure, attractive in appearance and safe to operate. Provide code required clearance about electrical equipment. Assembly work or installations that are improper, unsafe or unattractive shall be removed and replaced with satisfactory work at no additional cost to the Owner.

B. Provide a foreman or superintendent in charge of this work at all times.

C. Criminal Background Investigation Certification:

1. Contractor must comply with the fingerprinting and criminal background investigation requirements of California Education Code Section 45125.1 with respect to all contractor's employees who may have contact with District pupils in the course of providing services pursuant to the contract, and that the California Department of Justice has determined that none of those employees has been convicted of a felony, as that term is defined in Education Codes Section 45122.1.
2. A complete and accurate list of contractor's employees who may come in contact with District pupils during the course and scope of the contract must be provided to the district prior to contractor working on project.

3.2 COORDINATION

A. Coordinate work with other trades to avoid conflict and to provide correct rough-in and connection for equipment furnished by other trades. Inform other trades Sub-contractors of the required access to, and clearances around, electrical equipment to maintain serviceability and code compliance.

B. Verify equipment dimensions and requirements. Check actual job conditions before installing work. Report necessary changes in design to Construction Manager in time to prevent needless work. Changes, or additions subject to additional compensation, which are made without written authorization and an agreed price, shall be at Contractor's risk and expense.

3.3 MANUFACTURER'S INSTRUCTIONS

A. Where the specifications call for an installation to be made in accordance with Manufacturer's recommendations, a copy of such recommendations shall at all times be kept in the job superintendent's office and shall be available to the Owner's representative.

B. Follow manufacturer's instructions where they cover points not specifically indicated on drawings and specifications. If instructions are in conflict with the drawings and specifications, obtain clarification from the Engineer before starting work.

3.4 QUALITY ASSURANCE

A. Provide a Quality Assurance program. These specifications set forth the minimum acceptable requirements. The specifications do not prohibit the Contractor from executing other Quality Assurance measures which can improve the operating facility, improve the construction schedule, and conserve energy within the scope of this project.

B. The Contractor shall insure that workmen's practices, materials employed, equipment and methods of installation conform to accepted construction and engineering practices, and that each piece of equipment can satisfactorily perform its functional operation.

3.5 CLOSING IN UNINSPECTED WORK

A. The Contractor shall not allow or cause any of the work to be covered up or enclosed until it has been inspected, tested and/or approved. Field observations made by the architect or engineer do not waive the inspections required by the contract documents.

B. Should a portion of the work be enclosed or covered up prior to inspection and testing, the contractor shall uncover the work at his own expense, and after it has been tested, inspected and approved, make repairs with such materials as may be necessary to restore the uncovered work to its intended condition.

3.6 PRELIMINARY OPERATION

A. Should the Owner request that a portion of the plant, apparatus or equipment be operated prior to final completion and acceptance of the work, the Contractor shall consent, and such operation shall be under the supervision and direction of the Contractor, but expense thereof shall be paid by the Owner, separate and distinct from money paid on account of the Contract. Such preliminary operation and payment thereof shall not be construed as an acceptance of that portion of the work in this Contract.

3.7 ACCEPTANCE DEMONSTRATION

A. Upon completion of work, at a time to be designated by the Engineer, the Contractor shall demonstrate for the Owner, the operation of the electrical installation, including any and all special items installed by him or installed under his supervision. A minimum of four (4) hours of time for each system must be allowed for this purpose.

B. The system demonstrations shall be made by this Contractor in the presence of the District's facilities manager or his designated representative and the manufacturer's representative.

C. Demonstrate the function (in the structure) of each system and indicate its relationship to the single line diagrams and drawings.

D. Demonstrate by "start-stop operation", the controls, how to reset protective devices, how to replace fuses and what to do in case of emergency.

E. Demonstrate how maintenance and spare parts manuals are related to the equipment and systems installed.

3.8 TESTS

A. Where the Contract Documents, laws, ordinances or any public authority requires any work to be tested specifically or reviewed by another authority, the Contractor shall give the

Engineer/Owner timely notice of readiness therefor. The Contractor shall give the Engineer/Owner the test results for review. If any work to be tested is covered up without written approval or consent of the Architect, it must, if directed by the Architect, be uncovered for examination at the Contractor's expense.

B. The cost of all such tests shall be borne by the Contractor.

C. Any work which fails to meet the requirements of any test or any work which does not meet the requirements of the Contract Documents shall be considered defective and may be rejected. Rejected work shall be corrected promptly by the Contractor or removed from the site.

D. Provide written test reports for each test to the Engineer for review.

END OF SECTION 26 00 00

2. Fittings and Accessories: Products of the same manufacturer as channel supports.

D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

E. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

F. Expansion Anchors: Carbon-steel wedge or sleeve type.

G. Toggle Bolts: All-steel springhead type.

2.2 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

B. Materials and Components: Install level, plumbing, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Hot-dip galvanized materials, U-channel system components.

B. Dry Locations: Steel materials.

C. Support Clamps for PVC Raceways: Click-type clamp system.

D. Selection of Supports: Comply with manufacturer's written instructions.

E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four (4); minimum of 200-lb design load.

3.3 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze or bracket-type hangers.

D. Size supports for multiple raceway installations, so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

F. Install 1/4-inch diameter or larger threaded steel hanger rods, unless otherwise indicated.

G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

I. Simultaneously install vertical conductor supports with conductors.

J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceways with an approved fastener not more than 24-inches from the box.

K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:

1. Wood: Fasten with wood screws or screw-type nails.
2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
3. New Concrete: Concrete inserts with machine screws and bolts.
4. Existing Concrete: Expansion bolts.
5. Steel: Welded threaded studs or spring-tension clamps on steel.

    a. Field Welding: Comply with AWS D1.1.

6. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.

7. Light Steel: Sheet-metal screws.
8. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.4 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.5 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:

1. Supporting devices for electrical components.
2. Electrical demolition.
3. Cutting and patching for electrical construction.
4. Touchup painting.

3.6 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touchup paint. Paint materials and application requirements are specified in Division 9 Section "Painting."

1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.7 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations, and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION 26 05 00

SECTION 26 05 23

CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.3 SUBMITTALS

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

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the International Electrical Testing Association and that is acceptable to authorities having jurisdiction.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

1. American Insulated Wire Corp.; a Leviton Company.
2. General Cable Corporation.
3. Okonite Wire & Cable Company.
4. Southwire Company.

B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

C. Conductor Material: Copper complying with NEMA WC 5; stranded conductor.

D. Conductor Insulation Types: Type THHN-THWN complying with NEMA WC 5.

2.3 CONNECTORS AND SPLICES

A. Manufacturers:

1. AFC Cable Systems, Inc.
2. AMP Incorporated/Tyco International.
3. Hubbell/Anderson.
4. O-Z/Gedney; EGS Electrical Group LLC.
5. 3M Company; Electrical Products Division.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

A. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

B. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Concrete and Below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.

D. Exposed Branch Circuits: Type THHN-THWN, single conductors in raceway.

E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

F. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.

G. Fire Alarm Circuits: Refer to Section 16721.

3.2 INSTALLATION

A. All conductors and cables shall be installed in raceways.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Seal around conduits penetrating fire-rated elements according to Division 7 Section "Through-Penetration Firestop Systems."

E. Open cable installed above accessible ceiling space shall be supported by metallic J-hooks. No stapling is allowed. Staples used shall be removed by contractor at contractor's cost.

3.3 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

B. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.4 FIELD QUALITY CONTROL

A. Testing: Engage a qualified testing agency to perform the following field quality-control testing:

1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

B. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION 26 05 23

SECTION 26 05 26

GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Ground rods and ground rod well.
2. Fittings.

B. Field Test Reports: Submit written test reports to include the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1. Comply with UL 467.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Grounding Conductors, Cables, Connectors, and Rods:

a. Apache Grounding/Erico Inc.
b. Chance/Hubbell.
c. Copperweld Corp.
d. Erico Inc.; Electrical Products Group.
e. Framatome Connectors/Burndy Electrical.
f. Galvan Industries, Inc.
g. Ideal Industries, Inc.
h. ILSCO.
i. Kearney/Cooper Power Systems.
j. Korns: C. C. Korns Co.; Division of Robroy Industries.
k. O-Z/Gedney Co.; a business of the EGS Electrical Group.
l. Raco, Inc.; Division of Hubbell.
m. Superior Grounding Systems, Inc.
n. Thomas & Betts, Electrical.

2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Division 16 Section "Conductors and Cables."

B. Equipment Grounding Conductors: Insulated with green-colored insulation.

C. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.

D. Grounding Electrode Conductors: Stranded cable.

E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

F. Bare Copper Conductors: Comply with the following:

1. Solid Conductors: ASTM B 3.
2. Assembly of Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.

G. Copper Bonding Conductors: As follows:

1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch in diameter.
2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

H. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.3 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.

C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

PART 3 - EXECUTION

3.1 APPLICATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

B. In raceways, use insulated equipment grounding conductors.

C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.

D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

E. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.

F. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.

3.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and branch circuits.

C. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

D. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.

E. Water Heater and Heat-Tracing Cable: Install a separate equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

F. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.3 INSTALLATION

A. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.

1. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.

B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

E. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.

F. Install one test well for each service at the ground rod electrically closest to the service entrance. Set top of well flush with finished grade or floor.

G. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, Paragraph 250-81(c), using a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor to the main ground bus in the electrical room.

3.4 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Connections at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connections between conductors and ground rods.

F. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

G. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

H. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 FIELD QUALITY CONTROL

A. Testing: Engage a qualified testing agency to perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural

drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.

3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

    a. Equipment Rated 500 kVA and Less: 10 ohms.
    b. Equipment Rated 500 to 1000 kVA: 5 ohms.
    c. Manhole Grounds: 10 ohms.

4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect and Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION 26 05 26

SECTION 26 05 33

RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:

1. Division 26 Section "Basic Electrical Materials and Methods", "Security System", "Fire Alarm System", "Paging Clock System", "Data Telephone System" and "Television System" for supports, anchors, and identification products.
2. Division 26 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.
3. Division 23 Section "Automatic Temperature Control" for supports, anchors, and identification products.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. IMC: Intermediate metal conduit.

D. LFMC: Liquidtight flexible metal conduit.

E. RNC: Rigid nonmetallic conduit.

F. RSC: Rigid steel conduit

1.4 SUBMITTALS

A. Product Data: For conduit, fittings, surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 METAL CONDUIT AND TUBING

A. Available Manufacturers:

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Anamet Electrical, Inc.; Anaconda Metal Hose.
4. Electri-Flex Co.
5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
6. LTV Steel Tubular Products Company.
7. Manhattan/CDT/Cole-Flex.
8. O-Z Gedney; Unit of General Signal.
9. Wheatland Tube Co.

B. Rigid Steel Conduit: ANSI C80.1.

C. IMC: ANSI C80.6.

D. EMT and Fittings: ANSI C80.3.

1. Fittings: Compression type.

E. FMC: Aluminum.

F. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

A. Available Manufacturers:

1. American International.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corp.
4. Cantex Inc.
5. Carlon.
6. Certainteed Corp.; Pipe & Plastics Group.

7. Condux International.
8. ElecSYS, Inc.
9. Electri-Flex Co.
10. Lamson & Sessions; Carlon Electrical Products.
11. Manhattan/CDT/Cole-Flex.
12. RACO; Division of Hubbell, Inc.
13. Thomas & Betts Corporation.

B. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.

C. RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

2.4 METAL WIREWAYS

A. Available Manufacturers:

1. Hoffman.
2. Square D.
3. Circle AW

B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 1.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

E. Wireway Covers: Screw-cover type.

F. Finish: Manufacturer's standard enamel finish.

2.5 SURFACE RACEWAYS

A. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC compound with matte texture and manufacturer's standard color.

1. Manufacturers:

a. Walker Systems, Inc.; Wiremold Company (The).
b. Wiremold Company (The); Electrical Sales Division.

B. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.6 BOXES, ENCLOSURES, AND CABINETS

A. Available Manufacturers:

1. Circle AW
2. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.

3. Emerson/General Signal; Appleton Electric Company.
4. Erickson Electrical Equipment Co.
5. Hoffman.
6. Hubbell, Inc.; Killark Electric Manufacturing Co.
7. O-Z/Gedney; Unit of General Signal.
8. RACO; Division of Hubbell, Inc.
9. Robroy Industries, Inc.; Enclosure Division.
10. Scott Fetzer Co.; Adalet-PLM Division.
11. Spring City Electrical Manufacturing Co.
12. Thomas & Betts Corporation.
13. Walker Systems, Inc.; Wiremold Company (The).
14. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.

D. Floor Boxes: Cast metal, fully adjustable, rectangular. Walker Omni box, RFB 4 or equal as indicated.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

G. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.7 FACTORY FINISHES

A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard prime-coat finish ready for field painting.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors:

1. Exposed: Rigid steel or IMC. EMT at locations not exposed to vandalism.
2. Concealed: Rigid steel or IMC.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures: NEMA 250, Type 3R.

B. Indoors:

1. Exposed: EMT.
2. Concealed: EMT.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
4. Damp or Wet Locations: Rigid steel conduit.
5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:

    a. Damp or Wet Locations: NEMA 250, Type 4.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION

A. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

B. Complete raceway installation before starting conductor installation.

C. Support raceways as specified in Division 26 Section "Basic Electrical Materials and Methods."

D. Install temporary closures to prevent foreign matter from entering raceways.

E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.

F. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

1. Install concealed raceways with a minimum of bends parallel or perpendicular to building structure, considering type of building construction and obstructions, unless otherwise indicated.

H. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches of concrete cover with PVC wrapp.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
2. Space raceways laterally to prevent voids in concrete.
3. Run conduit larger than 1-inch trade size parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
4. Change from rigid nonmetallic conduit to rigid steel conduit or IMC before rising above the floor.

I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.

1. Run parallel or banked raceways together on common supports.
2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

J. Join raceways with fittings designed and approved for that purpose and make joints tight.

1. Use insulating bushings to protect conductors.

K. Terminations:

1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

L. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 36 inches of slack at each end of pull wire.

M. Telephone and Signal System Raceways, 2 Inch Trade Size and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of three 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

N. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

O. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semi recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.

P. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.

Q. Set floor boxes level and flush with finished floor surface.

R. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.4 CLEANING

A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION 26 05 33

SECTION 26 05 53

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes electrical identification materials and devices required to comply with ANSI C2, NFPA 70, OSHA standards, and authorities having jurisdiction.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Schedule of Nomenclature: An index of electrical equipment and system components used in identification signs and labels.

PART 2 - PRODUCTS

2.1 RACEWAY AND CABLE LABELS

A. Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

1. Color: Black letters on orange field.
2. Legend: Indicates voltage and service.

B. Adhesive Labels: Preprinted, flexible, self-adhesive vinyl with legend overlaminated with a clear, weather- and chemical-resistant coating.

C. Pretensioned, Wraparound Plastic Sleeves: Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the line it identifies and arranged to stay in place by pretensioned gripping action when placed in position.

D. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

E. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape.

1. Not less than 6 inches wide by 4 mils thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend indicating type of underground line.

F. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

G. Brass or Aluminum Tags: 2 by 2 by 0.05 inch metal tags with stamped legend, punched for fastener.

2.2 NAMEPLATES AND SIGNS

A. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.

B. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.

1. Engraved legend with white letters on black face.
2. Punched or drilled for mechanical fasteners.

C. Baked-Enamel Signs for Interior Use: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for the application. 1/4-inch grommets in corners for mounting.

D. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for the application. 1/4-inch grommets in corners for mounting.

E. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts and flat and lock washers.

2.3 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon cable ties.

1 Minimum Width: 3/16 inch.
2. Tensile Strength: 50 lb minimum.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: According to color-coding.

B. Paint: Formulated for the type of surface and intended use.

1. Primer for Galvanized Metal: Single-component acrylic vehicle formulated for galvanized surfaces.
2. Primer for Concrete Masonry Units: Heavy-duty-resin block filler.
3. Primer for Concrete: Clear, alkali-resistant, binder-type sealer.
4. Enamel: Silicone-alkyd or alkyd urethane as recommended by primer manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.

C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before applying.

E. Install painted identification according to manufacturer's written instructions and as follows:

1. Clean surfaces of dust, loose material, and oily films before painting.
2. Prime surfaces using type of primer specified for surface.
3. Apply one intermediate and one finish coat of enamel.

F. Caution Labels for Indoor Boxes and Enclosures for Power and Lighting: Install pressure-sensitive, self-adhesive labels identifying system voltage with black letters on orange background. Install on exterior of door or cover.

G. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above line at 12 inches below finished grade. Where width of multiple lines installed in a common trench does not exceed 16 inches overall, use a single line marker.

H. Color-Coding of Secondary Phase Conductors: Use the following colors for phase conductors:

1. 208/120-V Conductors:

a. Phase A: Black.
b. Phase B: Red.
c. Phase C: Blue.
d. Neutral: White
e. Ground: Green.

2. 480/277-V Conductors:

a. Phase A: Brown.
b. Phase B: Orange.
c. Phase C: Yellow.
d. Neutral: Grey
e. Ground: Green.

3. Factory apply color the entire length of conductors, except the following field-applied, color-coding methods may be used instead of factory-coded wire for sizes larger than No. 10 AWG.

a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1-inch wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.
b. Colored cable ties applied in groups of three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten to a snug fit, and cut off excess length.

I. Power-Circuit Identification: Metal tags or aluminum, wraparound marker bands for cables, feeders, and power circuits in vaults, pull and junction boxes, manholes, and switchboard rooms.

1. Legend: 1/4 inch steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.
2. Tag Fasteners: Nylon cable ties.
3. Band Fasteners: Integral ears.

J. Apply identification to conductors as follows:

1. Conductors to Be Extended in the Future: Indicate source and circuit numbers.
2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits' voltage and phase.
3. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.

K. Apply warning, caution, and instruction signs as follows:

1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

L. Device Identification Labels: Adhesive Labels: Preprinted, flexible, self-adhesive vinyl with legend overlaminated with a clear, weather- and chemical-resistant coating. Install on each device cover of power receptacles, switches and tele/data outlets with feeder source (i.e. panelboard, MDF, IDF) and circuit number information.

M. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2-inch high lettering on 1-1/2-inch high label; where two lines of text are required, use labels 2 inches high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment using mechanical fasteners:

1. Panelboards, electrical cabinets, and enclosures.
2. Access doors and panels for concealed electrical items.
3. Electrical switchboards.
4. Disconnect switches.
5. Enclosed circuit breakers.
6. Motor starters.
7. Push-button stations.
8. Contactors.
9. Remote-controlled switches.
10. Dimmers.
11. Control devices.
12. Telephone switching equipment.
13. Paging and clock master equipment.
14. Fire alarm master station or control panel.

15. Security-monitoring master station or control panel.

END OF SECTION 26 05 53

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes individually mounted enclosed switches and circuit breakers used for the following:

1. Motor and equipment disconnecting means.

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

B. RMS: Root mean square.

C. SPDT: Single pole, double throw.

1.4 SUBMITTALS

A. Product Data: For each type of switch, circuit breaker, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Maintenance Data: For enclosed switches and circuit breakers and for components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 Section "Closeout Procedures," include the following:

1. Routine maintenance requirements for components.
2. Manufacturer's written instructions for testing and adjusting switches and circuit breakers.
3. Time-current curves, including selectable ranges for each type of circuit breaker.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency that is a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NEMA AB 1 and NEMA KS 1.

D. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Square D for the following products:

1. Fusible Switches:
2. Molded-Case Circuit Breakers:
3. Combination Circuit Breaker and Ground-Fault Trip:
4. Molded-Case, Current-Limiting Circuit Breakers:
5. Integrally Fused, Molded-Case Circuit Breakers:

2.2 ENCLOSED SWITCHES

A. Enclosed, Nonfusible Switch: NEMA KS 1, Type HD, with lockable handle.

B. Enclosed, Fusible Switch, 800 A and Smaller: NEMA KS 1, Type HD, with clips to accommodate specified fuses, lockable handle with two padlocks, and interlocked with cover in closed position.

2.3 ENCLOSED CIRCUIT BREAKERS

A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic Trip Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:

a. Instantaneous trip.
b. Long- and short-time pickup levels.
c. Long- and short-time time adjustments.
d. Ground-fault pickup level, time delay, and I^2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.

5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
6. Molded-Case Switch: Molded-case circuit breaker without trip units.

B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Mechanical style suitable for number, size, trip ratings, and material of conductors.
2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
5. Auxiliary Switch: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
6. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
7. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

2.4 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2.5 FACTORY FINISHES

A. Manufacturer's standard prime-coat finish ready for field painting.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Electrical Identification".

B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.4 CONNECTIONS

A. Install equipment grounding connections for switches and circuit breakers with ground continuity to main electrical ground bus.

B. Install power wiring. Install wiring between switches and circuit breakers, and control and indication devices.

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.5 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each enclosed switch, circuit breaker, component, and control circuit.
2. Test continuity of each line- and load-side circuit.

B. Testing Agency: Engage a qualified independent testing agency to perform specified testing.

C. Testing: After installing enclosed switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.6 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges according to short circuit study if required.

3.7 CLEANING

A. On completion of installation, inspect interior and exterior of enclosures. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 26 28 16

SECTION 26 51 00

LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES
A. Lighting.

1.2 REFERENCES

A. Underwriters Laboratories (UL):
   1. Luminaire – Listed
B. IESNA LM-79 Testing Standard:
   1. IES files available
C. Durability: Light poles are designed to withstand winds up to 90mph.
D. International DarkSky Association Standard (IDA):
   1. Arne is a DarkSky approved luminaire when configured with 3000K and warmer CCTs.

1.3 SUBMITTALS
A. Product Data: Submit manufacturer's product data, storage and handling requirements and recommendations, installation methods and available colors, styles, patterns and textures.
B. Shop Drawings: Submit manufacturer's shop drawings, including plans and elevations, indicating overall dimensions.
C. Samples: Submit manufacturer's samples of materials, finishes, and colors.
D. Warranty: Manufacturer's standard warranty.

1.4 QUALITY ASSURANCE
A. Manufacturer's Qualifications: Manufacturer regularly engaged in manufacture of site furnishings since 1969.
B. Product Support: Products are supported with complete engineering drawings and design patents.
C. Base Worth: An installed base of products worth in excess of one hundred million dollars.
D. Assets: Excess of twenty million dollars in assets.
E. Production: Orders are filled within a 14-week schedule.
F. Facility Operator: Welders and machine operators are certified.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
B. Storage: Store materials in clean, dry area in accordance with manufacturer's instructions. Keep materials in manufacturer's original, unopened containers and packaging until installation.
C. Handling: Protect materials and finish during handling and installation to prevent damage.

1.6 WARRANTY
A. Warranty Information:
   -When properly installed and under normal conditions of use, Santa & Cole warrants all metal parts and painted finishes for a three year period (other than noted exceptions). Noted exceptions: LED cartridge and drive circuit are warranted for five years. Poles are warranted to be free of material and workmanship defects for a period of three years from the date of shipment.

-The warranty does not apply to damage resulting from accident, alteration, misuse, tampering, negligence, or abuse.
- Landscape Forms, Inc. shall, at its option, repair, replace, or refund the purchase price of any items found defective upon inspection by an authorized Landscape Forms service representative.
-Purchasers should be aware that normal use of these high quality products can result in superficial damage affecting the finish. Scratches, nicks, and dents are to be considered normal wear and tear, and are not the responsibility of the manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Landscape Forms, Inc., 7800 E. Michigan Ave, Kalamazoo, Michigan 49048.
Phone: (800) 521-2546. Fax (269) 381-3455. Website www.landscapeforms.com
E-mail: specify@landscapeforms.com

2.2 LIGHTING

A. "Arne" Area Lighting:
B. Style:

1. Mounting options:
   a. Pole mount (5in diameter pole not included unless specified)
2. Optics option:
   a. Flood light
      1) with clear lens
      2) with diffuser lens
   b. Street light (Type 2 Distribution)
3. LED quantity:
   b. 36
4. Color temperature:
   a. 3000K

C. Pole with nut covers
   2. 6 meter height (19.67ft)
      b. Three luminaires at three different heights

2.3 MATERIALS

A. Pole Assembly:
   1. Base Plate: Aluminum casting A356-T6
   2. Pole: Aluminum 6063-T6 seamless extrusion.
      a. 6m pole: 5" o.d. x 0.188" wall pole, overall height: 236"
   3. Nut covers: A356 cast aluminum, secured to base plate with one 1/4-20 x 5/8" socket button head cap screw, carbon steel with Magni-coat. (4) nut covers per pole.
   4. Pole cap: black plastic
B. Housing Assembly: Housing is rated IP66; CE compliant; UL listed
   1. Body: Injected aluminum; painted finish.
   2. Attachment Accessories: steel with anti-rust protection; painted finish.
   3. LED Boards: XP-G2 LEDs mounted to a RoHS compliant circuit board. PMMA optics affixed to each LED on the board.
      a. 27W flood unit has 18 LED boards per unit.
      b. 27W street unit has 18 LED boards per unit.
      c. 54W flood unit has 36 LED boards per unit.
      d. 54W street unit has 36 LED boards per unit.

4. Lens: tempered glass. frosted for flood optics.
5. Housing Lid: Aluminum; lid is attached to the housing with (2) hex M4 x 0.75 stainless steel screws. Removing the lid will void the warranty.
6. Driver Plate: Formed threaded aluminum sheet; heat sink is aluminum extrusion, black anodized finish.
7. Driver: Class 2 Output; CE; IP66; suitable for damp locations; Input: 120V-277VAC, 50/60Hz; Output 38-77Vdc, 0.1 – 0.53A. Dimmable output capable with 0-10V or Dali provided by others; driver attached to plate with (2) phillips head machine screws.
8. Wiring: Driver is connected to terminal strip; installed at factory.
9. Terminal Strip: 22 Pole; UL recognized component; attached to driver plate with (2) hex machine screws.

C. Brackets:
1. Wall mount and pole mount arm: 5mm thick aluminum.
2. Wall mount and pole mount ring: 4mm thick aluminum
3. Wall mount and Pendant mount cover plate ring: 4.5mm thick aluminum
4. Wall mount and pendant mount cover plate face: 3mm thick aluminum
5. Catenary and pendant mount bracket: 5mm thick aluminum

D. Miscellaneous:
1. Hand hole cover on pole: The opening measures 6m and 8m poles, 4”x6”. Flush-mounted cover secures to pole with (2) 1/4-20 x 1/2" tamper proof screws, carbon steel with Magni-coat.
2. Anchoring hardware: Included.
   a. 6m pole:
      (4) Galvanized anchor bolts, 3/4”-10 x 17” x 3” hook
      (8) Galvanized heavy hex nuts, 3/4” x 10
      (8) Galvanized flat washers, .81 ID” x 1.5” OD x 0.13” thick

2.4 RECYCLED CONTENT (minimums)

Description	Post-Consumer Content	Pre-Consumer Content
4.5m pole with nut covers	34%	0%
6m pole with nut covers	37%	0%
8m pole 5in/7in with nut covers	38%	0%
10m pole 5in/8in with nut covers	38%	0%
Luminaire	26%	25%

All units are 100% recyclable.

2.5 FINISHES

A. Finish on Metal (poles only):
1. Topcoat: Thermosetting TGIC polyester powder coat. UV, chip, and flake resistant.

Specifier Notes: Specify color of metal. Consult Landscape Forms, Inc. for selection of standard colors and availability of custom colors.

2. Color:
   a. Pole, nut covers: Black.

B. Color of Luminaire (includes mounting brackets):
1. dark grey

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas to receive light.
B. Notify Architect of conditions that would adversely affect installation or subsequent use.
C. Do not begin installation until unacceptable conditions are corrected.

3.2 INSTALLATION

A. Install light in accordance with manufacturer's instructions at locations indicated on the Drawings.
B. Install light plumb.
C. Anchor light securely in place.

3.3 ADJUSTING

A. Finish Damage: Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
B. Component Damage: Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

3.4 CLEANING

A. Clean light promptly after installation in accordance with manufacturer's instructions.
B. Do not use harsh cleaning materials or methods that could damage finish.

3.5 PROTECTION

A. Protect installed light to ensure that, except for normal weathering, light will be without damage or deterioration at time of Substantial Completion.

END OF SECTION