

SECTION 2H
LANDSCAPING

E. PLANTING OF TREES, SHRUBS & GROWDCOVERS (continued)

7. Place and firmly compact backfill specified soil mix carefully to avoid injury to roots, fill all voids.
8. When planting hole is one half to two-thirds filled, place planting tablets in quantities herein specified evenly spaced around each plant as indicated or Directed.
9. When hole is nearly filled, completely soak and allow water to soak away. Fill holes to finish grade with specified soil mix, and prepare for other work indicated. Provide shallow water basin at each shrub and tree.
10. Planting Tablet Quantities: Provide for all trees, shrubs, and groundcover at time of planting; quantities as follows:
 - a. All shrubs 6 to 15 inch size: One (1) tablet per plant.
 - b. All Shrubs 15 to 36 inches and larger: Three (3) tablets per plant.
 - c. All shrubs 36 inches and larger: Four (4) tablets per plant.
 - d. All evergreen trees: Six (6) tablets per tree.
 - e. Deciduous trees:
Up to 1½ inch caliper; 6 tablets per tree.
1½-2 inch caliper; 8 tablets per tree.
2-2½ inch caliper; 10 tablets per tree.
2½-3½ inch caliper; 12 tablets per tree.
4-6 inch caliper; 14 tablets per tree.

F. PLANTING BED GRADES

1. Finish grades and slopes shall be as indicated on the Drawings before addition of mulch.
2. Grades shall be 1½-2 inches below bordering paving, curbs, walls, etc., before application of mulch.

G. MULCHING

Mulch all planting beds with a 2½ inch layer of Hemlock Bark within two days after planting. Cover entire bed areas, apply evenly.

SECTION 2H
LANDSCAPING

H. STAKING, TYING & GUYING TREES

1. Stake and tie, or guy trees immediately after planting as indicated on Drawings.
2. Drive tree stakes vertically into ground to depth indicated. Do not injure the ball or roots.
3. Guy all trees where they occur in planters with Type 2 Soil Mix.
 - a. Provide 3 guys per tree; anchor to deadmen or eye screws as indicated on Drawings.
 - b. Provide 2 cable clips per connection.

I. CLEANUP

1. Keep premises reasonably free from accumulation of debris.
2. At completion of each division of work, remove all debris, equipment and surplus materials.

J. MAINTENANCE

1. Underground Irrigation System: Use of underground irrigation will be permitted. Supplement with hand watering.
2. Protect and maintain plantings until final acceptance.
3. Water, weed, cultivate, mulch, reset plants to proper grade or upright position, remove dead wood, repair beds, and do other necessary operations.
4. Irrigate when necessary to avoid drying out of plant materials and as required to promote healthy growth.

End of Section 2H

SECTION 21
IRRIGATION SYSTEM

The General Conditions, Parts I, II, and III, Special Conditions, and Section 1, General Requirements are part of the requirements of this Section as fully as if repeated herein.

Part I **GENERAL**

A. WORK INCLUDED

Underground automatic (remote) controlled irrigation system including demolition and salvage of portions of existing irrigation system.

B. RELATED WORK SPECIFIED ELSEWHERE

Tree, Shrub and Groundcover Plantings: Section 2H.

Electrical service to location of and connection to automatic controller: Division 16 and Electrical Drawings.

C. RELATED WORK BY OTHERS

Irrigation supply and distribution stubouts, as indicated on Drawings, located at concrete roof deck of underground parking structure.

D. DESIGN AND PLAN

1. The layout of the irrigation system is schematic, follow as closely as practicable.
2. Make no alterations or changes without prior approval of the Engineer.
3. The right is reserved for the Engineer to approve and authorize alterations in the locations of pipe lines, valves, and related equipment; also sprinkler heads as may be required to obtain complete irrigation coverage.

E. VERIFICATION OF DIMENSIONS

1. Before proceeding with the installation of any section or unit of the irrigation system, Contractor shall check and verify the correlation between ground measurements and the Drawings.
2. Advise the Engineer of any discrepancies.

SECTION 21
IRRIGATION SYSTEM

F. SUBMITTALS

1. Provide Product Affidavits, Project Record Documents, and Maintenance Brochure, all in accordance with requirements of the Special Conditions, Par.416 Owners' Maintenance Brochure.
2. Product Listing: Submit prior to 15 days after Contract date and before beginning irrigation Work a list of all specified and Approved products proposed to be incorporated into the Work.
3. Equipment for Operation: Provide the Local Public Agency with the following equipment, in addition to what is shown on the Drawings and specified.
 - a. Two (2) Control and Drain Valve Operating Keys.
 - b. Four (4) Lock Cap Keys.
 - c. Four (4) Keys for locking automatic controller doors.
 - d. Two (2) Keys for Locking Valve Box Lids.

G. PROTECTION OF UNFINISHED WORK

Provide protection at all times ample to keep rock, dirt, gravel, debris, and all other foreign materials from entering piping, valves and other irrigation equipment.

H. ENVIRONMENTAL CONDITIONS

1. Solvent weld PVC pipe only during non-freezing weather.
2. Solvent weld PVC pipe only under cover in rainy weather.

I. UTILITIES

Protect active utilities encountered; notify persons owning same.

J. INSPECTION

Do not allow any work to be covered or enclosed until it has been inspected and tested.

K. STORAGE

Store PVC pipe and fittings out of direct sunlight and protect from physical damage.

SECTION 21
IRRIGATION SYSTEM

L. GUARANTEE

1. Guarantee the irrigation system work, or any part thereof, against defective material and workmanship for one year from the date of provisional acceptance in accordance with General Conditions. Correct same without expense to Local Public Agency.
2. Repair any settling of backfilled trenches occurring during a one-year period after provisional acceptance without expense to the Local Public Agency. Include complete restoration of all damaged planting, paving, or other improvements of any kind.

M. ABBREVIATIONS

1. Buckner: Buckner Sprinkler Company.
2. Rain Bird: Rain Bird Sprinkler Manufacturing Company.
3. Moody: Moody Sprinkler Company, Inc.
4. Hays: Hays Manufacturing Company

Part II PRODUCTS

A. GENERAL

1. Materials and equipment shall be new and of brands, types, and manufacturer as shown on Drawings, specified in this Section, Or Approved, except as otherwise indicated.
2. Whenever reference is made to a product of a particular manufacturer, such reference shall be understood to be made for sole purpose of facilitating the description and representative quality of the product intended for use.
3. Each type of material or model of equipment shall be of one manufacturer throughout.

B. SUBSTITUTIONS

1. Manufacturer's catalog numbers specified establish standard of quality required, but are not restrictive.
2. Similar products of other manufacturers may be substituted if approved by Engineer in accordance with Instructions to Bidders.

SECTION 21
IRRIGATION SYSTEM

C. MATERIALS

1. Irrigation Heads: Bronze and brass construction except as otherwise specified by model number reference. Refer to Drawings for Sprinkler Head Key.
2. Pipes and Fittings:
 - a. Markings: All PVC (Polyvinyl-chloride plastic) pipe fittings shall bear the manufacturer's name or trade mark, material designation, nominal size, applicable IPS schedule or class rating, NSF seal of approval, and Product Standard number (pipe only).
 - b. PVC Pipe Type 'A': PVC 1120, Cell Class 12454 B, Schedule 40, meeting requirements of PS 21-70, IPS, NSF approved; color, white.
 - c. PVC Pipe Type 'B': PVC 1120, Cell Class 12454 B, Class 200, SDR-21, meeting requirements of PS 22-70, IPS, NSF approved; color, white.
 - d. Standard Weight PVC Pressure Fittings: Schedule 40, white or grey PVC, Type I/II, meeting requirements of ASTM D2466. All fittings shall be injection molded of polyvinyl-chloride compound featuring both high chemical resistance and high impact strength in compliance with Cell Class 13454A as described in ASTM D1784; IPS, NSF approved.
 - e. PVC Riser: PVC 1120, Cell Class 12454B, Schedule 80, meeting requirements of PS 21-70, IPS, NSF approved, threaded both ends; color, white or grey.
 - f. Flexible Riser: "Flex Riser", King Brothers Industries, except $\frac{1}{2}$ inch size; flexible riser, $\frac{1}{2}$ inch size, as supplied by United Pipe and Supply, Portland, Oregon.
 - g. Polyethylene Riser and Nipple: Molded flexible nipples, IPS, threaded both ends with lip. Buckner No. 300 and 310.
 - h. Galvanized Pipe and Fittings: Standard weight Schedule 40 pipe, hot dipped galvanized and threaded. Screwed cast iron or galvanized malleable fittings.
 - i. Pipe Sleeve: Meet requirements for PVC Pipe Type 'B' specified this Section.

SECTION 21
IRRIGATION SYSTEM

3. **PVC Solvent Cements & Primers:**
 - a. **Solvent Cement:** NSF approved, for Types I & II PVC through 4-inch pipe sizes meeting requirements of ASTM D2564.
 - b. **Primer:** NSF approved; Weld-On No. P-70, Industrial Polychemical Service.
4. **Automatic (Remote) Control Valve:** Flow control adjustment with a cross or slotted type wheel for operation with a key. Buckner, Electric 50 Series and Model No. 109GE (3/4"); Moody "Rain Master" Model RCV-170 series; Rain Bird, E series, electric; Hays, Series 3112.
5. **Manual Control Valve:** Buckner, No. 50K series; Rain Bird, Model MAV series; Moody, Model MCV series; H.L. Gee, Manufacturing Company, No. 200 series.
6. **Vacuum Breaker:** Atmospheric Type; No. 320 with union, H. L. Gee Manufacturing Company. Meet requirements of City of Portland Plumbing Regulations.
7. **Manual Drain Valve:** Buckner Model, No. 80M; Rain Bird, Model No. MVA-3/4; H. L. Gee Manufacturing Company, No. 205, 3/4 inch.
8. **Control Wire:** Type UF Bearing U/L approval for direct underground burial in National Electrical Code Class 11 circuits. AWG sizes, minimum size #14. Conductor of electrical conductivity-grade copper meeting requirements of ASTM B-3.
9. **Electrical Connectors:** Scotch-Lock connector sealing pack No. 3577 with Type R electrical connectors; Rain Bird Pen-Tite Wire Connectors, No. PT 101 thru 104.
10. **Automatic Controller :** Rainbird Rain Clox Controller Model No. RC-12 WB, "UL" Listed; one required.
11. **Control and Drain Valve Operating Key:** Buckner Model No. 71.
12. **Valve Marker:** Soft rubber expanding valve marker with key operated lock. Rain Bird Model No. 63100; Buckner Model No. 74.
13. **Locking Lid:** Buckner, Model No. 72.
14. **Lock Cap Key:** Buckner, Model No. LK-138; Rain Bird, Model No. 2049.

SECTION 21
IRRIGATION SYSTEM

15. Valve Boxes:

- a. For One Valve: Precast concrete box, (9½ x 16 inches, inside), with cast iron locking cover; Brooks Products, Inc. Model No. 3-TL, Meter Box. Provide extensions as required.
- b. For Two Valves: Precast concrete box, (12½ x 22½ inches, inside) with bolt down concrete cover; Brooks Products, Inc. Model No. 40, Pull Box. Provide extensions as required; modify location of openings for pipe access.
- c. For Three Valves: Precast concrete box (17 x 30 inches, inside) with bolt down concrete cover; Brooks Products, Inc., Model No. 66, Service Box. Provide extensions as required. Modify location of openings for pipe access.

16. Conduit: Rigid steel, galvanized by hot-dipping, electroplating, sherardizing, meeting requirements of NASI C 60.1 UL, and NEC.

17. Gate Valve: Brass construction, service rated at not less than 200 PSI, threaded ends, non-rising stem, hand wheel, quality equal to Crane, Powell, Hammond, Wallworth.

18. Gate Valve Box: Cast iron slip type valve box Rich No. 920-925 top section, No. 920 BS base section and No. 920-1 locking cover.

19. Metal Stake: Intermediate grade, new billet steel, deformed, ASTM A-615, Grade 40; or "Sta-Stake" manufactured by King Bros. Industries, Sepulveda, California.

20. Worm-Gear Clamp: Stainless steel Worm-Gear Clamp with hex head screw. Gold Seal Type "H" (3/8"), Murray Corporation.

21. Drainage Gravel: -3/4 + 1/2" clean, washed round gravel.

22. Other Materials: As indicated on the Drawings, specified or required.

Part III **EXECUTION**

A. WORKMANSHIP

- 1. Highest quality in all respects by competent workmen skilled at their trade.
- 2. Installation of all materials and equipment shall be in strict accordance with manufacturer's written specifications and recommendations, local and state codes.

SECTION 21
IRRIGATION SYSTEM

B. DEMOLITION & BACKFILL

1. Remove salvage and reuse existing irrigation piping, risers, and sprinkler heads.
2. Location of existing irrigation system indicated on Drawings.
3. Reuse of existing materials and equipment shall be only to the extent feasible and when salvaged materials and equipment meet requirements of products specified under this Section or indicated on the Drawings.
4. All unused salvaged materials and equipment will become the property of the Contractor and shall be removed from the project site upon completion of the irrigation work.

C. EXCAVATION & BACKFILL

1. Pipe trenches straight, or "snaked" slightly allowing for expansion and contraction of PVC pipe.
2. Trench bottoms on uniform slopes 1% standard grade, except 1/2% minimum where greater slope is not practicable.
3. Allow for minimum cover depths as follows:
 - a. All supply lines from water source to control valves: 21 inches, except as otherwise indicated Or Approved.
 - b. All lines from control valves to sprinkler heads: as indicated on Drawings, except as otherwise specified.
4. Provide trench of sufficient width to allow for proper tamping around pipe.
5. Top 4-6 inch layer of backfill shall be of topsoil quality as specified under Section 2H except where Type 2 (light weight) soil mix is used in planters.
6. Backfill any excess excavation with suitable material free of rock, or other materials that may damage pipe and thoroughly compact to give full support to the pipe.
7. Provide bell holes to insure support of pipe over its entire length.
8. Bottom of trenches shall be smooth and free of sharp rock and other objects that may damage pipe.

SECTION 21
IRRIGATION SYSTEM

9. **Backfill** to finish grade, place backfill carefully around and over piping, removing rock or other material that may damage pipe; compact earth at optimum moisture content in layers not over 6" thick until thoroughly compacted and settled.
10. Fill piping with water at approximately 25 PSI during back-filling operation.
11. Where backfill contains excessive rock and other material that may damage pipe, or in the opinion of the Engineer excavated material is not suitable for backfill, Contractor shall use Approved topsoil material. Place topsoil backfill around pipe minimum depths, 2 inches under and 4 inches over pipe, thoroughly compacted. Excavated material may be used for remainder of backfill.
12. Disposal of all excess excavated material shall be off Project Site except as Approved.

D. INSTALLATION

1. Control and Gate Valves:

- a. Install automatic and manual control valves, gate valves, as indicated on Drawings or as otherwise Directed.
- b. Provide threaded union at each automatic and manual control valve, and gate valve.
- c. Provide valve box with extensions as required for each automatic control valve or grouping of valves. Set top flush with finish grade.
- d. Provide protective sleeve (PVC pipe) and locking lid at each manual control valve, firmly anchor sleeve.
- e. Provide gate valve box with locking cover at each gate valve except gate valve located in existing valve box located adjacent to Ramada Inn Building. Set top flush with finish grade.
- f. Provide gravel sumps as indicated.

2. **Manual Drain Valve:** Install as indicated on Drawings at locations required to properly and completely drain all pipe lines as Approved.

SECTION 21
IRRIGATION SYSTEM

3. Sprinkler Heads:

- a. Install sprinkler heads of types, sizes and coverage called for in the Sprinkler Head Key, at locations shown and as indicated on Drawings or as otherwise directed by Engineer.
- b. Set pop-up heads flush with adjacent finish grade of curb, wall, or pavement.
- c. Set all shrub sprays on pipe risers 6-inches from adjacent curb, wall, or pavement.

4. Pipe:

- a. Lay pipe in accordance with industry standards and accepted practice; substantially support at all points and "snake " slightly allowing for expansion and contraction.
- b. Slope piping at 1% standard grade, except 1/2% minimum where greater slope is not practicable, to facilitate operation of manual drain valves.
- c. PVC Pipe Joints: Solvent welded except as indicated. Cut pipe square, chamfer, deburr, and wipe from the surface all saw chips, dust, dirt, moisture and any foreign matter which may contaminate the cemented joint. Apply primer and solvent cement, make joints in accordance with manufacturer's recommendations.
- d. G.I. Piping: Clean out threads of standard lengths, not more than two threads showing at joints. Make joint up with pipe thread sealant applied to male threads only.
- e. Provide a leak resistant joint with freedom of movement at all threaded joints.
- f. Use Teflon thread sealant (tape or liquid) at all threaded joints.

5. Conduit: Install at base of controller for protection of control wiring above finish grade to 15 inches below grade. Provide sweep elbow below grade. Secure to building as Approved.

6. Control Wiring:

- a. Lay in trenches under supply or branch lines when practicable for maximum protection, minimum depth 15 inches. Place in sleeves under walks, pavement and walls.

SECTION 21
IRRIGATION SYSTEM

- b. Single wires (red) to each solenoid from control and a common neutral wire (white) to all solenoids from the control.
 - c. Wire sizes shall meet minimum requirements of manufacturer of automatic control valves installed. Minimum size, 14 gauge.
 - d. Make all splices moisture proof using specified electrical connectors.
 - e. Bundle wires together and wrap with plastic electrical tape at 5-foot intervals.
 - f. Provide expansion curls within at least every 100 feet of wire length of runs more than 100 feet in length. Provide 18 inches of slack at connection to control valves.
7. Automatic Controllers: Install complete at exact location designated by Engineer approximately 5 feet above finish grade on existing building wall. General location indicated on Drawings.

E. FLUSHING AND TESTING

- 1. Thoroughly flush all piping before testing and installation of sprinkler heads.
- 2. Test all piping, valves, joints, and fittings at full pressure of the main source of supply, minimum of 100 PSI, for not less than two hours before inspection and prior to backfilling at fittings. Furnish gauge.
- 3. Make watertight under test and immediately correct any and all leaks or defects found and retest.

F. ADJUSTING AND BALANCING

Adjust and balance irrigation system to provide uniform coverage.

G. CLEANUP

Keep premises reasonably free from accumulation of debris. On completion of each division of work, remove all debris, equipment and surplus materials and leave the premises in a neat and orderly fashion.

End of Section 21

SECTION 2K
WOOD BENCHES & BOLLARDS

The General Conditions, Parts I, II, and III, Special Conditions and Section 1, General Requirements are part of the requirements of this Section as fully as if repeated herein.

Part I GENERAL

A. WORK INCLUDED

Benches and bollards.

B. RELATED WORK SPECIFIED ELSEWHERE

Concrete bench and bollard footings; Section 3D.

C. WORK INSTALLED but FURNISHED UNDER OTHER SECTIONS

Fabricated steel items: Section 5F.
Glued laminated bollards; Section 6B

D. SUBMITTALS

1. Certificates of Compliance: Submit certified evidence of maximum lumber moisture content for each specie and size.
2. Shop Drawings - Wood Benches:
 - a. Submit in accordance with requirements of the General Conditions, Part I coordinated with requirements of Section 5F, Metal Fabrications.
 - b. Include complete fabrication details, including sizes, cuts, holes, location of hardware, and method of assembly.
3. Samples: Submit sample of eased edges of bench wood members for Engineer's approval.

Part II PRODUCTS

A. BENCH LUMBER MATERIAL

Alaska Yellow Cedar; select lumber from Patio Grade free of any visible knots and defects on exposed surfaces, FOHC, S4S, KD or AD to 15% maximum moisture content; or Port Orford Cedar meeting equivalent grade requirements as Approved.

SECTION 2K
WOOD BENCHES & BOLLARDS

B. WOOD BOLLARDS

Meet requirements of Section 6B, Glued Laminated Construction.

C. ROUGH HARDWARE - General

Hardware items as indicated and required shall be hot-dipped galvanized, or an Approved type non-ferrous metal unless otherwise indicated.

D. BOLTS FOR WOOD BENCHES

Aluminum sex bolts as manufactured by Norton Pacific Sales Company, San Francisco, California; Or Approved.

E. WATERREPELLANT LIQUID

"Thompson's Water Seal #101" manufactured by E. A. Thompson Company, Inc.,: Or Approved.

Part III EXECUTION

A. BENCH MILLWORK

1. Shape wood members as indicated on Drawings and sand smooth.
2. Shop mill all eased edges of wood members to 1/8-inch radius and submit sample.

B. WOOD TREATMENT

1. Immerse all wood bollards in specified waterrepellent liquid.
2. Two five minute immersions required 24 hours apart. Let wood air dry a minimum of 3 days prior to installation.

C. INSTALLATION OF BENCHES & BOLLARDS

1. Employ only skilled craftsmen; accomplish work to Engineer's satisfaction.
2. Carefully lay out, cut, fit, and install carpentry items.
3. Install fabricated steel items accurately at locations indicated.
4. Use sufficient screws and bolts to insure rigidity and permanence. Nick threads to prevent loosening.

SECTION 2K
WOOD BENCHES & BOLLARDS

5. Install work to true lines, plumb and level except as otherwise indicated.

D. CLEANUP

At completion of work all finish surfaces shall be smooth and clean.

If ordinary cleaning is not adequate, special methods shall be used to clean the surfaces as Approved.

End of Section 2K

SECTION 3A
CONCRETE FORMWORK & ACCESSORIES

The General Conditions, Parts I, II, and III, Special Conditions and Section 1, General Requirements are a part of the requirements of this Section as fully as if repeated herein.

Part I GENERAL

A. WORK INCLUDED

Forms for cast-in-place concrete work and related accessories.

B. RELATED WORK SPECIFIED ELSEWHERE

Sleeving for irrigation work: Section 2I.

Construction/expansion joints, control joints, waterstops:
Section 3B.

Reinforcing and reinforcing accessories: Section 3C.

Cast-in-place concrete: Section 3D.

Fabricated steel anchors and inserts: Section 5F.

Inserts and sleeving for electrical work: Division 16.

C. QUALITY ASSURANCE

1. Standard Specifications: Meet requirements of ACI 347-68 "Recommended Practices for Concrete Work", except as modified or supplemented in this Section. All surfaces exposed to view will be considered "Architectural Concrete".

2. Design Conditions: Design, erect, support, brace and maintain form work for safe and rigid support of all loads encountered during construction.

3. Tolerances:

a. Length or width: $\pm 1/8$ inch in 10 feet; $\pm 3/16$ inch in 10 to 20 feet; $\pm 1/4$ inch in 20 feet or more.

b. Squareness: Up to 5 feet, difference in diagonals = $1/8$ inch; 5 to 20 feet, difference = $1/4$ inch; over 20 feet, difference = $3/8$ inch.

c. Flatness of exposed face: $\pm 1/16$ inch in 6 feet.

d. Flatness of concealed face: $\pm 1/4$ inch in 10 feet.

e. Thickness: $\pm 1/8$ inch.

f. Insert location: $\pm 1/4$ inch (radius).

D. PRODUCT DELIVERY, STORAGE, & HANDLING

Handle form materials to prevent damage to panel faces, stack form work panels face-to-face, horizontally on flat base, off ground or in vertical position.

SECTION 3A
CONCRETE FORMWORK & ACCESSORIES

Part II PRODUCTS

A. FORM MATERIALS

1. General:

- a. Forms and surfaces may be of any material providing the required structural strength and surface properties to produce the specified finish.
- b. Exposed work, as specified in Part I of this Section, shall have surfaces equal to or better than that produced by new plywood, B-B Plyform, Class 1, Exterior PS-1, except where otherwise shown or specified.
- c. Nonexposed work equal to or better than 1 x 8 shiplap boards.
- d. Steel forms shall be used for forming trench drain concrete as indicated on Drawings.
- e. Forms may be new or reconditioned with true shapes, sizes and flat plane surfaces, capable of being held rigidly in line by ties or hardware.
- f. Permanent Metal Form: As Approved.

2. Form Ties:

- a. Walls and other surfaces exposed to view: Superior "A.C." type with 1-inch breakback: Or Approved.
- b. All other work: As Approved. Wire ties and wood spacers shall not be used.

3. Chamfer Strips: Triangular wood strips; Or Approved.

4. Form Release Agent:

- a. Chemical agent guaranteed by manufacturer to be nonstaining and not to impair bond of any finish applied to concrete surface.
- b. W. P. Fuller "Rino-Film", Or Approved.
- c. Form Oil will not be permitted.

SECTION 3A
CONCRETE FORMWORK & ACCESSORIES

A. FORM MATERIALS (continued)

5. Styrofoam Separation: "Dow Chemical", styrofoam SB brand, Or Approved.
6. Wall Score Joint (Control Joint) material: Wood Strips; Or Approved.

B. FORM ACCESSORIES

1. Standard Manufactured Anchors & Inserts: As indicated on Drawings.

Part III EXECUTION

A. FIELD MEASUREMENTS

Lay out work, set batterboards, establish elevations, set grade stakes.

B. CONSTRUCTION

1. General: The sole responsibility for form design and any resulting damage due to form failure rests with the Contractor.
2. Conform to ACI 347, construct mortar tight of sufficient strength that movement will not occur during placing of concrete. Provide for openings, offsets, chamfers, blocking and other features required. Form all concrete surfaces; earth side walls permitted only where shown. Carefully form intersecting planes to provide true clean corners, block joints with extra studs or girts to maintain true surface. Construct side forms for beams, girding channels and other suspended work for removal without disturbing bottom forms or shoring.
3. Form Ties: Locate in level and plumb rows, uniformly spaced, in symmetrical arrangement with openings and joints.
4. Chamfers: All outside corners, horizontal and vertical in exposed concrete work where indicated. Reuse of wood strips limited to one (1) time.
5. Form Release Agent: Apply before placing reinforcement.
6. Anchors and Inserts: Install anchors, inserts, reglets, sleeves, and other embedded devices accurately in location and rigidly secure.

SECTION 3A
CONCRETE FORMWORK & ACCESSORIES

B. CONSTRUCTION (continued)

7. Shoring:

- a. Erect supports in size and strength to resist loads imposed without deflection, deformation or settlement.
- b. Install wedges on joists to bring forms, shoring or falsework to indicated elevations, provide uniform bearing before placing concrete.

C. FORM REMOVAL

1. Do not remove shoring where strength is a consideration except as required for reshore, until at least 14 days after concrete placing or until design strength is attained.
2. Remove only shoring which can be reshored within 8 hours.
3. Form removal in accordance with requirements of ACI 347.
4. Reshoring:
 - a. Permit no live loads on construction being reshored.
 - b. Avoid deflection and loss of camber during reshoring.
 - c. Place reshoring at not less than the third points of the concrete members.

D. REUSE OF FORMS

1. Remove dirt, nails, and old concrete from form materials prior to installation.
2. Repair damaged surfaces to match "new" surfaces.
3. Remove rust, dirt from form hardware before installation into form work.
4. Replace with new material when directed by Engineer.

E. PREPARATION

Remove dirt and other foreign debris before concrete placing is started.

End of Section 3A

SECTION 3B
EXPANSION & CONSTRUCTION JOINTS

The General Conditions, Parts I, II, and III, Special Conditions and Section 1, General Requirements are part of the requirements of this Section as fully as if repeated herein.

Part I **GENERAL**

A. WORK INCLUDED

Construction and expansion joints, score line joints.

B. RELATED WORK SPECIFIED ELSEWHERE

Expansion joints in brick paving: Section 2G
Concrete formwork: Section 3A
Steel reinforcement: Section 3C
Cast-in-place concrete: Section 3D
Sealants: Section 7I

Part II **PRODUCTS**

A. MATERIALS

1. Slip Dowelling Materials:
 - a. Dowels: 1/4-inch diameter smooth steel bars meeting requirements of ASTM A36.
 - b. Dowel Bar Tubes: 26 gauge steel as manufactured by Burke Concrete Accessories, Inc.: Or Approved.
 - c. Tar: Tar as Approved.
2. Expansion Joint Filler: Asphalt impregnated fiber meeting requirements of ASTM D1751.
3. Pre-Molded Asphalt Joint Material (at Mall): Kapco, tongue and groove 1/4-inch asphalt mastic board; Or Approved.
4. Wall Score Line Joint Former: Non-staining material; wood, plastic, or metal formed to be removed without spalling concrete.

Part III **EXECUTION**

A. GENERAL

Joints shall be true lines, constructed as detailed. Provide where indicated on Drawings.

SECTION 3B
EXPANSION & CONSTRUCTION JOINTS

B. CONSTRUCTION JOINTS

1. Construct to configuration indicated on the Drawings.
2. Provide shear keys where indicated.
3. Surface of joint shall be smooth and a Approved bondbreaker applied prior to adjacent pour.

C. EXPANSION JOINTS

Provide expansion joint filler as indicated,

D. DOWELED EXPANSION JOINTS

1. Joints to provide slip joint with shear key between adjacent concrete structures as indicated.
2. Provide pre-molded asphalt joint material.
3. To one end of dowel apply full coating of tar and install dowel bar tube.

E. SCORE LINE JOINTS

1. (Also known as control, dummy and false joints.)
At Pavement & Top of Walls: Hand tool to depth and widths indicated on Drawings,
2. At Exposed Face of Walls: Construct to depth and widths indicated on the Drawings using Approved joint former material.

End of Section 3B

SECTION 3C
CONCRETE REINFORCEMENT

The General Conditions, Parts I, II, and III, Special Conditions and Section 1, General Requirements are part of the requirements of this Section as fully as if repeated herein.

Part I **GENERAL**

A. WORK INCLUDED

Fabricate and install all steel reinforcement required for all cast-in-place concrete.

B. RELATED WORK SPECIFIED ELSEWHERE

Metal stakes (re-bar) at irrigation sprinkler heads: Section 2I.
Doweling at expansion joints: Section 3B.

C. QUALITY ASSURANCE

1. Standards Specifications:

- a. "Manual of Standard Practice for Detailing Reinforced Concrete Structures", ACI 315.
- b. "Manual of Standard Practices", CRSI (Concrete Reinforcing Steel Institutes).

2. Source Quality Control: Mill test certificates identifying chemical and physical analysis of each load of reinforcing steel delivered.

D. SUBMITTALS

1. Shop Drawings:

- a. Submit in accordance with requirements of General Conditions, Part I.
- b. Placing drawings and bending lists in accordance with requirements of ACI 315.
- c. Show sizes and dimensions for fabrication and placing reinforcing steel and bar supports.

2. Mill Test Reports: Submit for each shipment of reinforcing steel.

SECTION 3C
CONCRETE REINFORCEMENT

E. PRODUCT DELIVERY & STORAGE

1. Deliver reinforcement to Project Site in bundles marked to coordinate with placement drawings.
2. Handle and store to prevent contamination.

Part II PRODUCTS

A. MATERIALS

1. Reinforcing Bars: ASTM A 615 Grade 60 except as otherwise indicated on Drawings.
2. Welded Wire Fabric:
 - a. Meet requirements of ASTM A 185.
 - b. 6 x 6 inch mesh, No. 10 wire, except as indicated otherwise on Drawings.
 - c. All fabric heavier than 6 x 6 x #10/#10 shall be supplied in flat sheets.
3. Tie Wire: Steel, black annealed, 16-gauge minimum.
4. Reinforcing Bar Supports & Accessories: Meet requirements of CRSI Manual Chapter 3, pregalvanized or plastic-coated.

Part III EXECUTION

A. INSTALLATION

1. Placement: Meet requirements of CRSI "Manual of Standard Practice".
2. Steel Adjustment:
 - a. Move within allowable tolerances of Standard Specifications to avoid interference with other reinforcing steel, conduits, or embedded items.
 - b. Do not move, bend or displace bars beyond allowable tolerances without approval of Engineer.
3. Splices:
 - a. Lap splices: Tie securely with wire to prevent displacement of splice during placement of concrete.

SECTION 3C
CONCRETE REINFORCEMENT

3. Splices (continued)
 - b. Do not splice bars except at locations shown on the Drawings or as otherwise Approved.
4. Cleaning: Remove dirt, grease, oil, loose mill scale, excessive rust, and foreign matter that may reduce bond with concrete.
5. Protection During Concreting: Keep reinforcing in proper position during concrete placement.

End of Section 3C

SECTION 3D
CAST-IN-PLACE CONCRETE

The General Conditions, Parts I, II and III, Special Conditions and Section 1, General Requirements are part of the requirements of this Section as fully as if repeated herein.

Part I GENERAL

A. WORK INCLUDED

Furnish, place and finish cast-in-place concrete and accessories as shown on the Drawings.

B. RELATED WORK SPECIFIED ELSEWHERE

Concrete formwork, anchors, and inserts: Section 3A.

Construction/expansion joints: Section 3B.

Steel reinforcements: Section 3C.

Fabricated steel inserts: Section 5F.

Dampproofing on Concrete Walls: Section 7C.

Inserts for electrical work: Division 16.

C. STANDARD SPECIFICATIONS

1. ACI 301 "Specifications for Structural Concrete for Buildings".
2. ACI 306 "Recommended Practice for Cold Weather Concreting."
3. ACI 605 "Recommended Practice for Hot Weather Concreting."
4. ACI 211 "Recommended Practice for Selecting Proportions for Concrete."
5. ACI 304 "Recommended Practice for Measuring, Mixing and Placing Concrete."
6. General: Meet requirements of Standard Specifications except where supplemented or modified under this Section and where in conflict with other provisions of these Contract Documents.

D. SUBMITTALS

1. Manufacturer's Literature For: Accessory items, admixtures, curing materials.
2. Certificates: Batch certificates for each load of ready mix delivered to the job site, certifying that batch is in accordance with approved proportions.
3. Proposed proportions for mix of each strength class and type of concrete.

SECTION 3D
CAST-IN-PLACE-CONCRETE

D. SUBMITTALS (continued)

4. Samples:

- a. Before starting work obtain approval of sample panels for all different exposed architectural concrete surfaces and concrete paving. Sample panels 25 square feet minimum.
- b. Approved samples represent minimum acceptable standards. Any work of lesser quality will be subject to rejection and replacement. Approved samples may be used on Project.

E. ENVIRONMENTAL REQUIREMENTS

1. Cold Weather:

- a. Place no concrete during freezing weather without written Approval of Engineer.
- b. If Approval is granted, meet requirements of ACI 306.
- c. Admixture shall not be used unless Approved by Engineer.
- d. Contractor assumes full responsibility, including costs for replacing frozen concrete. Frozen concrete shall be removed and replaced at Contractor's expense.

2. Warm Weather:

- a. Place no concrete in weather deemed by the Engineer as excessively hot, windy and/or dry without meeting requirements of ACI 605.
- b. Admixtures shall not be used unless Approved by the Engineer.

3. Inclement Weather: Protect freshly poured concrete against infiltration of external water. Terminate placing against nearest construction joint bulkhead; cover at once with waterproof protection until concrete has set.

F. DEFECTIVE WORK

Repair or remove and replace to the satisfaction of the Engineer, concrete with finishes not matching approved samples, surfaces which show excessive shrinkage cracks, honeycomb rock pockets, voids, spalling, exposed reinforcement; paving slabs or walks which do not drain properly; concrete out of line, level or plumb or under-strength concrete.

SECTION 3D
CAST-IN-PLACE-CONCRETE

G. CONCRETE POUR RECORDS

Contractor shall keep a record at the Project Site indicating the time, date, and weather conditions, and location of all concrete pours. Record load number.

Part II PRODUCTS

A. CONCRETE MATERIALS

1. Portland Cement:

- a. ASTM C 150, Type II.
- b. Use one brand, type and source only for all concrete work.

2. Aggregates:

- a. Meet requirements of ASTM C 33.
- b. Maximum size $1\frac{1}{2}$ inch. Smaller aggregate may be used in slabs less than 4 inches thick and if required by minimum clear spacing between reinforcing bars when Approved.

3. Water: Clean and free from deleterious amounts of acids, alkalis, oils, and organic materials.

B. CONCRETE ADMIXTURES

- 1. Air-Entraining Admixture: Meet requirements of ASTM C 260.
- 2. Chemical Admixtures: Meet requirements of ASTM C 494.

C. CONCRETE CURING MATERIALS

- 1. Concrete Curing Paper: Reinforced kraft paper, "Sisalkraft," Grace "Dampproof XX", "Pabcotite, Or Approved.
- 2. Absorbative Fabric:
 - a. Burlap: ASTM C 467.
 - b. Mats: ASTM C 440.

SECTION 3D
CAST-IN-PLACE CONCRETE

D. CONCRETE MIX

1. General:

- a. Transit-Mixed Concrete: ASTM C 94, Alternate No. 3.
- b. Job site mixing shall not be permitted.
- c. Contractor will assume responsibility for mix design and product performance.

2. Strength: All concrete shall develop a minimum 28-day laboratory cured compressive cylinder strength of 3,000 PSI, except as otherwise indicated on the Drawings or specified.

3. Cement Content: 5.5 sacks cement per cubic yard, minimum.

4. Admixtures:

- a. Other than specified in this Section admixtures may be used only on written Approval of Engineer.
- b. All admixtures shall be used in strict conformance with manufacturer's written instructions.
- c. Air Entrainments: Air content by volume 5% plus or minus 1%; use for all concrete exposed to weather.
- d. Chemical Admixtures: Water reducing-Pozzoloth 300-N at 5 oz./sack of cement, use for all cast-in-place concrete.

5. Maximum Slump at Point of Delivery:

- a. Maximum 3 inches, plus or minus 1/2 inch, for all walks, steps, curbs, paving and fastenings except as otherwise indicated.
- b. Maximum 3½ inch., plus or minus 1/2 inch for walls and other vertical concrete work, except as otherwise indicated.

6. Mix Design:

- a. Design mix, batching procedures and quality of materials shall be established in accordance with this Section 3D by independent laboratory, under direction of and certified by a professional engineer registered in the State of Oregon. File certification with Engineer. Contractor may use existing mix design of supplier provided requirements of this Section are met.

SECTION 3D
CAST-IN-PLACE-CONCRETE

6. Mix Design (continued)

- b. Type of concrete shall be Working Stress. Refer to ACI 301, paragraph 302.
- c. Concrete shall be proportioned in accordance with requirements of Method 1, ACI 301, paragraph 308. Maximum water/cement ratio 3,000 PSI concrete shall be 6½ gallons per sack of cement for non-air-entrained concrete.
- d. Concrete work shall not be started on the Project, nor any mixture accepted therefore, until the Contractor has determined a proper design mix from the material he or his supplier has available.

Part III EXECUTION

A. GENERAL

Meet requirements of Standard Specifications except as modified and supplemented in this Section 3D and where in conflict with other requirements of these Contract Documents.

B. INSPECTION

- 1. Examine forms and subgrade surfaces to receive concrete and the reinforcing steel and wire mesh for:
 - a. Defects that will adversely affect the execution, quality and permanence of Work.
 - b. Deviations beyond allowable tolerances for installation of concrete.

SECTION 3D
CAST-IN-PLACE CONCRETE

B. INSPECTION (continued)

2. Do not start work until unsatisfactory conditions are corrected.
3. Notify Engineer at least 18 hours before an intended pour. Place no concrete until reinforcement has been inspected and Approved.

C. PREPARATION

1. Embedded Items: Secure accurately and permanently in place and obtain approval before pouring concrete.
2. Forms: Complete, obtain approval before pouring concrete.
3. Thoroughly wet board forms before depositing concrete.
4. Existing Surface of Underground Parking Structure Roof: Sweep subsurface clean; remove all material that might impair bond; rinse with water, prior to pouring topping slab.

D. PLACING

1. Conveying Concrete: Convey concrete from the mixer to the place of final deposit by methods which will prevent separation and loss of material.
2. Depositing Concrete:
 - a. Concrete shall be deposited as nearly as possible in its final position to avoid segregation due to rehandling or flowing.
 - b. Maximum height of vertical drop without use of trunks, placement parts in sides of formwork, or other Approved method shall be four feet.
3. Compaction of Concrete:
 - a. Employ mechanical high frequency vibrators supplemented by hand spading to consolidate concrete around reinforcement, into corners and angles of forms to exclude rock pockets, air bubbles, and honeycomb.
 - b. Keep vibrators in constant motion. Do not allow to remain in one spot longer than 30 seconds.

SECTION 3D
CAST-IN-PLACE CONCRETE

3. Compaction of Concrete (continued):

- c. Transportation of concrete with vibrator shall not be permitted.
- d. Maintain vertical penetration of vibrator into concrete.

4. Walls: Pour full height of wall between vertical construction joints.

F. FINISHING FORMED SURFACES, CONCRETE CURBS

1. General: Perform finishing immediately following form removal. Keep concrete damp until finishing is complete.

2. Fins, Protrusions: Remove flush to surface.

3. Patching:

- a. Cut honeycomb, gravel pockets and voids over $\frac{1}{2}$ " diameter back to solid concrete.
- b. Patch as acceptable to the Engineer.
- c. Finish patch flush to and matching adjacent wall surface.
- d. Curing: Damp cure patch for seven days.

4. Form Finish:

- a. Patch as specified.
- b. Remove fins and protrusions.

5. Sand Finish:

- a. Sample Panel: Prepare 5'0" square panel as directed by Engineer and maintain until acceptance of project. Match paving sand or smooth finish.
- b. Patch as specified.
- c. Apply 1:1½ cement sand grout uniformly to pre-wetted wall surfaces.
- d. Float surface immediately with cork or wood floats. Fill all voids, pits and irregular areas.

SECTION 3D
CAST-IN-PLACE CONCRETE

5. Smooth Finish (continued):

- e. Finish with sponge rubber float while grout is still plastic but after sufficiently set to prevent grout from being pulled from holes or depressions.
- f. Rub wall with dry burlap after surfaces are dry. Remove excess grout from wall.
- g. Finish in panels of size to permit completion of all operations in one day. DO NOT leave grout on wall overnight.

6. Surfaces to receive Membrane Waterproofing: Form finish.

7. Surfaces to receive Bituminous Dampproofing: Form Finish.

8. Surfaces Exposed to View: Sand Finish.

F. FINISHING PAVING, SLABS AND NONFORMED SURFACES(except as otherwise specified)

1. General: Finish concrete to true plane surface within tolerances specified in Section 3A, Concrete Formwork & Accessories, modified as follows:

- a. Subslabs: $\frac{1}{4}$ -inch in 10 feet, measured with 10-foot straightedge.
- b. Finish Slabs: $\frac{1}{8}$ -inch in 10 feet, measured with 10-foot straightedge.
- c. Joints, Edges: Finish with jointing and edging tools to true lines.
- d. Screed to true levels and slopes as indicated on Drawings for finish specified.
- e. Finishes shall match Approved samples panels.
- f. Sample panels shall match finishes on existing Walls when applicable.

2. Smooth or Sand Finish: Float finish, then after surface water has disappeared, steel trowel to a smooth uniform finish free from trowel marks.

3. Rough Bridge Broom Finish

- a. Float and trowel finish then after concrete has partially set, broom perpendicular to principal traffic except as otherwise indicated, within area defined by tooled joints.
- b. Use extreme care to achieve a uniform finish throughout Project Site, Match Approved sample.

SECTION 3D
CAST-IN-PLACE CONCRETE

F. FINISHING PAVING, SLABS AND NONFORMED SURFACES (continued)

4. Hair Broom Finish:

- a. Float and trowel finish; bring fine particles to surface, then after initial set brush lightly with a fine hair broom.
- b. Use extreme care to achieve a uniform finish throughout Project Site. Match Approved Sample.

5. Bull-Float Finish:

- a. Bull or wood float to a uniform textured surface.
- b. Texture shall be as required to insure the bonding of applied materials.
- c. Provide Bull-Float finish sub-slab where Brick Paving Types 1, 2, and 3 are indicated.

G. CURING

1. General:

- a. Concrete shall be protected from injurious action of the elements and defacement of any nature during construction operations.
- b. All concrete surfaces including footings must be kept wet by fog mist or equal for at least ten (10) days after concrete is deposited. Provide for curing during Saturdays, Sundays and holidays.
- c. Commence curing as soon as finishing is complete and moisture has disappeared from surface.
- d. Keep forms continuously wet until removed.

2. Curing Paving, Slabs, and Wide Steps:

- a. After first floating apply a fog mist above the concrete using "Trigger T Jet Fog Nozzles No. T8004" manufactured by Spray Systems Company, Mellwood Illinois, Or Approved, to keep air humid and to prevent loss of moisture from the concrete surface. Concrete surface shall have the appearance of a wet sheen. Concentration of water at any one location shall be avoided. Fogging shall continue during finishing operations until curing paper protection is applied.

SECTION 3D
CAST-IN-PLACE CONCRETE

2. Curing Paving, Slabs and Wide Steps: (continued)

- b. Curing Paper: Immediately following finishing operations and fogging, cover concrete work with specified concrete curing paper. Lap joints six (6) inches, seal with waterproof cement or tape and weight down to prevent damage from wind. Curing shall remain in place for at least twenty-one (21) days except during special finishing. At completion of special finishing replace curing paper. Promptly repair damage to paper. Remove at completion of curing period. Let rough finish paving set a while before covering.

H. PROTECTION OF CONCRETE

1. Provide plywood sheeting or other approved material where concrete is subject to heavy traffic during construction.
2. Remove at completion of work and when job conditions no longer require the covering.

I. FIELD QUALITY CONTROL

Test may be made at the discretion of the Engineer and paid for by the Local Public Agency. Refer to Section 10, Testing Laboratory Services.

J. CLEANUP

Clean up all excess concrete, other materials and debris on a weekly basis and remove from Project Site.

End of Section 3D

SECTION 3G
PRECAST CONCRETE

The General Conditions, Parts I, II, and III, Special Conditions and Section 1, General Requirements are part of the requirements of this Section as fully as if repeated herein.

Part I GENERAL

A. WORK INCLUDED:

Precast concrete trench drain covers and podiums.

B. WORK INCLUDED but SPECIFIED ELSEWHERE

Provide the following items of work as they relate to Precast Concrete work and meet the requirements of specifications Sections indicated except as supplemented and modified under this Section.

Concrete formwork, lifting inserts: Section 3A.

C. RELATED WORK SPECIFIED ELSEWHERE

Concrete manholes: Section 2F.

D. TESTING LABORATORY SERVICES

Refer to Section 1D.

E. SHOP DRAWINGS

1. Submit in accordance with requirements of General Conditions, Part I.
2. Show complete construction details. Indicate inserts for lifting, anchoring, and other required embedded items, if any.

F. SAMPLES

1. Submit full scale finished sample of podium and trench drain cover.
2. Obtain Approval before proceeding with precast concrete work.
3. Approved samples may be installed on finished item.

G. MANUFACTURER'S QUALIFICATIONS

Precast items shall be fabricated only by those specially trained and experienced in precast concrete work.

SECTION 3G
PRECAST CONCRETE

Part II PRODUCTS

A. MANUFACTURE OF PRECAST ITEMS

1. Formwork:
 - a. Meet requirements of Section 3A.
 - b. Steel forms standard with manufacturer may be used as Approved.
2. Concrete Materials & Mix:
 - a. General: Meet requirements of Section 3D except as modified or supplemented this Section.
 - b. Concrete Mix: Proportioned by weight, one (1) part grey cement to three (3) parts sand and aggregate. Sand and aggregate mixture shall be one-half Olympia #2 sand and one-half peagravel ½-inch size. Minimum of 3750 PSI at 28 days.
 - c. Alternate Concrete Mix: As approved by Engineer.
3. Concrete Placement, Repair and Patching, Finishes, and Curing:
 - a. General: Meet requirements of Section 3D.
 - b. Finish & Color: Match adjoining cast-in-place concrete.
 - c. Only sharp and precise edges, surfaces and finishes as indicated and specified will be acceptable.

Part III EXECUTION

A. INSTALLATION

1. Set items accurately in position, plumb, level and true at locations indicated or Directed.
2. Exercise care to prevent chipping, cracking and other damage.
3. Repair damage work as approved by Engineer.

End of Section 3G

SECTION 5F
METAL FABRICATIONS

The General Conditions, Parts I, II, and III, Special Conditions and Section 1 General Requirements are part of the requirements of this Section as fully as if repeated herein.

Part I GENERAL

A. WORK INCLUDED

Provide all fabricated steel and iron work for benches and bollards.

B. RELATED WORK SPECIFIED ELSEWHERE

Rough hardware: Section 2K.

Finish painting of steel and iron work: Section 9K.

Anchors, bolts, sleeves and supports for electrical work: Division 16.

C. STANDARDS

1. AISC "Code for Standard Practice".

2. AWS "Code for Welding in Building Construction".

D. SHOP DRAWINGS

1. Submit in accordance with requirements of the General Conditions. Coordinated with requirements of Sections 2K and 6B.

2. Show complete fabrication details, sizes and thickness of metal, cuts, holes, anchor or fastener spacing dimensions.

E. PRODUCT STORAGE

Protect materials from moisture with waterproof paper, tarpaulin or polyethylene sheeting.

Part II PRODUCTS

A. MATERIALS

1. Steel: ASTM A36.

2. Welding Rods: E 70 Series, submerged arc, Grade AWS-2

SECTION 5F
METAL FABRICATIONS

B. FABRICATION

1. Workmanship: In accordance with accepted and standard shop practices. Form work to detail with clean, straight, sharply defined profiles. Unless otherwise shown or specified, finish exposed welds flush and smooth.
2. Joints and Connections: Detail for ample strength and stiffness. Weld and grind smooth all joints, unless other fastening methods are shown, specified or specifically approved. Close fit exposed joints; make joints where least conspicuous.
3. Cutting, Drilling: Perform cutting, drilling and punching required for accurate fitting and assembly work. In addition, perform similar operations as required for attachment of work of other trades.

C. SHOP FINISHING

1. Preparation of Surfaces: Prior to galvanizing, thoroughly clean all items after fabrication, removing scale, flux deposits, rust and oil, dirt and other foreign matter.
2. Galvanizing: Hot-dip galvanize all steel or iron items after fabrication in accordance with requirements of ASTM A 123. Galvanize to 2.00 oz. per square foot minimum.

Part III EXECUTION

A. FIELD PREPARATION & INSPECTION

Verify grade and line positioning of items as set, report errors or deviations in order that corrective adjustments may be made before placement of concrete.

B. INSTALLATION

Specified under Section 2K, Wood Benches & Bollards.

C. FIELD TOUCHUP

Touch up job-abraded coating with bar zinc and heat process or 75% solids zinc-rich coating as Approved.

End of Section 5F

SECTION 6B
GLUED LAMINATED CONSTRUCTION

The General Conditions, Parts I, II, and III, Special Conditions and Section 1, General Requirements are part of the requirements of this Section as fully as if repeated herein.

Part I GENERAL

A. WORK INCLUDED

Glue laminated bollards.

B. RELATED WORK SPECIFIED ELSEWHERE

Installation of glued laminated bollards; Section 2K
Wood treatment: Sections 2K.

C. STANDARD SPECIFICATIONS

Meet requirements of the U.S. Department of Commerce Voluntary Product Standard PS 56-73 for "Structural Glued Laminated Timber," and American Institute of Timber Construction, AITC, standards named hereinafter, except as modified under this Section.

D. MANUFACTURER

By an experienced fabricator in accordance with the manufacturing requirements of "Standard for Structural Glued Laminated Timber," AITC 103.

E. QUALITY CONTROL

In accordance with the Standard Specifications and "Inspection Manual," AITC 200.

F. SHOP DRAWINGS

Submit in accordance with requirements of the General Conditions, Part I. Coordinate with requirements of Section 5F, Metal Fabrications

Include complete fabrication details, including sizes, cuts, and holes.

G. AFFIDAVIT

Deliver to Engineer a written statement certifying that all glued laminated bollards were manufactured in accordance with the requirements of the Technical Specifications, and the Standard Specifications except for certain requirements regarding structural capabilities of the laminated lumber. The certification shall also contain information required in Attachments No. 1 and 2 to AITC "Certificate of Conformance".

SECTION 6B
GLUED LAMINATED CONSTRUCTION

Part II PRODUCTS

A. LUMBER & GRADE

Alaska Yellow Cedar; select lumber free of loose knots, surface defects and relatively free of tight knots from Patio Grade, FOHC, S4S, KD to 15% maximum moisture content; or Port Orford Cedar meeting equivalent grade requirements as Approved.

B. ADHESIVE

Meet requirements of Standard Specifications; waterproof phenolic resin glues.

C. FABRICATION OF GLUE LAMINATED LUMBER

1. General: Meet requirements of Standard Specifications except end joints not permitted.
2. Pre-drilling: Pre-drill and piece mark in shop for bolts and lags.
3. Appearance Grade: Premium Appearance Grade, AITC 110-71, except knot holes and other voids, filled or unfilled, not permitted in exposed surfaces; and all surfaces exposed to view shall be sanded smooth.

D. PROTECTION OF GLUE LAMINATED LUMBER

1. Sealing: Seal end of all members as soon as practicable after end trimming in accordance with "Standard Protection for Structural Timber Framing," AITC 111.
2. Wrapping: All members shall be individually wrapped meeting requirements of AITC Specification 111.

PART III EXECUTION

A. INSTALLATION OF GLUE LAMINATED LUMBER

Refer to Section 2K.

End of Section 6B

SECTION 7C DAMPPROOFING

The General Conditions, Parts I, II and III, Special Conditions and Section I, General Requirements are part of the requirements of this Section as fully as if repeated herein.

Part I GENERAL

A. WORK INCLUDED

Application of bituminous dampproofing.

B. RELATED WORK BY OTHERS

Membrane waterproofing:

C. DELIVERY OF MATERIALS

1. Deliver in original containers, manufacturer's original labels thereon.
2. Do not open containers or remove labels until Engineer inspects and approves.

Part II PRODUCTS

A. BITUMINOUS DAMPPROOFING

Toch Bros., 'RIW Marine Liquid'; Horn, 'Dehydratine No. 4'; Sonneborn, 'Hydrocide 648'; Or Approved.

Part III EXECUTION

A. PREPARATION OF SURFACES

1. Put surfaces in proper condition for application of coatings.
2. Brush off loose particles; fill holes and cracks.
3. Surfaces must be dry when coatings are applied.

B. APPLICATION

1. Apply two heavy coats with brush or spray, each coat to cover surface completely. Lap membrane waterproofing.
2. Leave no pinholes or other surface breaks.

C. SURFACES TO BE COVERED

Apply to concealed retaining wall surfaces that will be in contact with earth or drainage gravel where indicated on the Drawings.

End of Section 7C

SECTION 71
SEALANTS

The General Conditions, Parts I, II and III, Special Conditions and Section 1, General Requirements, are part of the requirements of This Section as fully as if repeated herein.

Part I **GENERAL**

A. WORK INCLUDED

Sealing expansion and construction joints in concrete and brick paving where indicated on the Drawings.

B. GUARANTEE

Guarantee under General Conditions shall be increased to five (5) years for Work under this Section.

C. ENVIRONMENTAL REQUIREMENTS

Meet requirements of sealant manufacturer.

Part II **PRODUCTS**

A. MATERIALS

1. Sealants: Darseal - U Traffic Grade two-component polyurethane sealant, W.R. Grace & Company; Or Approved. Approximate color of adjacent surfaces as Approved, standard color.
2. Primer: Made or recommended by manufacturer of sealant.
3. Bond Breaker Tape: Polyethylene bond breaker tape as Approved.
4. Backing Rod: Closed-cell polyethylene gasketing rod; Dow 'Ethaform'; Or Approved.

Part III **EXECUTION**

A. INSPECTION

1. Examine surfaces scheduled to receive sealant for:
 - a. Defects that will adversely affect the execution and quality of Work.
 - b. Deviations beyond allowable tolerances for installation recommended by manufacturer of sealant.
2. Do not start work until unsatisfactory conditions are corrected.

SECTION 7I
SEALANTS

B. INSTALLATION

1. Bond Breaker Tape or Backing Rod:
 - a. Install behind sealant on top of expansion joint filler in accordance with manufacturer's recommendation.
 - b. Provide in continuous lengths as long as practicable.
2. Primer: Prime surfaces to receive sealant in accordance with manufacturer's directions.
3. Sealant:
 - a. Apply sealant in accordance with manufacturer's directions. Joints shall be clean and dry before sealing.
 - b. Apply with gun having nozzle of proper size.
 - c. Fill joints and voids solid; superficial pointing with skin bead will not be permitted.
 - d. Remove excess material and leave surfaces neat, smooth and clean.
4. Protection:
 - a. Mask surfaces adjacent to joints as required for complete protection.
 - b. Protect sealant during curing period.

End of Section 7I

SECTION 9K
PAINTING

The General Conditions, Parts I, II and III, Special Conditions and Section 1, General Requirements are part of the requirements of this Section as fully as if repeated herein.

Part I **GENERAL**

A. RELATED WORK SPECIFIED ELSEWHERE

Water repellent treatment: Section 2K.

B. NO FINISH REQUIRED

1. Items having complete factory finish.
2. Non-ferrous metal unless specifically mentioned in painting schedule.

C. COLORS

1. As indicated in this section or selected by Engineer from samples prepared on site by Contractor.
2. Allow ample time for selections; do no work until colors are Approved.

D. LABELS

1. Deliver materials in original containers, manufacturer's labels thereon.
2. Do not open containers or remove labels until Engineer inspects and approves.

F. SAMPLE PRODUCTS

1. Submit duplicate samples of each finish color and sheen. Sample size 12 x 12 inch minimum.
2. Submit samples on substrate identical to that intended for use on Project.
3. Obtain Approval before proceeding. Resubmit until Approval is obtained.

Part II **PRODUCTS**

A. GENERAL

Products of different manufacturers shall not be used over one another.

SECTION 9K
PAINTING

PRODUCTS (continued)

B. MATERIALS

1. Products named under this Section require no further approval.
2. Submit requests for substitution Approvals in accordance with Instructions to Bidders, Division B.
3. The following product numbers are given to establish quality, and are not intended to indicate desired color.
 - a. Galvanized Steel Primer: Glidden, 5229; Sherwin Williams, A-57-A-15; National Lead 041; Fuller, 7747; Pittsburgh, 6-206; Or Approved.
 - b. Flat Alkyd Enamel: Pittsburgh, 54-312; Or Approved.
 - c. Penetrating Oil Stain: Semi-transparent, Olympic, Cabot; Or Approved.

Part III EXECUTION

A. INSPECTION

Examine surfaces scheduled to receive paint or stain for defects or conditions that will adversely affect the execution and quality of labor. Do not start Work until unsatisfactory conditions are corrected.

B. PREPARATION OF SURFACES

1. Prepare surfaces in proper condition to receive paint as recommended by paint manufacturer as applicable. Surfaces to receive paint or stain shall be absolutely clean and dry.
2. Contractor responsible for defective work from any cause including unsuitable and improperly prepared surface.

C. PAINT & STAIN APPLICATION

1. Workmanship:

- a. Highest quality, performed by skilled craftsmen to Engineer's satisfaction.
- b. Apply paint and stain in strict accordance with manufacturer's printed directions.

SECTION 9K
PAINTING

C. PAINT & STAIN APPLICATION (continued)

- c. Protect adjacent surfaces.
 - d. Spread material evenly, without runs or sags.
 - e. Vary colors of successive coats to prevent skipping.
 - f. Cut sharp lines against other materials and different colors.
 - g. Allow ample time between coats for thorough drying.
2. Mixing & Thinning: Mix and thin proprietary products in strict accordance with manufacturer's printed instructions. Mix and thin other materials in accordance with standard practice, as Approved.
3. Method of Application: Brush apply all paint and stain.
4. Condition of Surfaces:
- a. Do no outside work during damp or freezing weather, or until surfaces have thoroughly dried from effects of such weather.
 - b. Apply paint or stain only when dust or insects are not present in quantities that will affect quality of work.

D. PAINTING & STAINING SCHEDULE

1. Metal Bench Supports:
- a. One (1) brush coat Galvanized Steel Primer; MWF 2.3 mils.
 - b. Two (2) brush coats Flat Alkyd Enamel; MWF 3.2 mils.

End of Section 9K

SECTION 16A
ELECTRICAL WORK - GENERAL

The General Conditions, Parts I, II, and III, Special Conditions and Section 1 General Requirements are a part of the requirements of this Section as fully as if repeated herein.

16A-1 GENERAL

A. DEFINITIONS

Where the words "Furnish," "Provide," "Install" appear in this Division, or a manufacturer is indicated with item or product catalog number listed, install and furnish the item complete for the purpose or function intended, unless noted otherwise.

B. MATERIAL SUBSTITUTIONS

1. Substitute material shall be submitted to the Engineer approval seven (7) calendar days prior to bid opening date in accordance with Instructions to Bidders.
2. Equipment submitted for substitution shall meet all the Contract Document requirements. Any deviation of non-compliance shall be indicated by an attached letter explaining a proposed change.
3. Additional cost to the project by Contractor's decision to use Approved substitute materials shall be included in bid sum and shall include all costs by other affected crafts.

C. VISITING SITE

1. Bidder shall visit site of proposes construction. Verify or determine all existing conditions that might affect the Work.
2. Include all costs in the bid price for all work or material required to meet requirements of the Contract Documents, due to variance between the actual existing conditions and the information indicated in the Contract Documents.
3. Failure to comply with the above paragraph will not relieve the Contractor from the necessity of doing any and all work which is evidently necessary to make all electrical installations and systems complete.

D. DESIGN AND PLAN

1. The electrical drawings are diagrammatic, but shall be followed as closely as actual construction and work of other crafts will permit. Drawings indicate general direction and routes of branch circuits and home runs to panels, cabinets, etc. Exact Route and installation of wiring will be determined by conditions of construction on the job.
2. All deviations from Drawings required to make the electrical installation conform to the construction design and the work of other crafts shall be included in Work of this Division 16.

SECTION 16A-
ELECTRICAL WORK - GENERAL

D. DESIGN AND PLAN

3. The data given herein and on the Drawings is an exact as could be secured, but its absolute accuracy is not guaranteed.
4. Outlets or equipment shown on the Drawings with no supply conduit or conductors indicated, shall be completed in the same method and manner as similar outlets or equipment shown on the Drawings.

E. CLARIFICATIONS OF SPECIFICATIONS & DRAWINGS

1. Obscure or doubtful items shall be brought to the attention of the Engineer prior to bid date in accordance with Instructions to Bidders.
2. Should the electrical documents indicate a condition which will conflict with the rules and regulations of applicable codes, the Contractor shall refrain from installing that portion of the work until he receives verification from the Engineer. Any work installed in violation of the governing codes shall be removed and correctly installed by the Contractor at his expense.

F. PROJECT RECORD DOCUMENTS

Submit in accordance with General Conditions and Special Conditions.

G. CODES AND PERMITS

1. Installation shall be in accordance with the latest rules and regulations of the codes of the state and local authorities having jurisdiction.
2. Furnish all materials and labor required for compliance with these laws.
3. Specified items exceeding code requirements shall take precedence.
4. Obtain all required permits and certificates. Deliver certificates of acceptance from the code enforcing authorities to the Engineer.

H. COOPERATION WITH OTHER CRAFTS

1. Cooperate with other crafts or contractors as may be necessary for the proper execution of the Work.
2. Prior to the installation of the electrical work for equipment by other crafts, or other contracts, verify the requirements indicated in the electrical division, with the requirements and characteristics of the other crafts or contractors' equipment. Deviations shall be brought to the attention of the Engineer immediately.

SECTION 16A
ELECTRICAL WORK - GENERAL

I. INSPECTION, OBSERVATION & TESTS

1. Work shall not be closed in or covered before inspection and approval by Engineer.
2. Cost of uncovering and making repairs where uninspected work has been closed in or covered shall be borne by the Contractor.
3. Provide (1) one journeyman, tools, meters, instruments and other test equipment required by the Architect. Contractor to remove and replace trim covers, fixtures, etc. for the Engineer to inspect and test materials, systems, methods and workmanship.
4. Conductor and equipment insulation shall be tested for conformity with 1000 volt megger. Minimum insulation resistance acceptable is 1000 ohm per applicable system volt.
5. Provide electrical supervisory personnel on the job during the construction period. He shall be familiar with the electrical and other crafts' materials and work. He shall coordinate space utilization, his men and the materials to be installed in or on the project.

J. GUARANTEE

1. Without additional charges, replace any work or material which develops defects, except from abuse, within one year from acceptance in accordance with the General Conditions.
2. Lamp guarantee shall be from date of Owner occupancy or acceptance: thirty (30) days for incandescent, six (6) months for multi-vapor.
3. Provide labor for lamp installation for only thirty (30) days after final acceptance.

K. CLEANUP

1. Leave the entire electrical system installed under this Contract in clean, dust-free, and proper working order.
2. Keep tools and materials in an orderly manner throughout the construction period.
3. Upon completion of the work, remove all supplies, materials, tools, etc. used during execution of electrical Work.
4. Dirt and debris of whatever nature caused by the execution of the electrical work shall be removed from job site.

L. FIXTURES & POLES FURNISHED BY OTHERS:

Install under this Contract.

SECTION 16B
BASIC ELECTRICAL MATERIALS AND METHODS

The General Conditions, Parts I, II, and III, Special Conditions and Section 1, General Requirements are a part of the requirements of this Section as fully as if repeated herein.

16B-1 GENERAL

A. GENERAL

1. Scratched, marred or deformed materials will not be accepted.
2. Special features, finishes, description or requirements indicated in the Contract Documents for particular items or equipment, but not included by or in the item's listed catalog number shall be included.
3. Incidentals, hangers, bracket supports, framing, backing, signal transformers, relays, etc. not specifically mentioned herein or noted on the Drawings and required to complete the system or systems in a safe and satisfactory working condition shall be provided and installed as part of the contract.
4. Fixtures, material, or equipment in wet cartons or boxes, stored in or exposed to rain, water, dust, dirt or snow will not be acceptable.

B. APPROVAL OF MATERIALS

1. Electrical materials shall be of the type and quality indicated, or Approved, new, listed by the Underwriters' Laboratories, and shall bear their label wherever standards have been established and label service is regularly furnished by them.
2. Indicated brand names and catalog numbers are used to establish standards of performance and quality.
3. Prior to ordering equipment, and prior to Contractor's first application for payment, the Contractor shall within fifteen (15) days after award of Contract, submit four (4) complete lists of materials and equipment he proposes to furnish for Engineer's review and approval. List shall bear the Contractor's stamp, signature, or other means to show that he has inspected the list and that the submitted material is substantially free of errors, of correct quantity, size, dimension, quality and has been coordinated with the Contract Documents. This includes four (4) fixture brochures and equipment shop drawings. Material list shall include: Material Item, Manufacturer's Name and Catalog Number and Supplier. List name of project supervisor.

Example:

PROPOSED MATERIALS

Project Title _____ Electrical Subcontractor _____

Project Supervisor: _____ Order Placed(will be placed) _____

MATERIAL ITEM

MANUFACTURER AND NUMBER

SUPPLIER

SECTION 16B
BASIC ELECTRICAL MATERIALS AND METHODS

C. MANUFACTURER

1. Like items shall be from one manufacturer, i.e. fixture types, switches, receptacles, breakers, panels, etc...
2. The manufacturer's installation instructions and wiring diagrams are part of the Contract Documents, and shall take precedence over wiring indicated in event of conflict except for wiring method.
3. Manufacturers listed as Approved shall modify their items and/or materials at the factory to comply with the special requirements noted. Contractor responsibility to verify compliance.

16B-2 MATERIALS & METHODS

A. WIRING METHOD

1. Wiring throughout shall be a metallic raceway system with outlets, cabinets, panels, etc., except where indicated otherwise.
2. Surface wiring shall be metallic raceway method.
3. All work shall be executed in a skilled workman-like manner and shall present a neat and mechanical appearance upon completion.
4. Wet, damp, and hazardous location: Meet code requirements and methods, and as indicated.
5. Consult Engineer before notching or cutting throughout construction.
6. For any cutting in the finished surfaces, repair and recondition in accordance with Special Conditions or as directed by Engineer.
7. Recondition or replace any damage to work of other crafts.

B. FEEDERS

1. Raceways shall be rigid conduits as approved by local code.
2. Provide ground conductor within, and full length of , each PVC feeder conduit, of a size indicated for equipment ground wire listed by NFPA #70, in table #250-95. Ground each panel, pull box and feeder conduit.

C. BRANCH CIRCUIT WIRING

1. Install wiring sized to suit load served except minimum wire size shall be #12 A.W.G., unless noted otherwise.
2. All splices for wire sizes A.W.G. #18 through #8 shall be electrically and mechanically secure, soldered, then insulated with 3M tape, except where indicated otherwise.
3. Connectors:

SECTION 16B
BASIC ELECTRICAL MATERIALS AND METHODS

3.
 - a.) Ideal and Scotchlock electrical spring connectors are acceptable up to #8 wire, in lieu of splicing.
 - b.) Kearney or other Engineer approved connectors for splicing or taping conductors larger than #8 wire using 3M insulating tape shall be the approved method.

End Section 16B

SECTION 16C
ELECTRICAL MATERIAL & METHODS FOR RACEWAYS & FITTINGS

The General Conditions, Parts I, II and III, Special Conditions and Section 1 General Requirements, are a part of the requirements of this Section as fully as if repeated herein.

A. CONDUITS GENERALLY

1. Conduits shown on Drawings which terminate without box, panel, cabinet or conduit fitting shall be provided with no less than five (5) full threads, bushings and metal washer type sealer between bushing and conduit end.
2. Condulets shall not be permitted in service or feeders.
3. Maximum bends permitted in any conduit run shall not exceed 270 degrees.
4. All rigid conduit joints shall be threaded, clean and tight (metal to metal). Threadless joints or connections not permitted.

B. CONDUIT UNDERGROUND

1. Conduits stubbed out underground for future continuation shall terminate not less than five (5) feet past building wall, walk, porch, base, platform or other permanent fixed object and shall be left so that removal of dirt, without tunneling, over conduit in the future is all that is required for continuation.
2. All joints shall be threaded.
3. Minimum depth for service conduits - 48 inches. Other conduits exterior of building, shall be 24 inches minimum below finished grade, except where indicated otherwise.

C. CONDUIT BUSHINGS, E.M.T. CONNECTORS & COUPLINGS

1. Bushings shall be insulated type, use T&B #1222 series of Gedney #NBC series, for feeders and service.
2. E.M.T. Connectors and couplings shall be steel: gland or "Tomic" or "Breagle," pre-insulated type connectors.
3. Set Screw type E.M.T. fittings are not acceptable.

D. PLUGGED CONDUITS AND EMPTY CONDUITS

1. Replace conduits containing concrete or other foreign materials without additional cost.
2. Provide and use Appleton steel bushing pennies with bushings, or approved seals, for all empty conduits during construction and completed project. Unsealed conduits and conduits with foreign materials shall be mandreled and wire brushed as directed by the Engineer.

SECTION 16C

ELECTRICAL MATERIAL & METHODS FOR RACEWAYS & FITTINGS

E. P.V.C. CONDUIT

1. Type 40 heavy wall PV-duct conduit shall be composed of high impact PVC (Polyvinyl Chloride) C200 compound, and shall meet industry NEMA standards and be 90 degrees C wire rated by UL listed in accordance with Article 347 of the 1971 National Electrical Code for underground and exposed use.
2. Material shall have tensile strength of 7000 PSI at 73.4 degrees F., flexural strength of 11,000 PSI, compression strength of 8600 PSI and minimum wall thicknesses in various sizes. Install grounding conductor in all PVC feeders and branch circuits.

End of Section 16C

SECTION 16D
ELECTRICAL CONDUCTORS

The general Conditions, Parts I, II, and III, Special Conditions and Section 1, General Requirements, are a part of the requirements of this Section as fully as if repeated herein.

A. WIRE, CABLE, BUSSING, BUS.

1. All conductors shall be copper. Wire sizes indicated are for copper.
2. Insulation shall meet code requirements.
3. Use "THW" or "RHW" for stranded conductors #2 A.W.G. and larger in conduits.

B. BRANCH CIRCUIT WIRING

Splices shall be made mechanically and electrically secure. Ideal and Scotchlok electrical spring connectors are acceptable connectors for wire #18 through #8 A.W.G. Direct burial cable splices are exceptions, use "3M" Scotchcast splicing kits and tapes.

C. INSULATION RESISTANCE

Minimum acceptable conductor and equipment insulation resistance is 2000 ohms per volt of the equipment operating voltage.

End of Section 16D

SECTION 16E
ELECTRICAL FIXTURES

The General Conditions, Parts I, II, and III, Special Conditions and Section 1, General Requirements are a part of the requirements of this Section as fully as if repeated herein.

A. GENERAL

1. Provide all fixtures, complete with lamps. Fixture design to govern type of lamp required.
2. Fluorescent type lamps shall meet the U.S.A.S.I. lamp specifications.
3. Incandescent lamps shall be 125 volt, except as noted otherwise.
4. Incandescent lamp sockets shall be porcelain, lamp ~~screw~~ shell of socket to be designed for anti-seizing lamp shell when used.
5. Outlet symbols on plans without a fixture type shall have a fixture the same as those used in similar or like locations within or on the building.
6. Capital letter adjacent to the outlet symbol indicates the type of fixture to be installed on this outlet.
7. Include additional indicated features, not included by mentioned manufacturer's catalog number.
8. All light outlets shall be supplied with a fixture.

B. FIXTURE TYPES - EXTERIOR OR DAMP LOCATIONS

All lighting fixtures installed in damp or exterior locations must be code approved for such areas. Fixtures specified or indicated for use in these areas shall be modified at the factory if necessary to meet this requirement.

End of Section 16E

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PARKS & MALLS PHASE IV
SOUTH AUDITORIUM URBAN RENEWAL PROJECT

SCHEDULE OF DRAWINGS

501. DRAWING SCHEDULE

<u>Sheet No.</u>	<u>Sheet Title</u>	<u>Sheet</u>	<u>Quantity</u>
1	Title Sheet	1	
2&3	Dimension & Reference	2	
4&5	Grading & Drainage	4	
6,7&8	Structural	3	
9&10	Electrical	2	
11,12&13	Details	3	
14&15	Planting	2	
16&17	Irrigation	2	