TECHNICAL SPECIFICATIONS

PROJECT MANUAL – 2 of 3

For

Ojai Permanent Supportive Housing

611 South Montgomery Street, Ojai, CA., 93023

Permit Set Documents.

Date: 11.07.2025

Prepared For:

Dignity Moves Under City of Ojai

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SECTION 22 07 00-

PIPING INSULATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Piping insulation.
B. Jackets and accessories.

1.3 RELATED SECTIONS

A. Division 7 - Firestopping.
B. Division 9 - Painting: Painting insulation jacket.
C. Section 230500 – Mechanical Requirements.
D. Section 221113 - Plumbing Piping.

1.4 REFERENCES

A. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
C. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus.
D. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
E. ASTM C240 - Standard Test Methods of Testing Cellular Glass Insulation Block.
F. ASTM C449/C449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
G. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
H. ASTM C547 - Standard Specification for Mineral Fiber Preformed Pipe Insulation.
I. ASTM D1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
K. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
L. NAIMA National Insulation Standards.
M. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
N. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.5 SUBMITTALS

A. Submit under provisions of Section 230500 and Division 1.
B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum five years documented experience.

B. Applicator Qualifications: Company specializing in performing the Work of this Section with minimum five years documented experience and approved by manufacturer.

1.7 REGULATORY REQUIREMENTS

A. Conform to maximum flame spread/smoke developed rating of 25/50 in accordance with NFPA 255.

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Accept materials on Project site, labeled with manufacturer's identification, product density, and thickness.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient conditions required by manufacturers of each product.
B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 – PRODUCTS

2.1 GLASS FIBER

A. Manufacturers:
   1. Johns Manville
   2. Certainteed
   3. Owens – Corning
   4. Or equal
B. Insulation: ASTM C547; rigid molded, noncombustible.
   1. 'K' value: ASTM C335, 0.25 at 100 degrees F.
   2. Maximum service temperature: 850 degrees F.
   3. Maximum moisture absorption: 0.2 percent by volume.
C. Vapor Barrier Jacket:
   1. ASTM C1136 White kraft paper reinforced with glass fiber yarn, bonded to aluminized film.
   2. Moisture vapor transmission: ASTM E96; 0.02 perm-inches.
   3. Secure with self sealing longitudinal laps and butt strips.
   4. Secure with outward clinch expanding staples & vapor barrier jacket.
D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
E. Vapor Barrier Lap Adhesive:
   1. Compatible with insulation.
F. Insulating Cement/Mastic:
   1. ASTM C195; hydraulic setting on mineral wool.
G. Fibrous Glass Fabric:
   1. Cloth: Untreated; 9 oz/sq yd weight.
   2. Blanket: 1.0 lb/cu ft density.
   3. Weave: 10x10.
H. Indoor Vapor Barrier Finish:
   1. Cloth: Untreated; 9 oz/sq yd weight.
   2. Vinyl emulsion type acrylic, compatible with insulation, white color.
I. Outdoor Vapor Barrier Mastic
   1. Vinyl emulsion type acrylic, compatible with insulation, white color.
J. Insulating Cement:
   1. ASTM C449/C449M.

2.2 JACKETS

A. Aluminum Jacket: ASTM B209.
   1. Thickness: 0.025 inch sheet.
   2. Finish: Embossed.
   3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
   4. Fittings: 0.025 inch thick die shaped fitting covers with factory attached protective liner.

5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.
6. Lap and joint seals: perimeter silicone bead.

B. PVC Jacket: ASTM E 136.
1. Manufacturers:
a. Schuller “Zeston 2000”
b. Owens – Corning
c. Certainteed
d. Or equal
2. Thickness: 20 mil sheet and fitting covers.
3. Joining: Install using adhesives per manufacturer specifications.
4. Fittings: Shaped fitting covers.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that piping has been tested and approved before applying insulation materials.
B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with NAIMA National Insulation Standards.
B. Exposed Piping: Locate insulation and cover seams in least visible locations.
C. Glass fiber insulated pipes conveying fluids below ambient temperature:
1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
3. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.
4. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
D. Glass fiber insulated pipes conveying fluids above ambient temperature:
1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
3. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
4. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
E. Inserts and Shields:
1. Application: Piping 1-1/2 inches diameter or larger.
2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
3. Insert location: Between support shield and piping and under the finish jacket.
4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
F. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Division 7 - “Firestopping” Section.
G. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping. Seal all joints with silicone.

3.3 SCHEDULES

A. Plumbing Systems:
   1. Domestic Hot Water Supply:
      a. Glass Fiber Insulation:
         1) Pipe Size Range: ½ - 1 inch.
         2) Thickness: 1.0 inch.
   2. Domestic Hot Water Recirculation:
      a. Glass Fiber Insulation:
         1) Pipe Size Range: All sizes.
         2) Thickness: 1 inch.
   3. Roof Drain Bodies:
      a. Glass Fiber Insulation:
         1) Pipe Size Range: All sizes.
         2) Thickness: 1 inch.
   4. Roof Drainage Above Grade(except in stairwell):
      a. Glass Fiber Insulation:
         1) Pipe Size Range: All sizes.
         2) Thickness: 1 inch.

B. Exterior piping exposed to weather or damage:
      a. Glass Fiber Insulation:
         1) Pipe Size Range: All sizes.
         2) Thickness: 1-1/2 inch.
         3) Cover with aluminum jacket.

C. Insulate indirect waste and condensate piping serving refrigeration equipment, above ceilings, in walls and other areas where piping may sweat.

MINIMUM INSULATION STANDARDS (MORE STRINGENT SPECIFIED VALUES APPLY)

FLUID TEMPERATURE RANGE (°F)	**CONDUCTIVITY RANGE (in Btu-inch per hour per square foot per °F)**	**INSULATION MEAN RATING TEMPERATURE (°F)**	**NOMINAL PIPE DIAMETER (in inches)**				
			<1	1to<1.5	1.5 to 4	4 to <8	8 and larger
			INSULATION THICKNESS REQUIRED (in inches)				
Space heating systems (steam, steam condensate and hot water)							
Above 350	0.32-0.34	250	4.5	5.0	5.0	5.0	5.0
251-350	0.29-0.31	200	3.0	4.0	4.5	4.5	4.5
201-250	0.27-0.30	150	2.5	2.5	2.5	3.0	3.0
141-200	0.25-0.29	125	1.5	1.5	2.0	2.0	2.0
105-140	0.24-0.28	100	1.0	1.5	1.5	1.5	1.5
Space cooling systems (chilled water, refrigerant and brine)							
40-60	0.23-0.27	75	0.5	0.5	0.5	1.0	1.0
Below 40	0.23-0.27	50	1.0	1.0	1.5	1.5	1.5

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SECTION 22 11 13-

PLUMBING PIPING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for piping systems.
   1. Sanitary sewer.
   2. Indirect waste.
   3. Domestic water.

1.3 RELATED SECTIONS

A. Division 08 - Access Doors.
B. Division 09 - Painting.
C. Section 230500 – Mechanical Requirements.
D. Section 230529 – Hangers and Supports for Piping and Equipment.
E. Section 230553 – Mechanical Identification.
F. Section 220700 – Piping Insulation.
G. Section 221113 – Domestic Plumbing Specialties.
H. Section 224000 – Plumbing Fixtures.
I. Division 23 - HVAC
J. Division 26 - Electrical.

1.4 REFERENCES

A. AGA Z21.22 - Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems.
B. ASME B16.3 - Malleable Iron Threaded Fittings.
C. ASME B16.4 - Cast Iron Threaded Fittings Class 125 and 250.
D. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
E. ASME B16.22 - Wrought Copper and Bronze Solder Joint Pressure Fittings.
F. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.
G. ASME B16.26 - Cast Bronze Fittings for Flared Copper Tubes.
H. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
I. ASME B31.9 - Building Service Piping.
J. ASME B31.2 - Fuel Gas Piping.ASME SEC IX - Welding and Brazing Qualifications.
K. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
L. ASTM A74 - Cast Iron Soil Pipe and Fittings.
M. ASTM A234/A234M - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
N. ASTM B32 - Solder Metal.
O. ASTM B42 - Seamless Copper Pipe.
P. ASTM B43 - Seamless Red Brass Pipe.
Q. ASTM B68 - Seamless Copper Tube
R. ASTM B75 - Seamless Copper Tube ASTM B88 - Seamless Copper Water Tube
S. ASTM B251 - Wrought Seamless Copper and Copper-Alloy Tube
T. AB. ASTM B280 - Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
U. ASTM B302 - Threadless Copper Pipe (TP).

V. ASTM B306 - Copper Drainage Tube (DWV).
W. ASTM C4 - Clay Drain Tile.
X. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
Y. ASTM E814 - Fire Tests of Through-Penetration Fire Stops.
Z. ASTM F708 - Design and Installation of Rigid Pipe Hangers.
AA. AWWA C651 - Disinfecting Water Mains.
BB. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. Through 12 in. for Water Distribution.
CC. AWS A5.8 - Brazing Filler Metal.
DD. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.
EE. CISPI 310 - Joints for Hubless Cast Iron Sanitary Systems.
FF. CLSI – Clinical and Laboratory Standards Institute.
GG. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
HH. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.
II. NCPWB - Procedure Specifications for Pipe Welding.
JJ. NFPA 54 - National Fuel Gas Code.
KK. UL 1479 - Fire Tests of Through-Penetration Firestops.

1.5 SUBMITTALS

A. Submit under provisions of Section 230500 and Division 01 - “Submittals” Section.
B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
C. Project Record Documents: Record actual locations of valves.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with the codes of the authority having jurisdiction.
B. Valves: Manufacturer's name and pressure rating marked on valve body.
C. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.7 REGULATORY REQUIREMENTS

A. Perform Work in accordance with the recognized edition of the Uniform Plumbing Code with applicable State and Local amendments.
B. Conform to applicable code for installation of backflow prevention devices.
C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Comply with Division 01.
B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
C. Provide temporary protective coating on cast iron and steel valves.
D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
E. Protect piping systems from entry of foreign materials by temporary covers, completed sections of the Work, and isolating parts of completed system.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Comply with Division 01.
B. Do not install underground piping when bedding is wet or frozen.

PART 2 – PRODUCTS

2.1 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight. Made in U.S.A.
1. Fittings: Cast iron.

2. Joints: Husky series 4000 coupling, ASTM C1540, ASTM C564, fm 1680 Class 1, CSA b602, neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.2 SANITARY VENT PIPING, ABOVE GRADE

A. Schedule 40 Galvanized steel: ASTM A120, for sizes 2-1/2”and smaller.
   1. Fittings: Galvanized Steel.
   2. Joints: Threaded.
B. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.3 WATER PIPING, ABOVE GRADE

A. Copper Tubing: ASTM B88, Type L hard drawn.
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, solder, Grade 95TA.
   3. Valves: Ball Valves.

2.4 WATER PIPING, BURIED

A. Copper Tubing: ASTM B88, Type K hard drawn.
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze. Wrap in Reactive soils.
   2. Joints: ASTM B32, solder, Grade 95TA.
   3. Reduced pressure backflow preventer: Febco

2.5 INDIRECT WASTE and CONDENSATE DRAIN PIPING

A. Copper Tubing: ASTM B88, Type L hard drawn.
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, solder, Grade 95TA.
   3. Insulate piping serving refrigeration equipment, above ceilings, in walls and other areas where piping may sweat.

2.6 BALL VALVES

A. Manufacturers:
   1. NIBCO
   2. Stockham
   3. Or equal
B. 3”and Smaller: Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, full port, Teflon seats and stuffing box ring, blow-out proof stem, lever handle, solder or threaded ends with union.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting Work.
B. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
B. Remove scale and dirt, on inside and outside, before assembly.
C. Prepare piping connections to equipment with flanges or unions.

3.3 SAWCUTTING, TRENCHING AND BACKFILLING:

A. Provide all necessary core drilling, sawcutting, excavation, shoring, backfilling and compaction required for the proper installation of the Work of this Section.
B. Comply with requirements for excavation, backfill and compaction specified in Division 01 and 02.

3.4 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
C. Install plumbing in accordance with the following:
   1. No piping shall come in direct contact with the structure.
   2. Provide felt inserts between all pipes and support hangers.
D. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
E. Install piping to maintain headroom, conserve space, and not interfere with use of space.
F. Group piping whenever practical at common elevations.
G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Lay long runs of below ground solvent welded piping in trench with in a gradual S form to allow contraction and expansion.
H. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
J. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Division 09 “Painting” Section.
K. Install valves with stems upright or horizontal, not inverted.
L. Install water piping to ASME B31.9.
M. Condensate Drain Lines: Install lines from air handling units, drain pans, and as shown. Provide U trap.
N. Install supply connections to fixtures through wall as high under fixtures as possible and take off hot water lines from top of main.
O. Unions: Install adjacent to each screwed valve and on connections to equipment. Installation of inaccessible unions not approved.
P. Shut-offs: Install ball valve in each branch line where branch takes off main, at connections to equipment, and as shown to isolate sections of piping and fixtures for repairs.
Q. Sleeve pipes passing through partitions, walls and floors.
R. Inserts:
   1. Hang piping from structural frame. Do not support piping from metal deck tabs or metal deck unless approved by Architect.
   2. Do not hang piping from other building equipment.
   3. Provide inserts for placement in concrete formwork.
   4. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   5. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
   6. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
   7. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and recessed into and grouted flush with slab.
   8. Prime coat exposed steel hangers and supports. Refer to Division 9 Section “Painting”. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
   9. Provide hangers adjacent to motor driven equipment with vibration isolation.
   10. Support cast iron drainage piping at every joint.
S. Openings in the building envelope separating conditioned from unconditioned space needed to accommodate piping and other necessary penetrations must be sealed in compliance with the California Energy Code. Exception: Annular spaces around piping or other openings in plates at the exterior walls shall be protected against the passage of rodents by closing such openings with cement mortar or concrete masonry.

3.5 APPLICATION

A. Use grooved mechanical couplings and fasteners only in accessible locations.
B. Install unions downstream of valves and at equipment or apparatus connections.
C. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

3.6 ERECTION TOLERANCES

A. Establish invert elevations, slopes for drainage to 1/4 inch per foot minimum. Maintain gradients.

3.7 ADJUSTING/ TESTING PIPING SYSTEMS

A. Test Systems as specified. Install shut-off valves to isolate existing systems that do not require testing. Existing systems that have been connected to by new systems shall be tested to the extent of the closest new connection.
B. Tests must be performed and systems approved prior to painting, covering, or concealing piping.
C. Provide all test equipment, instrumentation and labor in conjunction with tests.
D. Prior to test, protect or remove all devices, and other items, which are not designed to stand pressures used in test.
E. Accomplish testing of piping in sections so as not to leave any portion of pipe or joints untested.
F. Obtain prior approval for test procedures.
G. Responsibility for Damages: Bear costs of repair and restoration of Work of other trades damaged by tests or cutting done in connection with tests.
H. Water systems: Test all portions of new water systems at hydrostatic pressure of not less than 150 psig, with 5 psig permissible drop at end of four hours.
I. Verify correct pressure settings for service regulators.
J. Adjust controls and safety devices. Replace damaged and malfunctioning controls and safety devices.
K. Drainage Systems: Fill entire waste and vent system with water to level of highest vent stack. System shall hold water for two hours.
L. Rainwater Systems: Test in same manner as drainage systems.

3.8 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting Work, verify system is complete, flushed and clean. Install shut-off valves to isolate existing systems that do not require disinfecting. Existing systems that have been contaminated in any way from the new work shall be disinfected.
B. Ensure pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
C. Inject disinfectant, free chlorine in liquid (preferred) or gas form, throughout system to obtain 50 to 80 mg/L residual. Tablets or powders are not allowed.
D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
E. Maintain disinfectant in system for 24 hours.
F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
G. Flush disinfectant from system until residual equal to that of incoming water or 0.5 mg/L.
H. Take samples no sooner than 24 hours after flushing, from 5 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

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SECTION 22 11 19-

DOMESTIC PLUMBING SPECIALTIES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Floor drains and floor sinks.
B. Cleanouts.
C. Hose bibs.
D. Water hammer arrestors.
E. Access panels.
F. Trap primers.
G. Valve boxes.

1.3 RELATED SECTIONS

A. Section 221113 - Plumbing Piping.
B. Section 224000 - Plumbing Fixtures.
C. Division 26 - Electrical.

1.4 REFERENCES

A. ASME A112.21.1 - Floor Drains.
B. ASME A112.21.2 - Roof Drains.
C. ASME A112.26.1 - Water Hammer Arrestors.
D. ASSE 1011 - Hose Connection Vacuum Breakers.
E. PDI WH-201 - Water Hammer Arrestors.

1.5 SUBMITTALS FOR REVIEW

A. Submit under Provisions of Section 230500 and Division 01 - “Submittals” Section.
B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

1.6 SUBMITTALS AT PROJECT CLOSEOUT

A. Project Record Documents: Record actual locations of equipment, cleanouts, water hammer arrestors.
B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this Section with minimum five years experience.

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Comply with Division 01.
B. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 – PRODUCTS

2.1 FLOOR DRAINS

A. As shown on Drawings.
B. Coordinate with floor type.

2.2 FLOOR SINKS

A. As shown on Drawings.
B. Coordinate with floor type.

2.3 CLEANOUTS

A. Exterior Surfaced or Unsurfaced Areas:
   1. Smith - 4253
   2. Zurn - Z-1474 W/ Z-1449-BP
   3. Or equal
   4. Heavy duty lacquered cast iron double flanged housing with round epoxy coated gasketed scoriated cover. Bronze Plug.
B. Interior Finished Floor Areas:
   1. Smith – 4160
   2. Zurn - Z-1400-TX
   3. Or equal
   4. Lacquered cast iron body with anchor flange, threaded top assembly, and square gasketed depressed cover to accept floor finish. ABS plug.
C. Interior Floor Service Areas:
   1. Smith - 4020
   2. Zurn - ZB-1400
   3. Or equal
   4. Lacquered cast iron body with anchor flange, threaded top assembly, and round gasketed Nickel Bronze scored cover. ABS plug.
D. Interior Carpet Areas
   1. Smith – 4020 –X or Y. See Architect for use of carpet flange cover or carpet marker.
   2. Zurn - ZN-1400-NH-CF or CM. See Architect for use of carpet clamping frame or stamped stainless steel marker.
   3. Or equal
   4. Lacquered cast iron body with anchor flange, threaded top assembly, and round gasketed Nickel Bronze scored cover. ABS plug.
E. Interior Finished Wall Areas :
   1. Smith - 4510
   2. Zurn - Z-1446
   3. Or equal
   4. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw. Iron plug.
F. Interior Unfinished Accessible Areas: Caulked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.4 HOSE BIBBS

A. As shown on Drawings.

2.5 WATER HAMMER ARRESTORS

A. Bronze:
   1. Watts - 15 Series, or equal.
      a. ANSI A112.26.1; Bronze construction, bellows type sized in accordance with PDI WH-201, precharged suitable for operation in temperature range 34 to 250 degrees F and maximum 150 psi working pressure.

2. PPP, Inc. SC Series, or equal.
   a. Type K hard copper barrel, sized in accordance with PDI WH-201, precharged suitable for operation in temperature range 34 to 250 degrees F and pressures from 35 to 250 psig.

2.6 ACCESS PANELS

A. Manufacturers: Karp, Milcor, or equal.
B. Tile, masonry, drywall: Karp DSC-214M, stainless steel with No.4 finish, cylinder, and key operated lock. Minimum size 12 x 12 inches.
   1. In fire rated ceilings and walls use Karp DSC-211 FRT and install vermiculite.
C. Plaster: Karp DSC-214P, stainless steel with No.4 finish, cylinder, and key operated lock. Minimum size 12 x 12 inches.
   2. In fire rated ceilings and walls use Karp DSC-215 FRT with air cell asbestos.

2.7 FLASHINGS

A. All piping: Use 4 lb. flashing assembly or dead soft copper for roof penetrations.

2.8 TRAP PRIMERS

A. At Flush-Valve Toilets:
   1. Sloan F-72-A1
   2. Zurn
   3. Or equal.
B. At lavatory or drinking fountain:
   1. J R Smith 2698
   2. Zurn
   3. Or equal.
C. At lavatory or sink.
   1. PPP #PR-500, chrome plated under-lav assembly.
   2. Zurn
   3. Or equal.
D. Install at frequently used fixture (2.5 GPM minimum flow rate) to prime infrequently used fixtures in close proximity:
   1. J R Smith 2699
   2. Zurn
   3. Or equal.
   4. Mounted in accessible location.
E. Remote trap primer:
   1. PPP PR-500, Distribution units - DU as required.
   2. Zurn
   3. Or equal.
   4. Mounted in accessible location.

2.9 BACKFLOW PREVENTERS

A. Reduced pressure principal:
   1. Sizes ½” to ¾”
      a. Lead free Flomatic RPZ IIE, or equal.
   2. Sizes 1” to 2”
      a. Lead free Flomatic RPZE, or equal.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions and applicable building Codes.
B. Install floor cleanouts at elevation to accommodate finished floor.

C. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur and as shown on Drawings.
D. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to fixtures.

END OF SECTION – 22 11 19

SECTION 22 40 00-

PLUMBING FIXTURES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. All Plumbing Fixtures.

1.3 RELATED SECTIONS

A. Section 230500 – Mechanical Requirements.
B. Section 230529 – Hangers and Supports for Piping and Equipment.
C. Section 221119 – Domestic Plumbing Specialties.
D. Section 221113 – Plumbing Piping.
E. Division 23 HVAC
F. Division 26 Electrical

1.4 REFERENCES

A. ASME A112.6.1 - Supports for Off-the-Floor Plumbing Fixtures for Public Use.
B. ASME A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.
C. ASME A112.19.1 - Enameled Cast Iron Plumbing Fixtures.
D. ASME A112.19.2 - Vitreous China Plumbing Fixtures.
E. ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks, and Urinals.
F. CBC 1115B & 1118B – Accessible Fixtures and Controls.
G. NFPA 70 - National Electrical Code.

1.5 SUBMITTALS FOR REVIEW

A. Submit under Provisions of Section 230500 and Division 01 - “Submittals” Section.
B. Product Data: Provide catalog illustrations of fixtures, sizes, utility sizes, trim, and finishes.

1.6 SUBMITTALS AT PROJECT CLOSEOUT

A. Maintenance Data: Include fixture trim exploded view and replacement parts lists.
B. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this Section with minimum five years documented experience.

1.8 REGULATORY REQUIREMENTS

A. Accessible plumbing fixtures shall comply with all of the requirements of CBC Section 1115B. Heights and locations of all fixtures shall be according to CBC Table 1115B-1. Fixture controls shall comply with CBC Section 1118B.

1.9 DELIVERY, STORAGE, AND PROTECTION

A. Accept fixtures on site in factory packaging. Inspect for damage.
B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

PART 2 – PRODUCTS

2.1 FIXTURES

A. Provide plumbing fixtures that reduce the overall potable water consumption within a building by at least 20 percent in compliance with Chapter 5 of California's Green Code.
B. Provide diverter valves where multiple shower heads are installed in a single stall to ensure maximum peak flow of 2.5 gallons per minute.

2.2 INSULATION for SINK DRAINS, WATER SUPPLIES & VALVES AT ADA FIXTURES

A. Manufacturers:
   1. Truebro Inc. "Lav guard" under sink protective pipe covers, color – white.
   2. Plumberex "Pro-2000", color – white.
   3. Or equal.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify of existing conditions before starting Work.
B. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
C. Confirm that millwork is constructed with adequate provision for the installation of counter top sinks.

3.2 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.
B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
C. Install components level and plumb.
D. Install and secure fixtures in place with wall carriers and bolts.
E. Seal fixtures to wall and floor surfaces with sealant as specified in Division 7 - "Joint Sealants" Section, color to match fixture.
F. Solidly attach water closets to floor with lag screws. Lead flashing is not intended to hold fixture in place.
G. Cover lavatory drains and hot and cold supplies and valves with approved insulation.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.5 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.6 CLEANING

A. Clean plumbing fixtures and equipment prior to substantial completion.

3.7 ACCESSIBILITY

A. Fixture Heights: Install fixtures to heights above finished floor as appropriate for ADA requirements where applicable per CBC and fixture controls per CBC requirements.
B. Fixture Rough-In as shown on Drawings.

END OF SECTION – 22 40 00

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SECTION 23 00 00-

PROJECT RECORD DOCUMENTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General or Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 REQUIREMENTS

A. Maintain on site one set of the following record documents and record revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed Shop Drawings, Product Data, and Samples.
   6. Manufacturer's detailed instructions for assembly, installation, and adjusting.
B. Ensure entries are complete and accurate, enabling future reference by the owner/architect.
C. Store Record Documents separate from documents used for construction.
D. Record information concurrent with construction progress.
E. Specifications:
   1. Legibly mark and record at each Product section description of actual products installed, included but not limited to the following:
      a. Manufacturer's name and product model number.
      b. Product substitutions and or alternates utilized.
      c. Changes made by Addenda and modifications.
F. Record Drawings and Shop Drawings:
   1. Legibly mark each item to record actual construction including but not limited to:
      a. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible, permanent, and accessible features of the Work.
      b. Field changes of dimension and detail.
      c. Details not on original Contract Documents.
G. Submit Record Documents to the architect with claim for final acceptance and Application for Payment.

1.3 QUALITY ASSURANCE

1.4 PERFORMANCE REQUIREMENTS

A. No variation of requirements specified herein without prior written permission. Conform to latest AutoCAD CAD drafting standards.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 23 05 00.
B. Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for 4 inch pressure class and higher, kitchen hood exhaust, and glass fiber duct systems.
C. Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.
D. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and Flexible. More stringent requirements shall govern.

E. Maintain one copy of SMACNA document on site.

1.6 DELIVERABLES

A. Drawings: One complete AutoCAD file set with all modifications.

B. Drawings: One complete PDF file set with all modifications.

C. Specifications: One PDF copy with legible modifications.

D. Addenda: One PDF copy.

E. Change Orders: One PDF copy.

F. Reviewed Shop Drawings/Submittals: One PDF copy with legible modifications.

G. Manufacturer’s Installation Instructions: One PDF copy.

H. Electronic Drawing Files: Provide completed electronic files in AutoCAD latest version and PDF on digital media or downloadable link.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION – 23 00 00

SECTION 23 05 00-

MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section. Requirements of this section apply to all sections of Divisions 22, and 23.

1.2 SECTION INCLUDES

A. The General Requirements for all Work in Divisions 22, and 23.

1.3 RELATED SECTIONS

A. The following Sections are a part of this Specification.
   1. Section 22 07 00 – Piping Insulation
   2. Section 22 11 13 – Plumbing Piping
   3. Section 22 11 19 – Domestic Plumbing Specialties
   4. Section 22 40 00 – Plumbing Fixtures
   5. Section 23 00 00 - Project Record Documents
   6. Section 23 05 00 – Mechanical Requirements
   7. Section 23 05 29 – Hangers and Supports for Piping and Equipment
   8. Section 23 05 53 - Mechanical Identification
   9. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC
   10. Section 23 07 00 - HVAC Insulation.
   11. Section 23 31 13 - Ductwork
   12. Section 23 33 00 - Ductwork Accessories
   13. Section 23 37 13 - Diffusers, Registers and Grilles

1.4 REFERENCES

A. References to standard code specification, regulatory agencies, shall mean editions in effect at date of submission of bids, or the date of a Change Order or Field Order, as applicable, unless specified otherwise.

B. References to technical societies, trade organizations, and governmental agencies are made in Division 22, and 23 sections in accordance with the following abbreviations.

1. AABC	Associated Air Balance Council
2. ANSI	American National Standards Institute
3. ASME	American Society of Mechanical Engineers
4. ASTM	American Society for Testing Materials
5. IEEE	Institute of Electrical and Electronic Engineers
6. NEBB	National Environmental Balancing Bureau
7. NEMA	National Electrical Manufacturers Association
8. NFPA	National Fire Protection Association
9. SMACNA	Sheet Metal and Air Conditioning Contractors National Association
10. UL	Underwriters Laboratories, Inc.

C. Materials and Installations shall comply with applicable local, state, and national codes and ordinances.

D. In case of conflict between the referenced codes and ordinances, or between the Specifications and the General and Supplementary Conditions, the more stringent requirements shall govern.

1.5 CONDITIONS

A. Substitutions: Materials or products specified by brand name, trade name, or catalog reference, shall establish a standard of quality and performance. If the Contractor wishes to substitute materials or products other than those specified, submit such substitutions for evaluation as specified per Division 01 General Requirements and per the Bidding Requirements.
B. Inspection of conditions: Examine existing conditions before starting Work. Verify existing utilities, site conditions and points of connection. Report to the Architect in writing, before Work begins, conditions which prevent proper performance of this Work. Beginning Work of this Section without reporting unsuitable conditions to Architect constitutes acceptance of conditions by Contractor. Perform required removal, repair, or replacement of this Work at no additional cost to Owner.
C. Obtain and pay for all permits, fees, connection charges, and temporary service charges required for execution of Work included in Division 21, 22, and 23 Sections.
D. Drawings show pipe and ductwork diagrammatically.
E. Adhere to Drawings as closely as possible in laying out Work.
F. Vary run of piping, run and shape of ductwork, and offset as required to avoid structural and other interferences as approved by the Architect.
G. Remove from site: packing cartons, scrap materials and other rubbish resulting from operations of Work prior to Substantial Completion.
H. Cutting shall cause no damage to structure. Do not cut, notch, bore or modify structural members without prior consent by the Architect.
I. Contractor shall pay all costs of design and installation, including reviewing cost, resulting from substitutions of products. All substitutions shall have prior approval before installation.
    1. Acceptance of substitutions by the Architect does not change this requirement.

1.6 COORDINATION WITH WORK SPECIFIED IN OTHER SECTIONS

A. Coordinate with work specified in other sections to avoid construction delays and maintain required clearances. Make ductwork and equipment layouts available before start of Work.
B. Coordination Drawings (NO EXCEPTIONS): Prepare and submit to the Architect a coordinated, composite Shop Drawing that indicates the relationship of all mechanical piping, ductwork and equipment with all electrical conduit, electrical equipment, casework, supports, structural members and braces. These drawings shall be fully coordinated with other trades. Indicate the clearances between the Work of this Division, the structure, and the Work of other trades. Check routing and elevations of all ductwork and equipment before fabricating. Report to the Architect any conflicts that cannot be solved in the field. Extra charges shall not be allowed due to lack of coordination prior to, or during construction. Provide a title block on each Drawing with locations for signatures from all installers and subcontractors involved, including but not limited to the General, HVAC, Plumbing, and Electrical installers and subcontractors. Provide a title block on each drawing with locations for signatures from all installers and subcontractors involved. Include a statement for signature that each installer and subcontractor has reviewed the coordination drawings in detail and has coordinated the Work of his/her trade. Use minimum drawing scale of one-quarter inch per foot for floor and roof plans, and one-quarter inch per foot for sections.

1.7 QUALITY ASSURANCE:

A. Carry out Work in a workmanship manner satisfactory to and approved by the Architect. Materials or equipment not installed in a manner satisfactory and approved by Architect shall be removed and replaced without additional cost to Owner.

1.8 SAFETY

A. The Contractor shall make all necessary provisions to create a safe Work environment for the construction workers and the public.

1.9 SCHEDULING

A. Due to the short construction time period for this Contract, verify delivery times with appropriate manufacturers and vendors as soon as Notice to Proceed is issued. Order materials as soon as necessary to assure delivery in time for the scheduled installation.

1.10 SUBMITTALS

A. Submit manufacturer's data on all equipment in accordance with this Section, and the Contract Documents. Include installation and application instructions. Product cut sheets are not acceptable substitutions for manufacturer's submittal data. Also comply with Division 01.
    1. No product will be accepted on Project site or installed without prior approval.
    2. Include all O&M manuals and data.
    3. Bind submittal in booklet form with index; submit (6) copies.
B. Submit Shop Drawings, brochures, and schedules as follows:
    4. HVAC equipment.
    5. Vibration isolators, duct material, duct insulation, and support methods.
    6. Piping materials, couplings, joints, pumps, piping insulation, and support methods.
    7. Specialties, valves of all types.
    8. Service and access panels.
    9. As specified in Mechanical Sections.
C. Submit Project Record Drawings under provisions of Division 01. Mark clearly and legibly on a full-scale reproducible sheet the actual locations and sizes, including model numbers of the following components and equipment:
    10. HVAC equipment, ductwork, thermostats, temperature sensors, air terminals, dampers.
    11. Piping, couplings, joints, cleanouts.
    12. Specialties, valves.
    13. Service and access panels

1.11 CONDUIT AND WIRING RESPONSIBILITY

A. Line voltage and low voltage conduit and line voltage wiring shall be furnished, installed, and terminated by Division 26 - Electrical.
B. Low voltage control wiring shall be furnished, installed, and terminated by Division 23 - Mechanical.
C. Low voltage transformers shall be furnished, installed, and terminated by Division 23 - Mechanical.

1.12 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.13 SERVICE, ACCESS, AND PANELS

A. Provide adequate service and service clearances to all devices and equipment.
B. Provide service and access panels for all equipment and devices that require access, adjustment, servicing, repair, inspection, or replacement.

PART 2 – PRODUCTS

2.1 PRODUCT CONDITION

A. Provide materials in new and perfect condition.
B. Products shall bear the manufacturer's label.

END OF SECTION – 23 05 00

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SECTION 23 05 29-

HANGERS AND SUPPORTS FOR PIPING AND EQUIPMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Pipe, ductwork and equipment hangers and supports.
B. Equipment bases and supports.
C. Sleeves and seals.
D. Flashing and sealing equipment and pipe stacks.

1.3 RELATED SECTIONS

A. Division 09 - Painting.
B. Section 221113 – Plumbing Piping.
C. Section 230500 – Mechanical Requirements.
D. Section 233133 – Ductwork.

1.4 REFERENCES

A. ASME B31.9 - Building Services Piping
B. ASTM F708 - Design and Installation of Rigid Pipe Hangers.
C. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
D. MSS SP69 - Pipe Hangers and Supports - Selection and Application.
E. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
F. 2013 CMC.
G. SMACNA - HVAC Duct Construction Standards - Metal and Flexible

1.5 SUBMITTALS

A. Submit under provisions of Section 230500 and Division 01.
B. Shop Drawings: Indicate system layout with location and detail of trapeze hangers.
C. Product Data: Provide manufacturers catalog data including load capacity.
D. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.
E. Manufacturer's Installation Instructions: Indicate special procedures and assembly of components.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable code for support of piping.
B. Comply with Division 01.

PART 2 – PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Manufacturers:
   1. B-LINE
   2. Other acceptable manufacturers offering equivalent products:
      a. Elcen
      b. Grinnell

c. Superstrut
d. Vibrex
e. Or equal

B. Refrigerant Piping:
1. Conform to ASME B31.5.
2. Hangers for Pipe Sizes 1/2 to 1 1/2 Inch: Carbon steel, adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
7. Vertical Support: Steel riser clamp.
8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.2 ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

2.3 FLASHING

A. Metal Flashing: 26 gage galvanized steel.
B. Metal Counterflashing: 22 gage galvanized steel.
C. Lead Flashing (as approved by applicable code):
1. Waterproofing: 5 lb/sq ft sheet lead or dead-soft copper.
2. Soundproofing: 1 lb/sq ft sheet lead or dead-soft copper.
D. Flexible Flashing: 47 mil thick sheet compatible with roofing.
E. Caps: Steel, 22 gage minimum; 16 gauge at fire resistant elements.

2.4 SLEEVES

A. Sleeves for Pipes Through Non fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage galvanized steel.
B. Sleeves for Round Ductwork: Galvanized steel.
C. Sleeves for Rectangular Ductwork: Galvanized steel.
D. Sealant: Acrylic in non-fire rated walls.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Coordinate with Structural Drawings for all connections to building elements.
C. Coordinate with other trades for common pipe supports. See Section 230500 “Coordination With Work Specified in Other Sections.”

3.2 PIPE HANGERS AND SUPPORTS

A. Hang Piping from a structural frame. Do not support piping from metal deck tabs or metal deck unless approved by Architect.
1. Do not hang piping from other building equipment.
B. Support horizontal piping as scheduled.
C. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent Work.
D. Place hangers within 12 inches of each horizontal elbow.
E. Use hangers with 1 1/2 inch minimum vertical adjustment.
F. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
G. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

H. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
I. Support riser piping independently of connected horizontal piping.
J. Provide copper plated hangers and supports for copper piping.
K. Design hangers for pipe movement without disengagement of supported pipe.
L. Prime coat exposed steel hangers and supports. Refer to Division 9 - “Painting” Section. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
M. All pipe hangers and supports exposed to the weather shall have factory hot-dip galvanized finish (coating class G-90).
N. Provide sheet metal saddle for insulated piping.

3.4 EQUIPMENT BASES AND SUPPORTS

A. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.
B. Construct supports of steel members. Brace and fasten with flanges bolted to structure.
C. Provide rigid anchors for pipes after vibration isolation components are installed.
D. Provide housekeeping pads of concrete, minimum 4 inches thick and extending 6 inches beyond supported equipment. Refer to Division 03.

3.4 DUCTWORK SUPPORTS

A. See section 233133 - Ductwork.
B. Comply with SMACNA - HVAC Duct Construction Standards - Metal and Flexible, latest edition.

3.6 FLASHING

A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
B. Flash pipes through roof as shown on the Contract Documents.
C. Flash floor drains in floors with topping over finished areas with dead soft copper, 10 inches clear on sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp device.
D. Seal drains watertight to adjacent materials.
E. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.7 SLEEVES

A. Set sleeves in position in formwork. Provide reinforcing around sleeves.
B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
C. Extend sleeves through floors one inch above finished floor level. Caulk sleeves.
D. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent Work with fire stopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
E. Install chrome plated steel escutcheons at finished surfaces.

3.8 SCHEDULES

PIPE SIZE	MAX. HANGER SPACING	HANGER ROD DIAMETER
Inches	Feet	Inches
1/2 to 1-1/4	6.5	3/8
1-1/2 to 2	10	3/8
2-1/2 to 3	10	1/2
4 to 6	10	5/8
Cast Iron No-Hub And at Joints	5	5/8

END OF SECTION – 23 05 29

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SECTION 23 05 53-

MECHANICAL IDENTIFICATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Nameplates.
B. Tags.
C. Stencils.
D. Pipe Markers.

1.3 RELATED SECTIONS

A. Division 09.
B. Section 230500 – Mechanical Requirements.
C. Division 22 – Plumbing
D. Division 23 - HVAC

1.4 REFERENCES

A. ASME A13.1 Scheme for the Identification of Piping Systems.

1.5 SUBMITTALS

A. Submit under provisions of Section 230500 and Division 01 - “Submittals”.
B. Submit list of wording, symbols, letter size, and color-coding for mechanical identification.

PART 2 – PRODUCTS

2.1 NAMEPLATES

A. Manufacturers:
   1. Seton
   2. Westline
   3. Or equal
B. Description: Laminated three layer plastic with engraved black letters on light contrasting background color.

2.2 TAGS

A. Manufacturers:
   1. Seton
   2. Westline
   3. Or equal
B. Metal Tags: Brass or Aluminum with ¼ inch high stamped letters; tag size minimum 1 1/2 inch diameter with smooth edges.
C. Chart: Typewritten letter size list in anodized aluminum frame.

2.3 PIPE MARKERS

A. Manufacturers:
   1. Seton
   2. Westline
   3. Or equal.
B. Color: Conform to ASME A13.1.
C. Plastic Pipe Markers: Factory fabricated, flexible, semi rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

PART 3 – EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install plastic nameplates with corrosive resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
B. Install plastic pipe markers in accordance with manufacturer's instructions.
C. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
D. Identify air handling units, condensing units and fan coils, and controllers with plastic nameplates.
E. Identify control panels and major control components outside panels with plastic nameplates.
F. Identify thermostats relating to fan coils with nameplates.
G. Identify valves in main and branch piping with tags.
H. Identify piping, concealed or exposed, with plastic tape pipe markers. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
I. Identify ductwork with plastic nameplates. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION – 23 05 53

SECTION 23 05 93-

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.
B. Measurement of final operating condition of HVAC systems.
C. Testing, adjusting, and balancing of mechanical systems is included in this Section and is included in the Contract Sum.

1.3 REFERENCES

A. AABC - National Standards for Total System Balance.
B. ADC - Test Code for Grilles, Registers, and Diffusers.
C. ASHRAE 111 - Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-conditioning, and Refrigeration Systems.
D. NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.
E. SMACNA - HVAC Systems Testing, Adjusting, and Balancing.

1.4 SUBMITTALS

A. Submit under provisions of Section 230500 and Division 01.
B. Submit name of adjusting and balancing agency for approval within 30 days after award of Contract.
C. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
D. Prior to commencing Work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.
E. Submit draft copies of report for review prior to Substantial Completion of Project. Provide adequate numbers of final copies for Architect and for inclusion in operating and maintenance manuals.
F. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets and indicating thermostat locations.
G. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty prior to commencing system balance.
H. Test Reports: Indicate data on NEBB or AABC forms.

1.5 PROJECT RECORD DOCUMENTS

A. Record actual locations of flow measuring stations and balancing valves and rough setting.

1.6 QUALITY ASSURANCE

A. Perform total system balance in accordance with NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems or AABC National Standards for Field Measurements and Instrumentation.
B. Maintain one copy of each document on site.

1.7 QUALIFICATIONS

A. Testing Agency: Independent company specializing in the testing, adjusting, and balancing of systems specified in this Section with minimum five years documented experience.
B. Perform Work under supervision NEBB or AABC Certified Testing, Balancing and Adjusting Supervisor.

1.8 PRE-BALANCING CONFERENCE

A. Convene a conference one week prior to commencing Work of this Section, and under provisions of Division 01.

1.9 SEQUENCING

A. Sequence Work to commence after completion of systems and schedule completion of Work before Substantial Completion of Project.

PART 2 – PRODUCTS

Not used

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that systems are complete and operable before commencing Work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place. If required, install filters.
   5. Duct systems are clean of debris.
   6. Fans are rotating correctly.
   7. Air coil fins are cleaned and combed.
   8. Access doors are closed, and duct end caps are in place.
   9. Air outlets are installed and connected.
   10. Duct system leakage is minimized.
B. Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.
C. Beginning of Work means acceptance of existing conditions.

3.2 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.
B. Provide additional balancing devices as required.

3.3 INSTALLATION TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.4 ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.
B. Permanently mark settings of dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Architect.
F. Check and adjust systems approximately six months after final acceptance and submit report to Architect and Owner.

3.5 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross-sectional area of duct.
C. Measure air quantities at air inlets and outlets.
D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

3.6 SCHEDULES

A. Equipment Requiring Testing, Adjusting, and Balancing
    1. Air Handling Units
    2. Fans
    3. Air Filters
    4. Air Inlets and Outlets

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SECTION 23 07 00-

HVAC INSULATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Ductwork insulation.
B. Duct Liner.

1.3 RELATED SECTIONS

A. Division 07.
B. Section 230500 – Mechanical Requirements.
C. Section 233133 - Ductwork

1.4 REFERENCES

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
B. ASTM C518 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
D. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
E. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
F. ASTM C1071 - Standard Specification for Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material).
G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
H. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
I. ASTM E162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.
J. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
K. NAIMA National Insulation Standards.
L. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
M. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
N. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.
O. CA Title 24 Part 6, Section 120.4 - Requirements for Air Distribution System Ducts and Plenums.

1.5 SUBMITTALS

A. Submit under provisions of Section 230500 and Division 01 - “Submittals” Section.
B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
C. Manufacturer's Instructions: Indicate installation procedures which ensure acceptable workmanship and installation standards will be achieved.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum five years documented successful in-service experience.
B. Applicator Qualifications: Company specializing in performing the Work of this Section with minimum five years documented successful in-service experience approved by manufacturer.

1.7 REGULATORY REQUIREMENTS

A. Materials: Flame spread/smoke developed rating of 25/50 in accordance with NFPA 255.

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Accept materials on project site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 – PRODUCTS

2.1 GLASS FIBER DUCT WRAP

A. Manufacturers:
   1. Johns Manville “Microlite”
   2. Certainteed
   3. Owens-Corning
   4. Or equal.
B. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. 'K' value: ASTM C518, 0.31 at 75 degrees F.
   2. Maximum service temperature: 250 degrees F.
   3. Maximum moisture absorption: 0.20 percent by volume.
C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture vapor transmission: ASTM E96; 0.02 perm.
   3. Secure with pressure sensitive tape.
D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber-based adhesive.
E. Tie Wire: Annealed steel, 16 gage.

2.2 DUCT LINER - NOT ALLOWED

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that ductwork has been tested before applying insulation materials.
B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

A. Division 1 - Quality Requirements.
B. Install in accordance with NAIMA National Insulation Standards.
C. Install in accordance with CA Title 24 Part 6, Section 120.4.

D. Insulated ductwork conveying air below ambient temperature:
   1. Provide insulation with vapor barrier jackets.
   2. Finish with tape and vapor barrier jacket.
   3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
   4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

E. Insulated ductwork conveying air above ambient temperature:
   1. Provide with or without standard vapor barrier jacket.
   2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

AIR SYSTEM	INSULATION
Supply and Return ducts in concealed or non-conditioned spaces	Glass Fiber duct wrap and kraftpaper, minimum R-8
Portions of supply and return ducts not in concealed or unconditioned spaces.	Glass Fiber duct wrap and kraftpaper, minimum R-4.2
Exhaust Ducts, Outside air ducts, relief	No insulation required unless specified otherwise for sound attenuation

END OF SECTION – 23 07 00

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SECTION 23 31 33-

DUCTWORK

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General or Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Metal ductwork.
B. Non-metallic flexible ductwork.
C. Plenums.
D. Shop drawings of ductwork layout.

1.3 RELATED SECTIONS

A. Division 09 - Painting.
B. Section 230500 – Mechanical Requirements.
C. Section 230529 – Hangers and Supports for Piping and Equipment.
D. Section 230700 - HVAC Insulation.
E. Section 230593 - Testing, Adjusting, and Balancing for HVAC.
F. Section 233713 – Diffusers, Registers and Grilles.
G. Section 233300 – Air Duct Accessories.

1.4 REFERENCES

A. ASTM A 36 - Structural Steel.
B. ASTM A 90 - Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.
C. ASTM A 167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
D. ASTM A 366 - Steel, Sheet, Carbon, Cold Rolled, Commercial Quality.
E. ASTM A 480 - General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
F. ASTM A 525 - General Requirements for Steel Sheet, Zinc- Coated (Galvanized) by the Hot-Dip Process.
G. ASTM A 527 - Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock Forming Quality.
H. ASTM A 568 - Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled.
I. ASTM A 569 - Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality.
J. AWS D9.1 - Welding of Sheet Metal.
K. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
L. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems.
M. SMACNA - HVAC Air Duct Leakage Test Manual.
N. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
O. UL 181 - Factory-Made Air Ducts and Connectors.

1.5 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.6 SUBMITTALS

A. Submit under provisions of Section 230500 and Division 01 - “Submittals” Section.
B. Product Data: Provide data for duct materials, duct liner and duct connectors.

1.7 SHOP DRAWINGS

A. Provide shop drawings of all ductwork layout prior to fabrication and installation.
B. Prepare shop drawings on transparencies at a scale suitable to clearly delineate the subject. Show all ductwork in double line.

1.8 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 230500.
B. Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for 4 inch pressure class and higher, kitchen hood exhaust, and glass fiber duct systems.
C. Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.9 QUALITY ASSURANCE

A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and Flexible. More stringent requirements shall govern.
B. Maintain one copy of SMACNA document on site.

1.10 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this Section with minimum five years documented experience.
B. Installer: Company specializing in performing the Work of this Section with minimum five years documented successful in-service experience.

1.11 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A and NFPA 90B.

1.12 ENVIRONMENTAL REQUIREMENTS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
B. Maintain temperatures during and after installation of duct sealants.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Galvanized Steel Ducts: ASTM A525 and ASTM A527 galvanized steel sheet, lock-forming quality, having G90 zinc coating in conformance with ASTM A90.
B. Stainless steel: Type 316L passive stainless with No. 2B finish for locker room supply and exhaust ductwork. Joint construction for stainless shall be "butt" welded (use appropriate filler rod for type of stainless).
C. Steel Ducts: ASTM A366.
D. Insulated Flexible Ducts:
    1. Manufacturers:
        a. Thermaflex MKC
        b. Casco
        c. Or equal
    2. Two ply vinyl film supported by helically wound spring steel wire; fiberglass insulation; aluminized vapor barrier film.
    3. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.

4. Maximum Velocity: 4000 fpm.
5. Temperature Range: -10 degrees F to 160 degrees F.
6. Inner cores shall be non-porous.

E. Sound attenuating flexible ducts:
1. Manufacturers:
a. Thermaflex MKE
b. Casco
c. Or equal
d. Inner cores shall be non-porous.

F. Fasteners: Rivets, bolts, or sheet metal screws.

G. Sealant:
1. Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic.
2. Duct tape shall not be allowed as duct sealer.

H. Hanger Rod: ASTM A36; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.2 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
1. Round ductwork shall be spiral, manufactured.
2. Rectangular ductwork shall be shop fabricated or manufactured.

B. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where rectangular elbows are used because of space limitations, provide air foil turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.

C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

D. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4-inch cemented slip joint, brazed or electric welded. Prime coat welded joints.

E. Provide standard 45-degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

2.3 MANUFACTURED DUCTWORK AND FITTINGS

A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

B. Transverse Duct Connection System:
1. Rectangular:
a. “Ductmate” DM 35: Rigid class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips.
b. TDC or TDF duct flange system.
2. Round:
a. Spiral, manufactured.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible and as specified herein.

C. Duct Sizes are inside clear dimensions. For lined ducts, maintain sizes inside lining.

D. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
F. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.
G. Use double nuts and lock washers on threaded rod supports.
H. Connect diffusers to low pressure ducts directly. Concealed ductwork may be connected with 7 feet maximum length of flexible duct held in place with double draw bands.
I. Connect flexible ducts to metal ducts with double draw bands.
J. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.
K. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
L. Install Differential pressure taps.

3.2 CLEANING

A. Clean Work under provisions of Division 01 - “Project Closeout” Section.
B. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.
C. Clean duct systems with high power vacuum machines. Protect equipment which may be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

3.3 SCHEDULES

A. DUCTWORK MATERIAL SCHEDULE

AIR SYSTEM	MATERIAL
All	Steel, galvanized, G90

B. DUCTWORK PRESSURE CLASS SCHEDULE

AIR SYSTEM	PRESSURE CLASS
Supply Mains	2 inch
Return	2 inch
General Exhaust and Relief	1 inch
Outside Air Intake	1 inch
Supply Terminal Branches	1 inch

END OF SECTION – 23 31 33

SECTION 23 33 00-

DUCTWORK ACCESSORIES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Air turning devices/extractors.
B. Backdraft Dampers
C. Fire Dampers.
D. Duct access doors.
E. Duct test holes.
F. Flexible duct connections.
G. Volume control dampers.
H. Remote Damper Actuators

1.3 RELATED SECTIONS

A. Section 230500 – Mechanical Requirements.
B. Section 230529 – Hangers and Supports for Piping and Equipment.
C. Section 233133 – Ductwork.
D. Division 26 - Electrical.

1.4 REFERENCES

A. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
B. NFPA 70 - National Electrical Code.
C. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

1.5 SUBMITTALS

A. Submit under provisions of Section 230500 and Division 01 - “Submittals” Section.
B. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers and duct access doors.
C. Product Data: Provide for shop fabricated assemblies including volume control dampers, duct access doors and hardware used. Include electrical characteristics and connection requirements.
D. Manufacturer's Installation Instructions: Indicate for fire dampers and combination fire and smoke dampers.

1.6 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 230500.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

1.8 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories Inc., or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 – PRODUCTS

2.1 AIR TURNING DEVICES/EXTRACTORS

A. Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.

2.2 BACKDRAFT DAMPERS.

A. Gravity Backdraft Dampers, Size 18 x 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer’s standard construction.

2.0 FIRE DAMPERS and COMBINATION FIRE/SMOKE DAMPERS

A. Refer to detail(s) on Drawings for model numbers and style.
B. Manufacturers:
   1. Ruskin.
   2. Pottorff.
   3. Air Balance Inc.
C. Fabricate in accordance with NFPA 90A, UL 555 Dynamic Rating, and as indicated.
D. Provide factory sleeve and collar for each damper.
E. Curtain Type Dampers: Fabricate with 20 gage galvanized steel frame and 24 gage galvanized steel blades. Fire rating as indicated. Air foil blades when shown on Drawing.
F. Operators: UL listed and labeled.
G. Thermal Link: Fusible link melting at 165 degrees F

2.4 MOTORIZED DAMPERS

A. Manufacturer: Ruskin Model CD60 Ultra low leak, parallel blades.

2.5 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
B. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum one-inch-thick insulation with sheet metal cover.
   1. Less Than 12 Inches Square: Secure with sash locks.
   2. Up to 18 Inches Square: Provide two hinges and two sash locks.
   3. Up to 24 x 48 Inches: Three hinges and two compression latches with outside and inside handles.
   4. Larger Sizes: Provide an additional hinge.
C. Access doors with sheet metal screw fasteners are not acceptable.

2.6 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.7 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
B. Connector: Fabric crimped into metal edging strip.
   1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
   2. Net Fabric Width: Approximately 3 inches wide.

2.8 VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
B. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.
C. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch . Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
D. End Bearings: Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
E. Remote Damper actuators: At hard ceiling and soffited areas install remote actuator with white escutcheon plate at ceiling, manufactured by Young Regulator Co. See Drawings for additional information.
F. Access: Provide adequate access to dampers for balancing and maintenance operations.

PART 3 – EXECUTION

3.1 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 15890 for duct construction and pressure class.
B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.
D. Provide duct test holes where indicated and required for testing and balancing purposes.
E. Provide fire and smoke dampers at locations indicated, and any locations where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
F. Install fire dampers in accordance with NFPA.
G. Demonstrate re-setting of fire dampers to Architect.
H. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment and supported by vibration isolators.
I. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts and as required for air balancing. Install minimum 2 duct widths from duct take-off.
J. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION – 23 33 00

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SECTION 23 37 13-

DIFFUSERS, REGISTERS, AND GRILLES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Diffusers.
B. Registers/grilles.
C. Louvers.

1.3 RELATED SECTIONS

A. Division 09 - Painting.
B. Section 230500 – Mechanical Requirements.
C. Section 233133 – Ductwork.

1.4 REFERENCES

A. ADC 1062 - Certification, Rating and Test Manual.
B. AMCA 500 - Test Method for Louvers, Dampers and Shutters.
C. ARI 650 - Air Outlets and Inlets.
D. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.
E. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.
F. NFPA 70 - National Electrical Code.
G. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

1.5 SUBMITTALS

A. Submit under provisions of Section 230500 and Division 01 - “Submittal Procedures” Section.
B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.6 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.
B. Test and rate louver performance in accordance with AMCA 500.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this Section with minimum five years documented successful in-service experience.

PART 2 – PRODUCTS

2.1 AIR OUTLETS AND INLETS

B. Type: Frame, fabrication, and accessories as indicated on Drawings, baked on finish. Submit color pallets to Architect for selection.

C. Manufacturers:
   1. Custom (see Architect)
   2. Metal-Aire
   3. Anemostat
   4. Kruger
   5. Price
   6. Or equal

2.2 LOUVERS

A. Manufacturers:
   1. Ruskin
   2. Metal-Aire
   3. Kruger
   4. Greenheck
   5. Or equal

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Check location of outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.
C. Install diffusers to ductwork with airtight connection.
D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, whether dampers are specified as part of the diffuser, or grille and register assembly or not.
E. Paint ductwork visible behind air outlets and inlets matte black.

END OF SECTION – 23 37 13

SECTION 26 00 00 -

ELECTRICAL

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

Work in general includes, but is not limited to, the following:

A. Underground Service - 120/208 volt, three phase, four wire.

B. Grounding of equipment, service, etc.

C. Complete lighting and power system as shown on Drawings and specified herein, including conduit, wiring, panelboards, circuit breakers, relays, switches, receptacles, and other items necessary for complete and operable systems.

D. Electrical connection of equipment furnished by others as shown on the Drawings.

E. Control wiring and installation and connections of control devices as specified herein.

F. Telephone and Cable TV service.

G. Trenching and backfill as required for electrical Work.

H. Concrete Work as specified herein.

1.3 SITE VISITS, COORDINATION OF CONTRACT DOCUMENTS, VERIFICATION OF DIMENSIONS

A. Examine existing conditions as applicable. Become acquainted with Specifications and Drawings for all portions of the Project. Notify Project Manager of apparent discrepancies and of inconsistency between the Specifications and the existing conditions. Secure and follow Project Manager's instructions. The Drawings serve as working drawings only, indicating diagrammatically the general layout of the systems and their various components and equipment.

B. Scaled and figured dimensions are approximate and are given for estimate purposes only. Carefully check and verify dimensions and sizes in order to determine if equipment and materials will fit together and if the dimensions of the assembly are compatible with the space provided. Where equipment is furnished by others, verify that dimensions and requirements for assembly are compatible with the space provided before proceeding with the roughing-in connections. Field verifications of locations shown on Drawings are necessary since actual locations, distances, mounting heights, etc., may be affected by field conditions. The

right is reserved to make reasonable changes in locations of equipment or other features shown on Drawings prior to rough-in without additional cost to the Owner.

C. Where apparatus and equipment have been indicated on the Drawings, dimensions have been taken from typical equipment of the class indicated. Carefully check the Drawings to see that the contemplated equipment will fit into the spaces provided, regardless of whether or not it may have been approved for quality and utility as an equal.

D. Rough in all equipment, fixtures, etc., as designated on the Drawings and as specified herein. The Drawings indicate only the approximate location of rough-ins. The exact rough-in locations must be determined from large-scale certified Drawings. The Contractor shall obtain all certified rough-in information before progressing with any Work for rough-in connections.

E. Be responsible for providing outlets and services of proper size at the required locations.

F. Coordinate requirements of equipment furnished by others, prior to ordering and installation.

G. No allowance will be made for extra expense due to failure or neglect to follow foregoing directives.

1.4 RULES AND REGULATIONS

A. Materials and installation shall be in accordance with current rules and requirements of California Code of Regulations and local codes and ordinances including, but not necessarily limited to, the current editions of the following:

1. The California Electrical Code (CEC).
2. Title 8, Chapter 4, California Code of Regulations (Low Voltage Electrical Safety Orders).
3. Local Building Codes.
4. California State Fire Marshal.
5. California Statewide Qualified Product List (QPL), Title 20.
6. Design Lights Consortium (DLC).
7. NEMA (National Electrical Manufacturers Assoc.).
8. IEEE (Institute of Electrical and Electronic Engineers).
9. California Green Building Code.
10. ANSI (American National Standards Institute).
11. ASTM (American Society for Testing and Materials).
12. UL (Underwriters Laboratories).
13. OSHA (Occupational Safety & Health Act) Federal.
14. Title 24, California Code of Regulations, California Building Code.
15. NFPA (National Fire Protection Association).
16. NESC (National Electrical Safety Code).
17. NECA Standards of Installation.
    a. NECA 400-2018, Standard for Installing and Maintaining Switchboards (ANSI).

b. NECA 402-2018, Standard for Installing and Maintaining Motor Control Centers (ANSI).

c. NECA 408-2002, Recommended Practice for Installing and Maintaining Busways (ANSI).

d. NECA 409-2018, Recommended Practice for Installing and Maintaining Dry-Type Transformers (ANSI).

e. NECA 410-2005 Standard for Installing and Maintaining Liquid-Filled Transformers (ANSI).

f. NECA 411-2006 Standard for Installing and Maintaining Uninterruptible Power Supplies (UPS) (ANSI).

g. NECA 420-2018 Standard for Fuse Applications (ANSI).

h. NECA 430-2006, Standard for Installing Medium-Voltage Metal-Clad Switchgear (ANSI).

i. NECA/EGSA 404-2007 Standard for Installing Generator Sets (ANSI).

j. NECA/IESNA 500-2006, Standard for Installing Indoor Lighting Systems.

k. NECA/IESNA 501-2006 Standard for Installing Exterior Lighting Systems.

l. NECA 331-2018, Standard for Building and Service Entrance Grounding and Bonding

B. Where these Specifications call for a higher standard than the above-mentioned rules, the Specifications shall govern.

C. Should there be any direct conflict between the above-mentioned rules and these Specifications, the rules shall govern.

D. Nothing in the Drawings or Specifications is to be construed to permit Work not conforming to the rules, codes, and regulations.

E. All materials utilized shall be new and the best of their respective grades or kinds.

1.5 DEFINITIONS

A. Article 100 of the California Electrical Code shall serve as a guide for definitions.

B. Industry standard definitions.

C. Specific Definitions:

1. Concealed: Hidden from sight, as in trenches, chases, hollow construction, above furred spaces, suspended ceilings (acoustical or plastic type), or exposed to view only in tunnels, attics, shafts, crawl spaces, unfinished spaces, or other areas solely for maintenance and repair.

2. Exposed: Not concealed.

3. Unfinished Space: A room or space that is ordinarily accessible only to building maintenance personnel, a room noted on the "Finish Schedule" with exposed and unpainted construction for walls, floor or ceilings, or specifically mentioned as "unfinished".

4. Finished Spaces: Any space ordinarily visible to the visiting public, including exterior areas.

1.6 RULES OF LOCAL UTILITY COMPANIES

A. Comply with rules and regulations of the serving utility companies, and before submitting bid, check and include applicable service costs for the Project.

1.7 RECOGNIZED TEST LAB

A. All equipment specified or installed under this project shall be listed by a recognized test lab and bear that label of approval.

1.8 PERMITS AND FEES

A. Procure licenses and permits necessary for the completion of the Work, and inspection and other applicable fees. Before final payment, deliver to the Owner certificates and permits, approved and signed by the authorities having jurisdiction.

1.9 RECORD DRAWINGS

A. Include under this Work complete and accurate record information both during construction and before final acceptance by the Owner, and costs associated therewith shall be included under this Work.

B. Obtain from the Project Manager, at cost, a complete, full size set of prints. On these prints, systematically and accurately keep an up-to-date and legible dimensional record of Work installed differently from the location or manner indicated by the Drawings, as well as exact locations of stub-outs and hidden or underground features. Have these Drawings readily available for reference and review. When job status permits, submit them to the Project Manager and amend or correct and re-submit if requested.

C. When the above information is complete and acceptable, deliver Record Drawings to the Project Manager.

1.10 SUBMITTALS - SUBSTITUTIONS

A. Bids shall be based on Drawings and Specifications and references exactly as shown except as substitutions are permitted under terms of the Instructions to Bidders. Acceptance by the Project Manager of a variation or alternate shall not of itself waive other requirements of the Drawings and Specifications.

B. Before a substitute is used, it shall be equal in quality and utility to the material or make of equipment specified, and furthermore, shall be suitable for the particular application. The decision of the Project Manager as to the quality and utility of the substitute offered shall be final.

C. When submitting a substitute to a specified item, provide complete data for both the specified item and the substitute. Complete data includes:

1. Catalog cuts with complete dimensions, characteristics, electrical properties, Under-writer's Laboratory listing, harmonics, light output, mounting and support requirements.

2. Calculations, photometrics, system load data, energy effect on system, etc.

If the substitute is not deemed equal in both utility and quality to the specified item, the specified item will be approved and it shall be provided by the Contractor.

D. Submit in one package complete systematized lists of equipment and Drawings, catalog cuts, brochures, capacity tables and curves, descriptive information, performance data and guarantees and warranties referenced either to applicable Specification paragraphs or to item numbers as shown on the Drawings, or both. Submit six (6) copies.

E. Do not order or install equipment until submittals have been reviewed and approved.

F. Where accepted materials or equipment other than is specified or shown on the Drawings require redesign of structural, architectural, electrical or mechanical features or layouts, such changes shall be made by, or at the expense of the Contractor - all subject to complete review by the Project Manager.

G. Because of the contingencies involved, review and general acceptance of proposed substitutes shall not relieve the Contractor's responsibility under this Work for ensuring in all respects the suitability of such materials and equipment for the particular Project requirements.

1.11 SHOP DRAWINGS

A. Prepare shop Drawings of items as required by the Project Manager or by Drawings and Specifications; submit six (6) copies of each to the Project Manager as part of the submittal package, sufficiently in advance of construction, if necessary.

B. The shop drawings shall be submitted sufficiently in advance of construction to allow time for review and for resubmission, if necessary.

C. Submit all shop drawings and data at one time for equipment provided under this Section. The complete electrical shop drawings shall be bound in one pamphlet or binder indexed to this Section.

D. Shop drawing submittals processed are not change orders. The purpose of shop drawing submittals by the Contractor is to demonstrate that the Contractor understands the design concept; he demonstrates his understanding by indicating which equipment and material he intends to furnish and install and by detailing the fabrication and installation methods he intends to use. If deviations, discrepancies or conflicts between shop Drawings and Specifications are discovered, either prior to or after shop drawing submittals are processed, the design Drawings and Specifications shall control and shall be followed.

E. Manufacturers' data and dimension sheets shall be submitted giving all pertinent physical and engineering data including weights, cross-sections and maintenance instructions. Standard items of equipment such as receptacles, switches, plates, etc., which are cataloged items, shall be listed by manufacturer.

F. Index all submittals and reference to these Specifications.

1.12 COMPLETION DATA

A. Submit completion data to the Project Manager in acceptable quantity and form before requesting a final inspection. Such submittal shall be corrected, amended, or completed before final acceptance of the Work.

B. Include Record Drawings, maintenance manuals, and data; test results; control and wiring diagrams.

1.13 CUTTING, PATCHING, AND REPAIRING

A. Cutting, patching, and framing of wood members to accommodate this Work shall be done by the Contractor and shall be in conformance with Sections 613 and 617 (F) and (K), Title 24, California Code of Regulations. All such cutting, patching and framing shall be approved by the Project Manager.

B. Do minor miscellaneous cutting, drilling, and patching necessary and normally required at the time of actually installing this Work. Patching shall be of the same materials, workmanship, and finish as the original or surrounding Work to the complete satisfaction of the Project Manager. Comply with Division-1 CUTTING AND PATCHING Section.

C. Adequately inform other trades of openings and framing requirements for this Work and provide suitable instructions for establishing locations and sizes of openings or sleeves so that these may be provided in the proper location at the proper time. Concrete shall not be cut, except where approved by the Project Manager.

1.14 SIMILARITY OF MATERIALS

A. Unless specified otherwise, fixtures, fittings, hangers, and respective type features and equipment, of a similar type or having similar operative or functional features, shall be of the same manufacturer throughout the Project.

1.15 MANUFACTURERS' DIRECTIONS

A. Follow manufacturers' directions and recommendations in all cases where the manufacturers' equipment or articles are used for this Work. Compliance with the manufacturer's direction is a requirement for that product's listing with a recognized test lab.

1.16 VERIFICATION OF DIMENSIONS

A. Scaled and figured dimensions are approximate only. Before proceeding with Work, carefully check and verify dimensions, etc., on architectural Drawings, and be responsible for properly fitting equipment and materials together and to the structure in spaces provided.

B. Drawings are essentially diagrammatic, and many offsets, bends, pull boxes, special fittings, and exact locations are not indicated. Carefully study Drawings and premises in order to determine best methods, exact locations, routes, building obstructions, etc., and install apparatus and equipment in available locations. Install apparatus and equipment in manner and locations to avoid obstructions, preserve headroom, and keep openings and passageways clear.

1.17 IDENTIFICATION OF EQUIPMENT

A. All electrical equipment shall be labeled, tagged, stamped, or otherwise identified in accordance with the following schedule:

1. Branch Circuit Panelboards:

a. Panel identification shall be P-Touch ¾” label.

b. Circuit directory shall be a two-column, 8-1/2 x 11” sheet attached to the inside of the door. Each odd numbered circuit shall be in sequence in the left column and the even numbered circuit in the right column (e.g., 1, 3, 5..., 2, 4, 6...). Each circuit shall be identified as to the use and room name(s) or area(s). Confirm room names and/or room numbers with the Project Manager prior to project completion. Circuit breaker identification shall be by permanently installed metal numbers

or plastic numbers under acrylic plastic. "Paste-on" numbers will not be accepted. Refer to "Panelboards" section for additional requirements.

c. Distribution Panelboards: Identification shall be with 1" x 4" laminated, white on black, micarta nameplates on each major component, each with name and/or number of unit and other pertinent data as required. Emergency power distribution panels shall be identified with white on red micarta nameplates. Letters shall be no less than 3/8" high.

d. Circuit breakers shall be identified by number and name with 3/4" x 1-1/2" laminated micarta nameplates with 3/16" high letters mounted adjacent to circuit breaker or switch.

e. Miscellaneous equipment (electrical), such as individually mounted safety switches, starters, step-down transformers, pull boxes, junction boxes, etc., shall be identified by the use of such equipment with P-Touch labels as required.

f. In general, the installed nameplates, as herein called for shall also clearly indicate its use, area served, circuit identification, voltage and any other useful data.

g. All auxiliary systems, including communications, shall be labeled to indicate function.

h. Motor control and motor control centers shall be labeled with the identification given on drawing schedules.

1.18 ARC FLASH LABELING

A. All panels, circuit breaker enclosures, switchboards and motor control centers shall be labeled with Arc Flash Warning Stickers.

1.19 CLOSING IN OF UNREVIEWED WORK

A. Do not allow or cause any of this Work to be covered up or enclosed until it has been reviewed by the Project Manager. Should any of this Work be enclosed or covered up before such review, uncover the Work and make repairs with such materials as may be necessary to restore the Work and that of the other trades to its original and proper condition at no additional cost to the Owner.

1.20 SAFETY PRECAUTIONS

A. It is intended that within the scope of this Work during construction and until final acceptance, strict attention be given to matters pertaining to public safety and to safety of the construction workers and complementing personnel; and to other health and building safety requirements as specified and indicated including, but not limited to: Protection of openings in fire-rated construction; clearances from and/or protection of combustibles; proper securement for fixtures, equipment materials; method of performing the Work, operational and safety check of electrical devices, etc.; erection and maintenance of suitable barriers, protective devices, lights and warning signs and adequate provisions for storage and protection of Work, materials and equipment.

B. It is understood that the responsibility for the proper attention to the above stipulations is included under this Work.

1.21 WIRING OF EQUIPMENT FURNISHED UNDER OTHER SECTIONS

A. All electrical wiring including power wiring and control wiring (except as specified under Automatic Temperature Control), including raceways, wiring, outlet and junction boxes, and labor for installation of the wiring and equipment shall be included in this section of the Specifications.

B. All control devices, and starters not in motor control centers, for equipment furnished under the Air Conditioning section (except as specified under Automatic Temperature Control paragraph), Plumbing section, Fire Sprinkler or Lawn Sprinkler section are to be furnished under that particular section and installed under this section.

C. Wiring diagrams complete with all connection details shall be furnished under each respective section.

D. Coordinate requirements and locations for all equipment prior to ordering and installation.

E. Comply with requirements of Article 430 of the California Electrical Code.

1.22 EXCAVATION AND BACKFILL

A. Do excavation, trenching, and backfilling required for this Work. Do shoring, pumping, or draining that is necessary to keep the excavations and trenches safe and free from water. Where possible and practical, avoid planted or paved areas, walkways, floors, and other finished surfaces. See CONDUITS Sections for depth of conduits. Remove all excess excavated materials from the site, unless otherwise directed by the Project Manager.

B. Where required, do cutting and drilling of walls, pavements, walkways, etc., by means of cutting and drilling (coring) machines unless specifically approved otherwise.

Excavation, trenching, and backfill methods and procedures shall be in strict accordance with industry standards and local requirements.

C. Backfilling shall be done in one-foot layers, with each layer tamped before another layer is added. No stones or coarse lumps shall be laid directly on conduits.

1.23 BORING/HORIZONTAL DRILLING

A. Where approved as an alternate to trenching, provide boring plans. These plans shall be reviewed and approved before any boring operations may commence.

B. Boring plans shall include:

1. Bore pit location(s).
2. Receiving pit location(s).
3. Method of boring.
4. Procedure for protecting/avoiding existing lines.
5. Procedure for emergency repair of any damaged lines.

C. Obtain as-built plans of all site utilities before boring.

D. Call USA Dig or use a locator service to identify underground utilities before boring.

1.24 CONCRETE

A. Where used for structures to be provided under the contract such as bases, etc., concrete work and associated reinforcing shall be as specified under that Division.

B. See other sections for additional requirements for underground vaults, cable ducts, etc.

1.25 PROTECTION OF EXISTING LINES

A. Exercise special care to avoid damaging and to maintain in operation, all existing utility runs during the construction period. Also avoid damaging existing piping, conduits, or equipment that is to remain, whether or not specifically indicated on the Drawings. Existing utilities, piping, conduits, and equipment may or may not be shown on the Drawings. The Drawings only reflect information intended to suggest the probable extent and possible location of indicated runs and equipment. There may be other runs. There may be other locations. Neither the Owner nor the Project Manager represents that either has any precise knowledge as to either the full extent or exact location of equipment and runs that may fall within the building or Project Site.

B. Execute excavation and demolition on the Site and in the building with extreme care (by hand or small tools wherever appropriate) and at the sole risk of the Contractor and the workers involved.

C. Locate all known existing installations before proceeding with construction operations which may cause damage to such installations. The existing installations shall be kept in service where possible and damage to them shall be repaired at no increases in Contract Sum.

D. If other structures or utilities are encountered, request Project Manager to provide direction on how to proceed with the Work.

1.26 MOUNTING

A. Provide materials and accessories necessary to properly mount and secure equipment furnished and/or installed under the electrical Work. This includes but is not limited to such items as conduit, outlets, junction boxes, switches, relays, disconnect switches, lighting fixtures, cabinets, and transformers.

B. Inserts and Anchors shall be:

1. Furnished and installed for support of Work under this Division.
2. Adjustable concrete hanger inserts installed in new concrete work as manufactured by Hilti or as approved.
3. Installed in locations as approved by Project Manager.
4. Expandable lead type anchors installed in existing concrete with minimum surface damage, as manufactured by Hilti.
5. Toggle bolts, or "molly anchors", where installed in concrete block walls.
6. Complete with 3/16" or heavier steel backup plate where used to support heavy items. Through-bolts or backup plate shall be concealed from view, except as otherwise indicated.

C. Mounting of equipment that is of such size as to be freestanding and that equipment which cannot conveniently be located on walls, such as motor starters, etc., shall be rigidly supported on a framework of galvanized steel angle, Unistrut or as approved.

D. Furnish and install sleeves for the installation of Work under all sections of this Division. Sleeves through floors, roof and walls shall be as described in conduit section.

1.27 MOUNTING HEIGHTS

A. Receptacles shall be mounted no lower than 15” to the bottom of the device.

B. Switches and lighting control stations shall be mounted no higher than 48” to the top of the device.

C. Overcurrent devices and circuit breakers or disconnect switches shall be mounted no higher than 6 feet-7 inches.

D. Refer to the Drawings for specific mounting heights.

1.28 ACCESSIBILITY

A. Install all control devices or other specialties requiring reading, adjustment, inspection, repairs, removal or replacement conveniently and accessibly throughout the project.

B. All required access doors or panels in walls and ceilings are to be furnished and installed as part of the Work under this Division.

C. Provide doors which pierce a fire separation with the same fire rating as the separation.

D. Refer to "Finish Schedule" for types of walls and ceiling in each area and architectural Drawings for rated wall construction.

E. Coordinate Work of the various sections to locate specialties requiring accessibility with others to avoid unnecessary duplication of access doors.

1.29 FIRE-RATED PENETRATIONS

A. All penetrations in fire-rated assemblies shall be accomplished using a UL listed method and materials.

B. Fire-rated assembly penetrations shall be accomplished per details on the Drawings.

1.30 FLASHING

A. Flash and counterflash all conduits penetrating roofing membrane.

1.31 TESTS

A. Perform electrical tests as required or directed. Provide materials, labor, and equipment necessary for performances of these tests, and at completion of the Work perform a complete "in-service" operation of the entire electrical and power system to show compliance with the Drawings and Specifications. Replace Work showing faults under tests without additional cost to the Owner. Test system voltage at switchboards at completion of Work and provide a written report to the Project Manager.

1.32 EQUIPMENT LISTS AND MAINTENANCE MANUALS

A. Prior to completion of job, Contractor shall compile a complete equipment list and maintenance manual. The equipment list shall include the following items for every piece of material and equipment supplied under this section of the Specifications.

1. Name, model and manufacturer.

2. Complete parts Drawings and list.

3. Local supply for parts and replacement and telephone number.

4. All tags, inspection slips, instruction packages, etc. removed from equipment as shipped from the factory, properly identified as to the piece of equipment it was taken from.

B. Maintenance manuals shall be furnished for each applicable section of the Specifications, shall be suitably bound with hard covers, and shall include all available manufacturers' operation and maintenance instructions, together with as-built Drawings and lists hereinbefore specified and other diagrams and instructions necessary to properly operate and maintain the equipment. The equipment lists and maintenance manuals shall be submitted in duplicate to Architect for approval not less than 10 days prior to the completion of the job. The maintenance manuals shall also include the name, address and phone number of the General Contractor and all subcontractors involved in any of the Work specified herein. The maintenance manuals shall be finally provided in four copies.

1.33 CLEANING

A. During construction on a daily basis, and upon completion of the Work, remove from the site all debris and excess materials, tools, and removed items, resulting from this Work. Clean equipment, including lighting fixtures, free of dust, dirt, grease, paint, etc.

1.34 SALVAGE

A. Deliver salvaged equipment and material deemed salvageable by Project Manager to location designated by Project Manager. Remove other removed material and equipment from site.

1.35 GUARANTEE

A. Leave the entire installation in complete working order, free from defects in materials, workmanship or finish. Guarantee to repair or replace parts that may develop defects due to faulty materials, equipment, or workmanship within a period of one year after the Work is accepted by the Owner. Also, guarantee to repair or replace with like materials, other existing Work in the building damaged from or during the repair of any such defective equipment, materials, or workmanship.

1.36 INSTALLERS QUALIFICATIONS

A. Installer must have electrical certification per California Labor Code Section 3099.2.

B. All work described in the Electrical Specifications and shown on Electrical Drawings shall be performed by California State Certified Electricians.

C. All electrical foremen shall have a minimum of 500 hours of documented classroom training.

D. All electrical foremen shall have a minimum of 3,000 hours of documented on-the-job training.

E. At the time equipment submittals are made, provide copies of State Certification and training documents for electricians working on this project.

PART 2 PRODUCTS AND EXECUTION

2.1 GROUNDING

A. Grounding shall be executed in accordance with applicable codes and regulations of the State of California, California Electrical Code and local authorities having jurisdiction as well as any additional provisions specified or shown on Drawings.

B. Grounding bushings shall be used wherever conduits are grounded. Feeder conduits to panels and air conditioners shall have grounding bushings.

C. Grounding conductors should be located to permit, the shortest and most direct path to ground. Connections shall be readily accessible for inspection and connections shall not be permanently concealed in floors or walls.

D. Non-current carrying metallic parts of electrical equipment and raceways shall be securely grounded to the common system ground. In all locations, ground conductors shall be run through conduits and shall be securely bonded to the conduit at the entrance and exit. The conduit for the grounding conductors shall be continuous from the point of attachment to cabinets or equipment to the grounding electrode, and shall be securely fastened to the ground clamp fittings.

E. Ground connections to equipment shall be made with an approved type of exothermic weld or shall be bolted or clamped to equipment or conduit. Sheet metal strap types of ground clamps shall not be used. Contact surfaces shall be thoroughly cleaned and bright before connection is made so as to ensure a good metal to metal contact.

F. Where nonmetallic conduit is used, ground shall be achieved through use of a separate, green-insulated, copper, code-size, ground conductor included in the conduit.

G. Bonding of cold water piping system shall be achieved at the service entrance. A copper saddle shall be installed over the copper pipe at the location of the clamp to avoid damage to the pipe.

2.2 CONDUIT

A. Rigid Steel Conduit:

1. Rigid steel conduit shall have zinc coated exterior, zinc or enamel interior, standard weight, zinc coated couplings, locknuts and bushings and shall bear the U.L. label. Rigid conduit shall not be installed underground.
2. Use rigid conduit only for exposed exterior conduit runs, wherever subject to physical damage, or where specifically called for on the Drawings or required by a serving utility.
3. Intermediate metallic conduit (I.M.C.) may be used in lieu of rigid steel conduit.

B. Electrical Metallic Tubing:

1. Electrical metallic tubing (E.M.T.) shall bear the U.L. label and shall be zinc coated thinwall conduit with zinc-coated couplings and connections. "Indent" type fittings shall not be used.
2. E.M.T. may be used where rigid, flexible or non-metallic conduit is not required.
3. E.M.T. shall be used for interior dry locations. EMT shall be used where no specified conduit type is called for on the Drawings.

C. Flexible Metallic Conduit:

1. Flexible metallic conduit shall be galvanized steel and bear the U.L. label. Fittings for flexible conduit shall be squeeze type. Screw-in connectors and other connectors that decrease the interior diameter of the conduit shall not be used unless specifically approved by the Project Manager.
2. Liquid-tight flexible conduit shall bear the U.L. label and be plastic jacketed moisture and oil resistant with oil and vapor tight connectors.
3. Use flexible conduit for final connection to equipment where vibration may injure direct conduit connection. It may be used for indoor dry locations, for fixture whips not to exceed 72 inches and in other locations where structural conditions will not permit the use of EMT not to exceed six feet, only if approved by the Project Manager.
4. Use liquid-tight flexible conduit in lieu of flexible conduit for wet, damp, or outdoor areas or where weatherproof flexible conduit is called for on the Drawings or by code.

D. Plastic Conduit:

1. Plastic conduit shall be rigid polyvinyl chloride (PVC) Underwriter's approval, Schedule 40. Connections and fittings shall be "outside" type assembled in accordance with the recommended methods of the manufacturer.
2. Underground PVC conduit shall be buried a minimum of 24 inches below grade. Where more than two conduits are installed adjacently underground, use factory made conduit spacers.
3. PVC conduit shall be used for underground conduit runs in lieu of wrapped rigid conduit except as noted otherwise on the Drawings or required by the serving utility.
4. Provide a code size ground conductor in each conduit.
5. Only braided polyethylene or similar pull rope shall be used.

E. Installation of Conduit:

1. Underground conduit.
    i. Keep interior of conduit clean and clear. Clean underground conduits by pulling a mandrel through conduit run followed with a swab before pulling wire.
    j. Reroute conduit from locations shown on the Drawings where it is necessary to clear obstructions.
    k. Provide junction or pull boxes where required for pulling conductors due to excessive number of bends or length of conduit runs.
    l. Bury underground conduit, except those under buildings, a minimum of 24 inches below finished grade. Conduits under roadways shall be a minimum of 36 inches below finished grade. Conduit runs ¾ inch and smaller in slabs shall be located above vapor barriers. Bury conduit runs larger than ¾ inch to a minimum depth of 12 inches below floor slabs.
    m. Standard factory ells shall not be used in underground service conduits or other long underground runs. Field bends shall not be flattened or kinked and shall not materially reduce the internal diameter of the conduit. Bends in long underground runs shall be made in long sweeping bends. Do not bend at couplings. Approved conduit bending methods shall be used.
    n. All conduit runs shall have a code size insulated grounding conductor.
    o. Properly separate two or more conduits installed underground in a common concrete envelope with approved factory made conduit spacers.
    p. Locate conduit stub-outs dimensionally from building or curb lines on Record Drawings.

q. Pull wires shall be installed in empty conduits including telephone conduits and stub-outs, No. 12 AWG, type "THWN" insulated copper wire or 1/8-inch polyethylene rope shall be used.

r. Spare underground conduits shall be sealed with duct plugs that have pull tabs. Duct tape shall not be used to seal unused conduits.

2. Exposed/Concealed Conduit:

a. Provide secure mounting facilities for conduits. Wire or plumbers tape shall not be used for hanging conduit. Strap shall be factory made of the one hole malleable iron or two-hole galvanized clamp type.

b. Provide expansion couplings wherever conduits cross expansion joints.

c. Run conduit at right angles or parallel to structural members, walls, floors and ceilings. Where several conduits are run together or suspended, they shall be hung on Unistrut trapezes with minimum 3/8-inch rod hangers.

d. Cut ends of conduit square and ream to remove burrs or sharp edges. Terminate conduits properly with bushings, locknuts, etc. Terminate one (1) inch and larger conduits with insulated bushings.

e. Render conduits projecting through the roofing watertight by proper flashings. Securely fasten a sheet metal cap and tighten bank or storm collar to the conduits. Extend flashing a minimum of six (6) inches in all directions. Coordinate and install roof flashing for conduits to the satisfaction of the Project Manager.

f. All conduit runs shall have a code size insulated grounding conductor.

g. Pull wires shall be installed in empty conduits including telephone conduits and stub-outs, No. 12 AWG, type "THWN" insulated copper wire or 1/8-inch polyethylene rope shall be used.

h. Flexible conduit connections shall comply with NEC Section 350-22.

i. Provide Dura Block or similar support for roof-mounted conduits.

2.3 OUTLET, JUNCTION AND PULL BOXES

A. Outlet boxes and junction boxes shall be galvanized one-piece pressed steel, knockout type. The size of each box shall be determined by the number of wires or conduits or size of conduits entering the box, but shall not be less than 4" square and 1-1/2" deep unless otherwise noted. All boxes shall be UL listed.

B. Minimum box size for data and telephone outlets shall be 4" square and 2-1/8" deep.

C. Single gang boxes in concrete, for fixture outlets, shall be 4-3/8" octagonal concrete boxes, 2-1/2" deep minimum.

D. Single gang boxes in concrete, for wiring devices, shall be 3-1/2" deep, 3-3/4" long and 1-7/8" wide.

E. Single gang outlet boxes installed in concrete or masonry walls shall be a minimum of 3-1/2" deep, 4" long and 2" wide, set flush with the wall and provided with a single gang wall plate.

F. Install wood blocking for outlet boxes in a rigid, workmanlike manner using new material where wood studs are used. Provide rigid support to avoid twisting of outlet boxes where steel studs are used. Boxes shall be secured such that they are level and plumb.

G. Locknuts shall be used on both sides of conduit connections to box or panel, in addition to bushing. Where a larger size opening occurs than size of conduit, use reducing washers.

H. Exposed boxes shall be weatherproof, threaded or hub condulet with gasketed condulet cover suitable for device installed or with blank cover plate when condulet is used as a junction box. Condulet wire fill capacity shall not be exceeded.

I. Recessed weatherproof outlets or junction boxes shall be equipped with neoprene gasketed covers.

J. Large size junction or pull boxes shall be fabricated from code gauge sheet steel. Where located indoors, finish shall be gray enamel and covers shall be secured with screws. Where exposed to weather, they shall be weatherproof, NEMA 3R, and rain-tight and hot-dip galvanized after fabrication; also, they shall have weatherproof gaskets, flat covers and galvanized iron screws. Provide knockouts and/or threaded hubs as required for the conduit used. Boxes in finished areas shall be prime painted.

K. Any unused, removed knockouts shall be filled with a K.O. cover.

L. Provide bonding or grounding from metal conduit terminating in junction with concentric KO’s.

M. Install boxes and rings such that finished installation is flush with finished surface.

2.4 PLATES AND DEVICE COVERS

A. Plates for switches, receptacles, telephone and blank outlets shall be white nylon.

2.5 FLOOR BOXES

A. Floor boxes shall be suited for the type of flooring they are installed on.

B. Floor boxes shall be fully adjustable or adaptable/trimmable to accommodate finished floor elevation.

C. Covers for floor boxes shall be brass.

D. Acceptable manufacturers: Manufacturers shall be one of the following, but not limited to:

1. Wiremold/Legrand.
2. Hubbell.

E. Components in floor boxes shall be as specified on the Drawings.

2.6 RECEPTACLES

A. Duplex convenience outlets shall be specification grade, backwire, three wire, NEMA #5-20R, self-grounding type, 20-ampere, 12-volt parallel slots, polarized, in white. Additional receptacles shall be as indicated on the Drawings. Receptacles shall be tamper-resistant.

B. Receptacles indicated weatherproof shall have lift cover plates that are weatherproof "while in use" Hubbell/Taymac expandable flat ML450W or equal.

C. Ground fault current interrupter receptacles shall be self-testing, Hubbell # GFR5352WST.

D. Outdoor ground fault circuit interrupter receptacles shall be Hubbell #GFW RST 20W or equal.

E. USB receptacles shall be Hubbell #USB8200W or equal.

2.7 LIGHTING SWITCHES

A. Line voltage lighting switches shall be specification grade, quiet type, 20 amp. 120/277 volt A.C. white handled, unless otherwise noted. Switches shall be Hubbell #CS1221W.

B. Dimmers shall be specification grade 20 amp, 120/277 volt, white. Specific attributes of dimmers: types, loads, configuration, shall be as shown on the drawings. Dimmers shall match the drivers in the light fixtures that they feed.

C. A neutral conductor shall be routed to each switch and dimmer location.

2.8 WIRE AND CABLE

A. 600 Volt Conductors:

1. Conductors shall be copper and delivered to the site in their original, unbroken packages plainly marked or tagged with U.L. label, size, kind, insulation, name of manufacturer and trade name of the wire.
2. Type "THWN/THHN", 600-volt insulation shall be used for all locations.
3. Minimum size conductor shall be #12.
4. Conductors shall be stranded.
5. Ground conductors shall be bare copper or have green insulation.
6. 120 volt and 277 volt circuits shall have separate neutrals.

B. MC Luminary Cable:

1. MC Luminary cable may be used for line voltage and 0-10 volt wiring between light fixtures and dimmers.
2. MC Luminary cable shall be UL listed.
3. MC Luminary cable shall be properly supported along its route between fixtures and dimmers.
4. Acceptable manufacturers: Manufacturers shall be one of the following, but not limited to:
   a. AFC
   b. Southwire
   c. General Cable
5. MC Cable sizes shall be as shown on the Drawings.

C. Non-metallic sheathed cable, Romex shall be acceptable to use for branch circuits.

D. Installation:

1. Conductors shall be continuous between outlets or junction boxes and no splices shall be made except in outlet boxes, pull boxes, panelboard gutters or handholes.
2. Joints, splices and taps No. l0 or smaller (including fixture pigtails) shall be connected with "floating spring" type connectors. No. 8 and larger shall be connected with solderless connectors of 100% electrolytic copper. Split-bolt connectors are not acceptable.

3. Tighten pressure type lugs on panels and equipment, and then retighten 24 hours or more later after energizing. Provide written report of torque values on lugs.
4. Oil or grease shall not be used when pulling conductors. Use U.L. approved cable lubrication only.
5. Lace or train conductors neatly in panels, cabinets and equipment. Use plastic wire ties to route conductors at edge of enclosure away from overcurrent devices.
6. Branch circuits shall be color coded in compliance with Section 210-5 of the California Electrical Code. Colored tape is not acceptable.
7. All wiring, both line and low voltage, shall be installed in conduit unless otherwise noted.
8. Conductors from different panels or from different power sources shall not be installed in the same conduit, junction box, gutter, or raceway.

E. Tag:

1. Branch circuits shall be left tagged with circuit numbers in gutters and junction boxes where unused circuits terminate.
2. Feeder conductors shall be tagged as phase "A" or "B" or "C".
3. The method of tagging shall be with adhesive preprinted tape numbered or lettered wrap around tags. Colored tape is not acceptable.
4. Tagging shall be applied after wire is installed in conduit.
5. Feeders in panel or equipment shall be tagged by phase letter in each panel or equipment.
6. Where it is impractical to use printed markers on certain wires or cables, use blank tape with identification marked thereon with indelible pen or pencil.

F. Color Coding for Phase Identification: Color code secondary service, feeder, and branch circuit conductors with factory applied color as follows:

208y/120Volts	Phase
Black	A
Red	B
Blue	C
White	Neutral
Green	Ground

2.9 DISCONNECT SWITCHES

A. Non-fusible or fusible as shown on the Drawings, heavy duty, 250 or 600 volts as required, NEMA Type 1 enclosure, except where WP is indicated or required by code, use NEMA Type 3R enclosure.

2.10 LIGHTING FIXTURES

A. Lighting fixtures shall be of manufacture and type as specified in the Fixture Schedule, and shall have all parts and fittings necessary to completely and properly install the fixture. Fixtures of the same type shall be of one manufacturer and of identical finish and material.

B. Lighting fixtures shall bear Underwriter's Laboratories labels. Interior light fixtures shall be on the California Energy Commission approved list. Exterior light fixtures shall be on the DLC list.

C. Fixtures shall be furnished and installed as indicated on the Drawings, including hangers, glassware, auxiliary equipment, drivers, adapters, connectors for continuous installation, etc.

D. Each fixture shall be wired with conductors suitable for the voltage, current and temperature to which the conductors will be subjected.

E. If excessive driver flicker develops within 12 months after installation, the condition shall be corrected at no charge to the Owner. Flickering of the LED or failure of an LED array within 12 months of substantial completion shall also be corrected at no charge to the Owner.

F. Proper LEDs of type, size, color temperature and wattage indicated shall be furnished and installed in each fixture and shall be manufactured by Phillips, Sylvania, Cree, Soraa or Bridgelux. The Contractor shall replace LED arrays which have been burned out prior to final completion. Clean dust, dirt, fingerprints and grease from fixtures before final completion.

G. Install trims, reflectors, lenses and diffusers with care. Wear cloth or surgical gloves when installing these to avoid leaving fingerprints.

H. Follow manufacturer's installation instructions when installing light fixtures.

2.11 LED LAMPS

A. Any LED lamps used shall be JA8 compliant.

B. LED lamps shall be UL listed.

C. LED lamps shall be tested for use in the fixtures they will be installed in.

D. LED lamps shall not cause fixtures to overheat or lamps to prematurely fail.

2.12 PANELBOARDS

A. Section Includes:

1. Power Distribution Panelboard: Furnish and install distribution panelboard(s) as specified herein and where shown on the associated schedules on Drawings.
2. Lighting and Appliance Panelboard: Furnish and install lighting and appliance panelboard(s) as specified herein and where shown on the associated schedules on Drawings.

B. References: The panelboard(s) and circuit breaker(s) referenced herein are designed and manufactured according to the latest revision of the following Specifications.

1. NEMA PB-1 - Panelboards.
2. NEMA PB-1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
3. NEMA AB 1 - Molded Case Circuit Breakers.
4. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
5. UL 50 - Enclosures for Electrical Equipment.

6. UL 67 - Panelboards.
7. UL 489 - Molded-Case Circuit Breakers and Circuit Breaker Enclosures.

C. Power Distribution Panelboards: (Square D I-Line, no equal)

1. Interior:

a. Shall be rated 600 VAC. Continuous main current ratings as indicated on associated schedules on Drawings not to exceed 1200 amperes maximum. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67.

b. Provide UL Listed short circuit current ratings (SCCR) as indicated on the associated schedules on Drawings not to exceed the lowest interrupting capacity rating of any circuit breaker installed with a maximum of 200,000 rms symmetrical amperes. Main lug and main breaker panelboards shall be suitable for use as Service Equipment when application requirements comply with UL 67 and NEC Articles 230-F and -G.

c. The panelboard interior shall have three flat bus bars stacked and aligned vertically with glass reinforced polyester insulators laminated between phases. The molded polyester insulators shall support and provide phase isolation to the entire length of bus.

d. The bussing shall be fully rated with sequentially phased branch distribution. Panelboard bussing rated 100 through 600 amperes shall be plated copper. Bussing rated 800 amperes and above shall be plated copper. The entire interleaved assembly shall be contained between two (2) U-shaped steel channels, permanently secured to a galvanized steel-mounting pan by fasteners employing the use of a tamper-resistant warning label.

e. Interior trim shall be of dead-front construction to shield user from all energized parts. Main circuit breakers through 800 amperes shall be vertically mounted. Main circuit breaker and main lug interiors shall be field convertible for top or bottom incoming feed.

f. Equipment ground bar shall be insulated or bonded as shown on the Drawings. Ground bar shall be copper. Solid neutral shall be equipped with a full capacity grounding strap for service entrance applications. Gutter-mounted neutral will not be acceptable.

g. Nameplates shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, UL Listed label, and Short Circuit Current Rating shall be provided. Leveling provisions shall be provided for flush mounted applications.

h. Arc Flash labeling shall be provided in accordance with Section 1.18 of these specifications.

i. Panelboard lugs shall be tightened with a torque wrench to values listed on the equipment.

2. Molded Case Circuit Breakers - Mains and Branches:

a. Common Characteristics:

1) Circuit breakers shall be constructed in accordance with the following standards:
UL 489 Federal Specification W-C-375B/GEN
NEMA AB1 CSA 22.2, No. 5-M91
IEC 157-1 BS 4752

2) Circuit breakers shall be constructed using glass reinforced polyester insulating material providing superior dielectric strength. Current-carrying components shall be completely isolated from the handle and the accessory mounting area.

3) Circuit breakers shall have an overcenter, trip-free, toggle operating mechanism which will provide quick-make, quick-break contact action. The circuit breaker shall have common tripping of all poles.

4) Circuit breakers shall have a push-to-trip button for maintenance and testing purposes.

5) Circuit breaker escutcheon shall have international I/O markings, in addition to standard ON/OFF markings. Circuit breaker handle accessories shall provide provisions for locking handle in the ON or OFF position.

6) Breaker faceplate shall indicate rated ampacity. Breaker faceplate shall indicate UL and IEC certification standards with applicable voltage systems and corresponding AIR ratings.

7) Circuit breakers shall be factory sealed and shall have a date code on the face of the circuit breaker. Poles shall be labeled with respective phase designations.

   (a) Circuit breakers shall be UL Listed for use with the following accessories: Shunt Trip, Under Voltage Trip, Auxiliary Switch, Alarm Switch, Ground Fault Shunt Trip, Electrical Operators, Cylinder Locks, Mechanical Lugs Kits, Compression Lugs Kits, and Handle Accessories.

8) Lugs shall be UL Listed to accept solid or stranded copper conductors only. Lugs shall be suitable for 90° C rated wire, sized according to the 75° C temperature rating per NEC Table 310-16. Lug body shall be bolted in place; snap-in designs are not acceptable. Lugs shall be torqued with a torque wrench to the value listed on the circuit breaker.

9) Two- and three-pole circuit breakers shall have an internal common trip crossbar to provide simultaneous tripping. Circuit breaker frame sizes above 100 amperes shall have a single magnetic trip adjustment located on the front of the breaker, which allows the user to simultaneously select the desired trip level of all poles.

10) Standard circuit breakers up to 250 amperes at 600 VAC shall be UL Listed with HACR ratings.

11) Enclosures:

   (a) Type 1 Boxes:

      1. Boxes shall be galvanized steel constructed in accordance with UL 50 requirements. Zinc-coated galvannealed steel will not be acceptable.
      2. Boxes shall have removable blank endwalls and interior mounting studs. Interior support bracket shall be provided for ease of interior installation.
      3. Maximum enclosure dimensions shall be 42 in. wide and 9.5 in. deep.

   (b) Type 1 Trim Fronts:

      1. Trim front steel shall meet strength and rigidity requirements per UL 50 standards. Shall have an ANSI 49 medium gray enamel electrodeposited over cleaned phosphatized steel.
      2. Trim front shall be [4-piece surface] [1- piece with door] [hinged 1-piece with door] available in [flush] [surface] mount. Trim front door shall have rounded corners and edges free of burrs. A clear plastic directory cardholder shall be mounted on the inside of the door.
      3. Locks shall be cylindrical tumbler type with larger enclosures requiring sliding vault locks with 3-point latching. All lock assemblies shall be keyed alike. Two (2) keys shall be provided with each lock.

   (c) Type 3R, 4, 4X and 12:

1. Enclosures shall be constructed in accordance with UL 50 requirements. Endwalls shall be welded and sealed. Enclosures shall be painted with ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.
2. All doors shall be gasketed and be equipped with a tumbler type vault lock and two (2) additional trunk type latches. A clear plastic directory cardholder shall be mounted on the inside of door. All lock assemblies shall be keyed alike. Two (2) keys shall be provided with each lock.
3. Maximum enclosure dimensions shall not exceed 42 in. wide and 12.95 in. deep.

D. Lighting and Appliance Panelboard: (Square D NQOD, no equal)

1. Interior:
   a. Shall be rated for 240 VAC/48 VDC maximum. Continuous main current ratings, as indicated on associated schedules, not to exceed 600 amperes maximum.
   b. Minimum short circuit current rating: As indicated on schedules in rms symmetrical amperes at 240 VAC.
   c. Provide one (1) continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors suitable for plug-on or bolt-on branch circuit breakers. The bussing shall be fully rated. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67. Bussing rated 100-400 amperes shall be copper. Bussing rated for 600 amperes shall be copper as standard construction. Panelboards shall be suitable for use as Service Equipment when application requirements comply with UL 67 and NEC Articles 230-F and G.
   d. All current-carrying parts shall be insulated from ground and phase-to-phase by Noryl high dielectric strength thermoplastic or equivalent.
   e. Split solid neutral shall be plated and located in the mains compartment up to 225 amperes so all incoming neutral cable may be of the same length.
   f. Interior trim shall be of dead-front construction to shield user from energized parts. Dead-front trim shall have pre-formed twistouts covering unused mounting space.
   g. Nameplates shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, UL Listed label and short circuit current rating shall be displayed on the interior or in a booklet format.
   h. Interiors shall be field converted for top or bottom incoming feed. Main and sub-feed circuit breakers shall be vertically mounted. Main lug interiors up to 400 amperes shall be field convertible to main breaker. Interior leveling provisions shall be provided for flush mounted applications.
   i. Panelboard lugs shall be tightened with a torque wrench to values listed on the equipment.
   j. Arc Flash labeling shall be provided in accordance with Section 1.18 of these specifications.
2. Main Circuit Breaker:
   a. Main circuit breakers shall have an overcenter, trip-free, toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have a permanent trip unit with thermal and magnetic trip elements in each pole. Each thermal element shall be true rms sensing and be factory calibrated to operate in a 40^{o} C ambient environment. Thermal elements shall be ambient compensating above 40^{o} C.
   b. Two- and three-pole circuit breakers shall have common tripping of all poles. Circuit breakers frame sizes above 100 amperes shall have a single magnetic trip adjustment located on the front of the

circuit breaker, which allows the user to simultaneously select the desired trip level of all poles. Circuit breakers shall have a push-to-trip button for maintenance and testing purposes.

c. Breaker handle and faceplate shall indicate rated ampacity. Standard construction circuit breakers shall be UL Listed for reverse connection without restrictive line or load markings.

d. Circuit breaker escutcheon shall have international I/O markings, in addition to standard ON/OFF markings. Circuit breaker handle accessories shall provide provisions for locking handle in the ON or OFF position.

e. Lugs shall be UL Listed to accept solid or stranded copper conductors only. Lugs shall be suitable for 90° C rated wire, sized according to the 75° C temperature rating per NEC Table 310-16. Lug body shall be bolted in place; snap-in designs are not acceptable. Lugs shall be torqued with a torque wrench to the value listed on the main circuit breaker.

3. Branch Circuit Breakers:

a. Circuit breakers shall be UL Listed with amperage ratings, interrupting ratings, and number of poles as indicated on the panelboard schedules.

b. Molded case branch circuit breakers shall have bolt-on type bus connectors.

c. Circuit breakers shall have an overcenter toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have thermal and magnetic trip elements in each pole. Two- and three-pole circuit breakers shall have common tripping of all poles.

d. There shall be two forms of visible trip indication. The breaker handle shall reside in a position between ON and OFF.

e. The exposed faceplates of all branch circuit breakers shall be flush with one another.

f. Lugs shall be UL Listed to accept solid or stranded copper conductors only. Lugs shall be suitable for 90° C rated wire, sized according to the 75° C temperature rating per NEC Table 310-16. Lugs shall be torqued with a torque wrench to the value listed on the main circuit breaker.

4. Enclosures:

a. Type 1 Boxes:

1) Boxes shall be galvanized steel constructed in accordance with UL 50 requirements. Galvanized steel will not be acceptable.

2) Boxes shall have removable endwalls with knockouts located on one end. Boxes shall have welded interior mounting studs. Interior mounting brackets are not required.

3) Box width shall be [20 in wide] [14 in wide] [8.625 in wide - NQOB column width only].

b. Type 1 Fronts:

1) Front shall meet strength and rigidity requirements per UL 50 standards. Fronts shall have ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.

2) Fronts shall be hinged 1-piece with door. Mounting shall be as indicated on associated schedules.

c. Type 3R, 3S, 5, and 12:

1) Enclosures shall be constructed in accordance with UL 50 requirements. Enclosures shall be painted with ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.

2) All doors shall be gasketed and equipped with a tumbler type vault lock and two (2) additional trunk type latches. All lock assemblies shall be keyed alike. Two (2) keys shall be

provided with each lock. A clear plastic directory cardholder shall be mounted on the inside of door.

3) Maximum enclosure dimensions shall not exceed 20 in. wide and 6.5 in. deep.

2.13 SURGE PROTECTIVE DEVICES (SPD) (TVSS)

A. Surge protective devices shall be panel integrated.

B. SPDs shall be provided and installed in the panel by the manufacturer.

C. SPD size/rating shall be as shown on the Drawings.

D. SPDs shall be UL listed.

E. Where independent SPDs are used, they shall be installed adjacent to the equipment they serve. The conductor length from the circuit breaker to the SPD shall be minimized.

END OF SECTION 26 00 00

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SECTION 31 05 13 -

SOILS FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

A. Range of soil and subsoil materials intended to be referenced by other sections, generally for fill and grading purposes.

1.2 Related Sections:

A. Section 31 05 16 - Aggregates for Earthwork.

B. Section 31 22 13 - Rough Grading.

C. Section 31 23 17 - Trenching.

D. Section 31 37 00 - Riprap.

1.3 REFERENCES

A. Geotechnical Engineering Study SS-502-S prepared by Solid Soils and Geologic Consultants dated November 21, 2024, and all report updates.

B. ASTM International:

1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).

3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

1.4 SUSTAINABLE DESIGN SUBMITTALS

A. Section 01 81 13 - Sustainable Design Requirements: Requirements for sustainable design submittals.

B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.

1. Materials Resources Certificates:

a. Certify source for regional materials and distance from Project site.

1.5 QUALITY ASSURANCE

A. Furnish each material from single source throughout the Work.

Perform Work in accordance with soils report and geotechnical engineering recommendations and City of Ojai Design Guidelines.

PART 2 PRODUCTS

2.1 SUSTAINABILITY CHARACTERISTICS

A. Section 01 81 13 - Sustainable Design Requirements: Requirements for sustainable design compliance.

B. Materials and Resources Characteristics:

1. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project site.

2.2 SUBSOIL MATERIALS

1. Per geotechnical report.

2.3 TOPSOIL MATERIALS

1. Per geotechnical report

2.4 SOURCE QUALITY CONTROL

A. Section [01 40 00 - Quality Requirements: Testing and analysis of soil material.

B. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D698.

C. Testing and Analysis of Topsoil Material: Perform in accordance with ASTM D698.

D. When tests indicate materials do not meet specified requirements, change material and retest.

E. Furnish materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 EXCAVATION

A. Excavate subsoil and topsoil from areas designated. Strip topsoil to full depth of topsoil in designated areas.

B. Stockpile excavated material meeting requirements for subsoil materials and topsoil materials.

C. Remove excess excavated materials not intended for reuse, from site.

D. Remove excavated materials not meeting requirements for subsoil materials and topsoil materials from site.

3.2 STOCKPILING

A. Stockpile materials on site at locations indicated on Erosion Control Plan, if required.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Stockpile topsoil 8 feet high maximum.

E. Prevent intermixing of soil types or contamination.

F. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
G. Stockpile unsuitable materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.3 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION 31 05 13

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SECTION 31 05 16 -

AGGREGATES FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

A. Range of coarse and fine aggregate materials intended to be referenced by other sections

1.2 RELATED SECTIONS:

A. Section 31 05 13 - Soils for Earthwork: Fill and grading materials.

B. Section 31 22 13 - Rough Grading.

C. Section 31 23 17 - Trenching.

D. Section 33 41 00 - Storm Utility Drainage Piping.

1.3 REFERENCES

A. Geotechnical Engineering Study SS-502-S prepared by Solid Soils and Geologic Consultants dated November 21, 2024, and all report updates.

B. ASTM International:
1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
4. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
5. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Materials Source: Submit name of imported materials suppliers.

1.5 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

B. Perform Work in accordance with SSPWC.

PART 2 PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

A. Coarse Aggregate per SSPWC

2.2 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing and inspection services.

B. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698.

C. Fine Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698.

D. When tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.1 EXCAVATION

A. Excavate aggregate materials from on-site locations indicated on the plans as specified in Section 31 22 13.

B. Stockpile excavated material meeting requirements for coarse aggregate materials and fine aggregate materials.

C. Remove excess excavated materials not intended for reuse, from site.

D. Remove excavated materials not meeting requirements for coarse aggregate materials and fine aggregate materials from site.

3.2 STOCKPILING

A. Stockpile materials on site at locations approved by Dignity Moves Superintendent.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate different aggregate materials with dividers or stockpile individually to prevent mixing.

D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

END OF SECTION 31 05 16

SECTION 31 10 00 -

SITE CLEARING

PART 1 GENERAL

1.1 SUMMARY

A. Clearing site of incidental paving and curbs, debris, grass, trees, and other plant life in preparation for site or building excavation Work.

B. Related Sections:
1. Section 31 22 13 - Rough Grading.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Site Clearing:
1. Basis of Measurement: By square foot.
2. Basis of Payment: Includes clearing site, loading and removing waste materials from site, applying herbicide to designated plant life.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data for herbicide. Indicate compliance with applicable codes for environmental protection.

1.4 REFERENCES

A. Standard Specifications for Public Works Construction (SSPWC), 2019

B. Geotechnical Engineering Study SS-502-S prepared by Solid Soils and Geologic Consultants dated November 21, 2024, and all report updates.

1.5 QUALITY ASSURANCE

A. Conform to SSPWC.

B. Perform Work in accordance with Geotechnical Report

PART 2 PRODUCTS

A. None

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify existing plant life designated to remain is tagged or identified.

3.2 PREPARATION

A. Call Local Utility Line Information service at 811 not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

3.3 PROTECTION

A. Locate, identify, and protect utilities indicated to remain, from damage.

B. Protect trees, plant growth, and features designated to remain, as final landscaping [as specified in Section 01 50 00 - Temporary Facilities and Controls.

C. Protect benchmarks, survey control points, and existing structures from damage or displacement.

3.4 CLEARING

A. Clear areas required for access to site and execution of Work per Geotechnical Report.

B. Remove trees and shrubs indicated on Demo Plans. Remove stumps, main root ball, root system per recommendations of Arborist Report

C. Clear undergrowth and deadwood, without disturbing subsoil.

D. Apply herbicide to remaining stumps to inhibit growth.

3.5 REMOVAL

A. Remove debris, rock, and extracted plant life from site.

B. Remove paving, curbs, and debris.

3.6 TOPSOIL EXCAVATION

A. Remove topsoil from site per Geotechnical Report.

END OF SECTION 31 10 00

SECTION 31 13 16

TREE PROTECTION AND SELECTIVE TRIMMING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the contract, including General and Supplementary Conditions and Specification Sections, apply to this section.
1. Comply with 2024 Greenbook Standard Specifications.

B. The consulting Arborist on the project is under direct contract with the Owner.

1.02 SUMMARY

A. This section includes the protection and trimming of trees that interfere with, or are affected by, execution of the work, whether temporary or new construction.

B. Related sections include the following:

1. Section 329300 Plants

2.. Section 320100 Maintenance of Exterior Improvements

1.03 SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" article below to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Landscape Architects and Owners, and other information specified.

B. Certification: From the Arborist that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

C. Maintenance Recommendations: From the Arborist for care and protection of trees affected by construction during and after completing the work.

1.04 QUALITY ASSURANCE

A. Tree Service Qualifications: An experienced tree service firm that has successfully completed tree protection and trimming work similar to that required for this project.

B. Tree Service Arborist on staff Qualifications: An arborist certified by the International Society of Arboriculture or licensed in the jurisdiction where project is located.

C. Tree Pruning Standards: Comply with ANSI A300, "Trees, Shrubs, and Other Woody Plant Maintenance--Standard Practices," unless more stringent requirements are indicated.

PART 3 EXECUTION

3.01 PREPARATION

A. Protect tree root systems from damage due to noxious materials caused by runoff or spillage while mixing, placing, or storing construction materials. Protect root systems from flooding, eroding, or excessive wetting caused by dewatering operations.

B. Do not store construction materials, debris, or excavated material within the drip line of remaining trees. Do not permit vehicles or foot traffic within the drip line; prevent soil compaction over root systems.

3.02 EXCAVATION

A. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use air spade or narrow-tine spading forks and comb soil to expose roots.

1. Relocate roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and relocate them without breaking. If encountered immediately adjacent to location of new construction and relocation is not practical, cut roots approximately 3 inches (75 mm) back from new construction.

2. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

D. Where utility trenches are required within drip line of trees, tunnel under or around roots by air spade, drilling, auger boring, pipe jacking, or digging by hand.

1. Root pruning: Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots with sharp pruning instruments; do not break or chop.

3.03 TREE PRUNING

A. Prune remaining trees affected by temporary and new construction per the Arborist.

B. Prune remaining trees to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during contract period as recommended by the Arborist.

C. Pruning Standards: Prune trees according to ANSI A300.

D. Cut branches with sharp pruning instruments; do not break or chop.

3.05 TREE REPAIR AND REPLACEMENT

A. Promptly repair trees damaged by construction operations within 24 hours. Treat damaged trunks, limbs, and roots according to written instructions of the Arborist.

B. Remove and replace dead and damaged trees that the qualified Arborist determines to be incapable of restoring to a normal growth pattern.

C. Provide new trees of the same size and species as those being replaced.

3.06 DISPOSAL OF WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, and excess chips from City’s property.

END OF SECTION 31 13 16

SECTION 31 22 13 -

ROUGH GRADING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Excavating topsoil.
2. Excavating subsoil.
3. Cutting, grading, filling, and compacting.

B. Related Sections:
1. Section 31 05 13 - Soils for Earthwork: Soils for fill.
2. Section 31 05 16 - Aggregates for Earthwork: Aggregates for fill.
3. Section 31 10 00 - Site Clearing: Excavating topsoil.
4. Section 31 23 17 - Trenching: Trenching and backfilling for utilities.

1.2 REFERENCES

A. Geotechnical Engineering Study SS-502-S prepared by Solid Soils and Geologic Consultants dated November 21, 2024, and all report updates.

B. Standard Specifications for Public Works Construction (SSPWC), 2019.

C. ASTM International:
1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
3. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
4. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
5. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
6. ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
7. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head).
8. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
9. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C136.

B. Perform Work in accordance with Standard Specifications for Public Works standards.

PART 2 PRODUCTS

2.1 MATERIALS

A. Per geotechnical report.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify survey benchmark and intended elevations for the Work are as indicated on Drawings.

3.2 PREPARATION

A. Call Utility Line Information service at 811 three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum.

C. Notify any utility companies prior to the removal or relocation of utilities.

D. Protect utilities indicated to remain from damage.

E. Protect plant life, lawns, and other features remaining as portion of final landscaping.

F. Protect benchmarks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, relandscaped, or regraded without mixing with foreign materials for use in finish grading.

B. Do not excavate wet topsoil.

C. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion. Stockpile material on impervious material until disposal.

D. Remove excess topsoil not intended for reuse, from site.

3.4 SUBSOIL EXCAVATION

A. Excavate subsoil from areas to be further excavated, relandscaped, or regraded

B. Excavate and process wet material to obtain optimum moisture content.

C. When excavating through roots, perform Work by hand and cut roots with sharp axe.

D. Remove excess subsoil not intended for reuse, from site.

E. Benching Slopes: Horizontally bench existing slopes greater than 1: 2 to key placed fill material to slope to provide firm bearing.

F. Stability: Replace damaged or displaced subsoil as specified for fill.

3.5 FILLING

A. Fill areas to contours and elevations with unfrozen materials.

B. Place fill material in continuous layers and compact in accordance with the geotechnical report.

C. Maintain optimum moisture content of fill materials to attain required compaction density.

D. Slope grade away from building minimum 2 percent slope for minimum distance of 10 ft, unless noted otherwise.

E. Make grade changes gradual. Blend slope into level areas.

F. Repair or replace items indicated to remain damaged by excavation or filling.

3.6 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

3.7 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements

B. 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

C. Perform laboratory material tests in accordance with ASTM D1557.

D. Perform in place compaction tests in accordance with the following:
1. Density Tests: ASTM D1556.
2. Moisture Tests: ASTM D3017.

E. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

END OF SECTION 31 22 13

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SECTION 31 23 16 -

EXCAVATION

PART 1 GENERAL

1.1 SUMMARY

A. Excavation of site flatwork or structures.

1.2 Related Sections:

1. Section 31 05 13 - Soils for Earthwork: Stockpiling excavated materials.
2. Section 31 05 16 - Aggregates for Earthwork: Stockpiling excavated materials.
3. Section 31 23 17 - Trenching: Excavating for utility trenches.

1.3 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Excavating Soil Materials:
   1. Basis of Measurement: By cubic yard.
   2. Basis of Payment: Includes excavating to required elevations, loading and placing materials in stockpile, and removing from site. Over Excavating: Payment will not be made for over excavated work nor for replacement materials.

1.4 REFERENCES

A. Local utility standards when working within 24 inches of utility lines.

B. Geotechnical Engineering Study SS-502-S prepared by Solid Soils and Geologic Consultants dated November 21, 2024, and all report updates.

C. Standard Specifications for Public Works Construction (SSPWC), 2019

1.5 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with SSPWC.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PREPARATION

A. Call Local Utility Line Information service at 811 not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum.

C. Protect utilities indicated to remain from damage.

D. Protect plant life, lawns, trees, and other features remaining as portion of final landscaping per arborist report.

E. Protect benchmarks, survey control points, existing structures, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.2 SOIL DENSIFICATION - VIBRO-COMPACTION

A. Vibro-compact substrates below footing bearing surfaces for footings as indicated on Drawings before excavating site.

B. Densify existing subsoils per soils report.

C. Densification Equipment:
1. Depth Vibrator: Poker type with follower tubes with visible marking every 12 inches (300 mm) to enable insertion depth measurement.
2. Motion: radial in horizontal plane.

D. Perform densification in presence of Geotechnical Engineer directly under each footing with vibrator inserted in grid pattern at maximum 6 feet (1800 mm) on center.
1. Arrange compaction grid for each footing for maximum number of insertion points and with outermost insertion points within the bearing area of footings.
2. Adjust compaction grid arrangement and spacing as directed by [Architect/Engineer] [Geotechnical Engineer] to achieve required densification.

E. Insert vibrator to maximum specified depth. Densify soils for 30 seconds or other time as directed by Geotechnical Engineer. Withdraw vibrator every 12 inches (300 mm) increments and repeat densification at each increment.
1. When subsurface obstruction prevents vibrator insertion to specified depth, request instructions from [Architect/Engineer] [Geotechnical Engineer] to compensate for obstruction.

F. Tolerances:
1. Maximum Deviation from Center of Completed Compaction: 8 inches from indicated position.
2. Maximum Deviation from Vertical: 4 degrees during vibrator insertion.

3.3 EXCAVATION

A. Stockpile excavated material in area designated on site in accordance with Section 31 05 13

B. Repair or replace items indicated to remain damaged by excavation.

3.4 FIELD QUALITY CONTROL

A. Request inspection of excavation and controlled fill operations from geotechnical engineer.

3.5 PROTECTION

A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

C. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

END OF SECTION 31 23 16

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SECTION 31 23 23 -

FILL

PART 1 GENERAL

1.1 SUMMARY

1. Soil fill material to be used for onsite grading.

1.2 Related Sections:

1. Section 31 05 13 - Soils for Earthwork: Soils for fill.
2. Section 31 05 16 - Aggregates for Earthwork: Aggregates for fill.
3. Section 31 22 13 - Rough Grading: Site filling.
4. Section 31 23 16 - Excavation.
5. Section 31 23 17 - Trenching: Backfilling of utility trenches.
6. Section 31 37 00 - Riprap.
7. Section 33 11 16 - Site Water Utility Distribution Piping.

1.3 REFERENCES

A. Standard Specifications for Public Works Construction (SSPWC), 2019.

B. ASTM International:

1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
2. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
5. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
6. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with Standard Specifications for Public Works Construction.

B. Perform Work in accordance with Geotechnical Engineering Study SS-502-S prepared by Solid Soils and Geologic Consultants dated November 21, 2024, and all report updates.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Shall meet soils report and geotechnical engineer’s requirements

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify subdrainage, damp-proofing, or waterproofing installation has been inspected.

C. Verify structural ability of unsupported walls to support loads imposed by fill.

3.2 PREPARATION

A. Prepare site in accordance with project Geotechnical Report.

3.3 BACKFILLING

A. Backfill areas to contours and elevations with unfrozen materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

C. Place fill material in continuous layers and compact in accordance with soils report.

D. Employ placement method that does not disturb or damage other work.

E. Maintain optimum moisture content of backfill materials to attain required compaction density.

F. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

G. Slope grade away from building minimum 2 percent slope for minimum distance of 10 ft unless noted otherwise.

H. Make gradual grade changes. Blend slope into level areas.

I. Remove surplus backfill materials from site.

J. Leave fill material stockpile areas free of excess fill materials.

3.4 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Perform laboratory material tests in accordance with ASTM D1557.

C. Perform in place compaction tests in accordance with the following:
   1. Density Tests: ASTM D1556.
   2. Moisture Tests: ASTM D3017.
   3. Refer to soils report and geotechnical engineer’s requirements.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

E. Frequency of Tests: As indicated by soils engineer.

3.5 PROTECTION OF FINISHED WORK

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting finished work.

B. Reshape and re-compact fills subjected to vehicular traffic.

END OF SECTION 31 23 23

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SECTION 31 23 33 -

TRENCHING AND BACKFILLING

PART 1 GENERAL

1.1 SUMMARY

A. Trenching and backfilling for site utilities

B. Related Sections:
1. Section 31 05 16 - Aggregates for Earthwork: Aggregates for fill.
2. Section 31 22 13 - Rough Grading: Topsoil and subsoil removal from site surface.
3. Section 31 23 16 - Excavation: General building excavation.
4. Section 33 11 16 - Site Water Utility Distribution Piping
5. Section 33 31 00 - Sanitary Utility Sewerage Piping
6. Section 33 41 00 - Storm Utility Drainage Piping

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Trenching pricing should be included within utility pipe unit pricing.

1.3 REFERENCES

A. Standard Specifications for Public Works Construction (SSPWC), 2019.

B. Geotechnical Engineering Study SS-502-S prepared by Solid Soils and Geologic Consultants dated November 21, 2024, and all report updates.

C. ASTM International:
1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
2. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
5. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
6. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.4 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with utility pipe manufacturer’s specifications and SSPWC.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Fill materials per pipe manufacturer's specifications and SSPWC.

PART 3 EXECUTION

3.1 LINES AND GRADES

A. Lay pipes to lines and grades indicated on Drawings.
   1. Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

B. Use laser-beam instrument with qualified operator to establish lines and grades.

3.2 PREPARATION

A. Call Local Utility Line Information service at 811 not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum locations.

C. Protect plant life, lawns, and other features remaining as portion of final landscaping.

D. Protect bench marks, existing structures, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Maintain and protect above and below grade utilities indicated to remain.

3.3 TRENCHING

A. Excavate subsoil required for utilities to utility service.

B. Remove lumped subsoil, boulders, and rock larger than 6 inches.

C. Perform excavation within 24 inches of existing utility service in accordance with pipe manufacturer's requirements.

D. Do not advance open trench more than 200 feet ahead of installed pipe.

E. Cut trenches sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work.

F. Excavate bottom of trenches maximum 2 feet wider than outside diameter of pipe.

G. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and pipe.

H. When Project conditions permit, slope side walls of excavation starting 2 feet above top of pipe. When side walls cannot be sloped, provide sheeting and shoring to protect excavation as specified in this section.

I. When subsurface materials at bottom of trench are loose or soft, notify Soils Engineer, and request instructions.

J. Correct areas over excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by Engineer.

K. Remove excess subsoil not intended for reuse, from site.

L. In areas designated by arborist in close proximity to existing trees that are to remain,

3.4 SHEETING AND SHORING

A. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

B. Support trenches more than 5 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.

3.5 BACKFILLING

A. Place fill material in continuous layers and compact in accordance with geotechnical report.

3.6 FIELD QUALITY CONTROL

A. Perform in place compaction tests in accordance with the following:
1. Density Tests: ASTM D1556, ASTM D2167, or ASTM D2922.
2. Moisture Tests: ASTM D3017.

B. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.

C. Frequency of Tests: Per Soils Engineer’s recommendations.

3.7 PROTECTION OF FINISHED WORK

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting finished work.

B. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION 31 23 33

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SECTION 32 01 00

OPERATION AND MAINTENANCE OF EXTERIOR IMPROVEMENTS

PART 1 GENERAL

1.01 GENERAL PROVISIONS

A. Drawings and general provisions of contract, including general and supplementary conditions and division 1 specification sections, apply to this section.

1. Comply with 2024 Greenbook Standard Specifications.

B. Furnish all labor, material, equipment and services required to maintain the landscape in an attractive condition as specified herein for a period of 1 year.

C. Related Sections:
1. Section 329300 – Plants
2. Section 328000 – Irrigation

1.02 QUALITY ASSURANCE

A. Work Force: Contractor shall be experienced in landscape maintenance and shall have received an education in ornamental horticulture.

1.03 MAINTENANCE PERIOD

A. Continuously maintain landscape & irrigation work during the progress of the work and during the maintenance period until final acceptance of the work by the Landscape Architect.

B. Improper maintenance or possible poor conditions of any planting at the termination of the scheduled maintenance period may cause postponement of the final acceptance date of the Contract. Maintenance shall be continued by the Contractor until all work is acceptable.

C. Start of Maintenance Criteria: Maintenance period shall not start until the elements of construction, planting, and irrigation for the entire Project are Substantially Complete. Project will not be segmented into maintenance phases, unless specifically authorized in writing by the Landscape Architect.

D. The Contractor shall request an inspection to begin the plant maintenance period after all planting and related work has been completed in accordance with the contract documents. A prime requirement is that all groundcover areas be planted. If such criteria are met to the satisfaction of the Landscape Architect, a notification will be issued to the Contractor to establish the effective beginning date of the period.

E. Any day when the Contractor fails to adequately do weed control or other work, as determined necessary by the Landscape Architect, will not be credited as one of the maintenance working days.

F. The Contractor shall submit a schedule of activities planned during the maintenance period. This shall be accepted by the Landscape Architect prior to the start of maintenance. Schedule changes shall be documented and accepted by the Landscape Architect.

1.04 GUARANTEE AND REPLACEMENT

A. Plant material installed under the Contract shall be warranted against any poor workmanship during period of Substantial Completion. Any plant found to be dead or in poor condition due to faulty workmanship, as determined by the Landscape Architect, shall be replaced by the Contractor at his expense.

1.05 INSPECTIONS

A. Normal progress inspection shall be requested by the Contractor from the Landscape Architect at least 7 days in advance of anticipated inspection. Inspections are as follows:

1. Commencement of maintenance. (Pre-maintenance)
2. At 30 day intervals through maintenance period.
3. Completion of maintenance period - final walk-through: 10 days prior to end of maintenance period.

B. All conditions noted in Section 329300 Plants shall apply herein.

1.06 FINAL ACCEPTANCE OF THE PROJECT

A. Prior to the date of the final walk-through, the Contractor shall deliver to the Landscape Architect, record drawings prepared in accordance with Section D1.11 records of construction changes.

PART 2 PRODUCTS

2.01 MATERIALS

A. All materials used shall either conform to landscape planting specifications in other sections or shall otherwise be acceptable to the Landscape Architect. The Landscape Architect shall be given monthly record of all herbicides, insecticides and disease control chemicals used and approved The City of Ojai Earth Friendly Management policy Exhibit B.

B. Tree/Shrub/Groundcover Fertilizer: Do not apply to California native plants, unless otherwise recommended by Landscape Architect in field. All other ornamentals as recommended by the Landscape Architect.

PART 3 EXECUTION

3.01 MAINTENANCE

A. Maintenance shall be according to the following standards:

1. Areas shall be kept free of debris and planted areas shall be weeded and cultivated at intervals of not more than 10 days. Watering, edging, trimming, fertilization, spraying and pest control, as may be required, shall be included in the maintenance period per the City of Ojai Earth Friendly Management Policy.
2. The Contractor shall be responsible for maintaining adequate protection of the area. Damaged areas shall be repaired at the Contractor's expense.

3.02 TREE AND SHRUB CARE

A. Avoiding Damage: Plants native to dry regions are often some of the most tenacious and tough plants in the landscape. Once established they will thrive on neglect, but not negligence. Care must be taken to avoid

breakage of limbs, scarring of tree or shrub bark, damage to root systems and generally any damage, which will enable disease to establish a foothold in the plant.

B. Irrigation:

1. The Contractor shall maintain the landscape in a healthy and vigorous condition, ensuring that the plants are watered frequently enough to avoid wilting between watering, but not so frequently as to leave the soil constantly wet. Attention must be paid to the changes in the environment, such as hot, dry winds, or rain, which will alter irrigation intervals.
2. Drought tolerant plants, (plants which are native to areas which receive most of their yearly rainfall during the winter months, or those which receive small amounts of rain just a few times a year), once established in their environment, do not need, and often dislike large amounts of water and fertilizer.
3. Plants native to dry areas are susceptible to root rot and other diseases due to over-watering in a landscape situation. A plant which is container grown in a very light soil may be planted in a type of soil, such as clay, which holds water for a much longer time. The plant may dry out while the surrounding soil remains moist or it may remain saturated for extended periods.
4. Poor drainage and tight soil are the most common problems with native plant success.
5. Special care and greater than average observation on the part of the personnel responsible for planting and establishment of drought tolerant plants must occur to ensure success.
6. Recently planted container plants require frequent watering, regardless of whether they will become drought tolerant once established. The Contractor shall check the condition of newly planted areas at least twice weekly to determine irrigation schedules.
7. During hot spells, and/or for plants which are in direct sun all day or are in areas where the sun is very warm in the afternoon, watering may have to be done every other day.
8. During the rainy season, watering basins should be leveled out to match the surrounding terrain so as to prevent over-watering of the plants.
9. Maintain a large enough water basin around plants so that enough water can be applied to establish moisture through the major root zone.

A. Soil Level Changes: It is essential to be aware of the soil level of the plants as they are removed from the containers when planting, and to keep the level of soil at the base of the plant equal to or slightly above the surrounding soil surface. Changes in soil levels around the plants, even after becoming established, will adversely affect their health and growth.

B. Plants should retain, as much as possible, a natural habit, without the imposition of man-made shapes upon them. Shaping shrubs into tight balls or clipping a massing of plants into a squared off hedge should be avoided, as it detracts from the overall blending of plant forms.

1. Trees:
   a. Pruning of trees shall be completed only with consent of the Landscape Architect. Trees shall be pruned without consent of the Landscape Architect when necessary to prevent damage to persons and/or property. Prune trees to select and develop permanent scaffold branches that are smaller in diameter than the trunk or branch to which they are attached which have vertical spacing of from 18 inches to 48 inches and radial orientation so as not to overlay one another; to eliminate diseased or damaged growth; to eliminate narrow V-shaped branch forks that lack strength; to reduce toppling and wind damage by thinning out crowns; to maintain a natural appearance; to balance crown with roots.
   b. Under no circumstances will stripping of lower branches ("raising-up") of young trees be permitted. Lower branches shall be retained in a "tipped back" or pinched condition with as much foliage as possible to promote caliper trunk growth (tapered trunk). Lower branches can be cut leaving collar intact only after the tree is able to stand erect without staking or other support. Sucker growth shall be removed if deemed appropriate by the Landscape Architect.
   c. Evergreen trees shall be thinned out and shaped when necessary to prevent wind and storm damage. The primary pruning of deciduous trees shall be done during the dormant season. Damaged trees or those that constitute health or safety hazards shall be pruned at any time of the year as required to eliminate these conditions.
   d. Staking and guying: Remove stakes and guys as soon as they are no longer needed. Stakes and guys are to be inspected to prevent girdling of trunks or branches and to prevent rubbing that causes bark wounds. Replace all broken stakes and ties with specified materials.

2. Shrubs:

a. No shrubs shall be pruned without consent of the Landscape Architect. The objectives of shrub pruning are the same as for trees. Shrubs shall not be clipped into balled or boxed forms under any circumstances unless specified on the planting plans.

b. All pruning cuts shall be made to lateral branches or buds leaving the collar intact. "Stubbing" will not be permitted.

c. Weed Control: Keep basins and areas between plants free of weeds. Hand weeding is required. No herbicides may be used.

d. Insect and Disease Control: Maintain a reasonable control with approved materials per the City of Ojai Earth Friendly Management Policy.

3.03 GROUNDCOVER CARE

A. Weed Control: Control weeds by mechanical means so as to cause minimal damage to planted materials.
B. Watering: Water enough that moisture penetrates throughout root zone and only as frequently as necessary to maintain healthy growth.
C. Remove trash weekly.

3.05 IRRIGATION SYSTEM

A. The Contractor shall check weekly all systems for proper operation:
1. Check pressure regulator for correct pressure setting (PSI).

2. Check controller program for correct operation.

B. Set and program automatic controllers for seasonal water requirements. Give Owner a key to controllers and written instructions on how to turn off system in case of emergency.
C. Contractor is responsible for the complete operation and maintenance of the irrigation system except, per zones installed, as noted herein (See 1.05 - warrantee and replacement).
D. Repair/correct all damages/malfunctions to irrigation system at Contractor's expense. Repairs shall be made within 1 watering period.

END OF SECTION 32 01 00

SECTION 32 12 16 -

ASPHALT PAVING

PART 1 GENERAL

1.1 SUMMARY

A. Asphalt Concrete paving within parking lot areas

1.2 RELATED SECTIONS

A. Section 32 17 23 - Pavement Markings: Painted pavement markings, lines, and legends.

1.3 REFERENCE STANDARDS

A. Standard Plans and Specifications for Public Works Construction, 2019 Edition

B. Geotechnical Engineering Study SS-502-S prepared by Solid Soils and Geologic Consultants dated November 21, 2024, and all report updates.

C. City of Ojai Standard Details and Design Criteria

D. American Association of State Highway and Transportation Officials:
   1. AASHTO M29 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.
   2. AASHTO M140 - Standard Specification for Emulsified Asphalt.
   3. AASHTO M208 - Standard Specification for Cationic Emulsified Asphalt.
   4. AASHTO M320 - Standard Specification for Performance-Graded Asphalt Binder.
   5. AASHTO M324 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
   6. AASHTO MP1a - Standard Specification for Performance-Graded Asphalt Binder.

E. Asphalt Institute:
   1. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot- Mix Types.
   2. AI MS-19 - Basic Asphalt Emulsion Manual.
   3. AI SP-2 - Superpave Mix Design.

F. ASTM International:
   1. ASTM C1371[-2004a] - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
   2. ASTM C1549[-2004] - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
   3. ASTM D242 - Standard Specification for Mineral Filler For Bituminous Paving Mixtures.
   4. ASTM D692 - Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures.
   5. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.
   6. ASTM D977 - Standard Specification for Emulsified Asphalt.
   7. ASTM D1073 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.
   8. ASTM D1188 - Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples

9. ASTM D2027 - Standard Specification for Cutback Asphalt (Medium-Curing Type).
10. ASTM D2397 - Standard Specification for Cationic Emulsified Asphalt.
11. ASTM D2726 - Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.
12. ASTM D2950 - Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
13. ASTM D3381 - Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.
14. ASTM D3515 - Standard Specification for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
15. ASTM D3549 - Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:
1. Submit product information for asphalt and aggregate materials.
2. Submit mix design with laboratory test results supporting design. The CONTRACTOR shall formulate a job-mix formula using the Hveem method in accordance with S.S.P.W.C. Section 203-6.2 and submit it to the ENGINEER for approval. The resultant mixture shall have Hveem properties conforming to S.S.P.W.C. Section 203-6.4.3.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Mixing Plant: Conform to SSPWC standards

B. Obtain materials from same source throughout.

C. Perform Work in accordance with SSPWC standards

PART 2 PRODUCTS

2.1 MATERIALS

A. All materials shall conform to the requirements put forth in the Contract Documents, the City of Ojai Design Guidelines, and latest revisions thereto.

2.2 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Submit proposed mix design for review prior to beginning of Work.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify utilities indicated under paving are installed with excavations and trenches backfilled and compacted.

3.2 DEMOLITION

A. Saw cut and notch existing paving as indicted on Drawings.

B. Clean existing paving to remove foreign material, excess joint sealant and crack filler from paving surface.

C. Repair surface defects in existing paving to provide uniform surface to receive new paving.

3.3 INSTALLATION

A. Subbase:
   1. Prepare subbase in accordance with recommendations of soils report.

B. Asphalt Paving:
   1. Install Work in accordance with SSPWC standards.
   2. Compact paving by rolling to specified density. Do not displace or extrude paving from position.
   3. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

C. Asphalt Paving Overlay
   1. Apply asphalt cement to existing paving surface at rate recommended by geotextile fabric manufacturer.
   2. Compact overlay by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
   3. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.4 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Variation from Indicated Elevation: Within 1/2 inch.

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting, testing.

3.6 PROTECTION

A. Immediately after placement, protect paving from mechanical injury until surface temperature is less than 140 degrees F

END OF SECTION 32 12 16

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SECTION 32 13 13 -

CONCRETE PAVING

PART 1 GENERAL

1.1 SUMMARY

A. Portland Cement Concrete (PCC) paving for curbs, gutters, sidewalks, parking lots, and driveway pavements.

1.2 RELATED SECTIONS

A. Section 31 20 00 – Earthwork

1.3 REFERENCES

A. Standard Specifications for Public Works Construction (SSPWC), 2019.

B. Standard Plans for Public Works Construction (SPPWC).

C. American Concrete Institute (ACI) Standards.

D. American Society for Testing and Materials (ASTM) Standards.

E. Geotechnical Engineering Study SS-502-S prepared by Solid Soils and Geologic Consultants dated November 21, 2024, and all report updates.

F.

1.4 PERFORMANCE REQUIREMENTS

A. Surface Tolerances: Surface deviation shall not be in excess of 3/16 inch in 10 feet.

B. Thickness Tolerances: Thickness shall not be 1/2 inch or more less than that specified for an average of no more than 30 percent of the area of the slab.

C. Elevation Tolerances: Variation from indicated elevation within 1/4 inch.

D. Cracking: All cracking shall occur within cut or hand tooled control joints.

1.5 SUBMITTALS

A. Product Data: Submit data on joint filler, admixtures, and curing compounds.

B. Concrete Mix Design: Submit current mix design with aggregate gradation, cylinder compression test results, and mix proportioning prior to beginning work. Design shall not be dated prior to three years before start date.

C. Delivery Tickets: Submit concrete delivery tickets, indicating mix I.D. number, time water was added, elapsed time from when water was added and concrete placed, and amounts of additional water added.

D. Work Schedule: Submit schedule to allow at least 24-hour notice of work to be performed or concrete poured to allow for appropriate schedules for testing and inspection.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ACI and SSPWC Standards.

B. Maintain one copy of each document on site.

C. Obtain cementitious and aggregate materials from same source throughout.

1.7 QUALIFICATIONS

A. Installer: Company specializing in performing work of this section with documented experience.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when base surface temperature is less than 40 degrees F unless approved by Engineer, or surface is wet or frozen.

B. Concrete placed in cold weather conditions shall be done in accordance with ACI 306.

C. Conform to ACI 305 when concreting during hot weather.

PART 2 PRODUCTS

2.1 FORM MATERIALS

A. Form Materials: As specified in Section 303-5.2 of the SSPWC.

2.2 REINFORCEMENT

A. Reinforcing for concrete shall be grade 60 steel bars in accordance with SSPWC Section 201-2.

2.3 CONCRETE MATERIALS

A. Concrete materials shall be 520-C-2500 Portland Cement Concrete per SSPWC Section 201-1.

2.4 CONCRETE MIX

A. Mix and deliver concrete in accordance with ASTM C94.

B. Use accelerating admixtures in cold weather only. Use of admixtures will not relax cold weather placement requirements.

C. Use calcium chloride only when approved by the Engineer.

D. Use set retarding admixtures during hot weather only when approved by the Engineer.

2.5 SEALERS

A. Refer to SSPWC Section 201-3 for sealing agents.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify compacted subgrade is acceptable and ready to support imposed loads.

B. Verify gradients and elevations of subgrade are correct.

3.2 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete. Compact subgrade material to a depth of 12 inches beneath aggregate base to 95 percent relative compaction.

B. Coat surfaces of manhole, catch basin, and valve box frames with oil to prevent bond with concrete pavement.

C. Notify Soils Engineer minimum 24 hours prior to commencement of concreting operations.

D. Contractor to coordinate with Soils Engineer to determine if the use of lime and/or concrete treatment is applicable to reduce pavement thickness.

3.3 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.4 REINFORCEMENT

A. Place reinforcement as indicated on the Drawings. Do not deviate from the required position.

B. Place reinforcement to achieve pavement and curb alignment as detailed.

C. Place, support, and secure reinforcement against displacement.

D. Provide doweled joints as indicated at interruptions of concrete (construction joint) at curbs and gutter, and all longitudinal joints.

3.5 PLACING CONCRETE

A. Place concrete in accordance with ACI 301 and 304 and SSPWC Sections 302-6 and 303-5.

B. Place concrete using mechanical screed, slipform, or form paving type equipment, which will strike off, consolidate, and finish the pavement to the required cross section. A minimum 10-foot bull float or “bump cutter” shall be used following any paving equipment.

C. Ensure reinforcement, inserts, embedded parts, formed joints, and manhole or valve box lids are not disturbed during concrete placement.

D. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

E. Use of a vibrator or proper speed and size to properly consolidate the concrete when screeding by hand.

F. All curbs shall be poured monolithically.

G. Pre-molded 0.25-inch thick expansion joints conforming to SSPWC Section 303-5.4.2 shall be placed at ends of all curb returns and around utility poles.

H. Construct weakened plane joints conforming to SSPWC Section 303-5.4.3, ¾-inch deep, at intervals not exceeding 12 feet.

I. Score lines conforming to SSPWC, Section 303-5.5.3 shall be made in walks.

3.6 JOINTS

A. Place weakened plane joints at 10 foot intervals maximum on center, or width of walk, whichever is less. Construct expansion joints along walls and buildings. Align curb, gutter, and sidewalk joints when at all possible.

B. Joints shall be constructed by sawing concrete after is has set or by hand forming in the plastic concrete with an appropriate jointing tool. The transverse joints shall be hand tooled before the concrete has set.

C. Sawing shall begin as soon as the concrete has hardened sufficiently as to not allow raveling and before uncontrolled cracking occurs. Sawing shall take place regardless of time of day or weather conditions to assure proper joints.

D. Saw cut contraction joints to the width and depth indicated.

3.7 FINISHING

A. Portland cement concrete paving shall have a medium salt (medium broom) finish on all surfaces less than 6 percent and slip resistant (heavy broom finish) on all surfaces greater than 6 percent.

B. Direction of Texturing: Transverse to pavement direction.

3.8 JOINT SEALING

A. Proper cleaning and preparation of joints shall be completed prior to sealing operations, including but not limited to sandblasting per the sealant manufacturer’s instructions. A clean

joint shall be dry and have no visible signs of residual sealant or debris on the joint face, and will leave no residual cement powder or dust on your finger after rubbing the joint face.

B. All joints, including between pavement and curb, shall be sealed with joint sealant and backer rod.

C. Do not install sealant when temperature is below the dew point. If rain or other inclement weather occurs during joint preparation or sealing, all operations should cease and sufficient time must be allowed so that the joints are dry prior to starting or continuing the sealing operation.

D. A field adhesion test must be performed on a test section as follows:

1. Make a knife cut horizontally from one side of the joint to the other.
2. Make two vertical cuts (from horizontal cut) approximately 3 inches long, at both sides of the joint.
3. Place a mark 1-inch from the point where the 3-inch cuts stop.
4. Grasp the 2-inch piece of sealant firmly just beyond the 1-inch mark and pull at a 90-degree angle.
5. If dissimilar substrates are being sealed, check the adhesion of sealant to each substrate separately. This is accomplished by extending the vertical cut along one side of the joint, checking adhesion to the opposite side and then repeating for the other surface.
6. The adhesion test is considered passing when 1 inch of sealant is elongated to 4 inches without bond loss.

3.9 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed in accordance with ACI 301.

B. Provide free access to Work and cooperate with appointed firm.

C. Inspection and testing shall be performed by the Owner’s Testing Laboratory.

D. The Owner's Testing Laboratory will perform slump and compressive strength tests.

E. Contractor shall maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.10 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, wind, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for a period necessary for hydration of cement and hardening of concrete.

C. Apply curing compound to unformed surfaces immediately after finishing, not to exceed 300 square feet per gallon.

D. Remove forms only after concrete has attained sufficient strength to support all dead and live loads.

E. Contractor shall provide barricading or personnel as necessary to protect freshly finished concrete from vandalism or other damage.

END OF SECTION 32 13 13

SECTION 32 14 13

PRECAST CONCRETE UNIT PAVING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Division 01 Specification Sections, Drawings, General Conditions, Supplementary General Conditions, and Special Conditions apply to this section.
   1. Comply with 2024 Greenbook Standard Specifications.

1.2 SUMMARY

A. Section Includes:
   1. Concrete Paver Units (manually installed).
   2. Bedding and Joint Sand.
   3. Edge Restraints.
   4. Joint sand stabilizers.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM C 33, Standard Specification for Concrete Aggregates.
   2. ASTM C 67, Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile, Section 8, Freezing and Thawing.
   3. ASTM C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
   4. ASTM C 140, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
   5. ASTM C 144, Standard Specification for Aggregate for Masonry Mortar.
   6. ASTM C 936, Standard Specification for Solid Concrete Interlocking Paving Units.
   7. ASTM C 979, Standard Specification for Pigments for Integrally Colored Concrete.
   8. ASTM D 698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,000 ft-lbf/ft^3 (600 kN-m/m^3)).
   9. ASTM D 1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).
   10. ASTM D 2940, Specification for Graded Aggregate Material for Bases or Subbases for Highways or Airports.

B. Concrete Pavement Institute (ICPI):
   1. ICPI Tech Spec Technical Bulletins

1.4 SUBMITTALS

A. In accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

B. Manufacturer's drawings and details: Indicate perimeter conditions, relationship to adjoining materials and assemblies, expansion and control joints, concrete paver layout, patterns, color arrangement, installation and setting details.

C. Sieve analysis per ASTM C 136 for grading of bedding and joint sand.

D. Concrete pavers:
1. [Four] representative full-size samples of each paver type, thickness, color, finish that indicate the range of color variation and texture expected in the finished installation. Color selected by Landscape Architect from manufacturer's available colors.
2. Accepted samples become the standard of acceptance for the work.
3. Test results from an independent testing laboratory for compliance of concrete pavers with ASTM C 936.
4. Manufacturer's certification as having met applicable ASTM standards.
5. Manufacturer's catalog product data, installation instructions, and material safety data sheets for the safe handling of the specified materials and products.

E. Paver Installation Subcontractor:
1. A copy of Subcontractor's current certificate from the Concrete Pavement Institute Concrete Paver Installer Certification program.
2. Job references from projects of a similar size and complexity. Provide Owner/Client/General Contractor names, postal address, phone, fax, and email address.

1.5 QUALITY ASSURANCE

A. Paving Subcontractor Qualifications:
1. Utilize an installer having successfully completed concrete paver installation similar in design, material, and extent indicated on this project.
2. Utilize an installer holding a current certificate from the Concrete Pavement Institute Concrete Paver Installer Certification program.

B. Regulatory Requirements and Approvals: Per City of Ojai Public Works Department applicable licensing, bonding or other requirements of regulatory agencies.

C. Mock-Ups:
1. Install a 7 ft x 7 ft (2 x 2 m) paver area.
2. Use this area to determine surcharge of the bedding sand layer, joint sizes, lines, laying pattern(s), color(s) and texture of the job.
3. This area will be used as the standard by which the work will be judged.
4. Subject to acceptance by the Landscape Architect, mock-up may be retained as part of finished work.
5. If mock-up is not retained, remove and properly dispose of mock-up.

1.6 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirement Section.

B. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers packaging with identification labels intact.

1. Coordinate delivery and paving schedule to minimize interference with normal use of buildings adjacent to paving.
2. Deliver concrete pavers to the site in steel banded, plastic banded or plastic wrapped packaging capable of transfer by forklift or clamp lift.
3. Unload pavers at job site in such a manner that no damage occurs to the product.

D. Storage and Protection: Store materials protected such that they are kept free from mud, dirt, and other foreign materials. Store concrete paver cleaners and sealers per manufacturer's instructions.
1. Cover bedding sand and joint sand with waterproof covering if needed to prevent exposure to rainfall or removal by wind. Secure the covering in place.

1.7 PROJECT/SITE CONDITIONS

A. Environmental Requirements:
1. Do not install sand or pavers during heavy rain or snowfall.
2. Do not install sand and pavers over frozen base materials.
3. Do not install frozen sand or saturated sand.
4. Do not install concrete pavers on frozen or saturated sand.

1.8 MAINTENANCE

A. Extra Materials: Provide 10% additional material for use by owner for maintenance and repair.

B. Pavers shall be from the same production run as installed materials.

PART 2 PRODUCTS

2.01 CONCRETE PAVERS

A. Manufacturer: Angelus Paving Stones
1. Contact: Rialto Paver Plant at (951) 328-9115 or Oxnard Plant at (805-485-1137)

B. Concrete Pavers:
1. Paver Type: Antique Cobble I (rectangle) 60mm
a. Material Standard: Comply with material standards set forth in ASTM C 936.
b. Color Solid: Stone. Standard finish, not tumbled.
c. Color Pigment Material Standard: Comply with ASTM C 979.
d. Average Compressive Strength (C140): 8000 psi (55 MPa) with no individual unit under 7200 psi (50 MPa) per ASTM C 140.
e. Average Water Absorption (ASTM C 140): 5% with no unit greater than 7%.
f. Freeze/Thaw Resistance (ASTM C 67): Resistant to 50 freeze/thaw cycles with no greater than 1% loss of material. Freeze-thaw testing requirements shall be waived for applications not exposed to freezing conditions
g. Manually installed pavers may be installed with or without spacer bars. Size: 5.51. inches width x 8.25 inches length x 2 3/8.] inches [60 mm] height.

2.02 PRODUCT SUBSTITUTIONS

A. Substitutions: Alternatives:
   1. Concrete to match adjacent walk, color and finish.
   2. Stabilized decomposed granite. Organic Lock stabilizer or equal to meet ADA requirements. Local supplier: Gail Materials (951) 667-6106

2.03 BEDDING AND JOINT SAND

A. Provide bedding and joint sand as follows:
   1. Washed, clean, non-plastic, free from deleterious or foreign matter, symmetrically shaped, natural or manufactured from crushed rock.
   2. Do not use limestone screenings, stone dust, or sand for the bedding sand material that does not conform to conform to the grading requirements of ASTM C 33.
   3. Do not use mason sand or sand conforming to ASTM C 144 for the bedding sand.
   4. Where concrete pavers are subject to vehicular traffic, utilize sands that are as hard as practically available.
   5. Sieve according to ASTM C 136.
   6. Bedding Sand Material Requirements: Conform to the grading requirements of ASTM C 33 with modifications as shown in Table 1.

Table 1
Grading Requirements for Bedding Sand

ASTM C 33 Sieve Size	Percent Passing
3/8 in.(9.5 mm)	100
No. 4 (4.75 mm)	95 to 100
No. 8 (2.36 mm)	85 to 100
No. 16 (1.18 mm)	50 to 85
No. 30 (0.600 mm)	25 to 60
No. 50 (0.300 mm)	10 to 30
No. 100 (0.150 mm)	2 to 10
No. 200 (0.075 mm)	0 to 1

   2. Joint Sand Material Requirements: Conform to the grading requirements of ASTM C 144 as shown with modifications in Table 2 below:

Table 2
Grading Requirements for Joint Sand

	ASTM C 144 Natural Sand	ASTM C 144 Manufactured Sand
Sieve Size	Percent Passing	Percent Passing
No. 4 (4.75 mm)	100	100
No. 8 (2.36 mm)	95 to 100	95 to 100
No. 16 (1.18 mm)	70 to 100	70 to 100
No. 30 (0.600 mm)	40 to 75	40 to 100
No. 50 (0.300 mm)	10 to 35	20 to 40
No. 100 (0.150 mm)	2 to 15	10 to 25
No. 200 (0.075 mm)	0 to 1	0 to 10

2.04 EDGE RESTRAINTS

A. Provide edge restraints installed around the perimeter of all concrete paving unit areas as follows:
   1. Manufacturer: Permaloc.
   2. Material: Aluminum header, and concrete walk, CMU raised planter.
   3. Material Standard: Brickblock - aluminum brick and paver restraint, .065" x ¾", mil finish – natural aluminum.

2.05 ACCESSORIES

A. Provide accessory materials as follows:
   1. Geotextile Fabric:
      a. Material Type and Description: Non-woven
      b. Material Standard: 6 oz.
      c. Manufacturer: DeWitt
   3. Joint Sand Stabilizers
   4. Material Type and Description: Logic Sand Pro, polymeric
      a. Material Standard: ASTM C144 graded sand
      b. Manufacturer: Angelus.

PART 3 EXECUTION

3.01 EXAMINATION

5. General Contractor shall inspect, accept and certify in writing to the paver installation subcontractor that site conditions meet specifications for the following items prior to installation of interlocking concrete pavers
   a. Verify that subgrade preparation, compacted density and elevations conform to specified requirements, not less than 98% standard Proctor density per ASTM D 698.
   b. Verify that geotextiles, have been placed according to drawings and specifications.
6. Verify that Aggregate base materials, thickness, not less than 98% standard Proctor density per ASTM D 698.
   a. compacted density], surface tolerances and elevations conform to specified requirements.
   b. Provide written density test results for soil subgrade, aggregate base materials to the General Contractor and paver installation subcontractor.
   c. Verify location, type, and elevations of edge restraints.
7. Do not proceed with installation of bedding sand and concrete pavers until subgrade soil and base conditions are corrected by the General Contractor or designated subcontractor.

3.02 PREPARATION

A. Verify base is dry, certified by General Contractor as meeting material, installation and grade specifications.

C. Verify that base and geotextile fabric is ready to support sand, edge restraints, and, pavers and imposed loads.

D. Edge Restraint Preparation:
   1. Install edge restraints per the drawings and manufacturer's recommendations at the indicated elevations.
   2. Mount directly to finished base. Do not install on bedding sand.

3. The minimum distance from the outside edge of the base to the spikes shall be equal to the thickness of the base.

3.03 INSTALLATION

A. Spread bedding sand evenly over the base course and screed to a nominal 1 in. (25 mm) thickness, not exceeding 11/2 in. (40 mm) thickness. Spread bedding sand evenly over the base course and screed rails, using the rails and/or edge restraints to produce a nominal 1 in. (25 mm) thickness, allowing for specified variation in the base surface.
   1. Do not disturb screeded sand.
   2. Screeded area shall not substantially exceed that which is covered by pavers in one day.
   3. Do not use bedding sand to fill depressions in the base surface.

B. Lay pavers in pattern(s) shown on drawings. Place units hand tight without using hammers. Make horizontal adjustments to placement of laid pavers with rubber hammers and pry bars as required.

C. Provide joints between pavers between [1/16 in. and 3/16 in. (2 and 5 mm)] wide. No more than 5% of the joints shall exceed [1/4 in. (6 mm)] wide to achieve straight bond lines.

D. Joint (bond) lines shall not deviate more than ±1/2 in. (±15 mm) over 50 ft. (15 m) from string lines.

E. Fill gaps at the edges of the paved area with cut pavers or edge units.

F. Cut pavers to be placed along the edge with a [double blade paver splitter or] masonry saw.

G. Adjust pattern at pavement edges such that cutting of edge pavers is minimized. Cut pavers at edges as indicated on the drawings.

H. Keep skid steer and forklift equipment off newly laid pavers that have not received initial compaction and joint sand.

I. Use a low-amplitude plate compactor capable of at least minimum of 4,000 lbf (18 kN) at a frequency of 75 to 100 Hz to vibrate the pavers into the sand. Remove any cracked or damaged pavers and replace with new units.

J. Simultaneously spread, sweep and compact dry joint sand into joints continuously until full. This will require at least 4 to 6 passes with a plate compactor. Do not compact within 6 ft (2 m) of unrestrained edges of paving units.

K. All work within 6 ft. (2 m) of the laying face shall be left fully compacted with sand-filled joints at the end of each day or compacted upon acceptance of the work. Cover the laying face or any incomplete areas with plastic sheets overnight if not closed with cut and compacted pavers with joint sand to prevent exposed bedding sand from becoming saturated from rainfall.

L. Remove excess sand from surface when installation is complete.

M. Allow excess joint sand to remain on surface to protect pavers from damage from other trades. Remove excess sand when directed by General Contractor.

N. Surface shall be broom clean after removal of excess joint sand.

3.04 FIELD QUALITY CONTROL

A. The final surface tolerance from grade elevations shall not deviate more than ± 3/8 in. (±10 mm) under a 10 ft (3 m) straightedge.

B. Check final surface elevations for conformance to drawings.

C. The surface elevation of pavers shall be 1/8 in. to 1/4 in. (3 to 6 mm) above adjacent drainage inlets, concrete collars or channels.

D. Lippage: No greater than 1/8 in. (3 mm) difference in height between adjacent pavers.

3.05 JOINT SAND STABILIZATION

A. Apply joint sand stabilization materials between concrete pavers in accordance with the manufacturer's written recommendations.

3.06 PROTECTION

B. After work in this section is complete, the General Contractor shall be responsible for protecting work from damage due to subsequent construction activity on the site.

END OF SECTION 32 14 13

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SECTION 32 31 13

CHAINLINK FENCES AND GATES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. DIVISION 01 - GENERAL REQUIREMENTS: Drawings, quality, product and performance requirements, general and supplemental conditions apply as applicable to the project and project documents.
B. Comply with 2024 Greenbook Standard Specifications.

1.2 SUMMARY

A. This Section includes industrial/commercial chain link fence and gates specifications:
   1. Aluminum coated steel chain link fabric
   2. Galvanized steel framework and fittings
   3. Gates: swing and cantilever slide
   4. Installation

1.3 REFERENCES

A. ASTM A491 Specification for Aluminum-Coated Steel Chain-Link Fabric

B. ASTM A780 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

C. ASTM F552 Standard Terminology Relating to Chain Link Fencing

F. ASTM F567 Standard Practice for Installation of Chain Link Fence

G. ASTM F626 Specification for Fence Fittings

H. ASTM F900 Specification for Industrial and Commercial Swing Gates

I. ASTM F1043 Specification for Strength and Protective Coatings of Steel Industrial Chain Link Fence Framework

J. ASTM F1083 Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures

K. ASTM F1184 Specification for Industrial and Commercial Horizontal Slide Gates

L. ASTM F2200 Specification for Automated Vehicular Gate Construction

M. UL325 Automatic operators: Door, Drapery, Gate, Louver and Window

1.4 SUBMITTALS

A. Shop drawings: Site plan showing layout of fence location with dimensions, location of gates and opening size, cleared area, elevation of fence, gates, footings and details of attachments.

B. Material samples: When required, provide representative samples of chain link fabric, framework and fittings.

C. Specification Changes: May not be made after the date of bid.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Framework, posts, rails, fabric, and fittings for chain link fence system:
1. **MERCHANTS METALS®** www.merchantsmetals.com
Tech-Info@merchantsmetals.com
Phone: (888) 260-1600 Fax: (888) 261-3600

2.2 CHAIN LINK FABRIC

A. Steel Chain Link Fabric: 4' height, 2" mesh, 6 gauge,

1. **ARMORLINK®** Aluminum–Coated Steel Fabric (Aluminized): ASTM A491.

2. Fabric Selection Table: Steel chain link mesh size: 2" and 6 gauge, produced in one piece widths 3 feet (910 mm) to 12 feet (3660 mm)

Mesh Size In. (mm)	**6 gauge core** 0.192 in.	**9 gauge core** 0.148 in.	**11 gauge core** 0.120 in.	**11 1/2 gauge core** 0.113 in.	**12 Gauge core** 0.105 in.	**Notes**
	4.88 mm	3.76 mm	3.05 mm	2.87 mm	2.67 mm	N/A = Not applicable for
2 (50)	yes	yes	yes	N/A	N/A	industrial/commercial
1 ¾ (44)	yes	yes	yes	N/A	N/A	applications
1 (25)	N/M	yes	yes	N/A	N/A	N/M = Not manufactured
5/8 (16)	N/M	yes	yes	yes	yes*	*12 ga. only per F668
1/2 (13)	N/M	yes	yes	yes	yes*	
3/8 (10)	N/M	N/M	yes	yes	yes*	
	2170 lbf	1290 lbf	850 lbf	750 lbf	650 lbf	Wire Break Strength
	(9650 N)	(5740 N)	(3780 N)	(3340 N)	(2895 N)	

3. Fabric selvage:
Fabric less than 72 in (1.8 m), knuckle finish top and bottom, K&K

2.3 ROUND STEEL PIPE FENCE FRAMEWORK

A. Round steel pipe and rail: Schedule 40 standard weight pipe, in accordance with ASTM F1083, 1.8 oz/ ft² (550 g/m²) hot dip galvanized zinc exterior and 1.8 oz/ft² (550 g/m²) hot dip galvanized zinc interior coating.
Regular Grade: Minimum steel yield strength 30,000 psi (205 MPa)
High Strength Grade: Minimum yield strength 50,000 psi (344 MPa)
[Specify Grade: Regular or High Strength]
1. Line post <Insert outside diameter, zinc coating, weight >
2. End, Corner, Pull post <Insert outside diameter, zinc coating, weight >
3. Top, brace, bottom and intermediate rails, 1.660 in. (42.2 mm) OD: <Insert outside diameter, zinc coating, weight>

C. Typical post and rail size for normal Commercial / Industrial applications

Item	**Fence Height**	**Outside Diameter Inches (mm)**	***F1083 Schedule 40 Weight lb/ft (kg/m)**	**F1043-IC (LG-40) Weight lb/ft (kg/m)**
Line post	up to 6 ft. (1.8 m)	1.900 (48.3)	2.72 (4.0)	2.28 (3.39)
	over 6 to 8 ft. (1.8 to 2.4 m)	2.375 (60.3)	3.65 (5.4)	3.12 (4.64)
	over 8 to 12 ft. (2.4 to 3.7 m)	2.875 (73.0)	5.79 (8.6)	4.64 (6.91)

	over 12 to 16 ft. (3.7 to 4.9 m)	4.000	(101.6)	9.11	(13.6)	6.56	(9.78)
Terminal post	up to 6 ft. (1.8 m)	2.375	(60.3)	3.65	(5.4)	3.12	(4.64)
	over 6 to 8 ft. (1.8 to 2.4 m)	2.875	(73.0)	5.79	(8.6)	4.64	(6.91)
	over 8 to 12 ft. (2.4 to 3.7 m)	4.000	(101.6)	9.11	(13.6)	6.56	(9.78)
	over 12 to 16 ft. (3.7 to 4.9 m)	6.625	(168.3)	18.97	(28.2)	Not available	
		8.625	(219.1)	28.58	(42.5)	Not available	
Rails		1.660	(42.2)	2.27	(3.4)	1.84	(2.74)

*Regular Grade F1083 Schedule 40

Framework Wind Load Caution:
Fences containing windscreens or privacy slats and fences greater than 8 feet (2.4 m) in height using, 1 in. (25 mm) mesh or smaller - recommend a wind load force analysis for post selection and post spacing. See Chain Link Manufactures Institute – Wind Load Guide CLFMI: WLG 2445. A interactive Wind load Fence Post Calculator is available at www.wheatland.com]

2.4 TENSION WIRE

1. Metallic Coated Steel Marcelled Tension Wire: 7 gauge core (0.177 in.) (4.50 mm) marcelled wire complying with ASTM Type I Aluminum–Coated **ARMORLINK®** (Aluminized) 0.40 oz/ft² (122 g/m²)

2.6 FITTINGS

A. Tension and Brace Bands: Galvanized pressed steel complying with ASTM F626, minimum steel thickness of 12 gauge (0.105 in.) (2.67 mm), minimum width of 3/4 in. (19 mm) and minimum zinc coating of 1.20 oz/ft² (366 g/m²). Secure bands with 5/16 in. (7.94 mm) galvanized steel carriage bolts.

B. Terminal Post Caps, Line Post Loop Tops, Rail and Brace Ends, Boulevard Clamps, Rail Sleeves: In compliance to ASTM F626, pressed steel galvanized after fabrication having a minimum zinc coating of 1.20 oz/ft² (366 g/m²).

C. Truss Rod Assembly: In compliance with ASTM F626, 3/8 in. (9.53 mm) or 5/16” (7.94 mm) diameter steel truss rod with a pressed steel tightener, minimum zinc coating of 1.2 oz/ft² (366 g/m²), assembly capable of withstanding a tension of 2,000 lbs. (970 kg).

D. Tension Bars: In compliance with ASTM F626. Galvanized steel one-piece length 2 in. (50 mm) less than the fabric height. Minimum zinc coating 1.2 oz. /ft² (366 g/m²).
*[Bars for 2 in. (50 mm) and 1 ¾ in. (44 mm) mesh shall have a minimum cross section of 3/16 in. (4.8 mm) by 3/4 in. (19 mm)]
*[Bars for 1 in. (25 mm) mesh shall have a cross section of 1/4 in. (6.4 mm) by 3/8 in. (9.5 mm)]
*[Small mesh 3/8 in. (10 mm), 1/2 in. (13 mm) and 5/8 in. (16 mm) shall be attached (sandwiched) to the terminal post using a galvanized steel strap having a minimum cross section of 2 in. (51 mm) by 3/16 in. (4.8 mm) with holes spaced 15 in. (381 mm) on center to accommodate 5/16 in. (7.9 mm) carriage bolts which are to be bolted thru the strap the mesh and thru the terminal post.]

2.7 TIE WIRE and HOG RINGS

A. Basic commercial / industrial applications - specify 9 gauge core aluminum alloy ties and hog rings per ASTM F626.

2.9 SWING GATES

A. Swing Gates: Galvanized steel pipe welded fabrication in compliance with ASTM F900. Gate frame members 1.900 in. OD (48.3 mm) ASTM F1043 Group IC **(LG-40)** galvanized steel pipe.

Frame members spaced no greater than 8 ft. (2440 mm) apart vertically and horizontally. Welded joints protected by applying zinc-rich paint in accordance with ASTM Practice A780. Positive locking gate latch, pressed steel galvanized after fabrication. Galvanized malleable iron or heavy gauge pressed steel post and frame hinges. Provide lockable drop bar and gate holdbacks with double gates. Match gate fabric to that of the fence system. Gateposts per ASTM F1083 schedule 40 galvanized steel pipe. Gatepost diameter from table 2.9 B: 2.375 in. (60.3mm), 3.65 lb/ft (5.4 kg/m).

B. Gateposts: Regular Grade ASTM F1083 Schedule 40 pipe

Gate fabric height up to and including 6 ft. (1.2m)		
Gate leaf width	**Post Outside Diameter**	**Weight**
up to 4 ft. (1.2 m)	2.375 in. (60.3 mm)	3.65 lb/ft (5.4 kg/m)
over 4 ft. to 10 ft. (1.2 to 3.05 m)	2.875 in. (73.0 mm)	5.79 lb/ft (8.6 kg/m)
over 10 ft. to 18 ft. (3.05 to 5.5 m)	4.000 in. (101.6 mm)	9.11 lb/ft (13.6 kg/m)
Gate fabric height over 6 ft. to 12 ft. (1.2 to 2.4m)		
Gate leaf width		
up to 6 ft. (1.8 m)	2.875 in. (73.0 mm)	5.79 lb/ft (8.6 kg/m)
over 6 ft. to 12 ft. (1.8 to 3.7 m)	4.000 in. (101.6 mm)	9.11 lb/ft (13.6 kg/m)
over 12 ft. to 18 ft. (2.4 to 5.5 m)	6.625 in. (168.3 mm)	18.97 lb/ft (28.2 kg/m)
over 18 ft. to 24 ft. (5.5 to 7.3 m)	8.625 in. (219.1 mm)	28.58 lb/ft (42.5 kg/m)

2.11 CONCRETE

Concrete for post footings shall have a 28-day compressive strength of 2,500 psi. (17.2 MPa).

PART 3 EXECUTION

3.1 CLEARING FENCE LINE

Clearing: Surveying, clearing, grubbing, grading and removal of debris for the fence line or any required clear areas adjacent to the fence is included in the earthwork contractor's contract under the provisions of Division 31 – Earthwork. The contract drawings indicate the extent of the area to be cleared and grubbed.

3.2 FRAMEWORK INSTALLATION

A. Posts: Posts shall be set plumb in concrete footings in accordance with ASTM F567. Minimum footing depth, 24 in. (609.6 mm) plus an additional 3 in. (76.2 mm) depth for each 1 ft. (305 mm) increase in the fence height over 4 ft. (1220 mm). Minimum footing diameter four times the largest cross section of the post up to a 4.00" (101.6 mm) dimension and three times the largest cross section of post greater than a 4.00" (101.6 mm) dimension. Local codes, site soil conditions, local frost depth, fence height and wind load may require larger diameter or deeper footings - See Chain Link Manufactures Institute – Product Guide and Wind Load Guide CLFMI: WLG 2445. Top of concrete footing to be at grade crowned to shed water away from the post or 6 inches (152 mm) below grade, crowned to shed water away from the post. Line posts installed at intervals not exceeding 10 ft. (3.05 m) on center.

B. Top rail: When specified, install 21 ft. (6.4 m) lengths of rail continuous thru the line post or barb arm loop top. Splice rail using top rail sleeves minimum 6 in. (152 mm) long. Rail shall be secured to the terminal post by a brace band and rail end. Bottom rail or intermediate rail shall be field cut and secured to the line posts using boulevard clamps or brace band with rail end.

C. Terminal posts: End, corner, pull and gate posts shall be braced and trussed for fence 6 ft. (1.8 m) and higher and for fences 5 ft. (1.5 m) in height not having a top rail. The horizontal brace rail and diagonal truss rod shall be installed in accordance with ASTM F567.

D. Tension wire: Shall be installed 4 in. (101.6 mm) up from the bottom of the fabric. Fences without top rail shall have a tension wire installed 4 in. (101.6 mm) down from the top of the fabric. Tension wire to be stretched taut, independently and prior to the fabric, between the terminal posts and secured to the terminal post using a brace band. Secure the tension wire to each line post with a tie wire

3.3 CHAIN LINK FABRIC INSTALLATION

Chain Link Fabric: Install fabric to [outside or inside] of the framework maintaining a ground clearance of no more than 2 inches (50 mm). Attach fabric to the terminal post by threading the tension bar through the fabric; secure the tension bar to the terminal post with tension bands and 5/16 in. (7.94 mm) carriage bolts spaced no greater than 12 inches (304.8mm) on center. Small mesh fabric less than 1 in. (25 mm), attach to terminal post by sandwiching the mesh between the post and a vertical 2 in. wide (50mm) by 3/16 in. (4.76 mm) galvanized steel strap using carriage bolts, bolted thru the bar, mesh and post spaced 15 in. (381 mm) on center. Chain link fabric to be stretched taut free of sag. Fabric to be secured to the line post with tie wires spaced no greater than 12 inches (304.8 mm) on center and to horizontal rail spaced no greater than18 inches (457.2 mm) on center. Aluminum alloy tie wire shall be installed following ASTM F567: Wrap the tie around the post or rail and attached to a fabric wire picket on each side of the post or rail by twisting the tie wire around the fabric wire picket two full turns, cut off excess wire and bend over to prevent injury. Preformed 9 gauge power-fastened wire ties shall be installed following ASTM F626: Wrap the tie a full 360° around the post or rail and fabric wire picket, using a variable speed drill, twist the two ends together three full turns, cut off any excess wire and bend over to prevent injury. Secure the fabric to the tension wire by crimping hogs rings around a fabric wire picket and tension wire.

3.5 GATE INSTALLATION

A. Swing Gates: Installation of swing gates and gateposts in compliance with ASTM F 567. Direction of swing shall be [inward or outward.] Gates shall be plumb in the closed position having a bottom clearance of 3 in. (76 mm), grade permitting. Hinge and latch offset opening space shall be no greater than 3 in. (76 mm) in the closed position. Double gate drop bar receivers shall be set in a concrete footing minimum 6 in. (152 mm) diameter 24 in. (609.6 mm) deep. Gate leaf holdbacks shall be installed for all double gates. Electrically operated gates must be manufactured and installed in compliance with ASTM F2200 and UL 325.

3.6 NUTS AND BOLTS

Bolts: Carriage bolts used for fittings shall be installed with the head on the secure side of the fence. All bolts shall be peened over to prevent removal of the nut.

3.7 ELECTRICAL GROUNDING

Grounding: Grounding of the fence and gates is not the responsibility of the fence contractor and not included in the fencing scope of work for this contract. Grounding, when required, shall be specified and included in Contract Section 33 79 00 Site Grounding. A licensed electrical contractor shall install grounding when required.

3.8 CLEAN UP

Clean Up: The area of the fence line shall be left neat and free of any debris caused by the installation of the fence.

END OF SECTION 32 31 13

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SECTION 32 80 00

IRRIGATION

PART 1 GENERAL

1.01 SUMMARY

A. Drawings and general provisions of contract, including general and supplementary conditions and Division 1 specification sections, apply to this section.
1. Comply with 2024 Greenbook Standard Specifications.

B. Furnish labor, material, equipment and services necessary to furnish and install the irrigation system as shown on the drawings and described herein.
1. Automatic irrigation system including piping, fittings, irrigation heads and accessories.
2. Valves, and fittings.
3. Swappable module, rain sensor, control wire.
4. Testing.
5. Excavating and backfilling irrigation system work.
6. Associated plumbing and accessories to complete the system.
7. Pipe sleeves.

C. Related Sections:
1. 320100 – Maintenance
2. 329300 – Plants

1.02 QUALITY ASSURANCE

A. Manufacturer's Directions: Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturers of the articles used in the work of this section furnish directions covering points not shown on the drawings or specified.

B. Installation shall be a company specializing in the installation of irrigation work, with a minimum of five years current documentation.

C. Explanation of Drawings:
1. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, sleeves, etc., which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all of the work and plan the work accordingly, furnishing such fittings, etc. as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between irrigation systems, planting and architectural features.
2. The Contractor shall not install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in area dimensions exist that might not have been considered in engineering. Such obstructions or differences should be brought to the attention of the Owner's Authorized Representative. In the event this notification is not performed, the Contractor shall assume full responsibility for revisions necessary.

1.03 SUBMITTALS

A. Material List:

1. Furnish the articles, equipment, materials, and processes specified in the drawings and specifications. No substitutions will be allowed without written request and approval.
2. Submit complete materials list prior to performing work. Include the manufacturer, model number and description of all materials and equipment to be used.

B. Record Drawings:
1. These drawings shall also serve as work progress sheets. Make neat and legible annotations thereon daily as the work proceeds, showing the work as actually installed. These drawings shall be available at all times for inspections.
2. Dimension from 2 permanent points of reference, building corners, sidewalk, or road intersections, etc., the location of the following items:
   a. Connection to existing water lines.
   b. Connection to existing electrical power.
   c. Ball valves.
   d. Routing of irrigation pressure lines (dimension max. 100 feet along routing).
   e. Irrigation control valves.
   f. Routing of control wiring.
   g. Quick couplers.
   h. Other related equipment.

C. Controller Charts:
1. Drawings shall be approved by the Landscape Architect before controller charts are prepared.
2. Provide one controller chart in coordination with Owner’s Maintenance Personnel.
3. The chart shall show the area controlled by the automatic controller as pertains to this project and shall be the maximum size which the controller door will allow.
4. The chart is to be a legible reduced drawing of the actual system.
5. A different color shall be used on the chart to indicate the area of coverage for each station.
6. When completed and approved, hermetically seal the chart between two pieces of plastic (laminated).
7. These charts shall be completed and approved prior to final inspection of the irrigation system.

D. Operation and Maintenance Manuals:
1. Prepare and deliver to the Landscape Architect within ten calendar days prior to completion of construction, two binders containing the following information:
   a. Index sheet stating Contractor's address and telephone number, list of equipment with name and addresses of local Manufacturer's Representative.
   b. Catalog and parts sheets on every material and equipment installed under this contract.
   c. Warranty statement.
   d. Complete operating and maintenance instruction on all major equipment.
2. In addition to these maintenance manuals, instruct Owner’s Maintenance Personnel regarding operation of major equipment and show written evidence to the Landscape Architect at the conclusion of the project that his service has been rendered.

E. Equipment to be Furnished:
1. Supply the following tools:
   a. Two sets of special tools required for removing, disassembling and adjusting each type of irrigation head and valve supplied on this project.
   b. One quick coupler key and matching hose swivel for every 5 or fraction thereof of each type of quick coupling valve installed.
2. Turn over the above-mentioned equipment to the Owner at the conclusion of the project. Before final inspection can occur, evidence that the Owner has received material shall be shown to the Landscape Architect.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Handling of PVC pipe and Fittings and Blu-Lock pipe and fittings: The Contractor is cautioned to exercise care in handling, loading, unloading, and storing of PVC pipe and fittings and Blu-Lock pipe and fittings. Transport all PVC and Blu-Lock so as not to subject it to undue bending or concentrated external load at any point. Any section of pipe that has been dented or damaged shall be discarded and, if installed, shall be replaced with new piping.

B. Cover any pipe stored outdoors to protect it from sunlight.

1.05 WARRANTY

The following warranty form shall be typed on Contractor's letterhead:

WARRANTY FOR SPRINKLER IRRIGATION SYSTEM

We hereby warranty that the sprinkler irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications, ordinary wear and tear, unusual abuse or neglect excepted. We agree to repair or replace any defects in material or workmanship which may develop during a period of one year from the date of acceptance, and also to repair or replace any damage resulting from the repairing or replacing of such defects, at no additional cost to the Owner. We will perform such repairs or replacements within three days after receipt of written notice. In the event of our failure to perform such repairs or replacements within a reasonable time after receipt of written notice from Owner, we authorize the Owner to proceed to complete said repairs or replacements at our expense and we will pay the costs and charges therefore upon demand.

PROJECT:

CONTRACTOR:

ADDRESS:

PHONE NO.:

BY:

DATE OF ACCEPTANCE:

BY:

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Use only new materials of brands and types noted on drawings, specified herein, or approved equals.

B. PVC Pressure Main Line Pipe and Fittings:
1. Pressure main line piping shall be Crestline or equal, PVC SCH 40 pipe.
2. Pipe shall be made from an NSF approved Type I, Grade I PVC compound conforming to ASTM resin specification D1784. All pipe shall meet requirements as set forth in Federal Specification PS-22-70, with an appropriate standard dimension (S.D.R.)(Solvent-weld pipe).
3. PVC solvent-weld fittings shall be Schedule 80, 1-2, II-I NSF approved conforming to ASTM test procedure D2466.

4. Solvent cement and primer for solvent-weld and fittings shall be of type and installation methods prescribed by the manufacturer.
5. All PVC pipe shall bear the following markings:
   a. Manufacturer's name.
   b. Nominal pipe size.
   c. Schedule or class.
   d. Pressure rating in P.S.I.
   d. NSF (National Sanitation Foundation) approval.
   g. Date of extrusion.
6. All fittings shall bear the manufacturer's name or trademark, material designation, size, applicable I.P.S. schedule and NSF seal of approval.

C. PVC Non-Pressure Lateral Line Piping:
1. Non-pressure buried lateral line piping shall be Blu-Lock or equal, ABS or Class 200 PVC..
2. Blu-lock pipe shall be made from ABS
3. Except as noted in Paragraphs 1, 2, 3, and 4 of Article 2.01.B, requirements for non-pressure lateral line pipe and fittings shall be the same as for solvent-weld pressure main line size fittings as set forth in Article 2.01B of this Section.

D. PVC Pipe Sleeves: All piping installed under paving, through walls or footings shall be placed inside Schedule 40 PVC pipe sleeves of adequate size to allow free movement of the pipe and fittings within the sleeve. Sleeve sizes 2 1/2” and larger shall be Class 200.

E. Copper Pipe and Fittings: Type "L" copper pipe with wrought copper fittings.

F. Brass Pipe & Fittings:
1. Brass pipe shall be 85 percent red brass, American National Standard Institute (ANSI), Schedule 40 screwed pipe.
2. Fittings shall be medium brass, screwed 125 pound class.

G. Quick Coupler Valves: With valve key(s), of type and size as specified on the drawings.

H. Hose Bibbs: On galvanized riser, redwood post mount, of type and size as specified on the drawings.

I. Pressure Regulator: Use shall be determined in the field. Type and size as approved by the Owner’s Representative.

J. Control Wiring:
1. Connections between the automatic controller and the electric control valves shall be direct-burial, two-wire decoder connections. Maximum recommended distance, decoder to solenoid: 45 m maximum distance to decoder via two-wire path: - 14 AWG wire path: 10,000'- 12 AWG wire path: 15,000'. Approvals: UL, CUL, FCC, CE, UKCA, RCM Decoder rating: IP68 (submersible) ID WIRE MAXIMUM wire runs ID 1 Wire 5,000' with legacy DUAL™ systems ID 2 Wire 7,500 with legacy DUAL™ systems 10,000 with ICD systems 15,000' with ICD systems ID WIRE MODEL GUIDE 14 AWG Decoder Cable ID1GRY Gray jacket 12 AWG Long-Range, Heavy-Duty Decoder Cable. ID2GRY Gray jacket ID WIRE MODEL GUIDE 14 AWG Decoder Cable. ID1PUR Purple jacket 12 AWG Long-Range, Heavy-Duty Decoder Cable ID2PUR ID1YLW ID1ORG ID1BLU ID1TAN Yellow jacket Orange jacket Blue jacket Tan jacket ID2YLW ID2ORG ID2BLU ID2TAN.
2. Wiring shall occupy the same trench and shall be installed along the same route as pressure supply or lateral lines wherever possible.
3. Where more than 1 wire is placed in a trench, the wiring shall be taped together, already under the mainline, at intervals of 10 feet.
4. An expansion curl shall be provided within 3 feet of each wire connection. Expansion curl shall be of sufficient length at splice connection at each electric control, so that in case of repair, the bonnet may be brought to the surface without disconnecting the control wires. Control wires shall be laid loosely in trench without stress or stretching of control wire connectors.
5. Splices shall be made with Hunter Waterproof Splice Kit for all direct-burial, two-wire decoder connections. Use one splice per connector sealing pack.

6. Field splices between the automatic controller and electrical control valves will not be allowed without prior approval of the Landscape Architect.
7. Connections between electrical services and equipment shall be in rigid galvanized electrical conduit, with conduit and wiring sizes as required.

K. Automatic Controller:
1. Automatic controller: Hunter Industries Inc., as specified on the drawings.
2.. The 120-volt electrical power to the automatic controller location is noted on the drawings.

L. Electrical Control Valves:
1. All electric control valves shall be of the size and type shown on the drawings.
2. All electric control valves shall have a manual flow adjustment, and if specified on drawings, shall be pressure regulating.
3. Provide and install one control valve box for each electric control valves.

M. Check Valve:
1. Shall be PVC construction to meet schedule 80 thickness specifications
2. Shall be adjustable to compensate up to 32 feet of elevation change
3. Shall have 3/4” female inlet and 3/4”male outlet

N. Pressure Regulating Remote Control Valve for Subsurface Irrigation System:
1. Shall be made of glass-filled nylon construction rated for 200 psi
2. Shall have a flow range of 0.25 to 200 GPM
3. Shall have an internal ported manual bleed
4. Shall have a captive solenoid plunger
5. Shall have a fabric reinforced diaphragm rated for operation up to 200 psi
6. Shall have a built-in pressure regulator with dial adjustment from 20 to 100 psi

O. Control Valve Boxes:
1. Use round box for all ball valves, Carson Industries, with cover or approved equal. Extension sleeve shall be PVC-6 inches minimum size.
2. Use rectangular box for all electrical control valves, Carson Industries, with cover or approved equal.

P. Irrigation Heads:
1. Irrigation heads shall be of the same size, type, and deliver the same rate of precipitation with the diameter (or radius) of throw, pressure, and discharge as shown on the drawings or as specified.
2. Riser units shall be fabricated in accordance with the details as shown on the drawings.
3. Riser nipples for all irrigation heads shall be the same size as the riser opening in the irrigation head opening.
4. Irrigation heads of the same type shall be of the same manufacturer as specified on the plans.

Q. Underground Locator Tape: Mylar type, 2” wide or wider.

R. Rain Sensor
1. Shall be as manufactured by Hunter Industries Inc. Rain-Clik as specified on drawings.

PART 3 EXECUTION

3.01 SITE CONDITIONS

A. Scaled dimensions are approximate. The Contractor shall check and verify all size dimensions and report any discrepancies to the Landscape Architect prior to proceeding with work in this section.
B. Exercise extreme care in excavating and working near existing utilities. Contractor shall be responsible for damages to utilities which are caused by the Contractor's operations or neglect. Verify location of existing utilities prior to starting work.

C. Coordinate installation of irrigation materials including pipe, so there shall be no interference with utilities or other construction or difficulty in planting trees, shrubs and groundcovers.
D. Carefully check grades before starting work on the irrigation system.

3.02 PREPARATION

A. Physical Layout:
1. Prior to installation, stake out pressure supply lines, routing and location of irrigation heads.
2. Layout shall be approved by the Landscape Architect prior to installation.

B. Water Supply:
1. Connect the irrigation system to water supply point of connection indicated.
2. Make connections at approximate locations shown. Contractor is responsible for minor changes caused by actual site conditions.

3.03 INSTALLATION OF MAIN SYSTEM

A. Trenching:
1. Dig trenches straight and support pipe continuously on bottom of trench. Lay pipe to an even grade. Trenching excavation shall follow layout indicated on drawings and as noted.
2. Provide for a minimum of 18 inches cover for all pressure supply lines.
3. Provide for a minimum of 12 inches cover for all non-pressure lines.
4. Provide for a minimum of 18 inches cover for all control wiring.

B. Backfilling:
1. Do not backfill trenches until required tests are performed.
2. Initial backfill on lines shall be of a fine granular material, no larger than 1/16 inch diameter.
3. Compact backfill in landscaped areas to a dry density equal to adjacent undisturbed soil in planting area. Backfill will conform to adjacent grades without dips, sunken areas, humps or other surface irregularities.
3. Flooding of trenches will be permitted only with the approval of the Landscape Architect.
4. If settlement occurs and subsequent adjustments in pipe, valves, irrigation heads, lawn or planting, or other construction is necessary, make all required adjustments without cost to the Owner.

C. Trenching and Backfill Under Paving:
1. Backfill trenches located under areas where paving, asphaltic concrete or concrete will be installed with sand (a layer 6 inches below the pipe and 3 inches above the pipe) and compact in layers to 95 percent compaction, using manual or mechanical tamping devices. Compact trenches for piping to equal the compaction of the existing adjacent undisturbed soil and leave in a firm unyielding grade. Set in place, cap and pressure test, all piping under paving prior to the paving work.
2. Piping under existing walks is generally done by jacking, boring or hydraulic driving, but where any cutting or breaking of sidewalks or concrete is necessary, it shall be done and replaced by the Contractor as a part of the contract cost. Obtain permission to cut or break sidewalks or concrete from the Landscape Architect. No hydraulic driving will be permitted under concrete paving.
3. Provide for a minimum cover of 18 inches between the top of the pipe and the bottom of the aggregate base for all pressure and on-pressure piping installed under asphaltic concrete paving.

D. Valve Assemblies:
1. Routing of irrigation lines as indicated on the drawings is diagrammatic. Install lines (and various assemblies) in such a manner as to conform with the details.
2. Install no multiple assemblies in plastic lines. Provide each assembly with its own outlet.

3. Install assemblies specified herein in accordance with respective detail. In absence of detail drawings or specifications pertaining to specific items required to complete the work, perform such work in accordance with best standard practice with prior approval of the Landscape Architect.

4. PVC and Blu-Lock pipe fittings shall be thoroughly cleaned of dirt, dust and moisture before installation. Installation and solvent welding methods shall be as recommended by the pipe and fitting manufacturer.

5. On PVC to metal connections, work the metal connections first. Use Teflon tape, or approved equal, on threaded PVC, and on threaded PVC to metal joints. Light wrench pressure is all that is required. Where threaded PVC connections are required, use threaded PVC adapters into which the pipe may be welded.

E. Line Clearance: Lines shall have a minimum clearance of 6 inches from each other and from lines of other trades. Parallel lines shall not be installed directly over one another.

F. Automatic Controller with Swappable Module Option: Install per manufactures instructions. Connect remote control valves to controller in numerical sequence as shown on the drawings.

G. Flushing of System:

1. After new sprinkler pipe lines and risers are in places and connected, and necessary diversion work has been completed, and prior to installation of sprinkler heads, open the control valves and flush out the system using a full head of water.

2. Install sprinkler heads only after the system has been flushed to the complete satisfaction of the Landscape Architect.

H. Remote Control Valves: Install where shown on drawings and details. When grouped together, allow at least 12 inches between valves. Label each controller and station number at the valve with a 2-1/4 inch by 2-3/4 inch polyurethane I.D. tag attached to the control wire of the valve.

I. Rain Shut-off Device

1. Locate on wall such that top of device is open to the sky, and is not impeded by any structures, including trellises, umbrellas or building eaves.

2. Install per Manufacturer’s instructions.

J. Irrigation Heads:

1. Install the irrigation heads as designated.

2. Spacing of heads shall not exceed the maximum indicated. In no case shall the spacing exceed the maximum recommended by the manufacturer.

K. Drip Line:

1. Install drip lines as designated.

2. Spacing of drip lines shall not exceed the maximum indicated. In no case shall the spacing exceed the maximum recommendation by the manufacturer.

3.04 TEMPORARY REPAIRS

The Owner reserves the right to make temporary repairs as necessary to keep the irrigation system equipment in operating condition. The exercise of this right by the Owner shall not relieve the Contractor's responsibility under the contract documents.

3.05 EXISTING TREES AND SHRUBS

Where it is necessary to excavate adjacent to existing trees and shrubs, use all possible care to avoid injury to trees, tree roots and shrubs. Excavation in areas where 1 inch and larger roots occur shall be done by hand. All roots 1 inches and larger in diameter, except directly in the path of pipe or conduit, shall be tunneled under and shall be heavily wrapped with burlap to prevent scarring or excessive drying. Where a ditching machine is run close to trees having roots smaller than 2 inches in diameter, the wall of the trench adjacent to the tree shall be hand trimmed, making clean cuts through.

3.06 FIELD QUALITY CONTROL

A. Adjustment of the System:

1. If it is determined that adjustments in the irrigation equipment will provide proper and more adequate coverage, make adjustments prior to planting.

B. Testing of Irrigation System:

1. Request the presence of the Landscape Architect in writing at least 48 hours in advance of testing.
2. Test pressure lines under hydrostatic pressure of 150 pounds per square inch and prove watertight. NOTE: Testing of pressure mainlines shall occur prior to installation of electrical control valves.
3. Test piping under paved areas under hydrostatic pressure of 150 pounds per square inch and proved watertight prior to paving.
4. Sustain pressure in lines for not less than 2 hours. If leaks develop, replace joints and repeat test until entire system is proven watertight.
5. Make hydrostatic tests only in the presence of the Landscape Architect or other duly-Authorized Representative of the Owner. Do not backfill pipe until it has been duly inspected, tested, and approved.
6. Furnish necessary force pump and all other test equipment.
7. When the irrigation system is completed, perform a coverage test in the presence of the Landscape Architect, to determine if the water coverage for planting areas is complete and adequate. Furnish all materials and perform work required to correct inadequacies of coverage due to deviations from drawings, or after bringing this to the attention of the Landscape Architect. This test shall be accomplished before any groundcover is planted.
8. Upon completion of each phase of work, test and adjust the entire system to meet site requirements.

C. Material List: Equipment or materials installed or furnished which are not indicated on the drawings or specified, may be rejected and the Contractor required to remove such materials from the site at the Contractor's expense.

3.07 MAINTENANCE

A. The irrigation system shall be under full automatic operation for a period of 7 days prior to any planting. Drip lines shall be installed after planting.

B. The Landscape Architect reserves the right to waive or shorten the operation period.

3.08 CLEANING

Clean-up as each portion of work progresses. Remove refuse and excess dirt from the site, sweep all walks and paving clean, and repair damage to the work of others, and return to original conditions.

3.09 FINAL OBSERVATION PRIOR TO ACCEPTANCE

A. Operate each system in its entirety for the Landscape Architect at time of final observation. Any items deemed not acceptable by the Landscape Architect shall be reworked to the complete satisfaction of the Landscape Architect.

B. Show evidence to the Landscape Architect that the Owner has received all accessories, charts, record drawings, and equipment as required before final observation can occur.

3.10 OBSERVATION SCHEDULE

A. Notify the Landscape Architect in advance for the following observation meetings, according to the time indicated:

1. Pre-job conference: 7 days.
2. Pressure supply line installation and testing: 48 hours.
3. Reservoir installation and testing: 48 hours.
4. Automatic controller module installation: 48 hours.
5. Control wire installation: 48 hours.
6. Lateral line and emitter installation: 48 hours.
7. Coverage test: 48 hours.
8. Final inspection: 7 days.

B. When observations have been conducted by other than the Landscape Architect, show evidence in writing of when and by whom these observations were made.

C. No site observations will commence without record drawings.

3.11 DEMONSTRATION

Provide the Owner's maintenance personnel with instructions for use of irrigation equipment and show evidence in writing to the Landscape Architect at the conclusion of the project that this service has been rendered

END OF SECTION 32 80 00

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SECTION 32 92 00

TURF AND GRASSES

PART 1 GENERAL

1.1 SUMMARY

A. Comply with 2024 Greenbook Standard Specifications.
B. Section Includes:

1. Sodding.

1.2 REFERENCES

C. Hortus III – 1976 Edition, Bailey Hortorium, Cornell University.

D. Guideline Specifications to Turfgrass Sodding – 1995 Edition, By Turfgrass Producers International

1.3 DEFINITIONS

E. Finish Grade: Elevation of finished surface of planting soil.

F. Manufactured Soil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

G. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

H. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

I. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

1.4 SUBMITTALS

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

K. Certification of grass sod. Delta Blue Grass Tall Fescue 90/10

L. Product certificates.

D. Planting Schedule: Indicating anticipated planting dates for each type of planting.

1.5 QUALITY ASSURANCE

A. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.

B. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory or by supplier.

1. Report suitability of topsoil for lawn growth.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Sod: Harvest, deliver, store, and handle sod according to requirements in TPI's "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in its "Guideline Specifications to Turfgrass Sodding." Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying.

1.7 PROJECT CONDITIONS

A. Do not install lawns during rainy or freezing weather, or when soil is frozen.

1.8 TIMING OF INSTALLATION

A. Sod:

1. Immediately after finish grading is accepted.

2. Allow sufficient time for sod to knit together and meet requirements for preliminary review.

1.9 WARRANTY

A. Time Period: Warrant that lawns are in healthy and flourishing condition of vigorous active growth one year from date of Final Acceptance.

B. Appearance During Warranty: Lawns shall be free of dead or dying patches, and all areas shall show foliage of a normal density, size and color.

C. Delays: Delays caused by the Contractor in completing planting operations which extend the

planting into more than one planting season shall extend the Warranty Period correspondingly.

D. Exceptions: Contractor shall not be held responsible for failures due to neglect by Owner, vandalism, or Acts of God during Warranty Period. Report such conditions in writing.

2.0 MAINTENANCE SERVICE

A. Initial Lawn Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:

1. Sodded Lawns: 30 days from date of planting completion.

PART 2 PRODUCTS

2.1 LAWN SOD

A. Nursery-grown sod that is certified Tall Fescue. Delta Blue Grass Tall Fescue 90/10.

B. Local Supplier: Soil Solutions. Contact: Robert Soquist. 805-236-9272

C. Dense, healthy, field-grown, with the grass having been mowed at 1-inch height before lifting from field.

D. Dark green in color, free of thatch, free from diseases, weeds and harmful insects.

E. Reasonably free of objectionable grassy and broad leaf weeds. Sod shall be considered weed free if no more than ten (10) such weeds are found per 100 sq. ft. of sod.

F. Sod shall be rejected if found to contain other grass species, weeds, including invasive species.

G. Rhizome development should be apparent.

2.2 GENERAL ACCESSORIES

H. Water: Potable water as furnished by Owner.

I. Pre-plant Fertilizer: 10 lbs agricultural gypsum per 1000 square feet, till to 6” depth.

J. Top-Dress Fertilizer: BioFlora Dry Crumbles 6-10-1-+ 10% CA.

K. Herbicides: Not allowed. See City of Ojai Earth Friendly Management Policy.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Grades: Verify that grades are within 1-inch plus or minus the required finished grades. Verify that all soil preparation has been completed and approved. Report all variations in writing.

2. Stones, Weeds, Debris: Verify that all areas to receive lawns and grasses are clear of stones larger than 1-1/2 inch in diameter, weeds, debris, and other extraneous materials.

3.2 PREPARATION

A. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

B. Before planting, restore areas if eroded or otherwise disturbed after finish grading.

3.3 SODDING

A. Sod Bed Preparation:

1. Rolling: Roll amended soil with 200 pound water-ballast roller.
2. Moistening Soil Surface: After all unevenness in the soil surface has been corrected, lightly moisten the soil immediately prior to laying the sod.

3. Timing: Sod immediately thereafter, provided the sod bed has remained in friable condition.

B. Sodding Operations :

1. Starter Strip:

a. Lay first row of sod in a straight line, with subsequent rows parallel to and tightly against each other.

b. Stagger lateral joints.

c. Do not stretch or overlap sod.

d. Butt all joints tightly to eliminate all voids.

2. Cutting: Use a sharp knife to cut sod to fit curves, surface components of the irrigation system or other items.

3. Tamping and Rolling: Thoroughly tamp and roll sod to make contact with sod bed. Roll each entire section of completed sod.

4. Watering: Thoroughly water sod immediately after installation to wet the underside of the new sod pad and the soil immediately below to a depth of 6 inches. Maintain constant moisture for 2 weeks or until sod is fully rooted.

5. Top-Dress Fertilizer: Apply BioFlora Dry Crumbles 6-10-1+10% CA at the rate of (7) to (14) pounds per 1,000 square feet at 25 days and at 50 days after sodding.

3.4 LAWN MAINTENANCE

A. Maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, re-grade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth lawn. Provide materials and installation the same as those used in the original installation.

B. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowing.

C. Maintain maximum height of 3” per Ventura County Fire Code, with clippings removed.

D.

3.5 SATISFACTORY LAWNS

A. Satisfactory Sodded Lawn: At end of maintenance period, a healthy, well-rooted, even- colored, viable lawn has been established, free of weeds, open joints, bare areas, and surface irregularities.

B. Use specified materials to reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

3.6 FIELD QUALITY CONTROL

A. Tests: Samples of materials may be taken and tested for conformity to specifications at any time.

B. Rejected Materials: Remove rejected materials immediately from site at Contractor’s expense. Pay cost of testing of materials not meeting specified requirements.

3.7 CLEANING

A. Erosion: Immediately restore eroded areas. Keep all adjacent paved surfaces clear of dirt, mud, stains, and organic debris.

END OF SECTION 32 92 00

SECTION 32 93 00

PLANTS

PART 1 GENERAL

1.01 GENERAL PROVISIONS

A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division 1 specification sections, apply to this section.

1. Comply with 2024 Greenbook Standard Specifications.

B. Furnish all labor, materials and equipment necessary to provide and install trees, plants and groundcovers as shown on the drawings. The Contractor's work shall include:

1. Take representative soil samples.
2. Prepare soil for planting using native on site soil, imported amended topsoil, and imported potting soil. Furnish soil amendments per MWELO preliminary soil test and recommendations and landscape architects specifications .
3. Contractor to supply plant material: trees, shrubs, groundcover and sod.
4. Install plant materials per the planting plans.
5. Stake, tie and guy plant materials as specified.
6. Dispose of trash, debris and surplus materials.
7. Maintain the planting in a vigorous, healthy condition until final project acceptance.

1.02 QUALITY ASSURANCE

A. Contractor must have knowledge and experience with the ornamental and native plants specified. Contractor must also have successfully completed native landscape projects of similar size and nature and demonstrate familiarity and competence with planting techniques and identification of plants native to the Southern California region.

1.03 SUBMITTALS

A. Certified copies of soils analysis results.

B. Manufacturer's or supplier's installation instructions.

C. Samples of each of the following:

1. Mulch material to verify quality selected.
2. Soil amendment materials.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery:

1. Deliver soil amendments to site bearing manufacturer's guaranteed chemical analysis, name, trademark, and conformance to State law.
2. Deliver plants and stockpile with legible identification labels.
   a. State correct scientific plant name and size for each clone, species, or cultivar indicated on plant list.
   b. Use durable waterproof labels with water-resistant ink that will remain legible for at least 60 days.
3. Protect plant material during delivery to prevent damage to root ball or desiccation of leaves.
4. While stored on site, container plants to be fully protected from damage, which could adversely affect germination or plant health.
5. The Contractor shall notify the Landscape Architect 7 days in advance of delivery of plant materials and shall submit an itemized list of the plants in each delivery.

B. Storage:
1. Store plant material in shade and protect from weather and mechanical damage.
2. Maintain and protect plant material not to be planted within 4 hours in a healthy, vigorous condition.

C. Handling: The Contractor is cautioned to exercise care in handling, loading, unloading and storing of plant materials. Plant materials that have been damaged in any way shall be discarded, and, if installed, shall be replaced with undamaged materials at the Contractor's expense.

1.05 JOB CONDITIONS

A. Site Conditions: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify the Landscape Architect before planting.

B. Field Conditions: The planting plan is diagrammatic. Scaled dimensions are approximate. Prior to proceeding with installation work, the Contractor shall verify all dimensions with field conditions and notify the Landscape Architect of any deviation on the drawing.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials shall be of standard, approved and first-grade quality and shall be in prime condition when installed and accepted. Commercially processed or packaged material shall be delivered to the site in the original unopened container bearing the manufacturer's guaranteed analysis. Contractor shall supply the Landscape Architect with a sample of all supplied materials accompanied by analytical data from an approved laboratory source illustrating compliance or bearing the manufacturer's guaranteed analysis.

B. Imported Topsoil: Fertile, friable, natural topsoil of character and texture similar to the project site soil; without admixture of subsoil material, obtained from a well-drained arable site, reasonably free from clay, lumps, coarse sands, stones, plants, roots, sticks, and other foreign materials, with an acidity range of between pH 5.8 and 8.2. The sodium absorption ratio (SAR) shall not exceed 6 and the electrical conductivity (Ece) of the saturation extract of this soil shall not exceed 3.0 milliohms per centimeter at 25 degrees centigrade. The boron content shall be no greater than 1 part per million as measured on the saturation extract. In order to insure conformance, samples of the imported soil shall be submitted to an approved laboratory for analysis prior to, and following, backfilling or provided by the supplier.

C. Guying and Staking Materials: Install per plant schedule and detail.
1. Wood Tree Stakes: Lodge pole pine, 2-inch (min. nominal size) diameter by 8 feet long, by 10 long feet long for 24-inch, 36-inch, and 4-inch box size trees, no split stakes.
2. Ties: Wonder Tie, Z-18, as manufactured by Villa Root Barrier, 1 (800) 891-8338, or approved equal.
3. Guy Wire: 10 gauge galvanized. Notify the landscape architect to determine if needed on all trees 60” box or larger.
4. Turnbuckles/Compression Springs: 1/2 inch galvanized.
5. PVC Pipe: 1/2 Schedule 40 (white).
6. Rubber Hose: rubber garden-type.

D. Jute Netting, 4’ x 225’: DeWitt, dewittcompany.com

E. Anchor Pins, 8 gauge, 6” x 1” x 6”: DeWitt, dewittcompany.com

F. Gopher Baskets: (1 gal, and 5 gal) Root Guard gopher wire baskets manufactured by Diggers, www.gopherbaskets.com

G. ¼ Galvanized Hardware Cloth, 23 gauge, 4’ x 100’. Yardguard or equal.

H. Header Board: metal header board manufactured by Permaloc, (616) 399-9600. info@permaloc.com

H. Water: Must be potable, and/or reclaimed water (as supplied by Casitas Municipal Water District) containing no substances harmful to plant life.

I. Amended Top Soil: Planted areas including lawn and at grade planted beds. Agromin (805) 485-9200.

J. Potting Soil: Planting in raised beds. Agromin (805) 485-9200.

K. Compost 100: Backfill amendment. Agromin (805) 485-9200.

J. Mulch: Planting areas, to a minimum depth of 3", Organic Mulch, and Cover Mulch by Agromin (805) 485.9200 or Contact: (916) 409-6125, approved equal.

K. Mulch: Tree Protection Zones, 6" to 12" of mulch supplied by tree trimmings from tree removals and pruning on site, and existing leaf litter. Additional mulch per the approval of the Landscape Architect.

PART 3 EXECUTION

3.01 EXAMINATION

A. Obtain certification that final grades to within 0.1 foot, have been established prior to commencing planting operations. Provide for inclusion of amendments, settling, etc.

B. Inspect trees, shrubs and liner stock for injury, insect infestation and trees and shrubs for improper pruning.

C. Do not begin planting of trees until deficiencies are corrected or plants replaced.

D. The Contractor shall verify the locations of underground utilities prior to excavation. Damage to any such utilities resulting from the contractor's work shall be repaired at his/her expense.

E. The Contractor shall investigate the site for any subsurface drainage or unusual soil conditions which might prove detrimental to the success of the design as specified on the plan insofar as growth and survival of plant material is concerned. Should any such condition exist, the Contractor shall notify the Landscape Architect and submit a proposal for corrective measures and the cost. Should the Contractor fail to provide such notification, he will be held solely responsible for any corrections deemed necessary by the Landscape Architect should damage occur.

3.02 PREPARATION

A. Soil Analysis:

1. Prior to starting work, the Contractor shall take representative soil samples of Project site from the following areas; areas receiving cut grades and areas receiving fill.
2. Soil shall be analyzed by an approved commercial soil testing company-Wallace Laboratories. 365 Coral Circle. El Segundo, CA, 90245, 1-310-615-0116 or Fruit Growers Laboratory, 805-392-2092 for suitability for ornamental planting as specified on drawings.
3. A copy of the results of this analysis shall be submitted to the Landscape Architect.
4. Contractor shall amend as recommended by the report, only upon approval by the Landscape Architect, to provide a suitable medium for planting. The Contractor shall notify the Landscape Architect of harmful

substances found in the soil. Failure to act as specified may result in Contractor assuming financial responsibility for damage to plants.

B. Soil Preparation:

1. After approximate finished grades have been established, soil shall be conditioned and fertilized according to recommendations provided in the soil analysis report if required. The following amendments shall be uniformly incorporated into the backfill mix.

a. Organic Compost, screened to 1/2" incorporated with on-site soils at the application site prior to use, 4 cu. yards per 1,000 sq. ft. Compost must be mature, passing Solvita Compost Maturity Test to level #6. Test kit available from Solvita at Wood's End Research, P. O. Box 297, Mt Vernon, Maine 04352. solvita@woodsend.org (207) 293-2457

b. Amendments as recommended by the soil analysis report and the consent of the Landscape Architect.

2. At the time of planting, the top 2 inches of all areas to be planted shall be free of stones, stumps, or other deleterious matter 1 inch in diameter or larger, and shall be free from all wire, plaster or similar objects that would be a hindrance to planting or maintenance.

3. Soils which have been compacted by construction activity shall be loosened and made suitable for planting by disking, ripping, or other appropriate means.

C. Soil Preparation: On structure soils if required

1. The soil mix shall be delivered to the site thoroughly mixed and placed while damp, but not wet.

2. The planting mix shall be crowned in the center of all planting areas, installed to the very top of the surrounding planter walls.

3. Prior to planting thoroughly water soils for one week and top off with additional material to top of surrounding planter walls. Crown center of planting areas to 2" above surrounding planter walls.

D. Final Grades:

1. Minor modifications to grade may be required to establish the final grade.

2. Finish grading shall insure proper drainage of the site.

3. Areas shall be graded so that the final grades will be 2 inches below adjacent paved areas, sidewalks, valve boxes, clean-outs, drains, manholes, etc., or as indicated on drawings.

4. Surface drainage shall be directed away from all building foundations and paved areas.

5. Eliminate erosion scars prior to commencing maintenance period.

E. Disposal of Excess Soil: Dispose of any unacceptable soil at an offsite location approved by Landscape Architect.

F. Weed Eradication:

1. Prior to installation of plants, planting area will be free of exotic invasives or other plant material likely to inhibit or confine ornamental and native plant growth. All weed removal operations to be performed at the direction of the Landscape Architect. Mechanical removal of weeds is preferred in most cases.

a. Removal process should not promote spreading of weeds.

b. Remove plants prior to new planting, or ensure no seeds are distributed during removal processes.

c. Entire root system of plants that reproduce by rhizome or stolon must be removed.

2. Herbicides per City of Ojai Earth Friendly Management Policy. Exhibit B.

3.03 PLANTING INSTALLATION

A. General:

1. Actual planting shall be performed during those periods when weather and soil conditions are suitable and in accordance with locally accepted practice. Optimal time for planting California natives is November to March. Construction scheduling shall be coordinated to allow planting to occur during this time.

2. Only as many plants as can be planted and watered on that same day shall be distributed in a planting area.

3. Containers shall be opened and plants shall be removed in such a manner that the ball of earth surrounding the roots is not broken and they shall be planted and watered as herein specified immediately after removal from the containers. Containers shall not be opened prior to placing the plants in the planting area.

B. Installation of Imported Topsoil: Contractor to provide and install imported topsoil in all planting areas as required and per the consent of Landscape Architect to a finish grade of 2 inches below the top of adjacent concrete paving or curbs. Allow for settling.

C. Lay-Out of Plantings: All containerized plants shall be laid out in their containers at the locations indicated by the drawings before plant pits are dug. All such locations shall be approved by the Landscape Architect. If underground construction or utility line is encountered in the excavation of planting areas, other locations for planting may be selected by the Landscape Architect. It shall be the Contractor's responsibility to confirm with the Landscape Architect and governing agencies the location and depth of all underground utilities and obstructions.

D. Planting of Trees, Shrubs and Groundcovers:

1. Excavation for planting shall include the stripping and stockpiling of all acceptable topsoil encountered within the areas to be excavated for trenches, tree holes, plant pits, and planting beds.
2. Excess soil generated from the planting holes and not used as backfill or in establishing the final grades shall be removed from the site.
3. Protect all areas from excessive compaction when trucking plants and other material to the planting site.
4. Center plant in pit or trench.
5. Excavated holes shall have vertical sides with roughened then tapered surfaces and shall be of a size that is twice the diameter or as noted and 1 - 4” less than the depth of the root ball for all trees and shrubs. For individual plant holes, a fork should be used rather than a shovel to loosen soils in order to reduce possible layering of soil types.
6. Set plant plumb and hold rigidly in position until soil has been tamped firmly around ball or roots.
7. Drainage: Good drainage is essential to the establishment and continued health of plants native to dry regions. If the soil will not allow water to drain out of a hole one foot deep in one (1) hour, the Contractor shall notify the Landscape Architect of such a condition before planting begins.
8. Plants which settle deeper than the surrounding grade shall be raised to the correct level. After the plant has been placed, additional backfill shall be added to the hole to cover approximately one-half of the height of the root ball. At this stage, water shall be added to the top of the partly-filled hole to thoroughly saturate the root ball and adjacent soil.
9. Container removal:
    a. Do not injure root ball.
    b. After removing plant, superficially cut edge roots with knife on 3 sides.
10. Box removal:
    a. Remove bottom of plant boxes before planting for plant material less than a 36” box.
    b. Remove sides of box without damage to root ball after positioning plant and partly backfilling.
11. Backfill:

a. The remainder of the hole shall then be backfilled with and thoroughly watered. Do not overly compact backfill by stepping on or tamping soil. If settling occurs after initial watering, additional backfilling may be necessary.

b. Planting holes for California native plants as specified shall be backfilled with: native site soil.
    (1) 3 parts by volume on-site soil.
    (2) 2 parts by volume mature compost, tested for maturity as specified in section 02900
Planting holes for ornamental plants as specified shall be backfilled with Amended Top Soil.
Planting holes in raised beds as specified shall be backfilled with Potting Soil.

Part 2.01 B.

c. After backfilling, an earthen basin shall be constructed around each plant. Construct a double berm for 60” and 72” boxed trees. Each basin shall be of a depth sufficient to hold at least 2 inches of water. The basins shall be constructed of native soil.

12. Watering:

a. Drought tolerant plants, (plants which are native to areas which receive most of their yearly rainfall during the winter months, or those which receive small amounts of rain just a few times a year), once established in their environment, do not need, and often dislike large amounts of water and fertilizer.

b. Extra care should be taken to prevent over watering in clay soil situations. Extremely heavy or very poorly drained soils are not recommended for these plantings, and if such conditions occur, the Contractor shall notify the Landscape Architect prior to planting.

13. Pruning: Pruning shall be limited to the minimum necessary to remove injured twigs and branches, and to shape the plant material as directed by the Landscape Architect. Pruning may not be done prior to delivery of plants.

14. Staking and Guying: Staking and guying of trees shall be completed immediately after planting. All stakes and guys shall be installed as indicated in details. Remove no later than 1 year.

3.04 OBSERVATION SCHEDULE

A. The Contractor shall be responsible for notifying the Landscape Architect in advance for the following site visits, according to the time indicated:

1. Plant material review: 48 hours.
2. Plant layout review: 48 hours.
3. Soil preparation and planting operations: One tree with each type of specified staking shall be approved prior to planting of trees: 48 hours.
4. Pre-maintenance: 7 days.
5. Final walk-through: 7 days.

C. When observations are conducted by someone other than the Landscape Architect, the Contractor shall show evidence in writing of when and by whom these inspections were made.

END OF SECTION 32 93 00

SECTION 33 14 16 -

SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Water piping and accessories normally encountered with water systems from 5 feet outside building

B. Related Requirements:
1. Section 31 05 13 - Soils for Earthwork: Soils for backfill in trenches.
2. Section 31 05 16 - Aggregates for Earthwork: Aggregate for backfill in trenches.
3. Section 31 23 16 - Excavation: Product and execution requirements for excavation and backfill.
4. Section 31 23 17 - Trenching: Execution requirements for trenching.

1.2 REFERENCE STANDARDS

A. American Society of Sanitary Engineering:
1. ASSE 1012 - Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent.
2. ASSE 1013 - Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers.

B. ASTM International:
1. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
3. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR Series).
4. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
5. ASTM D2855 - Standard Practice for Making Solvent Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.

C. American Water Works Association:
1. AWWA C502 - Dry-Barrel Fire Hydrants.
2. AWWA C504 - Rubber-Seated Butterfly Valves.
3. AWWA C508 - Swing-Check Valves for Waterworks Service, 2-In. Through 24-In. (50-mm Through 600-mm) NPS.
4. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service.
5. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution.
6. AWWA C906 - Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 63 In. (1,600 mm), for Water Distribution and Transmission.

D. Standard Specifications for Public Works Construction (SSPWC), 2019.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on pipe materials, pipe fittings, valves, and accessories.

1.4 QUALITY ASSURANCE

A. Perform Work according to SSPWC standards.

PART 2 PRODUCTS

2.1 WATER PIPING

A. PVC Pipe:
1. AWWA C900 Class 305.
2. Fittings: AWWA C111, cast iron.
3. Joints: ASTM D3139 compression gasket ring.

2.2 TAPPING SLEEVES AND VALVES

A. Tapping Sleeves:
1. Manufacturer List:
a. Furnish materials according to Casitas Municipal Water District standards.

B. Tapping Valves:
1. Manufacturer List:
a. Furnish materials according to Casitas Municipal Water District standards.

2.3 BACKFLOW PREVENTERS

A. Manufacturer List:
1. Furnish materials according to Casitas Municipal Water District standards.

B. Reduced Pressure Backflow Preventers:
1. Comply with ASSE 1013.
2. Bronze body, with bronze internal parts and stainless steel springs.
3. Two independently operating, spring-loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve opening under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

C. Double Check Valve Assemblies:
1. Comply with ASSE 1012.
2. Comply with County of Ventura Fire Department and Casitas Municipal Water District.
3. Bronze body with corrosion-resistant internal parts and stainless steel springs.
4. Two independently operating check valves with intermediate atmospheric vent.

2.4 UNDERGROUND PIPE MARKERS

A. Manufacturers:
1. Brimar
2. Seton
3. Approved Equal

B. Plastic Ribbon Tape: Bright colored, continuously printed, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

C. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with “Water" in large letters.

2.5 VALVE BOXES

A. Manufacturer List:
1. Furnish materials according to City of Ventura Water standards.

2.6 MATERIALS

A. Bedding and Cover:
1. Bedding: Fill Type as specified in Section per manufacturer’s specifications
2. Cover: Fill Type per manufacturer’s specifications
3. Soil Backfill from above Pipe to Finish Grade per manufacturer’s specifications.

2.7 ACCESSORIES

A. Concrete for Thrust Restraints per SSPWC and City of Ventura Standard Details.

B. Manhole and Cover: As specified in Section 33 05 13 - Manholes and Structures.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing water utilities, building service connection, and municipal utility water main size, location, and invert are as indicated on Drawings.

3.2 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

D. Protect and support existing distribution piping and appurtenances as Work progresses.

3.3 BEDDING

A. Excavate pipe trench according to Section 31 23 17 - Trenching for Work of this Section.

B. Form and place concrete for pipe thrust restraints at change of pipe direction. Place concrete to permit full access to pipe and pipe accessories per SSPWC.

C. Place bedding material at trench bottom, level fill materials per manufacturer’s specifications.

D. Backfill around sides and to top of pipe with cover fill, tamp in place, and compact per manufacturer’s specifications.

3.4 INSTALLATION - PIPE

A. Install grooved and shouldered pipe joints according to AWWA C606.

B. Route pipe in straight line.

C. Form and place concrete for thrust restraints at each elbow or change of direction of pipe main.

D. Establish elevations of buried piping with not less than 3.5 ft of cover.

3.5 INSTALLATION - METERS

A. Installation Standards: Install Work according to Casitas Municipal Water District standards.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Flush and disinfect system according to Section SSPWC

3.7 FIELD QUALITY CONTROL

A. Pressure test system according to AWWA C600 and the following:
   1. Test Pressure: Not less than 200 psig (1 380 kPa) or 50 psi (345 kPa) in excess of maximum static pressure, whichever is greater.
   2. Conduct hydrostatic test for at least two hours.
   3. Fill section to be tested with water slowly; expel air from piping at high points. Install corporation cocks at high points. Close air vents and corporation cocks after air is expelled. Raise pressure to specified test pressure.
   4. Observe joints, fittings, and valves under test. Remove and renew cracked pipe, joints, fittings, and valves showing visible leakage. Retest.
   5. Correct visible deficiencies and continue testing at same test pressure for additional two hours to determine leakage rate. Maintain pressure within plus or minus 5 psi (34.4 kPa) of test pressure. Leakage is defined as quantity of water supplied to piping necessary to maintain test pressure during period of test.
   6. Compute maximum allowable leakage by the following formula:

L = SD x sqrt(P)/C
L = testing allowance, in gallons per hour (liters per hour)
S = length of pipe tested, in feet (meters)
D = nominal diameter of pipe, in inches (mm)
P = average test pressure during hydrostatic test, in psig (kPa)
C = 148,000 (794 797)
When pipe under test contains sections of various diameters, calculate allowable leakage from sum of computed leakage for each size.

   7. When test of pipe indicates leakage greater than allowed, locate source of leakage, make corrections, and retest until leakage is within allowable limits. Correct visible leaks regardless of quantity of leakage.

END OF SECTION 33 14 16

SECTION 33 31 00 -

SANITARY SEWERAGE PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Gravity sanitary sewer piping and accessories normally encountered with site sewer systems from 5 feet outside building

B. Related Sections:
1. Section 31 05 13 - Soils for Earthwork: Soils for backfill in trenches.
2. Section 31 05 16 - Aggregates for Earthwork: Aggregate for backfill in trenches.
3. Section 31 23 16 - Excavation: Product and execution requirements for excavation and backfill required by this section.
4. Section 31 23 17 - Trenching: Execution requirements for trenching required by this section.
5. Section 31 23 23 - Fill: Requirements for backfill to be placed by this section.

1.2 REFERENCES

A. Standard Specifications for Public Works Construction (SSPWC), 2019.

B. ASTM International:
1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
3. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
4. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
5. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
6. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
7. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
8. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
9. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
10. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data indicating pipe material used, pipe accessories, and cleanouts.

C. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record location of pipe runs, connections, cleanouts, and invert elevations.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with City of Ojai and Greenbook.

1.6 FIELD MEASUREMENTS

A. Verify field measurements and elevations of existing utilities and structures are as indicated prior to construction.

PART 2 PRODUCTS

2.1 SANITARY SEWAGE PIPE

A. Plastic Pipe: ASTM D3034, SDR 35, Poly (Vinyl Chloride) (PVC) material; inside nominal diameter of 4 inches (or as indicated on the plans), bell and spigot style rubber ring sealed gasket joint.
   1. Fittings: PVC.
   2. Joints: ASTM F477, elastomeric gaskets.

2.2 UNDERGROUND PIPE MARKERS

A. Manufacturers:
   1. Brimar
   2. Seton
   3. Approved Equal

B. Plastic Ribbon Tape: Bright colored, continuously printed, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

C. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with “Sewer Service" in large letters.

2.3 BEDDING AND COVER MATERIALS

A. Per manufacturer’s specifications

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify trench cuts are ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

3.2 PREPARATION

A. Correct over excavation with sand or native soil

B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 31 23 17.

B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with manufacturer’s specifications

3.5 FIELD QUALITY CONTROL

A. Compaction Testing: In accordance with ASTM F2619

B. When tests indicate work does not meet specified requirements, remove work, replace and retest.

C. Frequency of Compaction Tests to be determined by soils engineer

3.6 PROTECTION OF FINISHED WORK

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION 33 31 00

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SECTION 33 42 11 -

STORMWATER GRAVITY PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Gravity storm drain piping and accessories normally encountered with site storm drainage systems from 5 feet outside building

1.2 Related Sections:

1. Section 31 05 13 - Soils for Earthwork: Soils for backfill in trenches.
2. Section 31 05 16 - Aggregates for Earthwork: Aggregate for backfill in trenches.
3. Section 31 23 16 - Excavation: Product and execution requirements for excavation and backfill required by this section.
4. Section 31 23 17 - Trenching: Execution requirements for trenching required by this section.

1.3 REFERENCES

A. Standard Specifications for Public Works Construction (SSPWC), 2019.

B. ASTM International:

1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).

C. Manufacturer’s Specifications

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data indicating pipe, pipe accessories, and inlets.

1.5 Approved Manufacturers

A. ADS

B. Approved Equal

PART 2 PRODUCTS

2.1 STORM DRAINAGE PIPING

A. Polyethylene Pipe: ASTM F714, HDPE material

1. Fittings: HDPE.
2. Joints: ASTM F2206, Fabricated Fittings of Butt-Fused Polyethylene (PE)

2.2 UNDERGROUND PIPE MARKERS

A. Manufacturers:
1. Brimar
2. Seton
3. Approved Equal

B. Plastic Ribbon Tape: Bright colored, continuously printed, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

C. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with “Storm Sewer Service" in large letters.

2.3 CATCH BASINS

A. Manufacturers:
1. Brooks Product
2. Jensen Precast
3. NDS
4. Approved Equal

B. Catch Basin Lid and Frame:
1. Construction: Cast iron construction, hinged lid.
2. Lid Design: ADA and heel proof
3. Construction: Plastic grate, flush & atrium

2.4 BEDDING AND COVER MATERIALS

A. Per Manufacturer’s Specifications and City of Ojai Standard Details and Design Guidelines.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify trench is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with sand.

B. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 31 23 17 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Place bedding material at trench bottom, level materials in continuous layers per manufacturer’s specifications.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with manufacturer's specifications.

B. Lay pipe to slope gradients noted on drawings with maximum variation from indicated slope of 1/8 inch in 10 feet.

C. Refer to manufacturer's specifications for backfilling and compacting requirements. Do not displace or damage pipe when compacting.

D. Install trace wire continuous over top of pipe.

E. Install site storm drainage system piping to 5 feet of building. Connect to building storm drainage system.

3.5 INSTALLATION - CATCH BASINS

A. Clear bottom of excavation clean and smooth to correct elevation.

B. Install Work in accordance with manufacturer's specifications.

3.6 FIELD QUALITY CONTROL

A. Compaction Testing: In accordance with ASTM F2619

B. When tests indicate work does not meet specified requirements, remove work, replace and retest.

C. Frequency of Compaction Tests to be determined by soils engineer

3.7 PROTECTION OF FINISHED WORK

A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.
   1. Take care not to damage or displace installed pipe and joints during construction of pipe supports, backfilling, testing, and other operations.
   2. Repair or replace pipe that is damaged or displaced from construction operations.

END OF SECTION 33 42 11

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