



CHABOT- LAS POSITAS COMMUNITY COLLEGE DISTRICT

Facilities Planning & Management Department

March 14, 2008

Addendum No. B **INVITATION FOR BID NO.: 08-07** **Chabot Community & Student Services Center**

All Prospective Bidders:

This Addendum modifies the original Bid Documents for the above Bid. Acknowledge receipt of this addendum in the space provided on the BID PROPOSAL FORM. Failure to do so may subject Bidder to disqualification.

The original Bid Documents, dated February 5, 2008, and Addendum A, dated March 3, 2008, are modified by the revision as follows:

A. Response to Bidders' Questions

- Q1: A211.2 Room #122 "Storage" shows a 4-foot light fixture, not shown on E221.B. Provide fixture type if required.
A1: No light fixture required at Storage 123.
- Q2: C421 shows site light fixtures not shown on E101. If required, provide fixture type identification.
A2: Site lighting shown on C421 is in addition to site lighting shown on E101. See detail 1/C422 for fixture specification.
- Q3: E111 shows Add Alternate #1 for 30kw photovoltaic system. Bid Proposal form shows Add Alternate #1 to be demountable walls – CSCI. Please clarify.
A3: Photovoltaic System is deleted from project scope per Addendum #A.
- Q4: Request prior approval as an equal on the Chabot College Community and Student Services Center. Submitting America Decorative Ceilings "Wave" product, in reference to Section 09546-2 Metal Ceilings.
A4: Product Substitutions are addressed in Division 1 General Requirements, Section 01630 Product Options and Substitutions. Substitutions will be reviewed during the 35-day period after award of Contract.
- Q5: Section 16715-2.04 Termination refers back to Section 16710 Telecom Horizontal Cabling for requirement. It is not clear what type of patch panels are to be used for backbone and horizontal station voice termination..
A5: Terminate the copper backbone cabling on the same type of patch panel as the horizontal cabling. This is the only patch panel listed in section 16710. Refer to T013 for pair allocation per jack.

- Q6: Please confirm that the only building concrete to receive integral color are the cast-in-place pilasters.
- A6: Per replaced spec sections 03345 and 03470 included in this Addendum, all structural and architectural tilt-up concrete panels and cast-in-place pilasters shall have integral color.
- Q7: Section 03345 covers various concrete finishes. Please confirm the following:
1. 3.01A-3: Sacked finish is not applicable to the project.
 2. 3.02B-1: Smooth finish gets a “light-sandblast” finish – S5.
 3. 3.02B-3: Medium etched finish: Is this the “medium sandblast” S1? No description is provided in the specifications.
- A7: See replaced spec section 03345 included in this Addendum for clarification of concrete finishes. Sacked finish will be as required for exposed concrete surfaces, such as curbs etc., and as required by Architect during field inspection of concrete.
- Q8: On T.011 note E-1 says to provide Maxcell Innerducts. Is this supplied by Electrical or the Telecom Contractor?
- A8: Work allocation determined by General Contractor. Telecom drawing lists this work as electrical. Since a section of the duct work is new, placing the innerducts in the electrical scope of work makes sense in this case.
- Q9: Per sheet note #2 on A203.2, the detail for the Mechanical enclosure is 19/A431A. This detail does not exist.
- A9: See AR-28 included in this Addendum for detail referenced.
- Q10: Please advise as to if we can supply signs made of photopolymer rather than etched magnesium for Sign Types B1, C1, C2, C3, C4, C5, E1, H1, H2, H3, I1, I2, I3, K1, L1, L2, L3 and N1. As all these signs are for interior use and are to be painted, the finished products will be indistinguishable to the casual observer. Photopolymer will also offer an economic advantage over the magnesium.
- A10: The magnesium product specified is a superior and more durable material. The substitution of materials is not acceptable.
- Q11: Regarding section 04730 Masonry, Product material “Neoparies”. Unable to find this product on the Drawings. Please identify on Drawings and clarify scope of work.
- A11: Neoparies is referenced as “SS-3” on sheet A501, elevations for Information 101, 102 and Office & Reception 139, 141, 142. SS-3 is the countertop at these locations.
- Q12: Will there be a bid date extension on this project? If so, to what date?
- A12: There will not be any extension to the bid date. Bids are due on March 25, 2008 2PM as originally stated in the Bid documents.

5020 Franklin Drive, Pleasanton, California 94588
Tel. (925)485-5287 FAX (925)485-5294

- Q13: Per Section 00010 Table of Contents, Section 09615 and 13600 are Add Alternates. There is no space on the Bid Form for these alternates.
- A13: Section 13600 Photovoltaic System is deleted from project scope per Addendum #A. Contract to provide section 09615 Water Vapor Emission and Alkalinity Control Systems as part of Base Bid. No changes for Alternates will be made to the Bid Form. See revised Bid Proposal 003500 included in this Addendum that addresses the inclusion of Phase 3 Parking.
- Q14: In Kitchen 171, the floor plan on A502 shows a dishwasher to the left of the sink. On the elevation, it shows a cabinet. Please clarify which is required at this location.
- A14: Refer to AR-29 included in this Addendum.
- Q15: Sheet A201.3 says that there is an elevation for Open Office 140 (140/A502). This detail does not exist.
- A15: No elevation will be provided, as no additional information is required for bid.
- Q16: On Sheet A201.3, detail 7/A612 is reference at gridlines Y-A.5 and 4. This detail does not exist.
- A16: Architectural Seating Section at this location is detail 20/A752.
- Q17: Please review attached substitution request of Acorn AquaContour #A152400B-FG-W36 for specified accessible hi-low drinking fountain.
- A17: Product Substitutions are addressed in Division 1 General Requirements, Section 01630 Product Options and Substitutions. Substitutions will be reviewed during the 35-day period after award of Contract.
- Q18: Please clarify the scope of work in regards to the doors in the demountable partitions. Under Base Bid, will the Owner be providing these doors including all associated hardware? Under the alternate, are the doors to be manufacturer's standard per 10615 or per 08211? The locksets manufacturer's standard per 10615 or per 08710?
- A18: Doors in demountable walls shall be manufacturer's standard per 10615, finished to match flush wood doors in 08211 (ie stained to match) and to receive locksets. Door hardware shall be furnished under section 08710.
- In the Base Bid, Contractor shall furnish and install the door hardware. Owner's vendor shall furnish and install demountable walls including doors, door frames, sidelights and transom glass. Per Alternate 1, Contractor shall furnish and install full scope of demountable walls.
- Q19: Per A302, the louvers at the "Natural Ventilation Enclosure" are regular and acoustical and covered in Division 15. Section 10210 states that these louvers are covered in that section, but does not list acoustical louvers. Please clarify.
- A19: Acoustical Louvers at the Natural Ventilation Enclosure are specified in Division 15.

5020 Franklin Drive, Pleasanton, California 94588
Tel. (925)485-5287 FAX (925)485-5294

Q20: Per 10260 2.02 A.4a, the corner guards are to be full-height. Per 3.01B, they are to be 44" high. Please advise which is correct. A 48" corner guard is the standard for specified model.

A20: Corner guards are to be full-height.

Q21: Please review McNear Brick and Block Permeable Concrete pavers as equal to specified product.

A21: Product Substitutions are addressed in Division 1 General Requirements, Section 01630 Product Options and Substitutions. Substitutions will be reviewed during the 35-day period after award of Contract.

B. Changes to Specifications:

Section 00350 – Bid Proposal: REPLACE entire section with new section 00350 provided in this Addendum.

Section 01810 General Systems Commissioning Requirements: ADD entire NEW section 01810 provided in this Addendum.

Section 03300 – Cast-in-Place Concrete: Revise table 2-1 as follows:

1. Min. % Slag at Tilt-up Wall Panels = 0.
2. Max. total % Flyash and Slag = 15.

Section 03345 Concrete Finishes: REPLACE entire section with new 03345 section included in this addendum.

Section 03470 – Tilt Up Precast Concrete: REPLACE entire section with new 03470 section included in this addendum.

Section 07540 – PVC Thermoplastic Membrane Roofing: REVISE as follows:

1. Section title is revised to "PVC Thermoplastic Membrane Roofing".
2. At paragraph 1.04 B.4, ADD:
 - b. Submit two samples (in small plastic bag) illustrating stone ballast color.**
3. At paragraph 1.08 B, ADD "Duration of warranty shall be manufacturer's standard 20 year warranty".
4. At paragraph 2.01 A, strike "~~Polyolefin~~" and replace with "PVC Thermoplastic Membrane Roofing".
5. At paragraph 2.02 A.1, ADD "...and felt backing."
6. At paragraph 2.02 A.4, thickness is revised to 0.080 inch minimum (clarification of G410-20 membrane thickness noted as 80 mil in 2.02 A.1)
7. Strike paragraph 2.02 A.7a
8. At paragraph 2.02 B.1a, membrane thickness is clarified as 60 mil.

5020 Franklin Drive, Pleasanton, California 94588
Tel. (925)485-5287 FAX (925)485-5294

9. At paragraph 2.02 B.1b, strike "~~Sarnafil G459 Membrane~~".
10. At paragraph 2.02 B.3f, strike "~~Multi-purpose Sealant~~" and replace with "Sika-Plex -1A Sealant."
11. Strike paragraph 2.02 B.3g.
12. At paragraph 2.02 B.3i, strike "~~or G459~~".
13. ADD paragraph 2.02 C.2 as follows:
 2. **Sarnatherm XEPS 25 psi tapered insulation, used at second floor deck area as indicated in Drawings.**
14. ADD paragraph 2.04 L as follows:
 - L. **Protection Membrane: Sarnafil G410 (60 mil) membrane, used at second floor deck area as indicated on Drawings, under installation of ballast.**
15. ADD paragraph 2.04 M as follows:
 - M. **Stone Ballast: 1-1/2" – 2-1/2" well-rounded, well-washed riverbed stone, medium gray color.**
16. At paragraph 3.04 F, ADD "(when used)" to paragraph title.
17. At paragraph 3.05 F, strike "~~over cant strips and~~".
18. At paragraph 3.09 A,
 - a. Membrane thickness of G410 is clarified as 60 mil.
 - b. Strike "~~Do not run walkway over Sarnabars.~~"

Section 09680 – Carpet and Carpet Tile:

1. At paragraph 1.03 B, ADD the following: "**Contractor to identify threshold transitions (Carpet Type CP-6) as described in 3.03C.**"
2. At paragraph 2.02 C.1, Product is changed to "**Grid Overlay #02969**".
3. At paragraph 2.03 A, Product is changed to "**Grid Overlay #02969**".
4. Renumber paragraphs 2.05 and 2.06 to "2.06 Cushion" and "2.07 Accessories"
5. ADD NEW paragraph 2.05 as follows:
 - 2.05 **Carpet Types CP-6 (threshold transitions):**
 - A. **Product: Plexus Colour #02875**
 - B. **Roll Width: 6 feet.**
 - C. **Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E 648 or NFPA 253.**
 - D. **Surface Flammability Ignition: Pass ASTM D 2859 (the "pill test").**
 - E. **VOC Content: Provide CRI Green Label Plus certified product; in**

5020 Franklin Drive, Pleasanton, California 94588
Tel. (925)485-5287 FAX (925)485-5294

lieu of labeling, independent test report showing compliance is acceptable.

F. Color: as indicated on drawings.

G. Construction: Loop.

H. Pile Height Ave: 0.135 inches (not to exceed 1/2 inch).

6. At paragraph 2.07B, strike “~~Embossed aluminum~~” and replace with “Resilient floor transition joiner, vinyl”.

7. ADD paragraph 3.03E as follows:

E. Carpet Type CP-6 is to be installed at threshold transitions (sized to match depth of door frame and width of door opening), where the carpet types of two adjacent spaces are not the same.

Section 10800 – Toilet and Bath Accessories:

1. At paragraph 2.04 K, revise as follows:
 - a. ~~Combination Sanitary Napkin Disposal and Toilet Tissue Dispenser:~~
Stainless...
 - b. Change product to B-270
2. At paragraph 2.04 I.1, revise as follows:
 - a. Size: Per architects dwgs.
3. At paragraph 2.05 I.2, revise as follows:
 - c. Change product to B-5806

Section 10210 – Wall Louvers: STRIKE paragraph 1.01 A.5.

Section 10260 – Corner Guards: REPLACE 3.01B as follows:

B. Position corner guard above floor base to full-height at underside of ceiling.

Section 13700 – Basic Security Requirements: REVISE as follows:

1. Renumber paragraph 1.01 I.7 to I.8
2. Renumber paragraphs 1.01 I.8-13 to I.10-15.
3. ADD NEW paragraph 1.01 I.4 as follows:
 - 4. Section 13735: Intercom System**
4. ADD NEW paragraph 1.01 I.9 as follows:
 - 9. Earthwork: Include trenching, backfilling, boring and soil compaction as required for the installation of underground conduit, in-grade pull boxes, vaults, and bollard foundations. Refer to Division 2, Earthwork.**
5. REPLACE paragraph 1.04 as follows:

5020 Franklin Drive, Pleasanton, California 94588
Tel. (925)485-5287 FAX (925)485-5294

1.04 SYSTEM DESCRIPTION

A. Overview

1. The Chabot – Las Positas Community College District is constructing a 2-story multi-level Community and Student Services Building on the Chabot Campus.
2. The District is converting the existing bus loop area just south of parking lot A/B into additional parking for the Chabot Campus.
3. Security at the new facility to consist of video surveillance, access control and alarm monitoring.
4. Security at the additional parking to consist of video surveillance and emergency blue phone systems.
5. The Community and Student Services Building requires access control and alarm monitoring (ACAMS) to automate opening and closing the buildings, restrict access after hours by cardholder privileges, and monitor specific spaces for intrusion.
6. The additional parking area requires video surveillance to view activity during and after campus hours. The emergency blue phone system allows individuals under duress a means to contact local security.
7. The new system will connect to the Las Positas exiting head end located on the Las Positas Campus over the District's LAN/WAN.
8. Refer to individual sections for detailed description of systems.

Section 13720 – Video Surveillance System: REVISE as follows:

1. Renumber paragraphs 1.01 G.4-6 to G5.7.
 2. ADD NEW paragraph 1.01G.4 as follows:
 4. **Section 13735 Intercom System: includes product information for the intercom system integration with the video surveillance system.**
 3. Renumber 1.02 A.3 to 1.02 A.4
 4. ADD NEW paragraph 1.02 A.3 as follows:
 3. **Route fixed and PTZ camera control and coaxial video cable in underground conduit system to video server located in existing Building 1200. Consider video server existing for parking lot PTZ camera.**
 5. Renumber paragraphs 1.02 B.3-8 to B.4-9
 6. Renumber paragraphs 1.02 B.9-11 to B.11-13
 7. ADD NEW paragraph 1.02 B.10 as follows:
-

5020 Franklin Drive, Pleasanton, California 94588
Tel. (925)485-5287 FAX (925)485-5294

10. Provide light pole-mount day/night PTZ camera as indicated on the site plan to view the overall lot with a default camera position. Include environmental housing with heater and blower.
8. REPLACE paragraph 2.04 C.3 as follows:
 3. Accessories (ALT-13720-02):
 - a. Power Supply: #ENV-PSU
 - b. PTZ Pole Mount: Bosch #ENV-PA1 w/ pole adapter #LTC 9541/01
 - c. Heater/blower unit for exterior cameras
 - d. UTP Adaptor: Nitek VB31PT for distances greater than 1200 feet.
9. Renumber paragraph 3.01 A.5 to A.6
10. ADD NEW paragraph 3.01 A.5 as follows:
 5. Route watertight flex from junction box to camera housing from below on exterior cameras.
11. ADD paragraph 3.01 C.2 as follows:
 2. Utilize spare camera port on existing recording system in Building 1200. Recording system serves parking lot A/B.
12. At paragraph 3.01 D, ADD the following:
 5. Provide underground conduit in joint trench to light poles with cameras.
 6. Route device conduit back to closest IDF room in either Building 200 or Building 1200.
 7. Provide underground low voltage pull boxes near light poles with cameras or future camera locations.
 8. Provide pathway in light pole for low voltage camera cables.

Section 13735 – Intercom System: ADD entire NEW section 13735 included in this Addendum.

Section 13770 – Security System Cabling: REVISE as follows:

1. ADD paragraph 2.01E as follows:
 - E. Intercom System
 1. Communications Cable:
 - a. CAT6 OSP Cable
 - 1) Application: Suitable for outdoor installation within conduit.
 - 2) Conductors:
 - a) Insulated Conductors: 23 AWG solid copper, fully insulated with a polyethylene or equivalent jacket.
 - b) Twisted Pairs: Two insulated conductors “twisted” into a “pair” (twisted pair), individually color-coded to industry standards (ANSI/ICEA Publication S-80-576-1994, and EIA-230).
 - 3) Core & Sheath:

5020 Franklin Drive, Pleasanton, California 94588
Tel. (925)485-5287 FAX (925)485-5294

- a) Cable core (twisted pairs) to contain a tape applied longitudinally (wrapped around it's entirety)
- b) Center member: non-hydroscopic polyolefin fluted or equal
- c) Electrical Performance: Meet or exceed TIA/EIA-568B.2-1 requirements for CAT6 OSP cabling.
- 4) Manufacturer:
 - a) Systimax #1571 004ABK 4/23 R1000

2. Intercom Activation Cable:

- a. #18/4 AWG unshielded: Westpenn #25244B

Section 13790 – Security System Testing: REVISE as follows:

- 1. Renumber paragraph 3.02 A.4 f-j to 4g-k.
- 2. ADD NEW paragraph 3.02 A.4f as follows:

f. Parking Lot Camera Test: Review camera for proper coverage and connection to existing video server. Verify clear video provided through existing recording system.

- 3. Renumber 3.02 A4.k to 4.m.
- 4. ADD NEW paragraph 3.02 A4.l as follows:

l. Emergency Intercom Test: Test duress intercom stations for correct dial-up and communication to the main Security Office. Verify correct integration with the CCTV system.

Section 15040 – Acceptance Testing and Documentation: REPLACE paragraph 1.02 with the following:

1.02 THE COMMISSIONING TEAM

- A. Commissioning Team.** The members of the commissioning team consist of the Commissioning Provider (CP), the Owner's Representative (PM), the General Contractor (GC or Contractor), the Design Team (A/E), the Mechanical Trade Contractor (MTC), the Electrical Trade Contractor (ETC), the Test and Balance representative (TAB), the Controls Trade Contractor (CTC), the Owner's staff representative, and any other installing Trade Contractors or suppliers of equipment.

Section 15240 - Mechanical Equipment Sound, Vibration and Seismic Control:
REPLACE entire section with new 15240 section included in this addendum.

5020 Franklin Drive, Pleasanton, California 94588
Tel. (925)485-5287 FAX (925)485-5294

Section 15250 – Insulation: REPLACE paragraph 2.09 C as follows:

C. Noise Reduction Coefficient: Using duct liner with a noise reduction coefficient of 0.65 or higher.

Minimum sound-absorption coefficients (ASTM C423 Mounting Type A) for sound-absorbing duct lining material:

	Octave Band Center Frequency, Hz.					
	125	250	500	1000	2000	4000
1" Thickness Lining	.05	.25	.50	.70	.85	.85
1.5" Thickness Lining	.20	.40	.70	.90	.90	.85
2" Thickness Lining	.25	.50	.80	.90	.90	.90

Section 15855 – Air Handling Units: REVISE as follows:

1. Strike paragraph 2.02 H.
2. At paragraph 2.08B, REPLACE text as follows:

B. Fan motors shall be heavy duty, premium efficiency open drip-proof, operable at 460 volts, 60 Hz, 3-phase. Motors shall be premium efficiency.
3. At paragraph 2.08 D, ADD the following text: **“(Variable frequency drives furnished to AHU manufacturer by Controls contractor).”**
4. At paragraph 2.09 B, REPLACE text as follows:

C. See airflow measuring station specifications in Section 15950.2.05.D and/or on drawing equipment schedules.
5. At paragraph 2.11 A, ADD “(MERV-8)” after “...30% efficient”.
6. At paragraph 2.12 B, REPLACE text as follows:

D. The final filter media shall be of high density microfine glass fibers laminated to a non-woven synthetic backing to form a lofted filter blanket. The filter media shall be MERV-13 filters. Filters shall be listed by Underwriters’ Laboratories as Class 2.
7. At paragraph 2.02 F, REPLACE text as follows:

F. Variable Speed Drive (*VSD or VFD): The manufacturer to provide material required of the installation of VSDs. See specification Section 15950 for VSDs. Air Handler manufacturer to provide vented weatherproof cabinet for the VSDs.
8. At paragraphs 2.21A and B, REPLACE text as follows:

A. The manufacturer shall provide installation of material furnished by

5020 Franklin Drive, Pleasanton, California 94588
Tel. (925)485-5287 FAX (925)485-5294

Controls Contractor (temperature sensors, actuators, VFDs, air flow measuring stations) required for direct digital control of components specified. All components shall be installed in EMT conduit with liquid tight fittings. Electrical interlock wiring of field devices is the responsibility of the contractor. Devices are specified in Section 15950 and the drawings.

B. The manufacturer shall install temperature sensors furnished by Controls Contractor. The sensors shall be located where they will register accurate measurement of the monitored value. The mixed air sensor shall be of the averaging type. Temperature transmitter shall be located at the sensor and output 0-10 vdc shall terminate on a numbered terminal strip in the main electrical panel. The manufacturer shall install temperature sensors in the following locations (and any other locations indicated on the control diagrams or sequence of operations):

- 1. outdoor air
- 2. mixed air (averaging type)
- 3. discharge air

9. At paragraph 3.02 E.16, REPLACE text as follows:

16. Provide secondary drain pans with auxiliary drain for indoor units installed above a ceiling.

Section 15890 – Ductwork: ADD paragraph 2.03 as follows:

2.03 ACOUSTICAL FLEXIBLE DUCTS

A. Provide flexible duct consisting of flexible vapor barrier jacket, wire reinforced inner core, containing 1-1/2 inch-thick resilient glass fiber insulation faced with reinforced coated glass fabric, conforming to NFPA Standard 90A. Regenerative noise due to air turbulence within the duct shall not exceed the following sound power levels for a 12 inch diameter duct with an air speed of 1,000 feet per minute.

	Sound Power Levels, dB re.10 ⁻¹² Watts, at Octave Band Center Frequency, Hz.				
	125	250	500	1000	2000
Maximum Regenerative Noise	30	31	30	22	20

Section 15950 – HVAC Instrumentation and Controls:

1. ADD paragraph 1.06 F as follows:

F. Control system vendor and Controls Contractor shall assist

5020 Franklin Drive, Pleasanton, California 94588
Tel. (925)485-5287 FAX (925)485-5294

commissioning agent during commissioning of the control system and mechanical systems. Scope of work and procedures used by the commissioning agent are described in sections 01810, 15995 & 16080 and shall be adhered to in all details.

2. ADD paragraph 2.05D as follows:

D. Air flow Measuring Devices (AFMD)

1. Ebtron GTX 116 Thermal Dispersion type or equal. Must be able to accurately measure airflow and temperature to be considered.
2. Each sensor shall have (2) bead-in-glass thermistors
3. Operating range 0 to 5,000 FPM
4. Airflow accuracy shall be +/-2% of reading over entire operating airflow range.
5. Temperature accuracy shall be +/- 0.15°F over the entire operating temperature range of -20F to 160F.
6. Probes shall be constructed of extruded, gold anodized 6063 aluminum tube. All wires within the tube shall be kynar coated.
7. Probe mounting brackets shall be 304 stainless steel.
8. Transmitter shall have LCD display capable of simultaneously displaying air flow and temperature.
9. Transmitter shall have a power switch and operate on 24 VAC power (supplied by others, not isolated).
10. Linear analog output signals for air flow and temperature: field selectable, fuse protected and isolated, 0-10VDC or 0-24mA (4 wire).
11. AFMD shall be UL listed and CE labeled as an entire assembly.

Section 15990 – Testing, Adjusting and Balancing: ADD the following paragraph:

- G. TAB (Testing, Adjusting and Balancing) contractor shall provide a copy of TAB report to the commissioning agent within 5 working days from its completion. Commissioning agent shall not begin testing of mechanical and hydronic systems before having reviewed complete TAB reports as they apply to these systems.**

Section 16110 - Raceways: ADD to paragraph 3.02 A.2 as follows:

- g. Conduit must not bridge independently framed sound-rated partitions or resilient ceilings by rigidly connecting to the framing. Flexible conduit connections are required.**
- h. Conduit must not contact piping and ductwork in sound-rated construction.**

Section 16130 – Boxes: ADD the following:

1. At Paragraph 1.01 A,

5. Telecommunication Outlet Boxes

2. At paragraph 1.03 A,

5020 Franklin Drive, Pleasanton, California 94588
Tel. (925)485-5287 FAX (925)485-5294

5. Telecommunication Outlet Boxes

3. At paragraph 2.01, ADD 2.01 G as follows:

G. Telecommunication Outlet Boxes: Randl Industries, or approved.

4. ADD paragraph 2.08 as follows:

2.08 TELECOMMUNICATION OUTLET BOXES

A. Construction: Provide 5 inch square by 2.875 inch deep metal outlet box with cable management means. (1) 1 inch and (1) 1-1/4 inch side knockouts and (1) 1/2 inch back knockout.

B. Location: Install telecommunication outlet boxes flush with wall.

5. ADD to paragraph 3.01 F as follows:

3. Telecommunication Outlets: As indicated in telecommunication specifications and as detailed on drawings.

6. ADD to paragraph 3.01 as follows:

H. All recessed junction boxes are to be offset at least 16 inches on opposing sides of sound-rated construction.

I. All recessed junction boxes four-gang and smaller are to have the back and sides sealed airtight using sheet caulking. Refer to sealant section 07920.

J. All recessed panel boards, equipment, junction boxes, lighting devices, etc. larger than a four-gang box are to be enclosed and sealed airtight in one hour fire rated construction using gypsum board or two pound per square foot sheet lead at sound-rated construction. Refer to gypsum board section 09250.

Section 16461 – Dry-Type Transformers: ADD to paragraph 3.01 as follows:

D. Mount transformers on vibration isolating resilient mounts and flexible conduit suitable for isolating the transformer housing from building structure. Resilient mounts are to be Mason Industries model BR (714-535-2727) having a minimum static deflection of 0.25 inches.

Section 16705 – Telecommunications Equipment Rooms: At paragraph 3.02 A.4a, ADD the following text to end "... **per equipment rack.**"

Section 16706 - Telecommunications Bonding: At paragraph 2.01 B.2, ADD "**CPI #40164-001**" under manufacturers.

Section 16710 – Telecommunications Horizontal Cabling: REVISE as follows:

- 1. REPLACE 2.03 A.3 as follows:**

5020 Franklin Drive, Pleasanton, California 94588
Tel. (925)485-5287 FAX (925)485-5294

3. **Port density: 48-ports arranged in six-port distribution modules which can be removed and snapped onto the front cord management rings for easy access and termination.**
2. Renumber 2.03 A.6 to 2.03 A.7 and ADD 2.07 A.7a as follows:
 - a. **#PM-GS5-48, GigaSPEED X10D PatchMAX modular patch panel, 48-ports.**
3. ADD 2.03 A.6 as follows:
 6. **Integrated front patch cord management rings.**
4. ADD paragraph 2.08 as follows:

2.08 PATCH CORDS

- A. **Application: Suitable for indoor installation within a telecommunications room or workstation environment.**
 - B. **Cords assembled from a single, continuous length of cordage, homogenous in nature, and terminated at both ends via 8 position modular plugs. Splices are not permitted anywhere.**
 - C. **Cordage**
 1. **Insulated Conductors: solid copper, fully insulated with a flame retardant thermoplastic material (such as PVC, or equivalent).**
 2. **Twisted Pairs: Two insulated conductors “twisted” into a “pair” (twisted pair), and individually color coded.**
 3. **Unshielded sheath and flame-retardant polyvinyl chloride (PVC) jacketed.**
 4. **Flame Rating: NEC CM (or higher) rated, and UL listed as such.**
 - D. **Electrical Performance: Meet or exceed TIA/EIA-568-B.2-AD10, ISO 11801 Class E Edition 2.1, and IEEE Std. 802.3an latest draft proposal channel requirements for supporting 10GBASE-T.**
 - E. **Lengths: 3’, 5’, and 7’.**
 - F. **Manufacturer: SYSTIMAX INC.**
 1. **GS10E, X10D Double Ended Cord**
5. ADD paragraph 3.03 as follows:

3.03 PATCH CORDS

- A. **Furnish to owner the following:**
 1. **3’ Patch Cord, Orange, quantity = 100**
 2. **5’ Patch Cord, Orange, quantity = 100**
 3. **7’ Patch Cord, Orange, quantity = 150**
 4. **3’ Patch Cord, Blue, quantity = 150**
 5. **5’ Patch Cord, Blue, quantity = 150**
 6. **7’ Patch Cord, Blue, quantity = 300**

5020 Franklin Drive, Pleasanton, California 94588
Tel. (925)485-5287 FAX (925)485-5294

Section 16712 – Telecommunications Backbone ISP Fiber Cabling: REVISE as follows:

1. At paragraph 2.02 H.3, REPLACE text as follows:
 3. **#5200-012A- WRYL (760 004 440); 12 strand, singlemode, yellow, OFNR rated.**
2. ADD paragraph 2.06 as follows:
 - 2.06 FIBER OPTIC PATCH-CORDS**
 - A. Match patch cord composition to backbone fiber composition.**
 - B. Manufactured terminated and tested.**
 - C. Manufacturer: SYSTIMAX Inc.**
 - 1. #FPCXSCLC22-PF015, MM duplex fiber patch cord**
 - 2. #FPCWSCLC22-PF015, SM duplex fiber patch cord**
3. ADD paragraph 3.04 C as follows:
 - C. FIBER PATCH CORDS**
 - 1. Furnish to owner the following fiber optic patch cables:**
 - a. Two multi-mode patch cables per IDF room**
 - b. Two single-mode patch cables per IDF room**
 - c. Eight multi-mode patch cables for the MDF room**
 - d. Eight single-mode patch cables for the MDF room**

Section 16715 – Telecommunications Backbone OSP UTP Cabling: REVISE as follows:

1. ADD paragraph 2.05 as follows:
 - 2.05 BUILDING ENTRANCE PROTECTION – BEP TERMINAL**
 - A. Swivel Stub Input, Swivel Stub Output**
 - B. Application: BEP terminal shall be suitable for indoor installation, within a telecom room (such as an Entrance Facility or ‘MPOE’). BEP terminals shall provide termination of the backbone twisted pair cables specified within this Section, shall protect premises equipment against induced voltages and stray currents, and shall accept ‘5-pin’ protector modules specified within this Section.**
 - C. Configuration: BEP terminal shall be designed for a wall-mounted configuration, and shall have the capacity to accept <100-pair> <50-pair> incoming and outgoing pairs.**
 - D. Input: 100-pair 25-foot 26 AWG STP ‘fusible’ swivel stub.**
 - E. Output: 100-pair 25-foot 24 AWG STP swivel stub.**

5020 Franklin Drive, Pleasanton, California 94588
Tel. (925)485-5287 FAX (925)485-5294

1. #489ACC1-100 (107894966); 100-pair BEP terminal, swivel stub input, 110 output

1. #3C1S (105 514 756); solid-state module, 220V – 300V
breakdown voltage, black

1. Install the termination apparatus such that the bottom row of terminations is at a height as shown on the Drawings. If no height is shown, install bottom at 24" AFF (+/- 3").

- 2. Provide accessories required for a complete installation.**
- 3. Mount blocks plumb and square.**

Section 16716 – Telecommunications Backbone OSP Fiber Optic Cabling: REVISE
as follows:

1. At paragraph 1.04 B.1b, REPLACE as text as follows:
 - b. Pathways and vaults to Campus MDF in building 300.**
2. At paragraph 2.01 G.1, REPLACE text as follows:
 - 1. Armored with a corrugated polymer coated steel tape.**
3. At paragraph 2.01 Ha, b: REPLACE text as follows:
 - a. #5024-024A-XXBK (760 002 592); 24 strand 50/125 m multimode outdoor, loose tube, armored**
 - b. #5024-024A-WXBK (760 007 377); 24 strand singlemode outdoor. loose tube, armored**

Section 16719 – Telecommunications Testing: ADD paragraph 1.02 B.5 as follows:

- 5. TIA 568 B2.10 addendum published February 2008.**

C. Changes to Drawings

- Sheet A201.3: detail reference at gridlines Y-A.5 and 4 is changed to 20/A752.
- Sheet A203.1:
 - Keynote 1 is revised as follows: “... **includes stone ballast**”. Note that roof assembly at the second floor roof areas designated with keynote 1 (between grids X-F and X-G; west of grid X-2 and east of X-5) is revised to include protection membrane and stone ballast per revised detail 4/A432 (AR-01).
 - Keynote 5 is revised to “**4-inch topping concrete** ...” to match notes at detail 19/A431.
- Sheet A211 and A212 series ADD under “General Notes”,
 - **9. For Typ. Horizontal Pipe Run above the ceiling see detail 2/A821**
- Detail 5/A452: note that panel extrusion is missing. See detail 8/A456 for metal panel information at same condition.
- Sheets A451 and A453: typical at all jamb details, fluid-applied vapor barrier at inside face of panel shall wrap into edge of opening min.2-inches, typical as shown on revised detail 18/A454 (AR-19).
- At door head and louver head details (3/A455, 15/A457, 12/A451 etc.), provide galvanized S.M. drip head flashing typical, painted to match door frame, similar that shown at detail 6/A451.
- Detail 15/A457: door header revised to typical boxed header per detail 8/A811.

5020 Franklin Drive, Pleasanton, California 94588
Tel. (925)485-5287 FAX (925)485-5294

- A521 & A522, at Keynote #2, change product model to B-3500.25 (Recessed) to match specs.
- A731, A732: At Finish Legend, Carpet colors are revised as follows:
 - Change to CP-1
 - Open Office 126
 - Open Office 135
 - Office 138
 - Open Office 140
 - Reception 142
 - Copy 143
 - Open Office 144
 - Hallway 150
 - Copy 153
 - Open Office 155
 - Reception 160
 - Hallway 161
 - Vestibule 165
 - Open Office 168
 - Copy 172
 - Copy 226
 - Change to CP-3
 - Office 116
 - Study 242
- Type CP -3 Carpet is revised to **C&A Oxide (44005)**.
- Type CP-4 Carpet is revised to **C& A Oxide (44005)**.
- **Type CP -6 Carpet C&A Gun Powder (18509)** is added for threshold transitions.
- Partition Schedule Notes on sheet A741, ADD note as follows
 - **5. Provide acoustical sealant at all sound rated partitions, see floor plans for location of sound rated partitions and see details 2, 11, 12, 16, 17/ A821**
- A812 detail 13: change HSS to **4'-0" O.C.**
- E111: Delete notes pertaining to "Add Alternate #1" for photovoltaic system (deleted from E213.C in Addendum A). 2-inch conduit to remain.

D. New Drawings

- M604 – SAGE GLASS CONTROLS DIAGRAMS

5020 Franklin Drive, Pleasanton, California 94588
 Tel. (925)485-5287 FAX (925)485-5294

E. Reissued Drawings

- C201 Site Plan: Campus drive alignment revised and path and planter southeast of Bldg 800 revised.
- C202 Site Plan: Campus drive alignment revised. Horizontal Control table revised.
- C301 Grading Plan: Grading at the planter southeast of Bldg 800 and along the campus drive modified slightly due to site plan changes.
- C302 Grading Plan: Grading along campus drive revised due to new road alignment, tree protection and adjacent IOB project.
- C322 Erosion Control Plan: Added detail reference for inlets.
- C402 Utility Plan: Utility Plan revised due to grading and site modifications. Approximately 100 LF of 15" SD pipe added and (1) additional curb inlet.
- C421 Site Lighting Plan: Site Lighting along campus drive revised due to new road alignment.
- L101 Layout Plan: Path shifted slightly to accommodate existing planter wall to remain, layout plan updated.
- L102 Layout Plan: Campus Drive realignment, layout plan updated. Coordinates affected: 2-4, 11-16, 33-35, 166-167, 327-330.
- L201 Construction Plan: Existing planter wall to remain: concrete path updated accordingly and decomposed granite paving added. Expansion joint symbols added.
- L202 Construction Plan: Campus Drive realignment, construction plan updated accordingly. Expansion joint symbols added.
- L302 Irrigation Plan: Campus Drive realignment, irrigation plan updated accordingly.
- L402 Planting Plan: Campus Drive realignment, planting plan updated accordingly.
- A301, A302: Drawings re-issued to indicate graphically the scope of where compensation joints, compensation receptors etc. are located.
- A521 & A522: Restroom elevations added actuators & Dims / moved equipment/ clarify graphics.
- A712:
 - Glass types for Window types T1, T2, V1 and V2 are revised to GL1 for vision glass areas and GL1F for spandrel glass areas (shown hatched).

- Typical note "Compensation Receptor at Curtainwall Head typ." is added to all window types this sheet.
- Added detail keys for typical intermediate horizontal and vertical mullions
- T002: Revised telecom furniture/raceway feed point schedule.
- T201.1: Deleted two furniture feed points in Open Office-168
- T201.2: Added five raceway feed points in Room-124.
- T201.3:
 - Deleted five furniture feed points along column line Z-B from column line 2 through 3.2.
 - Changed conduit qty and size in note E-3 from one 3" to two 4".
 - Changed conduit size in note E-4 to 2" from 1.5".
- T202.2
 - Revised E-5 note to clarify conduit routing requirement.
 - Added E-5 note outlets Info-202.
- T404: Corrected detail #3 call-out.
- SY001
 - Added emergency duress station symbol to symbols list.
 - Added sheet SY505 to drawings index
- SY101
 - Changed general sheet note 1 to security sheet note S-1
 - Added sheet note E-1 and E-2 for required power to emergency duress station and PTZ camera in phase 3 bus loop area
 - Added emergency duress station and PTZ camera to phase 3 bus loop area
- SY505
 - Added sheet to package to incorporate details for emergency duress station and PTZ camera to phase 3 bus loop area

F. Sketches (included as attachments):

ARCHITECTURAL

- AR-17: Revised Detail 4/A432 – added stone ballast and protection membrane to roof assembly. Revised specified insulation.
- AR-18: Revised Detail 6/A452 – added HSS horizontals
- AR-19: Revised Detail 18/A454 – added HSS horizontals
- AR-20: Revised Detail 3/A432 - Provide backing plate typical per detail 18/A812 at panel attachment. Add note for revised roof.
- AR-21: Revised Detail 15/A431A – revised notes
- AR-22: Revised Detail 20/A431A – revised notes

5020 Franklin Drive, Pleasanton, California 94588
 Tel. (925)485-5287 FAX (925)485-5294

- AR-23: Revised Detail 5/A457 – clarified overlap of self-adhered flexible flashing behind metal panel to concrete.
- AR-24: New detail 1B/A455 – Curtainwall jamb at Type G2.1/G2.2 window
- AR-25: Floor plans showing window type changes per ADD #A
- AR-26: Revised Detail 15/A456 – added note, dimensions.
- AR-27: New detail 14/A431A – parapet section at Part A
- AR-28: New detail 19/A431A – mechanical duct enclosure
- AR-29: Revised plan and elevation at Kitchen 171.
- AR-30: Partial reflected ceiling plan 2/A212.2 – revised dimensions
- AR-31: Revised detail 2/A456
- AR-32: Detail 7/A821 added acoustical notes and added extra layer of gyp bd.
- AR-33: Revise location of Actuators
- AR-34: Revised detail 14/A454
- AR-35: New detail 9/A458 – HSS support at sill of window type I
- AR-36: Provide ¾” deflection @ glass
- AR-37: Reference correct detail added notes.
- AR-38: Added head condition for HSS.

CIVIL

- CR-04: Demolition plan revised to retain existing planter southeast of Bldg 800

LANDSCAPE

- LR-05: Detail 2/*PIP Concrete Paving – Pedestrian*: Replace welded wire mesh with rebar reinforcement, per comments by structural engineer.
- LR-06: Detail 10/*Existing Planter Wall Cladding*: New detail for existing planter wall to remain.
- LR-07: L301 Irrigation Plan: Revised irrigation layout at existing planter wall to remain.
- LR-08: L401 Planting Plan: Revised planting layout at existing planter wall to remain.

STRUCTURAL

- SR-23: Curtain wall support columns added.
- SR-24: Curtain wall support framing added and HSS elevations modified.
- SR-25: Curtain wall support framing added and HSS elevations modified.
- SR-26: Curtain wall support framing added and HSS elevations modified.
- SR-27: Curtain wall support framing added and HSS elevations modified.
- SR-28: Curtain wall support framing added and HSS elevations modified.
- SR-29: HSS elevations modified.
- SR-30: HSS header added at tilt-up panel opening.

5020 Franklin Drive, Pleasanton, California 94588
Tel. (925)485-5287 FAX (925)485-5294

- SR-31: Transfer ladder graphically shown.
- SR-32: Reception counter support columns graphically shown.
- SR-33: Plan sheet notes added and modified.
- SR-34: HSS canopy framing modified.
- SR-35: HSS canopy framing detail added.
- SR-36: HSS canopy framing detail modified.

ELECTRICAL

- ER-01: Reference Sheet E111 - Removed Add-Alternate No. 1 - PV System.
- ER-02: Reference Sheet E112 - Revised Detail 2, Typical Glass System Wiring Diagram.
- ER-03: Reference Sheet E211.A - Removed receptacles for WiFi equipment power connection above ceiling.
- ER-04: Reference Sheet E211.A –
 - Removed receptacles for WiFi equipment power connection above ceiling.
 - Added General Sheet Note F. Provide acoustical sealant at all sound rated walls, see architectural floor plans for locations and details 2, 11, 12, 16, 17 on sheet A821. This General Sheet Note is added to all E2 Sheets.
- ER-05: Reference Sheet E211.B - Revised location of j-boxes in Men's and Women's restroom.
- ER-06: Reference Sheet E212.B –
 - Revised Sheet Keynote tag to 17 from 11.
 - Revised location of j-boxes in Men's and Women's restroom.
- ER-07: Reference Sheet E213.A –
 - Revised location and Panel designation for circuits to glass system equipment.
 - Revised Sheet Keynote 10 to include power connection to DDC provided by Division 15 for glass system controls.
- ER-08: Reference Sheet E213.A - Revised location and circuits to glass system equipment.
- ER-09: Reference Sheet E213.C - Removed Add-Alternate No. 1 - PV System.
- ER-10: Reference Sheet E213.C - Removed General Sheet Note B and Sheet Keynote 2 regarding Add-Alternate No. 1 - PV System.
- ER-11: Reference Sheet E401 - Revised Panel Schedule Panel L1A (Section 1).
- ER-12: Reference Sheet E402 - Revised Panel Schedule Panel L2A (Section 2).

MECHANICAL

- MR-08: Revised AHU control diagram to include heating coil control. Sheet M601.
- MR-09: Added General Mechanical Note #27 on sheet M001: **“SEALANT AT ALL SOUND RATED WALLS, SEE ARCHITECTURAL FLOOR PLANS FOR LOCATIONS AND DETAILS 2,11,12,16,17 ON SHEET A821.”**

5020 Franklin Drive, Pleasanton, California 94588
 Tel. (925)485-5287 FAX (925)485-5294

- MR-10: Added acoustical flex duct to Detail #1 & 2.
- MR-11: Added schedule.

PLUMBING

- PR-03: Added General Plumbing Note #17 on sheet P001: **“SEALANT AT ALL SOUND RATED WALLS, SEE ARCHITECTURAL FLOOR PLANS FOR LOCATIONS AND DETAILS 2,11,12,16,17 ON SHEET A821.”**
- PR-04: Changed WH-1 to WH-2 in Janitor 171 and reroute hot water piping.
- PR-05: Routing hot water supply and return for S-2 sink at Workroom 154
- PR-06: Added WH-2 to plumbing schedule.
- PR-07: Keynote changed: Termination of downspout nozzle (typical)

G. PARKING – PHASE 3

Phase 3 of Parking Lot project DSA Application #01-109173 shall be incorporated into this Addendum, as Bid # --. The following drawings and specs are issued for this purpose:

1. Drawings

C001	CIVIL NOTES, LEGEND & ABBREVIATIONS
C003	TOPOGRAPHIC SURVEY
C102	DEMOLITION PLAN-LOTS A&B
C203B	SITE PLAN
C303B	GRADING PLAN - PHASE 3
C322	EROSION CONTROL PLAN-LOTS A&B
C403B	UTILITY PLAN - PHASE 3
C901	DETAIL SHEET
C902	DETAIL SHEET
C903	DETAIL SHEET
C904	DETAIL SHEET
E202	LIGHTING PLAN-LOTS A&B
E901	ELECTRICAL DETAILS
OS001	COVER SHEET
OS002	KEY MAP
OS101	DEMOLITION PLAN
OS201	SITE PLAN
OS203	BUS STOP RELOCATION
OS301	PLANTING AND IRRIGATION PLAN
OS901	DETAIL SHEET
L305	IRRIGATION PLAN – PHASE 3 PARKING
L403	PLANTING PLAN – PHASE 3 PARKING
S203	SITE PLAN - SIGNAGE LOTS A & B

5020 Franklin Drive, Pleasanton, California 94588
Tel. (925)485-5287 FAX (925)485-5294

CHABOT COLLEGE COMMUNITY AND STUDENT SERVICE CENTER
INVITATION FOR BID 08-07 ADDENDUM NO. B

2. Project Specifications: Divisions 2-16 for the PARKING LOT project are issued with this Addendum. For revisions to specifications included in PARKING LOT Addendum #1, issued on January 18, 2008, see the following link to the District's website:

http://www.clpccd.org/bond/documents/011708_Addendum1forBid08_11.pdf

If you have any questions regarding this Addendum No. B, please contact the Office of the Facilities Planning & Management in **writing, via facsimile or email**. All other terms and conditions of BID No. 08-07 to remain the same.

Regards,

Victoria L. Lamica
Contract Manager
vlamica@clpccd.org

C: Bid File

5020 Franklin Drive, Pleasanton, California 94588
Tel. (925)485-5287 FAX (925)485-5294



**CHABOT-LAS POSITAS COMMUNITY COLLEGE DISTRICT
MEASURE B BOND PROGRAM**

**PROJECT REQUIREMENTS
DSA SUBMISSION**

Issued December 19, 2007

**CHABOT COLLEGE
PARKING LOTS A&B / G&H IMPROVEMENTS**

**Chabot Las Positas Community College District
5020 Franklin Drive
Pleasanton, CA 94588**

ARCHITECT:

tBP/ARCHITECTURE
1000 Burnett Avenue Suite 140
Concord, CA 94520
(925) 246-6419

CONSTRUCTION MANAGER:

Swinerton Management & Consulting Inc.
Chabot College Jobsite Trailer
25555 Hesperian Blvd.
Hayward, CA 94545
(510) 723-7053

CIVIL ENGINEER:

Sandis Civil Engineers
1721 Broadway, Suite 201
Oakland, CA 94612
(510) 873-8866

LANDSCAPE ARCHITECT:

Royston Hanamoto Alley & Abey
225 Miller Avenue
Mill Valley, CA 94941
(415) 383-7900

**TECHNOLOGY / SECURITY
CONSULTANT:**

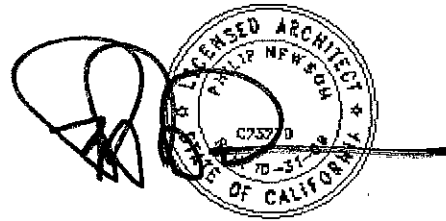
TEECOM Design Group
1333 Broadway Suite 601
Oakland, CA 94612-1906
(510) 337-2800

SECTION 00005

CERTIFICATIONS PAGE

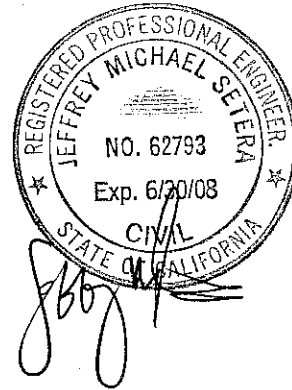
ARCHITECT:

tBP/ARCHITECTURE
1000 Burnett Avenue Suite 140
Concord, CA 94520
(925) 246-6419



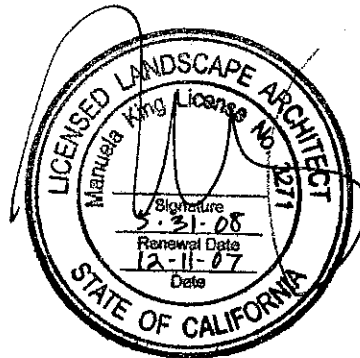
CIVIL ENGINEER:

Sandis Civil Engineers
1721 Broadway, Suite 201
Oakland, CA 94612
(510) 873-8866



LANDSCAPE ARCHITECT:

Royston Hanamoto Alley & Abey
225 Miller Avenue
Mill Valley, CA 94941
(415) 383-7900



IDENTIFICATION STAMP
DIVISION OF THE STATE ARCHITECT

APPL 01 109173

AC D. Poore FIS Admin SS [Signature]
DATE 12/19/07

END OF SECTION

SECTION 00010

TABLE OF CONTENTS

INTRODUCTORY INFORMATION

Section 00005	Certifications
Section 00010	Table of Contents
Section 00015	List of Drawings

BIDDING REQUIREMENTS

Section 00001	Advertisement for Bids
Section 00005	Table of Contents
Section 00100	Notice Calling for Bids
Section 00200	Instructions for Bidders
Section 00225	Subcontractors List
Section 00250	Non Collusion Affidavit
Section 00270	Statement of Qualifications
Section 00290	DVBE Policy
Section 00300	Bid Bond
Section 00325	Certification of Pre-Bid Site Visit
Section 00350	Bid Proposal

CONTRACTING REQUIREMENTS

Section 00500	Agreement
Section 00600	Performance Bond
Section 00610	Labor/Materials Payment Bond
Section 00620	Workers Compensation Insurance Certification
Section 00630	Drug Free Workplace Certification
Section 00700	General Conditions
Section 00750	Special Conditions
	Attachment A – Change Order Form
	Attachment B – Asbestos/Haz Mat Certification
	Attachment C – Debris Recycling Statement
Section 00775	Guarantee

DIVISION 1 – GENERAL REQUIREMENTS

Section 01010	Summary of Work
Section 01035	Modification Procedures
Section 01040	Project Coordination

Section 01060	Regulatory Requirements
Section 01061	Regulatory Requirements – Hazardous Waste
Section 01090	References and Definitions
Section 01115	Additional Requirements for DSA Reviewed Projects
Section 01230	Alternates
Section 01300	Submittals
Section 01310	Progress Schedules and Reports
Section 01400	Quality Control
Section 01510	Temporary Facilities
Section 01600	Material and Equipment
Section 01630	Product Options and Substitutions
Section 01700	Contract Closeout
Section 01720	Project Record Documents

DIVISION 2 – SITE CONSTRUCTION

Section 02110	Plant Protection
Section 02200	Site Preparation
Section 02300	Earthwork and Grading
Section 02315	Trenching, Backfilling, and Compacting
Section 02510	Water Systems
Section 02518	Turf Block Pavers
Section 02520	Landscape Site Concrete
Section 02530	Sanitary Sewer
Section 02630	Storm Drainage
Section 02750	Paving and Surfacing
Section 02780	Pavement Marking
Section 02810	Irrigation
Section 02870	Site Furnishings
Section 02900	Planting

DIVISION 10 - SPECIALITIES

Section 10400	Identification Devices
---------------	------------------------

DIVISION 13 - SPECIAL CONSTRUCTION

Section 13700	Basic Security Requirements
Section 13720	Video Surveillance
Section 13735	Intercom System
Section 13770	Security Cabling
Section 13780	Security System Labeling
Section 13790	Security Commissioning

DIVISION 16 - ELECTRICAL

Section 16487	Outdoor Lighting Systems
---------------	--------------------------

APPENDIX A Signage Program

APPENDIX B Storm Water Pollution Prevention Plan (Under Separate Cover)

END OF TABLE OF CONTENTS

SECTION 02110

PLANT PROTECTION

PART 1 - GENERAL

1.01 DESCRIPTION: Preserve and protect existing trees, shrubs and other plant materials to remain, including protecting plants on adjoining properties during removal work, site preparation work and construction.

1.02 QUALITY ASSURANCE

A. Review

1. Contractor shall review and identify with the Owner's Representative the limits of Work and extent of plant materials to be protected.
2. At the Owner's discretion, an Arborist may represent the Owner to review the work of the Contractor in regards to plant protection.

B. Stipulations

1. Plant Protection:
 - a. Protect trees against cutting, breaking, skinning and bruising of bark; permit no traffic or stockpiling within drip line.
 - b. Do not change earth surface within drip line of trees.
 - c. Do not park vehicles or store materials, supplies and construction equipment within drip line of trees.
 - d. Install a temporary 4-foot high orange plastic fence typically at the "drip line" of the tree(s) except as otherwise directed by the Arborist / Owner's Representative.
 - e. Obtain specific instruction from Arborist / Owner's Representative for pruning of trees, shrubs, roots or disturbance of soil within spread of tree branches.
 - f. Note that trees vary greatly in their tolerance of root pruning from the high tolerance of Redwoods to the medium tolerance of Pittosporum to the low tolerance of Buckeye. Generally cutting of roots three inches or greater shall be avoided. Roots one inch and greater in diameter that must be cut shall be cut cleanly and obliquely with the cut surface facing down.
 - g. Exposed and pruned roots shall be covered with light well-drained soil backfill and mulch over. The area shall be kept moist.
 - h. Any trenching required within the root zone shall be done by hand and as directed by the Arborist / Owner's Representative.
 - i. Air spading is required for excavation in the "critical root zones" of any trees for the installation of infrastructure where roots 2 inches in diameter and larger are encountered. The "critical root zone" is defined as any area around a tree in which a two inch diameter root is encountered. The Arborist / Owner's Representative shall define the critical root zone and the Contractor shall excavate using a pneumatic excavator (AIR-SPADE or equivalent) as follows:
 - 1) Trenching for utility lines or other infrastructure may be done mechanically outside the critical root zone. As the equipment

operator approaches the canopy radius, or for certain species up to 1.5 times the canopy radius out from the base of the tree (Oaks, Poplars, Redwoods, etc.) the operator shall be assisted by a spotter who shall inspect the excavation for roots. If a root of two inches diameter is encountered the spotter shall halt mechanical excavation and pneumatic excavation shall proceed. If no other two inch or greater diameter root is encountered in an excavation of two feet forward and two feet deep, the single two inch root may be cleanly cut proximal to (on the tree side of) any fracture or torn bark. Mechanical excavation may continue until a two inch diameter root is encountered, and the pneumatic excavation, exploration is then repeated.

- 2) The Contractor shall control dust and the spread of soils excavated. The air-spade operator shall moisten the soil to field capacity and to a minimum probe depth of 2.5 feet with a watering needle (hydro-spear) 48 hours prior to pneumatic excavation. The spread of excavated soil shall be contained to the area adjacent to the trench path with upright plywood sheeting.
 - 3) These specifications shall not be considered operating instructions or a requirement to use a specific pneumatic excavation product. It is the responsibility of the Contractor to read and understand the pneumatic excavator operation instructions and safety procedures (including the proper and safe use of air compressor, hoses, excavation tools, etc.) prior to operations.
- j. In areas where construction in tree protection zones is authorized, Contractor shall protect trees with a strapped "barrel stave-like" surrounding of 2"X4"s, around the full circumference of the tree trunk. Such protection shall be installed at no additional cost to the Owner as accepted by the Owner's Representative.
- k. Provide periodic watering for all planting within Contract limit and any adjacent areas affected by the work as accepted by the Owner's Representative.

C. Standards

1. Accomplish disposal of materials removed from site in accordance with applicable state and local regulations.

D. Plant Replacement

1. Replace trees cut or severely damaged. Determine tree value by formula adopted by the National Shade Tree Conference 1951 and 1955. Replace in cash value.
2. A qualified Arborist may be retained by the Owner to determine the condition of trees in question as to their ability to survive. Comply with recommendations to rehabilitate or to replace in accordance with paragraph above.

Coordinate shutoff of irrigation systems with the Owner and be responsible for any damage caused to adjacent landscaping by Contract Work.

- E. Related work specified elsewhere includes:
 - 1. Section 02200 – SITE PREP
 - 2. Section 02300 – EARTHWORK AND GRADING.
 - 3. Section 02900 - PLANTING.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.01 Examination

- A. Examine areas in which work is to be performed. Report in writing to the Owner's Representative all prevailing conditions that will adversely affect the existing plant materials to remain. Do not proceed with work until a solution acceptable to the Owner's Representative has been arrived at.
- B. Install and maintain temporary fencing and other required protective devices and exclude construction activities from tree/shrub zones except as supervised by the Arborist / Owner's Representative.
- C. If access to tree/shrub zones cannot be avoided an intact four inch layer of mulch with minimum 1.25 inch thick, metal strap linked plywood shielding shall be maintained in the tree/shrub zone where heavy equipment will be operated.

- 3.02 Field Verification: Before removing non-designated trees, shrubs, stumps, bushes, vines, rubbish, undergrowth and deadwood as shown on the Drawings and as specified, obtain verification from Owner's Representative.

*** END OF SECTION ***

SECTION 02200

SITE PREPARATION

PART 1 - GENERAL

1.01 SUMMARY

- A. This section describes general requirements, products, and methods of execution relating to site preparation, unless otherwise noted. This section applies to:
 - 1. Surface and subsurface demolition.
 - 2. Backfilling of excavations and depressions.
 - 3. Coordination, demolition and/or relocation of existing utilities.
 - 4. Prior to start of demolition of facilities, shut-off, disconnect, cut, and cap where required, underground utility services to facilities.
 - 5. Removal of A.C. pavement driveway and concrete pavement, concrete pads, and A.C. curbing.
 - 6. Removal of cyclone wire, wood fences and barricades.
 - 7. Removal of storm drainage piping, catch basins, and manholes.
 - 8. Removal of vegetation and trees as specified herein.
- B. Contractor shall provide labor, material and equipment required for demolishing, cutting, removing and disposing of existing construction as designated and shown on the drawings for the following as required, unless otherwise noted.
- C. Related Sections:
 - 1. Section 02300 - EARTHWORK.
 - 2. Section 02315 - TRENCHING, BACKFILLING, AND COMPACTING.
 - 3. Section 02225 – DEMOLITION.

1.02 SUBMITTALS

- A. Comply with requirements of Section 01300 - SUBMITTALS.
- B. Submit all permits and certificates required for the project, for record purposes.
- C. Demolition schedule and proposed methods and operations.
- D. Permits and notices authorizing demolition.
- E. Letter or certificates of severance of utilities services from the affected agencies or utilities.
- F. Proposed haul route(s) from the demolition worksite to an authorized disposal site.
- G. Permit for transport and disposal of debris.
- H. Make arrangements of disposing of waste and excess materials at a legally licensed landfill/disposal facility outside worksite and paycost thereof.
- I. Photograph existing conditions of existing structure surfaces, equipments, and adjacent improvements that might be misconstrued as damage related to removal operations. File photographs with Architect prior to start of work.
- J. Submit Proposed dust control measures.
- K. Submit Proposed noise control measures.
- L. Work Schedule: Submit a proposed schedule of work items to be performed, and a

description of how the work is to be accomplished, for the Architect's review.

- M. Report of inspections conducted with the [Owner's Representative] and [Architect] both before and after performing work.

1.03 QUALITY ASSURANCE

- A. Comply with the following Standards: American National Standards Institute, Inc. "American National Standard Safety Requirements for Demolition" (ANSI A10.6 and A10.8).
- B. Regulatory Agencies:
 - 1. Comply with rules and regulations of State of California, California Administrative Code, Title 8, Industrial Relations, Chapter 4, Subchapter 4, "Construction Safety Order."
 - 2. Comply with applicable local and state agencies having jurisdiction.
 - 3. Comply with governing EPA notification regulations.
- C. Secure all required Permits or Certificates for demolition or discontinuance of utilities, prior to beginning the work.

1.04 PROJECT CONDITIONS

- A. Disposition of Existing Improvements:
 - 1. All materials indicated to be removed shall become the property of the Contractor; dispose of these outside the project site.
 - a. Do not dispose of removed materials to the general public by sale, gift or in any other manner at the Site.
 - b. These provisions shall not be construed as limiting or prohibiting sale or disposal of such materials at the Site to duly licensed Contractors or material suppliers, provided materials are removed from the construction site by the Contractor.
 - 2. All removal of debris from the site, including removal of inventory to site of storage, is part of this Contract and shall be done by Contractor's employees and no others.
- B. Salvage and Reuse:
 - 1. Where units or items of existing work are designated in Section 01040 - PROJECT COORDINATION to be removed and reused in the new work or are to become salvage, remove such units or items carefully.
 - a. Use tools and methods that will not damage such units or items.
 - b. Protect underlying or adjoining work from damage.
 - c. Salvaged items shall be cleaned by the Contractor.
- C. Protection:
 - 1. Erect and maintain temporary bracing, shoring, lights, barricades, except construction barricades for subsequent new construction, warning signs, and guards necessary to protect public, the Owner's employees, finishes, improvements to remain and adjoining property from damage, all in accordance with applicable regulations.
 - 2. Wet down areas affected by this work as required preventing dust and dirt from rising.
- D. Scheduling:
 - 1. Coordinate with the District in scheduling noisy or dirty work.
 - 2. Schedule work at the District's convenience to cause minimal interference with the

District's normal operations.

3. Jackhammering will be allowed only during the following time periods: 7:00 AM - 6:00 PM on weekdays.

E. Traffic Circulations: Ensure minimum interference with roads, streets, driveways, sidewalks, and adjacent facilities.

1. Do not close or obstruct public thoroughfares without first obtaining the required permit or permission of the responsible jurisdiction.
2. Where closing of a vehicular or pedestrian traffic circulation route is necessary, provide adequate directional signs to minimize the potential for confusion.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas affected by work of this Section and verify following:
 1. Disconnection of utilities as required.
 2. That utilities serving occupied portions of buildings on and off the site will not be disturbed.
 3. Removal by the Owner of the Owner's personal property, movable furniture and equipment items not designated for relocation.
- B. Where existing conditions conflict with representations of the construction Documents, notify the Architect and obtain clarifications. Do not perform work affecting the conflicting conditions until clarification of the conflict is received.

3.02 PREPARATION

- A. Verify that the area to be demolished or removed has been vacated, or adequate space made available to perform the work.
- B. Arrange for, and verify termination of utility services to include removing meters and capping of lines.
- C. Lay out cutting work at Job Site and coordinate with related work for which cutting is required.

3.03 DEMOLITION

- A. If known or suspected hazardous materials are encountered during operations, stop operations immediately and notify the Construction Manager.
- B. Perform work in accordance with ANSI A10.6-1969 unless otherwise noted.
- C. Provide noise and dust abatement as required to prevent contamination of adjacent areas.
- D. Remove all materials not designated as salvage, in their entirety.
- E. Remove building foundations in their entirety, unless otherwise indicated on the plans.

- F. Fill voids in the land left by the removal of existing structures as follows:
 - 1. In accordance with the requirements of Section 02300 – EARTHWORK. Grade finished remaining surface to the contours shown, or if not shown, to match the existing natural contours.
- G. Lower, or remove, heavy structural framing members by hoist or crane.
- H. Concrete and Masonry:
 - 1. Demolish concrete and masonry in sections, less than 3 feet in any direction.
 - 2. Method of cutting shall be limited to saw cutting and torch.

3.04 CUTTING

- A. Make new openings neat.
- B. Do not cut or alter structural members and any utilities including appurtenances unless indicated to do so in the Construction Documents, or written approval is received from the Architect.
- C. Take care not to damage reinforcing or structural steel scheduled to remain in place.
- D. Concrete: Cut new openings in concrete by coring and saw cutting. Saw run-bys will not be permitted.

3.05 PREPARATION FOR NEW FINISH WORK

- A. Where demolished surfaces are scheduled to receive new finishes, Contractor shall restore such substrate to a condition ready to receive the scheduled new finishes, including grinding or leveling.

3.06 DISPOSAL OF DEMOLISHED MATERIALS

- A. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning of demolished materials off District's property in a legal manner.

3.07 FIELD QUALITY CONTROL

- A. The Construction Manager and Architect will accompany the Contractor before and after performance of work to observe physical condition of existing structures or improvements involved.

END OF SECTION

SECTION 02300

EARTHWORK AND GRADING

PART 1 - GENERAL

1.01 SUMMARY:

- A. This section describes general requirements, products, and methods of execution relating to on-site earthwork. Any work within the public right-of-way shall be constructed to the standards of the City of Hayward. Earthwork includes, but is not limited to, the following:
 - 1. Grading.
 - 2. Material.
 - 3. Excavation.
 - 4. Filling and backfilling.
 - 5. Soil Sterilant.
 - 6. Termiticide.
- B. Provide labor, material and equipment and services necessary to complete the excavations, recompaction and finish grading as specified and indicated on Drawings.
 - 1. Obtain permit from local authorities.
 - 2. Provide surveying for grading operations.
 - 3. Provide shoring design.
 - 4. Provide dewatering operations.
 - 5. Provide Site Grading, cut, fill and finish.
 - 6. Provide excavation and backfill for filling construction, including trenches within building lines.
 - 7. Preparation for subgrade for building slabs, walks, pavements, and landscaping.
 - 8. Provide distribution of stockpiled topsoil.
 - 9. Provide sub-base course for walks and pavements.
 - 10. Provide sand and gravel for capillary break/moisture barrier under building slabs.
 - 11. Provide sub-surface drainage backfill for walls and trenches.
 - 12. Provide engineered fills for building slabs and foundations.
- C. The work includes removal and legal disposal off the site of debris, rubbish and other materials resulting from clearing and grubbing operations.
- D. Work specified in Related Sections:
 - 1. Section 02200 – SITE PREPARATION.
 - 2. Section 02315 – TRENCHING, BACKFILLING, & COMPACTING.
 - 3. Section 01355 – LEED CERTIFICATION PROCEDURES.

1.02 DEFINITIONS:

- A. Engineered Fill:
 - 1. Soil or soil-rock material approved by Owner's Representative and transported to the site by the Contractor in order to raise grades or to backfill excavations.
 - 2. The Owner's Testing Agency will make sufficient tests and/or observations for the purpose of issuing a written statement that specification requirement.
- B. On-site Material: Soil or earth material obtained from required on-site excavation.
- C. Excavation: Consists of the removal of material encountered to subgrade elevations and the re-use or disposal of materials removed.

- D. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below sub-base, drainage fill, or topsoil materials.
- E. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations.
- F. Base Course: The layer placed between the sub-base and surface pavement in a paving system.
- G. Relative Compaction: In-place dry density of soil expressed as percentage of maximum dry density of same materials, as determined by laboratory test procedure American Society for Testing and Materials (ASTM) D1557.
- H. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below top soil, rock base course, or drainage fill.

1.03 SYSTEM DESCRIPTION:

- A. Requirements:
 - 1. Grades and elevations are to be established with reference to bench marks referenced on Drawings.
 - 2. Maintain engineering markers such as monuments, bench marks and location stakes. If disturbed or destroyed, replace.
- B. Criteria:
 - 1. The character of the material to be excavated or used for subgrade is not necessarily as indicated.
 - 2. Ground water elevations indicated are those existing at the time subsurface investigations were made and do not necessarily represent ground water elevation at the time of construction.
 - 3. Blasting will not be permitted. Remove material in an approved manner.
- C. Shoring Design: Where shoring is required by State Law or determined by the Contractor to be necessary, provide proposed excavation shoring method for review prior to commencement of excavation requiring shoring. Include the following information:
 - 1. Basic design assumptions.
 - 2. Design Calculations.
 - 3. Describe materials or shoring system to be used.
 - 4. Indicate whether or not any components will remain after filling or backfilling.
 - 5. The shop drawings for the proposed shoring system.
 - 6. Coordinate with the Construction Documents and identify any proposed modifications or deviations.
 - 7. Certification of the above by a registered professional civil or structural engineer licensed by the State of California.
- D. Dewatering Plan: Based upon site surface and subsurface conditions, including available geotechnical and hydrological data, provide a system to perform the following:
 - 1. Lower the ground water level below bottom of excavation.
 - 2. Relieve the hydrostatic pressure below the subgrade to prevent uplift.
 - 3. Prevent surface drainage from accumulating within work area.
 - 4. Legally discharge and dispose of excess water.
- 5. Submit description of basic components of proposed dewatering system and its planned method of operation.

1.04 SUBMITTALS:

- A. Comply with provisions of Section 01300 - SUBMITTALS.
- B. Product Data: Manufacturer's literature and data, including, where applicable, capacity, labels, or other markings on equipment made to the specified standards for materials, for the following:
 - 1. Imported materials.
 - 2. Class II aggregate base (CDT Section 26).
 - 3. Storm Water Pollution Prevention / Erosion Control Plans.
 - 4. Permit/Notice of Intent (N.O.I.), for discharge of storm run-off from the construction site.
 - 5. Soil Sterilant.
 - 6. Termiticide.
- C. Test Reports: Submit following reports for import material directly to Architect from the Contractor's testing services:
 - 1. Test reports on borrow material.
 - 2. Density test reports.
 - 3. One optimum moisture-maximum density curve for each type of soil encountered.
 - 4. Report of actual unconfined compressive strength and/or results of bearing test of each strata tested.
 - 5. At least one laboratory optimum moisture - maximum dry density curve for each type of soil encountered.
- D. Shoring Design: Submit 4 copies of shoring design and shop drawings; none will be returned unless a concern is observed.
- E. Submit description of dewatering methods proposed for use.
- F. Submit description of vibratory compactors proposed for use when requesting placement of backfill and fill materials in layers greater than 6 inches thick.
- G. Samples:
 - 1. 20-lb. Samples, sealed in air-tight containers, of each proposed fill and backfill soil material from on-site or borrow sources.
 - 2. 12-by-12 inch sample of filter fabric.
- H. Pad Certification
 - 1. Submit a pad certification stamped by a California Licensed Land Surveyor.

1.05 QUALITY ASSURANCE:

- A. Requirements of Regulatory Agencies:
 - 1. Comply with State of California Business and Transportation Agency, Department of Transportation (Caltrans) "Standard Specifications."
 - 2. Comply with State of California Code of Regulations (CCR).
 - 3. Comply with State of California Construction Safety Orders, Latest Edition (CAL/OSHA).
 - 4. City of Hayward Department of Public Works, Standards and Specifications and Drawings, latest addition herein referred to as the Hayward Specifications.
- B. Soil Testing:
 - 1. Owner will engage a geotechnical testing agency, to include testing soil materials proposed for use in the work and for quality control testing during excavation and fill

- operations.
2. Test results will be distributed in compliance with Section 01410 - TESTING AND INSPECTION SERVICES.
- C. Codes and Standards:
1. Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.
 2. Storm Water Pollution Prevention and Monitoring Plan to be prepared by others.
 3. Statewide General Permit to Discharge Storm Water associated with construction activity.
- D. Comply with the latest editions of the following Standards and Regulations:
1. American Society for Testing and Materials (ASTM):
 - a. C33: Concrete Aggregates.
 - b. C125: Standard Terminology Relating to Concrete and Concrete Aggregates.
 - c. C136: Sieve Analysis of Fine and Coarse Aggregates.
 - d. C566: Total Evaporable Moisture Content of Aggregate by Drying.
 - e. D421: Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.
 - f. D422: Particle Size Analysis of Soil.
 - g. D854: Specific Gravity of Soils.
 - h. D1556: Density of Soil by the Sand Cone Method.
 - i. D1557: Laboratory Compaction Characteristics of Soil Using Modified Effort
 - j. D2216: Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures.
 - k. D2487: Classification of Soils for Engineering Purposes.
 - l. D2922: Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
 - m. D2937: Density of Soil in Place by Drive Cylinder Method.
 - n. D3017: Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
 - o. D4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
 2. California Administrative Code, Title 24, Part 2 - Basic Building Regulations, Chapter 24 - Excavations, Foundations, and Retaining Walls.
 3. California Department of Transportation (CDT) Standard Specifications:
 - a. Section 16: Grading
 - b. Section 17: Watering.
 - c. Section 18: Dust Palliative.
 - d. Section 19: Earthwork.
 4. CAL/OSHA, Title 8.
 5. City of Hayward Standard Plans and Specifications
 6. Other authorities having jurisdiction
- D. Geotechnical Engineering Services:
1. Geotechnical Engineer will be the Owner's Representative to observing grading observations during preparation offsite, excavation, and compaction of fill materials.
 2. Make visits to site to familiarize himself generally with progress and quality of work.
 3. Make field observations and tests to enable him to form opinions regarding adequacy of site preparation, acceptability of fill materials and extent to which earthwork construction and relative compaction comply with specifications requirements.

4. Examine conditions exposed in foundation excavations.
- E. Site Information:
 1. Geotechnical Investigation Reports are available for examination by Contractor.
 2. Additional soil borings and other exploratory operations may be made by Contractor at no cost to Owner. Submit proposed boring locations for review prior to performing the work.

1.06 DELIVERY, STORAGE, AND HANDLING:

- A. Protect materials of this section before, during and after installation; objects designated to be retained; and the installed work of other trades.
- B. In the event of damage to any of these items, immediately make repairs or replacements necessary to the acceptance of the Owner's Representative and at no additional cost to the Owner.
- C. Comply with provisions of Section 01500 - TEMPORARY FACILITIES where necessary to control dust and noise on and near the work caused by operations during performance of the Work.

1.07 PROJECT CONDITIONS:

- A. Site Information: Review the geotechnical report identified in Section 02010 - SUBSURFACE INVESTIGATION.
- B. Environmental Requirements:
 1. When unfavorable weather conditions necessitate interrupting filling and grading operations, prepare areas by compaction of surface and grading to avoid collection of water.
 2. Provide adequate temporary drainage to prevent erosion.
 3. After interruption, reestablish compaction specified in last layer before resuming work.
 4. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to Owner.
 5. Protect existing streams, ditches and storm drain inlets from water-borne soil by means of straw bale dikes, filter fiber dams, or other methods as approved by the Architect.
- C. Barricade open excavations and post with warning lights.
 1. Comply with requirements of Section 01500 - TEMPORARY FACILITIES.
 2. Operate warning lights as recommended by authorities having jurisdiction.
 3. Protect structures, utilities, sidewalks, pavements, and other facilities immediately adjacent to excavations, from damages caused by settlement, lateral movement, undermining, washout and other hazards.
- D. Protection of Subgrade: Do not allow equipment to pump or rut subgrade, stripped areas, footing excavations, or other areas prepared for project.
- E. At Contractor's option, a working pad of granular material may be laid to protect footing and floor subgrade soils from disruption by traffic during wet conditions.
- F. Transport all excess soils materials by legally approved methods to disposal areas.
 1. Coordinate with the Owner's Representative.
 2. Sufficient topsoil and fill material shall be retained from the site to complete project

requirements.

3. Any additional topsoil and fill requirements shall be the responsibility of the Contractor.

G. Use of explosives will not be permitted.

H. Dust Control Requirements: At all times during earthwork operations and until final completion and acceptance of the earthwork, the Contractor shall prevent the formation of an airborne dust and dirt nuisance from interfering with the surrounding normal operations.

The Contractor shall effectively stabilize the site of work in such a manner that it will confine dust particles to the immediate surface of the work and to obtain a minimum of 40 percent emissions reduction by applying a dust palliative. The dust palliative shall be non-petroleum based. Water alone is not considered to be a dust palliative. The dust palliative shall be applied at the rate and method in conformance with Section 18, "Dust Palliative," of the CDT Standard Specifications and as recommended and/or specified by the manufacturer. Contractor shall assume liability for all claims related to dust and dirt nuisances.

1.08 Existing Utilities

A. The Owner will contact local utility agencies & campus facilities prior to construction and arrange for the shut-off of all utilities serving the buildings to be demolished. Coordinated work required to abandon active lines with the Program Manager and the Owner.

B. Locate existing underground utilities in the areas of work. If utilities are to remain in place, provide adequate means of protection during excavation operations.

C. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult utility Owner immediately for directions.

1. Cooperate with the Owner and public and private utility companies in keeping their respective services and facilities in operation.

2. Repair damaged utilities to the satisfaction of the utility owner.

D. Do not interrupt existing utilities serving facilities occupied and used by the Owner or others, except when permitted in writing by Architect and then only after acceptable temporary utility services have been provided.

1.09 SEQUENCING AND SCHEDULING:

A. The sequence of operations shall be reviewed by the Owner's Representative prior to commencement of any work.

B. Coordinate operations with relocation of existing utilities.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. General:

1. Fill material will be subject to approval by the Geotechnical Engineer.

2. For approval of imported fill material, notify the Owner's Representative at least 7 days in advance of intention to import material, designated proposed borrow area, and permit the Geotechnical Engineer to sample as necessary from borrow area for purpose of making acceptance tests to prove quality of material.

3. The Geotechnical Engineer's report on acceptability shall be final and binding.

4. During grading operations, soil types other than those analyzed in the geotechnical report for the project may be encountered.
 5. Consult the Geotechnical Engineer to determine the suitability of these soils.
- B. Engineered Fill Material: Soil excavated from site or imported conforming to requirements for fill material contained in geotechnical report for this project.
1. Imported materials should have a plasticity index not less than 5 nor greater than 15, as determined by ASTM D4318; and expansion index not exceeding 20, as determined by UBC Specification 29-2; and a particle size not exceeding 3 inches as determined by ASTM D422.
- C. Topsoil: Friable clay loam surface soil found in a depth of not less than 10 inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones and other objects over 2 inches in diameter, and without weeds, roots and other objectionable material.
1. Use topsoil for top 2 feet of fill against exterior walls, except at paving and sidewalks.
 2. Topsoil may also be used beyond the area within 5 feet of building, except under paving and sidewalks.
 3. Confirm suitability of stockpiled materials.
- D. Sand: Clean, well-graded fine to coarse sand with not more than 2 percent passing the #200 sieve based on wet sieve analysis.
1. Provide 2-inch layer under building slabs on grade.
 2. Provide layer at least two feet wide (thick) against embedded walls.
 3. Provide at other locations indicated.
 4. Where coarse sand is required, provide sand no finer than No. 40 sieve.
- E. Graded Rock Base:
1. Bedding for Utility Piping: Washed, uniformly graded mineral aggregate ASTM D448 with percentage composition of dry weight conforming with following limits:
 - a. Passing 1-inch Sieve: 100 percent.
 - b. Passing 3/4-inch Sieve: 90-100 percent.
 - c. Passing No. 4 Sieve: 0-10 percent.
 2. Base at Slab-on-Grade: As specified in the geotechnical report for this project.
 3. Absorption of water to saturated-surface dry condition shall not exceed 3 percent of oven-dry weight of a sample.
- F. Backfill material for use behind retaining walls shall be a granular material consisting of sand, broken rock, or a mixture of sand and gravel containing no size larger than 2 ½ inches and not more than 15 percent passing the No. 200 sieve.
- G. Imported Fill Requirements: Imported fill, where required, shall be non expansive granular soil, free of organic matter and deleterious substances. Imported fill material shall conform to the following requirements:
1. Grading:

<u>U. S. Sieve Size</u>	<u>Percentage Passing Sieve</u>
2 ½ inch	100
No. 8	25-45
No. 200	0-10
 2. Be thoroughly compactable without excessive voids.
 3. Meet the following plasticity requirements:

- a. Maximum Plasticity Index of 12, as determined by ASTM D4318.
 - b. Maximum Liquid Limit of 35, as determined by ASTM D4318
- H. Imported Fill for Planting Areas: Imported fill for use in planting areas shall be sandy loam weed free soil. Submit analysis from certified Soil and Plant Lab. Coordinate with Landscape Architect.
- J. Pea Gravel: 3/8 inch to 1/2 inch washed, uncrushed gravel. Use at drainage pipe and at other locations indicated.
- K. Filter Fabric: Provide filter fabrics that meet or exceed the listed minimum physical properties determined according to ASTM D4759 and the referenced standard test method in parentheses.
 - 1. Grab Tensile Strength (ASTM D4632): 100 lb.
 - 2. Apparent Opening Size (ASTM D4751): #100 U.S. Standard sieve.
 - 3. Permeability (ASTM D4491): 150 gallons per minute per square foot.
- L. Drainage Pipe:
 - 1. Perforated corrugated plastic drainage tubing meeting ASTM F405, with continuous integral nylon filter screen.
 - 2. Acceptable Manufacturers and Products: Advanced Drainage Systems "DrainGuard," Hancor "Agri-Flow."
 - 3. Provide couplings, elbows and other fittings as recommended by pipe manufacturer.
- M. Water: Clean and free from deleterious amounts of acids, alkalis, salts and organic matter.

2.02 SOIL STERILANT:

- A. Soil Sterilant shall be Treflan E.C. or equal.

2.03 TERMITICIDE:

- A. Termiticide shall be Permethrin, Denon, or approved equal.

PART 3 - EXECUTION

3.01 GENERAL:

- A. Prior to commencement of earthwork, become thoroughly familiar with site conditions.
- B. If event discrepancies are found, immediately notify the Owner's Representative in writing, indicating the nature and extent of differing conditions.
- C. No earthwork shall be performed without physical presence or acceptance of the Geotechnical Engineer.
- D. The Geotechnical Engineer's acceptance is required by these specifications; notify the Owner's Representative at least 48 hours prior to commencing any phase of earthwork.
 - 1. No phase of work shall proceed until prior phase has been accepted by the Geotechnical Engineer.
 - 2. Work shall not be covered up or continued until acceptance of the Geotechnical Engineer shall give written notice of conformance with the specifications upon completion of grading.
- E. Compacting:
 - 1. Compact by power tamping, rolling or combinations thereof as accepted by the Geotechnical Engineer.

- a. Where impractical to use rollers in close proximity to walls, stairs, etc., compact by mechanical tamping.
 - b. Scarify and recompact any layer not attaining compaction until required density is obtained.
2. Compaction by flooding, ponding or jetting will not be permitted, unless specifically accepted by the Geotechnical Engineer.

F. Hazardous Materials

1. If any materials are encountered that may be hazardous (as defined in Section 25117 of the California Health and Safety Code), inform the State's representative verbally within 24 hours and in writing within 2 business days. Upon discovery, material is to remain undisturbed until investigation by State's representative is complete. The removal and disposal of hazardous materials, if discovered, is not part of the scope of work of this Division for this project.

3.02 SITE PREPARATION:

- A. Protect structures, utilities, sidewalks, pavements, and other facilities which are to remain from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations. Set up tree protection measures prior to commencing grading or demolition operations.
- B. Clearing and Grubbing:
 1. Remove from area of designated project earthwork all improvements and obstructions, including designated concrete curbs or slabs, asphaltic concrete, all tree and shrub roots, any buried utility and irrigation lines, and other matter determined by the Geotechnical Engineer to be deleterious.
 - a. In all new planting areas, remove existing base material.
 - b. Use only hand methods for grubbing inside the drip line of trees indicated to be left standing.
 2. Remove from the site all trees and shrubs, unless otherwise indicated on the drawings as existing trees to be left standing.
 3. Remove or fill existing basements left from removed structures as appropriate to areas. Compact in accordance with requirements of these specifications.
 4. Removed material shall become property of the Contractor and shall be removed from site, unless otherwise indicated on the drawings or specified herein.
 5. Holes resulting from removal of underground obstructions that extend below finish grades shall be cleared and backfilled with engineered fill.
 6. Existing Trees to remain:
 - a. Verify the locations of existing trees to be preserved.
 - b. Replace existing trees to remain that are damaged during construction at no additional cost to the Owner.
 - c. Carefully make clean cuts at roots and branches of trees indicated to be left standing, where such roots and branches obstruct new construction. Paint cuts over ½ inch in size with tree pruning compound.
- C. Topsoil:
 1. Strip topsoil to whatever depths encountered in manner to prevent intermingling with the underlying subsoil or other objectionable material.
 2. Remove heavy growths of grass from areas before stripping. Where trees are

indicated to be left standing, stop topsoil stripping a sufficient distance to prevent damage to the main root system.

3. Stockpile topsoil in storage piles to freely drain surface water.
4. Cover storage piles if required to prevent windblown dust.

3.03 EXISTING UTILITIES:

- A. Protect existing utilities that are to remain in operation as specified.
- B. Demolish and completely remove from the site existing underground utilities indicated to be removed. See Section 02225 – DEMOLITION.
- C. Movement of construction machinery and equipment over existing pipes and utilities during construction shall be at contractor's risk.
- D. Excavation made with power-driven equipment is not permitted within 2 feet of any known utility or subsurface structure.
 1. Use hand or light equipment for excavating immediately adjacent to or for excavations exposing a utility or buried structure.
 2. Start hand or light equipment excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured.
 3. Support uncovered lines or other existing work affected by excavation until approval for backfill is obtained.
 4. Report damage of utility line or subsurface structures immediately to Owner's Representative

3.04 PREPARATION OF SUBGRADE:

- A. Expansive soils are anticipated to basement depth.
 1. To help mitigate expansive soil problems, overexcavate and construct the upper 12 inches of building pad subgrade such that at least 18 inches of nonexpansive structural fill underlies these areas.
 2. Review the necessity for overexcavation of expansive soils once the final basement depth has been determined.
- B. Scarify building pad, exterior flatwork and pavement subgrade to a depth of at least 8 inches and work until uniform and free from large clods.
 1. Bring expansive subgrades to 2 to 5 percentage points above the optimum moisture content and compact to 90 percent of the maximum laboratory dry density, in accordance with ASTM D1557.
 2. Bring nonexpansive subgrades to or slightly above the optimum moisture content and compact to 90 percent of the maximum laboratory dry density in accordance with ASTM D1557.
 3. Increase compaction of the upper 12 - 18 inches of pavement subgrades to 95 percent of the maximum laboratory dry density per ASTM D1557 for nonexpansive subgrades.

3.05 DEWATERING:

- A. Do not allow water from surface drainage or underground sources to accumulate in excavations, unfinished fills, or other low areas.
- B. Provide and maintain ample means and devices to remove water promptly and dispose

properly of water entering excavations or other parts of the work to prevent softening of exposed surfaces.

- C. Dewater by methods which will ensure dry excavation and preservation of finish lines and grades of excavation bottoms.
- D. Prior to excavating below ground water level, place dewatering system in operation.
 - 1. Lower the ground water level a minimum of 1 foot below the bottom of the excavation.
 - 2. Relieve the hydrostatic pressure in pervious zones below the subgrade elevation to prevent uplift.
 - 3. Use screens and gravel packs as necessary to prevent removal of fines from the soil.
- E. Operate the dewatering system continuously, 24 hours a day, 7 days a week until construction work below existing ground water level is completed.
 - 1. Measure and record the performance of the dewatering system.
 - a. Perform at the same time each day.
 - b. Use piezometers and observation wells.
 - 2. After placement of initial slabs and backfill, the ground water level may be allowed to rise.
 - 3. At no time allow ground water to rise higher than 1 foot below the prevailing level of excavation or backfill.
 - 4. Have a back-up pump and system available for immediate use.
- F. Dispose of water away from the work in suitable manner without damage to adjacent property or menace to public health.
- G. Do not drain water into work being built or under construction without prior acceptance of the Owner's Representative.
- H. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to the Owner.

3.06 SITE EXCAVATION:

- A. General
 - 1. All supports, shoring, and sheet piling required for the sides of excavations or for protection of adjacent existing improvements shall be provided and maintained by the Contractor. The adequacy of such systems shall be the complete responsibility of the Contractor.
 - 2. Earth and rock, regardless of character and subsurface conditions, shall be excavated to depths shown on drawings and to the neat dimensions of the footings wherever practicable, to permit pouring of footings and grade beams without use of side forms, except at slab perimeters.
 - 3. Large rocks, pieces of concrete or other obstructions, if encountered during the excavation/scarifying operations, shall be removed and disposed of by the Contractor off the site in a legal manner.
 - 4. Where footing excavation is too deep, backfill shall be concrete. Where footings are over dug laterally, side forms shall be employed for backfill with rock fill or concrete

- backfill shall be used (Contractor's option).
5. Where forming is required, only that excavation necessary to permit placing and removal of forms shall be done.
 6. Bottoms of all footings and foundations trenches shall be subject to testing by the Geotechnical Engineer. Corrective measures as directed by the State's representative shall be executed promptly.
- B. Excavate subgrade as required to allow for finish grades shown on drawings, as required for structural fill or otherwise required for proper completion of the work.
- C. Remove and replace subgrade materials designated by Geotechnical Engineer as unsuitable.

3.07 FILL AND COMPACTING:

- A. See Section 02315 – TRENCHING, BACKFILLING, & COMPACTING for fill and compacting requirements.

3.08 MOISTURE CONTROL:

- A. Do not place, spread or roll fill material during unfavorable weather conditions or when fill material is excessively wet.
- B. Do not resume operations until moisture content and fill density are satisfactory to the Geotechnical Engineer.
- C. Provide berms or channels to prevent surface water from flooding excavations. Promptly remove water collecting in depressions.
- D. Where soil has been softened or eroded by flooding or by placement during unfavorable weather, remove damaged areas and recompact as described for fill and compaction.
- E. Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material.
1. Prevent free water appearing on surface during or subsequent to compaction operation.
 2. Remove and replace, or scarify and air dry, soil material too wet to permit compaction to specified density.
 3. Soil material removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory value.

3.09 GRADING:

- A. General: Uniformly grade areas of work including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.
1. All areas covered by the project, including excavated and filled areas and adjacent transition areas, shall be uniformly graded so that finished surfaces are at the elevations established by the plans. Planter areas to receive future topsoil shall be graded below finished grade to allow for such material.
 2. Finished surfaces and surfaces to receive paving and aggregate base shall be smooth, compacted, and free from irregular surface drainage.
 3. Ditches, gutters, and swales shall be finished to permit proper surface drainage.
 4. All surface areas, except paved and sloped embankments exceeding 8:1, shall be

hydroseeded in accordance with specifications in Landscaping Sections.

B. Grading Tolerances:

1. Excavations shall not exceed 0.10-foot variation from dimensions and elevations shown or noted, unless otherwise approved by Owner's Representative.
2. Fill and backfill shall be placed with tolerance of plus or minus 0.10 foot if placed in layers.
3. Grading shall be done within plus or minus 0.10 foot typically; areas under slabs, walks or pavements shall be graded within tolerance of 0 to 0.10 foot.
4. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10 foot above or below required subgrade elevations.
5. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 0.10 foot above or below required subgrade elevation.
6. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than ½ inch above or below required subgrade elevation.

C. Compaction: After grading, compact subgrade surfaces to the depth and percentage of maximum density for each area classification.

3.10 SOIL STERILIZATION:

- A. General: Soil sterilant shall be applied to prepared subgrade or after installation of rock or aggregate base as recommended by the manufacturer. Sterilant shall be applied uniformly at the rate recommended by the manufacturer to all areas beneath asphalt concrete pavement, brick pavement, concrete pavement, or on-grade concrete slabs including sidewalks, curbs, and gutters and areas between the inner and outer security fences. In addition to ground areas treated, sterilant shall be applied below expansion or control joints, and at all areas where pipe, ducts, or other features penetrate slabs.

3.11 DISPOSAL OF EXCESS AND WASTE MATERIALS:

- A. Removal of Excess Excavated Material: Excess material shall be removed by the Contractor off the site in a legal manner.
- B. Testing Agency Services: Allow testing agency to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.
1. Perform field in-place density tests according to ASTM D1556 (sand cone method), ASTM D2167 (Rubber Balloon Method), or ASTM D2937 (Drive Cylinder Method), as applicable.
 - a. Field in-place density tests may also be performed by the nuclear method according to ASTM D2922, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D1556. With each density calibration check, check the calibration curves furnished with the moisture gauges according to ASTM D3017.
 - b. When field in-place density tests are performed using nuclear methods, make calibration checks of both density and moisture gauges at beginning of work on each different type of material encountered, and at intervals as directed by the Architect.
 2. Footing Subgrade: At footing subgrades, perform at least one test of each soil stratum to verify design bearing capacities. Subsequent verifications and approval of other footing subgrades may be based on a visual comparison of each subgrade with related tested strata when acceptable to the Architect.

3. Paved and Building Slab Areas; At subgrade and at each compacted fill and backfill layer, perform at least one field in-place density test for every 2,000 square feet or less of paved area or building slab, but in no case fewer than three tests.
 4. Foundation Wall Backfill: In each compacted backfill layer, perform at least one field in-place density test for each 100 feet or less of wall length, but no fewer than two tests along a wall face.
 5. Trench Backfill: In each compacted initial and final backfill layer, perform at least one field in-place density test for each 150 feet or less of trench, but not fewer than two tests.
- C. Number and location of test shall be at option of the Geotechnical Engineer.
 - D. When testing agency reports that subgrades, fills, or backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, recompact and retest until required density is obtained.
 - E. After grading is completed and the testing agency has completed observation of the work, permit no further excavation or filling, except as approved by Owner's Representative.

3.12 PROTECTION:

- A. Protect newly graded areas from traffic and erosion. Install erosion control mat and straw wattles as shown on the plans. Keep free of trash and debris.
- B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
- C. Where completed compacted areas are disturbed by subsequent construction operation or adverse weather, scarify surface, reshape, compact to required density and provide other corrective work, including retesting, prior to further construction.

3.13 CLEAN-UP:

- A. Comply with requirements of Section 01710 CLEANING.

3.14 TERMITICIDE:

- A. Termiticide shall be applied to soils as recommended by the manufacturer. Termiticide shall be applied uniformly at the rate recommended by the manufacturer to all areas beneath and around wood frame structures.

END OF SECTION

SECTION 02315

TRENCHING, BACKFILLING, AND COMPACTING

PART 1 – GENERAL

1.01 SUMMARY:

- A. Provide labor, material, equipment, and services necessary to complete the backfilling and compacting as necessary for this project. Section includes, but is not limited to:
 - 1. Select Backfill Material.
 - 2. Aggregate Base.
 - 3. Detectable Tape.
 - 4. Trench Excavation.
 - 5. Pipe Bedding.
 - 6. Trench Backfill.
 - 7. Trench Surfacing.
- B. Work specified in Related Sections:
 - 1. Section 02300 – EARTHWORK.
 - 2. Section 02630 – STORM DRAINAGE.

1.02 DEFINITIONS:

- A. Engineered Fill:
 - 1. Soil or soil-rock material approved by the Geotechnical Engineer and transported to the site by the Contractor in order to raise grades or to backfill excavations.
 - 2. Contractor shall provide sufficient tests, and a written statement that all materials brought onto the project site comply with specification requirements.
- B. Excavation: Consists of the removal of material encountered to subgrade elevations.
- C. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below base.
- D. Base: The layer placed between the subgrade and surface pavement in a paving system.
- E. Relative Compaction: In-place dry density of soil expressed as percentage of maximum dry density of same materials, as determined by laboratory test procedure American Society for Testing and Materials (ASTM) D1557.

1.03 SYSTEM DESCRIPTION:

- A. Requirements:
 - 1. Comply with the recommendations of the Geotechnical Engineer.
 - 2. Protect existing trees to remain. No grading is permitted under the drip line of protected trees.
 - 3. Excavations for appurtenant structures, such as, but not limited to, manholes, transition structures, junction structure, vaults, valve boxes, catch basins, thrust blocks, and boring pits, shall be deemed to be in the category of trench excavation.
 - 4. Unless otherwise indicated in the Drawings, all excavation for pipelines shall be open cut.

1.04 SUBMITTALS:

- A. Comply with provisions of Section 01330 – SUBMITTALS PROCEDURES.
- B. Test Reports: Submit the following report for import material directly to the Owner's Representative from the Contractor's testing services:
 - 1. Compaction test reports for aggregate base.
- C. Submit description of compactors proposed for use when requesting placement of base material.

1.05 QUALITY ASSURANCE:

- A. Requirements of Regulatory Agencies:
 - 1. Comply with State of California Business and Transportation Agency, Department of Transportation (Caltrans) latest edition of "Standard Specifications." (CSS).
 - 2. Comply with State of California Code of Regulations (CCR).
 - 3. Comply with State of California Construction Safety Orders, Latest Edition (CAL/OSHA).
- B. Soil Testing:
 - 1. Contractor shall engage a geotechnical testing agency, to include compaction testing and for quality control testing during fill operations.
 - 2. Test results will be submitted to the Owner's Representative.
- C. Codes and Standards:
 - 1. Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.
 - 2. Storm Water Pollution Prevention Plan to comply with Section 01520 – STORM WATER POLLUTION PREVENTION.
 - 3. California Department of Transportation (CDT):
 - a. Section 19: Earthwork.
 - b. Standard Test Methods: No. 202.
 - 4. American Society for Testing and Materials (ASTM):
 - a. D1556: Density of Soil by the Sand Cone Method.
 - b. D1557: Moisture Density Relations of Soils and Soil-Aggregate Mixtures

1.06 DELIVERY, STORAGE AND HANDLING:

- A. Protect materials before, during and after installation.
- B. Comply with provisions of Section 01500 - TEMPORARY FACILITIES AND CONTROLS where necessary to control dust and noise on and near the work caused by operations during construction activities.

1.07 PROJECT CONDITIONS:

- A. Environmental Requirements:
 - 1. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to the Owner.
 - 2. Protect existing streams, ditches and storm drain inlets during work on this project.
- B. Barricade open excavations and post with warning lights.

1. Comply with requirements of Section 01500 – TEMPORARY FACILITIES AND CONTROLS.
 2. Operate warning lights and barricades as required.
 3. Protect structures, utilities, sidewalks, pavements, and other facilities immediately adjacent to excavations, from damages caused by settlement, lateral movement, undermining, washout, and other hazards.
- C. Protection of Subgrade: Do not allow equipment to pump or rut subgrade, stripped areas, footing excavations, or other areas prepared for project.
- D. Transport all excess soils materials by legally approved methods to disposal areas.
1. Coordinate with the Owner's Representative.
 2. Any additional fill requirements shall be the responsibility of the Contractor.

1.08 EXISTING UTILITIES:

- A. Locate existing underground utilities in the areas of work. For utilities that are to remain in place, provide adequate means of protection during excavation operations.
- B. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult utility agency immediately for directions.
1. Cooperate with the Owner's Representative and public and private utility companies in keeping their respective services and facilities in operation.
 2. Repair damaged utilities to the satisfaction of the utility owner.
- C. Do not interrupt existing utilities serving facilities occupied and used by the Owner or others, except when permitted in writing by the Owner's Representative and then only after acceptable temporary utility services have been provided.

1.09 SEQUENCING AND SCHEDULING:

- A. The sequence of operations shall be reviewed by the Owner's Representative prior to commencement of any work.

PART 2 – PRODUCTS

2.01 MATERIALS:

- A. General:
1. Import materials will be subject to approval of the Geotechnical Engineer.
 2. For approval of imported fill material, notify the Owner's Representative at least 7 days in advance of intention to import material.
- B. Class II Aggregate Base: $\frac{3}{4}$ " maximum, Class II AB, free from organic matter and other deleterious substances and conforming to CSS Section 26-1.02.
- C. Water: Clean and free from deleterious amounts of acids, alkalis, salts and organic matter.

2.02 BURIED WARNING AND IDENTIFICATION TAPE

- A. Polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 75 mm 3 inch minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar

wording. Color and printing shall be permanent, unaffected by moisture or soil.

1. Warning Tape Color Codes.

Red: Electric.

Yellow: Gas, Oil; Dangerous Materials.

Orange: Telephone and Other Communications.

Blue: Water Systems.

Green: Sewer Systems.

White: Steam Systems.

Gray: Compressed Air.

2. Warning Tape for Metallic Piping: Acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of tape shall be 0.003 inch. Tape shall have a minimum strength of 1500 psi lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.

3. Detectable Warning Tape for Non-Metallic Piping: Polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of the tape shall be 0.004 inch. Tape shall have a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3 feet (920 mm) deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

2.03 DETECTION WIRE FOR NON-METALLIC PIPING

A. Detection wire shall be insulated single strand, solid copper with a minimum of 12 AWG.

PART 3 – EXECUTION

3.01 GENERAL:

- A. Prior to commencement of work, become thoroughly familiar with site conditions.
- B. In the event discrepancies are found, immediately notify the Owner's Representative in writing, indicating the nature and extent of differing conditions.
- C. Backfill excavations as promptly as work permits.
- D. Do not place engineered fill or backfill until rubbish and deleterious materials have been removed and areas have been approved by the Owner's Representative.
- E. Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.
- F. In excavations, use satisfactory excavated or borrow material.
- G. Under grassed areas, use satisfactory excavated or borrow material.

3.02 COMPACTING:

- A. Compact by power tamping, rolling or combinations thereof.
 - 1. Where impractical to use rollers in close proximity to walls, stairs, etc., compact by mechanical tamping.
 - 2. Scarify and recompact any layer not attaining compaction until required density is obtained.

3.03 SITE PREPARATION:

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, which are to remain, from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to the Owner.

3.04 EXISTING UTILITIES:

- A. Identify the location of existing utilities.
 - 1. Prior to trenching, the Contractor shall excavate at locations specifically indicated on the Drawings, if any, and where new lines cross other utilities of uncertain depth and determine the elevation of the utility in question to ensure that the new line will clear the potential obstruction.
 - 2. The Contractor shall contact Underground Service Alert (USA) at 1-800-227-2600 for assistance in locating existing utilities.
 - 3. If, after the excavation, a crossing utility does present an obstruction, then the line and grade of the new line will be adjusted as directed by the Owner's Representative to clear the utility.
- B. Protect all existing utilities to remain in operation.
- C. Movement of construction machinery and equipment over existing pipes and utilities during construction shall be at Contractor's risk.
- D. Excavation made with power-driven equipment is not permitted within 2 feet of any known utility or subsurface structure.
 - 1. Use hand or light equipment for excavating immediately adjacent to known utilities or for excavations exposing a utility or buried structure.
 - 2. Start hand or light equipment excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured.
 - 3. Support uncovered lines or other existing work affected by excavation until approval for backfill is obtained.
 - 4. Report damage of utility line or subsurface structures immediately to the Owner's Representative.
- E. Backfill trenches resulting from utility removal in lifts of 8 inches maximum. Compact backfill to at least 95 percent of the maximum dry density, per ASTM D1557.

3.05 TRENCH EXCAVATION

- A. General
 - 1. Excavation shall include removal of all water and materials that interfere with construction. The Contractor shall remove any water which may be encountered in the trench by pumping or other methods during the pipe laying, bedding and backfill operations. Material shall be sufficiently dry to permit approved jointing.
 - 2. Excavation shall include the construction and maintenance of bridges required for vehicular and pedestrian traffic, support for adjoining utilities.
 - 3. The Contractor shall be responsible to safely direct vehicular and pedestrian traffic through or around his/her work area at all times.

4. The Contractor shall relocate, reconstruct, replace or repair, at his/her own expense, all improvements which are in the line of construction or which may be damaged, removed, disrupted or otherwise disturbed by the Contractor.
- B. Existing Paving and Concrete:
1. Existing pavement over trench shall be sawcut, removed, and hauled away from the job. Existing pavement shall be neatly sawcut along the limits of excavations.
 2. Existing concrete over the trench shall be sawcut to a full depth in straight lines either parallel to the curb or at right angles to the alignment of the sidewalk.
 3. Boards or other suitable material shall be placed under equipment outrigger to prevent damage to paved surfaces.
- C. Trench Width:
1. The maximum allowable trench widths at the top of the pipe shall be as follows:

<u>Pipe Type</u>	<u>Trench Width (Maximum)</u>
Copper	Outside diameter of barrel plus 18 inches
Plastic	"
Vitrified Clay	"
Cast-Iron	Outside diameter of barrel plus 24 inches
Concrete Cylinder	"
Ductile-Iron	"
Reinforced Concrete	"

 - a. The maximum trench width shall be inclusive of all shoring.
 - b. If the maximum trench width is exceeded, the Owner's Representative or Inspector of Record may direct the Contractor to encase or cradle the pipe in concrete at no additional charge.
 2. For pipes 3 inch diameter and larger, the free working space on each side of the pipe barrel shall not be less than 6 inches.
- D. Open Trench:
1. The maximum length of open trench shall be 300 feet or the distance necessary to accommodate the amount of pipe installed in a single day, whichever is greater. No trench shall be left open at the end of the day.
 2. Provisions for trench crossings and free access shall be made at all street crossings, driveways, water gate valves, and fire hydrants.
- E. Excavation Bracing:
1. The excavation shall be supported and excavation operations shall be conducted in accordance with the California Industrial Accident Commission and CAL/OSHA.
 2. The Contractor shall, at his/her own expense, furnish, put in place, and maintain such sheeting and bracing as may be required to support the sides of all excavations (whether above or below the pipe grade), and to prevent any movement which could in any way diminish the required trench section or otherwise injure or delay the work. The sheeting and bracing shall be withdrawn in a manner such as to prevent any earth movement that might overload the pipe.
- F. Excavated Material:
1. All excavated material not required for backfill shall be immediately removed and properly disposed of in a legal manner by the Contractor.

2. Material excavated in streets and roadways shall be laid alongside the trench no closer than 2 feet from the trench edge and kept trimmed to minimize inconvenience to public traffic.
3. Provisions shall be made whereby all storm and wastewater can flow uninterrupted in gutters or drainage channels.

3.06 PIPE BEDDING

- A. Bedding Excavation: The trench shall be excavated below the grade of the pipe bottom to the following minimum depths:

<u>Pipe Type</u>	<u>Depth</u>
Copper	4 inch
Reinforced Concrete	4 inch
Plastic: 2 inch diameter and smaller	4 inch
Cast/Ductile Iron	6 inch
Plastic: over 2 inch diameter	6 inch

1. Stabilization of Trench Bottom: When the trench bottom is unstable due to wet or spongy foundation, trench bottom shall be stabilized with gravel or crushed rock. The Inspector of Record will determine the suitability of the trench bottom and the amount of gravel or crushed rock needed to stabilize a soft foundation. Soft material shall be removed and replaced with gravel or crushed rock as necessary.
2. Placement of Bedding Material: The trench bottom shall be cleaned to remove all loose native material prior to placing select backfill material. Sufficient select backfill material shall be placed in trench and tamped to bring trench bottom up to grade of the bottom of pipe. The relative compaction of tamped material shall be not less than 90 percent. It is the intention of these requirements to provide uniform bearing under the full length of pipe to a minimum width of 60 percent of the external diameter.

3.07 TRENCH BACKFILL

- A. Initial Backfill:

1. Prior to trench backfill, the condition of the trench and laying of pipe must be inspected and approved by the Inspector of Record.
2. Select backfill material shall be used for initial backfill. After the pipe has been properly laid and inspected, select backfill material shall be placed on both sides of the pipe and compacted to final depth as follows:

<u>Pipe</u>	<u>Type Depth</u>
Copper	6 inches above top of pipe
Cast Iron	6 inches above top of pipe
Plastic: less than 3 inches diameter	6 inches above top of pipe
Plastic: 3 inches diameter and larger	12 inches above top of pipe
Ductile Iron	12 inches above top of pipe
Reinforced Concrete	½ outside diameter of pipe (pipe spring line)

3. Compaction: Initial backfill compaction shall be by mechanical means. The initial backfill material shall be hand tamped in layers not exceeding 4 inches in uncompacted depth and shall be brought up uniformly on both sides of the pipe to avoid bending or distortional stress. After hand tamping, the relative compaction of the initial backfill material shall be not less than 90 percent.

4. Pipe Detection: In trenches containing pressurized plastic pipes, tracer wire shall be placed directly above the pipe and shall be connected to all valves, existing exposed tracer wires, and other appurtenances as appropriate.
- B. Subsequent Backfill:
1. Structure and utility trench backfill should be moisture conditioned, placed in lifts eight inches or less in loose thickness, and mechanically compacted to at least 90 percent relative compaction; jetting will not be permitted. The moderately expansive clay soils exposed in trenches should not be allowed to dry out prior to placement of trench backfill materials.
 2. It must be the contractor's responsibility to select equipment and procedures that will accomplish the grading as described above. He/she must organize his/her work in such a manner that the Soil Engineer can test and/or observe each element of grading.
 3. Subsequent backfill shall be compacted to a relative compaction of not less than 90 percent except the relative compaction shall not be less than 95 percent within 3 feet of finished permanent surface grade or 1-1/2 feet below the finished subgrade, whichever is greater.
- C. Jetting and Ponding:
1. Jetting of trench backfill is not permitted.
- D. Compaction Testing:
1. Compaction testing shall be in accordance with California Test Method ASTM D1556 or D1557.

3.08 TRENCH SURFACING

- A. Unpaved Areas:
1. In unimproved areas, the trench surface shall be restored to its original condition. No mounds of earth shall be left along the trench. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
 2. Where completed compacted areas are disturbed by subsequent construction operation or adverse weather, scarify surface, reshape, compact to required density and provide other corrective work, including retesting, prior to further construction.
- B. Temporary Surfacing:
1. Temporary surfacing shall be a minimum of 2 inches of cutback asphalt on 10 inches of Class 2 aggregate base and shall be placed at all trench locations subject to vehicular or pedestrian traffic.
 2. Temporary surfacing shall be laid within one day after backfilling (except where the Contractor elects to place permanent surfacing within this time period).
 3. Before the trenching area is opened for traffic, all excess dirt, rock, and debris shall be removed, the street surface shall be swept clean and the pavement shall be washed down with a water truck and pressure nozzle.
 4. Temporary surfacing shall be maintained to prevent the occurrence of mudholes and prevent the surface from settling below 1 inch or rising more than 1 inch from the existing pavement grade.

3.09 FILL AND COMPACTING:

A. General Requirements:

1. Backfill excavations as promptly as work permits.
2. Do not place engineered fill or backfill until rubbish and deleterious materials have been removed and areas have been approved by the District's Representative.
3. Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.
4. In excavations, use satisfactory excavated or borrow material.
5. Under grassed areas, use satisfactory excavated or borrow material.

B. After subgrade compaction has been approved by the Geotechnical Engineer, spread the engineered fill materials in 6 to 8 inch loose lifts and uniformly mixed during the spreading operation.

1. Bring non-expansive fill materials to or slightly above the optimum moisture content and compacted to at least 85 percent of the maximum laboratory dry density, per ASTM D1557.
2. Bring non-expansive aggregate fill materials to or slightly above the optimum moisture content and compacted to at least 95 percent of the maximum laboratory dry density, per ASTM D1557.
3. Do not compact the top 12 inches of soil in the planting areas.
4. Fill sections greater than 5 feet in depth shall be compacted to at least 90 percent.

C. Repeat compaction procedure until proper grade is attained.

D. Rocks generated during site earthwork may be used in fill when conforming to material specifications.

3.10 MOISTURE CONTROL:

A. Do not resume operations until moisture content and fill density are satisfactory to the Engineer.

3.11 DISPOSAL OF EXCESS AND WASTE MATERIALS:

A. Testing Services: Allow testing agency to test each backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.

B. When testing agency reports that backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, recompact and retest until required density is obtained.

3.12 PROTECTION:

A. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

B. Where completed compacted areas are disturbed by subsequent construction operation or adverse weather, scarify surface, reshape, compact to required density and provide other corrective work, including retesting, prior to further construction.

3.13 CLEAN-UP:

A. Remove all debris, equipment, tools and materials upon completion prior to final inspections to the satisfactions of the engineer.

- B. In unpaved areas without landscaping, cover with straw erosion control blanket. Follow manufacturer's recommendations for installation. Provide and place straw wattles or biodegradable fiber logs across the slope at the midpoint and along the downhill edge of site. No soil is to be left uncovered at the completion of construction.

END OF SECTION

SECTION 02510

WATER SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. This section describes general requirements, products, and methods of execution relating to on-site domestic water and fire water systems serving all buildings and appurtenances. Unless otherwise noted, this section does not apply to irrigation water systems and water systems inside and within 5 feet of buildings. This section applies to:
 - 1. Domestic water distribution and services.
 - 2. Fire water distribution and services.
- B. Contractor shall provide all labor, equipment, materials, and testing services unless otherwise noted.
- C. Related Sections:
 - 1. Section 02321 – TRENCHING, BACKFILLING AND COMPACTING.
- D. Water pressure data:
 - 1. Provided by: [Northern California Fire Protection Services, Inc.]
Testing Date: [February 2005]
Location: [Hydrant #1, approximately 225' west of southern entry from Hesperian Blvd.]
Static Pressure: [120] psig
Residual Pressure: [90] psig
Flow: [1475] gpm
Orifice Size: [2.5 inch]
 - 2. Contractor shall notify Engineer if actual water pressure encountered varies by $\pm[10]$ psig.

1.02 SUBMITTALS

- A. Comply with requirements of Section 01300 – SUBMITTALS.
- B. Product Data: Manufacturer's literature and data, including, where applicable, sizes, pressure rating, rated capacity, listing/approval stamps, labels, or other marking on equipment made to the specified standards for materials, and settings of selected models, for the following:
 - 1. Piping and fittings.
 - 2. Gaskets, couplings, sleeves, and assembly bolts and nuts.
 - 3. Gate valves and ball valves.
 - 4. Blow-off valves, air release and vacuum valves, and combination air valves.
 - 5. Check valves.
 - 6. Pressure reducing valves.
 - 7. Backflow preventers.
 - 8. Valve boxes, frames and covers.
 - 9. Water meter boxes, frames and covers.
 - 10. Post indicators.
 - 11. Fire department connections and wet stand pipes.

12. Fire hydrants.
13. Thrust block concrete mix and/or restrained joints and fittings.
14. Tapping sleeves and tapping valves.
15. Service saddles and corporation stops.
16. Identification materials and devices.
17. Corrosion protection.
18. Water sampling stations.

C. Shop Drawings and Calculations: Where an on-site fire water system is required, Contractor shall provide shop drawings for engineer and agency approval prior to construction. Coordinate with the Contract Documents and identify any proposed modifications or deviations. Shop Drawings and Calculations shall be stamped and signed by a registered Fire Protection Engineer licensed by the State of California as required.

1. Include the following information:
 - a. Design assumptions.
 - b. Thrust block sizing and calculations.
 - c. Materials to be used.
 - d. Available water pressure.
 - e. Required water pressure.
2. The review of fire system components constitutes only a portion of the review and approval required. A copy of the fire system component submittal package shall be forwarded to the local fire marshal for further review and approval.

D. Test Reports:

1. Water Pressure Report: Contractor shall engage the public utility agency, or a qualified testing service to conduct a flow test of the existing water main(s). Provide date and location of test, type and method of test performed, static pressure and residual pressure in psig, observed flow in gpm, and orifice size.

E. Samples: None specified. Provide as necessary.

1.03 QUALITY ASSURANCE

A. Comply with the latest edition of the following Standards and Regulations:

1. American Water Works Association (AWWA) and American National Standards Institute (ANSI):
 - a. C104/A21.4 ANSI Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
 - b. C105/A21.5 ANSI Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
 - c. C110/A21.10 ANSI Standard for Ductile-Iron and Gray-Iron Fittings, 3 inch - 48 inch for Water.
 - d. C111/A21.11 ANSI Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - e. C115/A21.15 ANSI Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
 - f. C116/A21.16 ANSI Standard for Protective Fusion-Bonded Epoxy Coatings Interior & Exterior Surfaces for Ductile-Iron and Gray-Iron Fittings.
 - g. C150/A21.50 ANSI Standard for Thickness Design of Ductile-Iron Pipe.
 - h. C151/A21.51 ANSI Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
 - i. C153/A21.53 ANSI Standard for Ductile-Iron Compact Fittings for Water Service.

- j. C500 Metal-Seated Gate Valves for Water Supply Service.
 - k. C502 Dry-Barrel Fire Hydrants.
 - l. C503 Wet-Barrel Fire Hydrants.
 - m. C504 Rubber-Seated Butterfly Valves.
 - n. C507 Ball Valves, 6 inches - 48 inches.
 - o. C508 Swing-Check Valves for Waterworks Service, 2 inches - 24 inches NPS.
 - p. C509 Resilient-Seated Gate Valves for Water Supply Service.
 - q. C510 Double Check Valve Backflow Prevention Assembly.
 - r. C511 Reduced-Pressure Principle Backflow Prevention Assembly.
 - s. C512 Air Release, Air/Vacuum, and Combination Air Valves for Waterworks Service.
 - t. C550 Protective Epoxy Interior Coating for valves and Hydrants.
 - u. C600 Installation of Ductile-Iron Water Mains and their Appurtenances.
 - v. C602 Cement- Mortar Lining of water Pipelines in place- 4 inches and larger.
 - w. C605 Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
 - x. C651 Disinfecting Water Mains
 - y. C652 Disinfection of Water-Storage Facilities
 - z. C800 Underground Service Line Valves and Fittings for 1/2 inches - 2 inches.
 - aa. C900 Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 inches - 12 inches, for Water Distribution.
 - bb. C901 Polyethylene (PE) Pressure Pipe and Tubing, 1/2 inches through 3 inches, for Water Service.
 - cc. C905 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 inches - 48 inches.
 - dd. C906 Polyethylene (PE) Pressure Pipe and Fittings, 4 inches - 63 inches, for Water Distribution and Transmission.
 - ee. C907 Polyvinyl Chloride (PVC) Pressure Fittings for Water, 4 inches - 8 inches.
 - ff. C908 PVC Self-Tapping Saddle Tees for Use on PVC Pipe.
 - gg. D103 Factory-Coated Bolted steel Tanks for water Storage.
2. National Fire Protection Association (NFPA):
 - a. NFPA 13 Standard for the Installation of Sprinkler Systems.
 - b. NFPA 14 Standard for the Installation of Standpipe, Private Hydrants, and Hose Systems.
 - c. NFPA 20 Standard for the Installation of Stationary Pumps for Fire Protection.
 - d. NFPA 22 Standard for Water Tanks for Private Fire Protection.
 - e. NFPA 24 Private Service Mains and their Appurtenances.
 - f. NFPA 25 Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
 3. Uni-Bell Plastic Pipe Association (UNI).
 - a. PUB 3 PVC Pipe – Technology Serving the Water Industry.
 - b. PUB 7 External Corrosion of Underground Water Distribution Piping Systems.
 - c. PUB 8 Tapping Guide for AWWA C900 Pressure Pipe.
 - d. PUB 9 Installation Guide for PVC Pressure Pipe.
 - e. B-8 Recommended Practice for the Direct Tapping of Polyvinyl Chloride (PVC) Pressure Water Pipe (Nominal Diameters 6-12 inch).
 4. American Society of Testing and Materials (ASTM).
 - a. ASTM A536 Standard Specification for Ductile Iron Castings.
 - b. ASTM A674 Standard Practice for Polyethylene Encasement for Ductile Iron Pipe for Water or Other Liquids.

- c. ASTM D1785 Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- d. ASTM D2241 Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe.
- e. ASTM D2466 Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- f. ASTM D2564 Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
- g. ASTM D2683 Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.
- h. ASTM D3139 Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
- i. ASTM D3261 Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
- j. ASTM D3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
- k. ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- l. ASTM F1055 Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing.
- m. ASTM F1056 Standard Specification for Socket Fusion Tools for Use in Socket Fusion Joining Polyethylene Pipe or Tubing and Fittings.
- n. ASTM A53/A53M Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- o. ASTM A795 Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.
- p. ASTM A865 Standard Specification for Threaded Couplings, Steel, Black or Zinc-Coated (Galvanized) Welded or Seamless, for Use in Steel Pipe Joints.
- q. ASTM B88 Standard Specification for Seamless Copper Water Tube.
- 5. American Society of Mechanical Engineers (ASME).
 - a. ASME B16 series for valves, fittings, flanges, and gaskets applicable for use in water systems.
 - b. ASME B1.20.1 American Standard Tapered Pipe Threads for factory-threaded pipe and pipe fittings.
- 6. National Sanitation Foundation (NSF).
 - a. NSF/ANSI 14 Plastics Piping System Components and Related Materials.
 - b. NSF/ANSI 61 Standard for Drinking Water Systems Components – Health Effects.
- 7. Underwriters Laboratories, Inc. (UL).
 - a. UL 157 Standard for Safety for Gaskets and Seals.
 - b. UL 194 Standard for Safety for Gasketed Joints for Ductile-Iron Pipe and Fittings for Fire Protection Service.
 - c. UL 213 Rubber Gasketed Fittings for Fire-Protection Service.
 - d. UL 246 Standard for Safety for Hydrants for Fire-Protection Service.
 - e. UL 262 Standard for Safety for Gate Valves for Fire-Protection Service.
 - f. UL 312 Standard for Safety for Check Valves for Fire-Protection Service.
 - g. UL 405 Standard for Safety for Fire Department Connections.
 - h. UL 448 Standard for Safety for Pumps for Fire-Protection Service.
 - i. UL 789 Standard for Safety for Indicator Posts for Fire-Protection Service.
 - j. UL 860 Pipe Unions for Flammable and Combustible Fluids and Fire-Protection Service.

- k. UL 1091 Standard for Safety for Butterfly Valves for Fire-Protection Service.
- l. UL 1285 Pipe and Couplings, Polyvinyl Chloride (PVC), for Underground Fire Service.
- m. UL 1468 Direct Acting Pressure Reducing and Pressure Restricting Valves.
- n. UL 1478 Standard for Safety for Fire Pump Relief Valves.
- 8. FM Global (FM).
 - a. FM 1020 Automatic Water Control Valves.
 - b. FM 1045 Waterflow Detector Check Valves.
 - c. FM 1110 Indicator Posts.
 - d. FM 1111 Post-Indicator-Valve-Assembly.
 - e. FM 1112 Indicating Butterfly Valves.
 - f. FM 1120 and FM 1130 Fire Service Water Control Valves (OS&Y and NRS Type Gate Valves).
 - g. FM 1210 Swing Check Valves.
 - h. FM 1221 Backflow Preventers (Reduced Pressure Principle and Double Check Valve Types).
 - i. FM 1311 Centrifugal Fire Pumps (Horizontal, Split-Case Type).
 - j. FM 1312 Centrifugal Fire Pumps (Vertical-Shaft, Turbine Type).
 - k. FM 1319 Centrifugal Fire Pumps (Horizontal, End Suction Type).
 - l. FM 1361 Water Pressure Relief Valve.
 - m. FM 1362 Pressure Reducing Valves.
 - n. FM 1371 Centrifugal Fire Pumps (In-Line Type).
 - o. FM 1510 Fire Hydrants (Dry Barrel Type) for Private Fire Service.
 - p. FM 1511 Fire Hydrants (Wet Barrel Type) for Private Fire Service.
 - q. FM 1530 Fire Department Connections.
 - r. FM 1610 Plastic Pipe & Fittings for Underground Fire Protection Service.
 - s. FM 1620 Pipe Joints & Anchor Fittings for Underground Fire Service Mains.
- 9. Plastics Pipe Institute (PPI).
 - a. Underground Installation of Polyethylene Pipe.
 - b. Polyethylene Joining Procedures.
 - c. Inspections, Test and Safety Considerations.
- 10. American Association of State Highway and Transportation Officials (AASHTO) for H2O Loading.
- 11. American Concrete Institute (ACI).
 - a. ACI 348 - Meter Pit Construction.
- 12. City of Hayward Standard Specifications and Details.
- 13. City of Hayward Fire Marshal Regulations.
- 14. Other authorities having jurisdiction.
- B. System Description: Grades and elevations are to be established with benchmarks referenced on Plans.
- C. Comply with City of Hayward Standards and authorities having jurisdiction for the installation and testing of potable water piping and fire protection systems.
- D. All testing of systems specified in this section shall be witnessed by representatives of the local water department or local authority. Provide at least 7 days notice.
- E. The Contractor shall prepare shop drawings and calculations, and obtain all required approvals for the fire water system of the proposed project. Contractor shall have shop drawings and calculations stamped and signed by a fire protection engineer, licensed by the State of California, as required by the City of Hayward.

PART 2 - PRODUCTS

2.01 PIPING

- A. Water Distribution Main (pipe size 4 inches and larger).
 - 1. Ductile Iron Pipe (DIP): Pressure Class 350 pipe conforming to AWWA/ANSI C151/A21.5, cement-mortar lining conforming to AWWA/ANSI C104/A21.4, with standard thickness per AWWA/ANSI C150/A21.50. U.S. Pipe, American Cast Iron Pipe Company (ACIPCO), or approved equivalent.
 - a. Flanged ends shall conform to AWWA/ANSI C115/A21.15.
 - b. Rubber-gasket joints shall conform to AWWA/ANSI C111/A21.11.
 - 2. Polyvinyl Chloride Pipe (PVC): Pressure Class 200, DR 14, spigot and gasket bell end, conforming to AWWA C900 or AWWA C905, with equivalent cast-iron pipe outer diameter (O.D.). J-M Manufacturing, PW Pipe, North American Pipe Company, or approved equivalent.
 - 3. Polyethylene Pipe (PE): PE 3408, Pressure Class 200, DR 9, conforming to AWWA C906. Driscopipe 4000/4100, or approved equivalent.
- B. Water Service Line (pipe size 3 inches and smaller)
 - 1. Copper (Cu): Provide Type K soft or hard copper pipe conforming to ASTM B88.
 - 2. For pipe size 1 inches and smaller High Density Polyethylene Pipe (HDPE): PE3408, Pressure Class 200, DR 9 conforming to AWWA C901. PWPIPE or approved equivalent.

2.02 FITTINGS, GASKETS, COUPLINGS, SLEEVES, AND ASSEMBLY BOLTS AND NUTS

- A. For DIP: Provide fittings with pressure rating greater than or equal to that of the pipe. Provide flanged joints, mechanical joints, push-on joints, and insulating joints where indicated. Fittings with push-on joint ends shall conform to the same requirements as fittings with mechanical-joint ends. Provide mechanically coupled type joints using a sleeve-type mechanical coupling where indicated. Provide ends of pipe and fittings suitable for the specified joints. Fittings shall have cement-mortar lining conforming to AWWA/ANSI C104/A21.4.
 - 1. Flanged Joints: Provide bolts, nuts, and gaskets in conformance with AWWA/ANSI C115/A21.15. Flanged fittings shall conform to AWWA/ANSI C110/A21.10 or C153/A21.53.
 - a. Provide flange for setscrewed flanges of ductile iron, ASTM A536, Grade 65-45-12, and conform to the applicable requirements of ASME B16.1, Class 250.
 - b. Provide setscrews for setscrewed flanges of 190,000 psi tensile strength, heat treated and zinc-coated steel.
 - c. Gaskets for setscrewed flanges shall conform to the applicable requirements for mechanical-joint gaskets specified in AWWA/ANSI C111/A21.11.
 - d. Design of setscrewed gaskets shall provide for confinement and compression of gasket when joint to adjoining flange is made.
 - e. Unless otherwise required, above ground flange assembly bolts shall be standard hex-head, cadmium plated machine bolts with American Standard Heavy, hot-pressed, cadmium plated hexagonal nuts. Buried flange nuts and bolts shall be as above except they shall be of Type 304 stainless steel.
 - 2. Mechanical Joints: Dimensional and material requirements for pipe ends, glands, bolts and nuts, and gaskets shall conform to AWWA/ANSI C111/A21.11.
 - 3. Push-on Joints: Provide shape of pipe ends and fitting ends, gaskets, and lubricant for joint assembly conforming to AWWA/ANSI C111/A21.11. Modify bell design fittings,

- as approved.
4. Insulating Joints: Provide a rubber-gasketed or other suitable approved type of insulating joint or dielectric coupling which will effectively prevent metal-to-metal contact at the joint between adjacent sections of dissimilar metals.
 - a. Provide joint of the flanged type with insulating gasket, insulating bolt sleeves, and insulating washers.
 - b. Provide gasket of the dielectric type, full face, as recommended in AWWA/ANSI C115/A21.15.
 - c. Provide bolts and nuts as recommended in AWWA/ANSI C115/A21.15.
- B. For PVC: Fittings shall be DIP or PVC.
1. DIP fittings: Provide gray-iron or ductile-iron conforming to AWWA/ANSI C110/A21.10, with cement-mortar lining conforming to AWWA/ANSI C104/A21.4, and standard thickness, with equivalent cast-iron pipe O.D.
 - a. Fittings with push-on joint ends shall conform to the same requirements as fittings with mechanical-joint ends, except the bell design shall be modified, as approved, for push-on joint suitable for use with PVC plastic pipe.
 - b. Provide push-on joints, compression joints and mechanical joints where indicated between pipe and fittings, valves, and other accessories.
 - c. Mechanical joints, glands, bolts and nuts, and gaskets shall conform to AWWA/ANSI C111/A21.11.
 2. PVC fittings: Provide fabricated PVC fittings for pressure pipe conforming to AWWA C900, C905, or C907.
 - a. PVC fittings shall conform to ASTM D2466.
 - b. Push-on joints shall conform to ASTM D3139.
 - c. Compression joints shall conform to ASTM D3139.
 - d. Provide each joint connection with an elastomeric gasket suitable for the bell or coupling with which it is to be used. Gaskets shall conform to ASTM F477.
- C. For PE: Fittings shall conform to AWWA C901 or AWWA C906. Driscopipe, or approved equivalent.
1. Socket type fittings shall conform to ASTM D2683.
 2. Butt fusion fittings shall conform to ASTM D3261.
 3. Electrofusion fittings shall comply with ASTM F1055.
- D. For Cu:
1. Cast copper alloy solder-joint pressure fittings shall conform to ASME B16.18.
 2. Wrought copper solder-joint pressure fittings or wrought copper alloy unions shall conform to ASME B16.22
 3. Cast copper alloy flare fittings shall conform to ASME B16.26.
 4. Wrought copper alloy body, hexagonal stock, metal-to-metal seating surfaces, and solder-joint threaded ends shall conform to ASME B1.20.1.
 5. Compression connections shall be Mueller 110, Ford or approved equivalent.
- E. For HDPE:
1. Cast Copper Fittings shall conform to ASME B16.18.
 2. Cast Copper Compression Fittings and connections shall be Mueller 110 Ford or approved equivalent.

2.03 GATE VALVES AND BALL VALVES

- A. Gate Valves: Valves shall open by counterclockwise rotation of the valve stem. Provide valves with ends as appropriate for the adjoining pipe.
 - 1. Stuffing boxes shall have O-ring stem seals. Provide stuffing boxes bolted and constructed so as to permit easy removal of parts for repair.
 - 2. Valves (2-1/2 inches and larger):
 - a. Provide valves conforming to AWWA C500 or AWWA C509 and of one manufacturer. Valves shall have a non-rising stem, a 2-inch square nut, and double-disc gates. Valves shall be rated for 250 psi maximum working pressure. Mueller 2360 series, ACIPCO, or approved equivalent.
 - b. For the domestic water system, valves shall also conform to ANSI/NSF 61.
 - c. For the fire water system, valves 2 inches through 16 inches in size shall also conform to UL 262 and FM 1120 or FM 1130 to a working pressure of 200 psi.
 - 3. Where a post indicator is shown, provide valve with an indicator post flange.
 - B. Ball Valves: Valves shall open by counterclockwise rotation of the valve stem. Provide valves with ends as appropriate for the adjoining pipe.
 - 1. Valves (2-inches and smaller):
 - a. Provide valves conforming to AWWA C800 and of one manufacturer. Mueller 300 Series, Ford, or approved equivalent.
 - 2. Provide valve with operating nut or handle as shown on the Construction Documents.
- 2.04 BLOW-OFF VALVES, AIR RELEASE AND VACUUM VALVES, AND COMBINATION AIR VALVES
- A. Blow-off valves: Provide valve and service size as shown in the Contract Documents. Provide 2-inch valves at low points of the piping system, and 4-inch valves at dead-ends of the piping system, unless otherwise directed by the Engineer.
 - 1. 2-inch blow-off shall have a 2-inch vertical female iron pipe (FIP) inlet and a 2-inch normal pressure and temperature (NPT) nozzle outlet with cap. Valve shall open by counterclockwise rotation of a top-mounted 9/16-inch square operating nut. All working parts shall be serviceable without excavation. Kupferle/Truflo Model TF550, or approved equivalent.
 - 2. 4-inch blow-off shall have a 4-inch vertical FIP inlet and a 4-inch male iron pipe (MIP) outlet with cap. Valve shall open by counterclockwise rotation of a top-mounted 9/16-inch square operating nut. All working parts shall be serviceable without excavation. Kupferle/Truflo Model TF800, or approved equivalent.
 - B. Air release and vacuum valves: Provide valve and service size as shown on the Contract Documents, and where there is an increase in the downward slope or a decrease in the upward slope of the piping system. Valve shall have cast-iron single valve body, and shall conform to AWWA C512. A compound lever system shall have a maximum operating pressure of 300psi. Provide a protective cap for the outlet of the valve. Provide universal air-vacuum type valves, Crispin Model UL, Apco, or approved equivalent.
 - C. Combination air valves: Provide valve and service size as shown on the Contract Documents, and at high points and sharp changes in gradient of the pipe system. Valve shall have cast-iron single valve or double valve body, and shall conform to AWWA C512. A simple or compound lever system shall have a maximum operating pressure of 300psi. Provide a protective cap for the outlet of the valve. Crispin Model C, Apco, or approved equivalent.

2.05 CHECK VALVES

- A. Check Valves: Valves shall have clear port opening and a cast-iron body. Provide spring-loaded or weight-loaded valves where indicated on the Construction Documents.
 - 1. For the domestic water system, provide swing-check type valves conforming to AWWA C508. Provide valves of one manufacturer. Mueller, Apco, or approved equivalent.
 - 2. For the fire water system, provide swing-check type valves conforming to FM 1210 and UL 312. Mueller, Watts, or approved equivalent.

2.06 PRESSURE REDUCING VALVES

- A. Pressure Reducing Valves: Valves shall have a cast-iron body, conforming to ASTM A536, with epoxy interior coating conforming to AWWA, and rated to pressure class .300. Watts N223F, Singer, or approved equivalent.
 - 1. Valves shall have flanged ends.
 - 2. Valves sized 3-inches or smaller may have screwed ends.

2.07 POST INDICATORS

- A. Posts Indicators shall withstand up to 900 ft-lbs of operating torque, be free-standing, and tamper-proof.
- B. Post Indicators shall conform to UL 789 and FM 1110. Mueller, ACIPCO, or approved equivalent.

2.08 VALVE BOXES, METER BOXES, FRAMES AND COVERS

- A. Water Valve Box: Provide pre-cast concrete valve box for each buried valve. Provide box with steel or cast iron traffic cover marked "WATER". Christy Model G5 with G5C cover or approved equivalent.
- B. Valve or Meter Boxes: Contractor shall verify box size required for water system appurtenances as shown in the Contract Documents. Provide a precast concrete utility box for each buried appurtenance. Provide a traffic-rated lid for H20 loading. A non-traffic rated lid may be used for boxes located in landscape areas. Christy, or approved equivalent.

2.09 BACKFLOW PREVENTERS

- A. Provide backflow preventers as shown on the Contract Documents. Subject to local water department approval. Backflow preventers on the fire water system shall be subject to approval by the local office of the fire marshal.
- B. Reduced Pressure Principle Assemblies (RPPA): Provide a cast-iron body RPPA consisting of two independently operating check valves with a pressure differential relief valve located between the two check valves, two shut-off valves and four test cocks. RPPA shall be tamper-proof and conform to AWWA C511. Febco 860, Watts, or approved equivalent.
- C. Double Check Detector Assemblies (DCDA): Provide a cast-iron body DCDA consisting of mainline double check assemblies in parallel with a bypass double check and meter assembly, two shut-off valves and four test cocks. DCDA shall be tamper-proof and conform to AWWA C510. Febco 806, Watts, or approved equivalent.

2.10 FIRE DEPARTMENT CONNECTIONS AND WET STAND PIPES

- A. Fire Department Connections (FDC): Provide FDC's with 2-1/2 inch female hose

connections, sidewalk or free-standing type. Number of inlets shall be as shown on the Contract Documents. Clapper and spring check inlets shall each have a minimum capacity of 250 gpm, and be furnished with a cap and chain. Outlet shall be sized for simultaneous use of all inlets. Connection shall be branded "AUTO SPKR".

1. 2-Way FDC: Connection shall conform to UL 405 or FM 1530. Elkhart, Croker, or approved equivalent.
 2. 3-Way FDC: Connection shall be subject to approval by the local water department or fire marshal. Elkhart, Croker, Potter-Roemer or approved equivalent.
 3. 4-Way FDC: Connection shall conform to UL 405. Potter-Roemer, Croker, or approved equivalent.
 4. 6-Way FDC: Connection shall be subject to approval by the local water department or fire marshal. Croker, Potter-Roemer or approved equivalent.
- B. Wet Stand Pipes (WSP): Provide 2-Way WSP's with valves and two (2) 2-1/2 inch male hose connections free-standing type, with a 4" inlet. Each outlet shall each have a minimum capacity of 250 gpm, and be furnished with a cap and chain. Water to the WSP shall be controlled with a remote valve. Connection shall be branded "HYDRANT". Subject to approval by the local water department or fire marshal. Croker, Elkhart, Potter-Roemer or approved equivalent.

2.11 FIRE HYDRANTS

- A. Provide two 2-1/2 inch and one 4-1/2 inch outlets, with a 6-inch nominal inside diameter inlet and break-away type bolts. Hydrant shall have a working pressure of 250 psi and shall conform to AWWA C502 or C503, and be UL listed and FM approved. Provide hydrants of one manufacturer. Clow 800 series, Mueller, ACIPCO, or approved equivalent, subject to approval by the local water department and fire marshal.

2.12 THRUST BLOCKS AND PIPE RESTRAINTS

- A. Thrust Blocks: Provide thrust blocks in accordance with NFPA 24 Standards. Use concrete conforming to ASTM C94 having a minimum compressive strength of 2,500 psi at 28 days; or use concrete of a mix not leaner than one part cement, 2-1/2 parts sand, and 5 parts gravel, having the same minimum compressive strength.
- B. Pipe Restraints: Provide thrust restraint systems for fittings and joints as required or as indicated on the Plans.
1. For mechanical joint fittings and joints: Pipe restraints shall be "Mega-Lug" pipe restraint system by EBBA Iron, Inc., or approved equivalent.
 2. For push-on joint fittings and joints: Pipe restraints shall be "Field-Lok" gaskets by U.S. Pipe, or approved equivalent.
- C. Thrust blocks, gravity blocks, or mechanical pipe restraints may be used at Contractor's option, unless otherwise indicated on the Plans.
- D. Provide thrust blocks or mechanical pipe restraints at all fittings and changes in angle, alignment or elevation.
- E. Where depth or location of water piping, existing utilities, or other structures prohibit the use of standard thrust blocks, gravity blocks or mechanical pipe restraints may be used. Conform to NFPA 24 Standards.

2.13 TAPPING SLEEVES AND TAPPING VALVES

- A. Tapping sleeves shall be epoxy coated and furnished with stainless steel washers, nuts and bolts. Mueller H-615 and H-619, Ford, or approved equivalent.
- B. Tapping valves shall have flanged inlet, Class 125, conforming to ASME B16.1 and furnished with stainless steel washers, nuts and bolts. Tapping valves shall be constructed with a mechanical joint outlet. Mueller T-687, T-642, T-681, or approved equivalent.

2.14 SERVICE SADDLES AND CORPORATION STOPS

- A. Service Saddles Saddles shall conform to AWWA C800 and NSF 61.
 - 1. For DIP: Provide bronze or stainless steel body, double strap type with a 200 psi maximum working pressure. Mueller BR2 Series, Ford, or approved equivalent.
 - 2. For PVC: Provide bronze body, wide strap type. Mueller H-13000 Series, Ford, or approved equivalent.
- B. Corporation Stops: Provide ground key type; bronze conforming to ASTM B61 or ASTM B62, for a working pressure of 100 psi. and suitable for the working pressure of the system.
 - 1. Ends shall be suitable for adjoining pipe and connections, solder-joint, or flared tube compression type joint.
 - 2. Threaded ends shall conform to AWWA C800.
 - 3. Coupling nut for connection to flared copper tubing shall conform to ASME B16.26.
 - 4. Mueller H-15000 Series with "CC" threads and a copper flare straight connection outlet, Ford, or approved equivalent.

2.15 IDENTIFICATION MATERIALS AND DEVICES

- A. Marker Tape: Provide marker tape consisting of metallic foil bonded to plastic film not less than 2-inches wide. Film shall be inert polyethylene plastic. Film and foil shall each not be less than 1-mil. thick. The tape shall be identified with lettering, not less than 3/4-inch high, "CAUTION: WATER MAIN BELOW", repeated at approximately 24-inch intervals.
- B. Tracer Wire for Nonmetallic Piping: Provide 12 gage, coated copper or aluminum wire not less than 0.10 inch in diameter in sufficient length to be continuous over each separate run of nonmetallic pipe. Wire shall be tied in at all valves.

2.16 CORROSION PROTECTION

- A. In soils with high resistivity, high sulfides, high/low ph, redox potential and/or poor surrounding drainage conditions, or as indicated in the Contract Documents, encase underground pipe and appurtenances in 4-mil, high-density cross-laminated (HDCL) polyethylene film or 8-mil linear low-density (LLD) polyethylene film in accordance with AWWA/ANSI C105/A21.5. U.S. Pipe, ACIPCO, or approved equivalent.

2.17 WATER SAMPLING STATIONS

- A. Provide Sampling Stations with or without a flushing valve as indicated on the Contract Documents.
- B. All stations shall be enclosed in a lockable, nonremovable, aluminum-cast housing. The

station shall require no key for operation. All working parts will be brass and be removable without excavation. Exterior piping shall be galvanized steel or brass.

- C. Sampling Station without Flushing Valve: Sampling Stations shall be 30" bury, with a 3/4-inch female-iron-pipe (FIP) inlet, and a 3/4-inch nozzle. A 1/2-inch copper vent tube shall be provided to pump the station free of standing water to prevent freezing and minimize bacteria growth. Kupferle Eclipse 88, or approved equivalent.
- D. Sampling Station with Flushing Valve: Sampling Stations shall be 30" bury, with a 1-inch male-iron-pipe (MIP) inlet, and a 1-inch FIP discharge. A 1/4-inch bent-nose sampling bibb shall be located before the discharge. Provide a 1/2-inch brass drain pipe for the housing. Kupferle Eclipse 88WC, or approved equivalent.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine surfaces and areas for suitable conditions where water service is being installed.
- B. Do not begin installation until unsatisfactory conditions have been corrected.

3.02 LOCATION OF WATER LINES

- A. Where the location of the water line is not clearly defined by dimensions on the Plans, do not lay water line closer than 10 feet horizontally from any sewer line.
- B. Where water lines cross under gravity sewer lines, encase sewer line in concrete for a distance of at least 10 feet on each side of the crossing, unless sewer line is made of pressure pipe with rubber-gasketed joints and no joint is located within 3 feet horizontally of the crossing.
- C. Where water lines cross sewer force mains and inverted siphons, install water line at least 2 feet above these sewer lines.
- D. When joints in the sewer line are closer than 3 feet horizontally from the water line, encase sewer line joints in concrete.
- E. Do not lay water lines in the same trench with other utilities.
- F. Install water lines at 3'-0" minimum depth or as detailed on Plans.

3.03 INSTALLATION OF PIPING

- A. Inspection:
 - 1. Before placing in position, inspect pipe for noticeable defects. Clean the pipe, fittings, valves, and accessories, and maintain in a clean condition.
 - 2. Remove fins and burrs from pipe and fittings.
- B. Pipe laying and jointing:
 - 1. Provide proper facilities for lowering sections of pipe into trenches.
 - 2. Do not drop or dump pipe, fittings, valves, or any other water line material into trenches.
 - 3. Cut pipe accurately to length established at the site and work into place without springing or forcing. Replace any pipe or fitting that does not allow sufficient space for proper installation of jointing material.
 - 4. Blocking or wedging between bells and spigots will not be permitted. Lay bell-and-

- spigot pipe with the bell end pointing in the direction of laying.
5. Grade the pipeline in straight lines; avoid the formation of dips and low points.
 6. Support pipe at proper elevation and grade.
 7. Provide secure firm, uniform support. Wood support blocking will not be permitted.
 8. Lay pipe so that the full length of each section of pipe and each fitting rests solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings.
 9. Provide anchors and supports where indicated and where necessary for fastening work into place.
 10. Make proper provision for expansion and contraction of pipelines.
 11. Keep trenches free of water until joints have been properly made.
 12. Do not lay pipe when conditions of trench or weather prevent proper installation.
 13. All fittings shall be blocked with appropriately sized thrust blocks as shown in the Contract Documents.
- C. Installation of Tracer Wire:
1. Install a continuous length of tracer wire for the full length of each run of nonmetallic pipe.
 2. Attach wire to top of pipe in such manner that it will not be displaced during construction operations.
- D. Connections to Existing Lines:
1. Make connections to existing water lines after approval is obtained and with a minimum interruption of service on the existing line.
 2. Make connections to existing lines under pressure in accordance with the recommended procedures of a manufacturer of pipe of which the line being tapped is made.
- E. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads to keep out debris and contamination.

3.04 INSTALLATION OF DUCTILE-IRON PIPING

- A. Install pipe and fittings in accordance with requirements of AWWA C600 for pipe installation, joint assembly, valve-and-fitting installation, and thrust restraint.
- B. Jointing:
1. Provide push-on joints with the gaskets and lubricant specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly.
 2. Provide mechanical joints with the gaskets, glands, bolts, and nuts specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly and with the recommendations of AWWA C111.
 3. Provide flanged joints with the gaskets, bolts, and nuts specified for this type joint.
 - a. Install flanged joints up tight; avoid undue strain on flanges, fittings, valves, and other equipment and accessories.
 - b. Align bolt holes for each flanged joint.
 - c. Use full size bolts for the bolt holes; use of undersized bolts to make up for misalignment of bolt holes or for any other purpose will not be permitted.
 - d. Do not allow adjoining flange faces to be out of parallel to such degree that the

- flanged joint cannot be made watertight without over straining the flange.
- e. Where flanged pipe and fitting have dimensions that do not allow the installation of a proper flanged joint as specified, replace it by one of proper dimensions.
- f. Use setscrewed flanges to make flanged joints where conditions prevent the use of full-length flanged pipe. Assemble in accordance with the recommendations of the setscrewed flange manufacturer.
- 4. Provide insulating joints with the gaskets, sleeves, washers, bolts, and nuts previously specified for this type joint. Assemble insulating joints as specified for flanged joints. Bolts for insulating sleeves shall be full size for the bolt holes.
- 5. Ensure that there is no metal-to-metal contact between dissimilar metals after the joint has been assembled.
- C. Exterior Protection: Completely encase buried ductile iron pipelines and underground appurtenances with polyethylene wrap. Install 8-mil linear low-density polyethylene (LLD) film or 4-mil high-density cross-laminated (HDCL) film per manufacturer's recommendations and in accordance with AWWA/ANSI C105/A21.5 and ASTM A674.
- D. Pipe Anchorage:
 1. Provide concrete thrust blocks or restrained joints for pipe anchorage, except where metal harness is indicated on the Construction Documents.
 2. Pipe anchorage shall be in accordance with NFPA 24 Standards.

3.05 INSTALLATION OF POLYVINYL CHLORIDE PIPING

- A. Install pipe and fittings in accordance with the requirements of UNI B-3 for the following:
 1. The laying of pipe, joining PVC pipe to fittings and accessories.
 2. The setting of hydrants, valves, and fittings.
- B. Comply with the recommendations for pipe joint assembly and appurtenance installation in AWWA Manual M23, Chapter 7, "Installation".
- C. Comply with the applicable requirements of AWWA C600 for joint assembly, and with the recommendations of Appendix A to AWWA C111.
- D. Jointing:
 1. Provide push-on joints with the elastomeric gaskets specified for this type joint, using either elastomeric-gasket bell-end pipe or elastomeric-gasket couplings.
 2. For pipe-to-pipe push-on joint connections, use only pipe with push-on joint ends having factory-made bevel.
 3. For push-on joint connections to metal fittings, valves, and other accessories, cut spigot end of pipe off square and re-bevel pipe end to a bevel approximately the same as that on ductile-iron pipe used for the same type of joint.
 4. Use an approved lubricant recommended by the pipe manufacturer for push-on joints.
 5. Assemble push-on joints for connection to fittings, valves, and other accessories in accordance with the requirements of UNI B-3 for joining PVC pipe to fittings and accessories and with the applicable requirements of AWWA C600 for joint assembly.
 6. Make compression-type joints/mechanical-joints with the gaskets, glands, bolts, nuts, and internal stiffeners previously specified for this type joint. Cut off spigot end of pipe for compression-type joint or mechanical-joint connections and do not re-bevel.
 7. Assemble joints made with sleeve-type mechanical couplings in accordance with the

recommendations of the coupling manufacturer using internal stiffeners as previously specified for compression-type joints.

E. Pipe Anchorage:

1. Provide concrete thrust blocks or restrained joints for pipe anchorage, except where metal harness is indicated on the Construction Documents.
2. Anchorage shall be in accordance with the requirements of UNI B-3 and in accordance with NFPA 24 Standards for reaction or thrust blocking and plugging of dead ends, except that size and positioning of thrust blocks shall be as indicated on the Construction Documents.

3.06 INSTALLATION OF POLYETHYLENE PIPING

A. Install pipe, fittings, and appurtenances in accordance with PPI and Manufacturer's Recommendations.

B. Jointing:

1. Provide mechanical joints, compression fittings, or flanges as recommended by the manufacturer.
2. Jointing shall be performed using proper equipment and machinery by trained and certified personnel.
3. Joints, fittings and tools shall be clean and free of burrs, oil, and dirt.
4. Butt fusion:
 - a. Pipe ends shall be faced to establish clean, parallel mating surfaces.
 - b. Align and securely fasten the components to be joined squarely between the jaws of the joining machine.
 - c. Heat the ends of the pipe to the pipe manufacturer's recommended temperature interface pressure and time duration. A pyrometer or other surface temperature measuring device should be used to insure proper temperature of the heating tool. Temperature indicating crayons shall not be used on a surface which will come into contact with the pipe or fitting.
 - d. Prevent molten plastic from sticking to the heater faces. Molten plastic on the heater faces shall be removed immediately according to the tool manufacturer's instructions.
 - e. Bring the molten ends together with sufficient pressure to properly mix the pipe materials and form a homogeneous joint. Hold the molten joint under pressure until cooled adequately to develop strength. Refer to the Manufacturer's recommendations for temperature, pressure, holding, and cooling times.
 - f. Remove the inside bead from the fusion process using Manufacturer's recommended procedure.
5. Socket fusion:
 - a. Mixing manufacturers' heating tools and depth gages will not be allowed unless the tools conform to ASTM F1056.
 - b. Pipe ends shall be faced square to establish clean, parallel mating surfaces.
 - c. Clamp the cold ring on the pipe at the proper position using a depth gauge.
 - d. Heat the tool to the pipe manufacturer's recommended temperature. A pyrometer or other surface temperature measuring device should be used to insure proper temperature. Temperature indicating crayons shall not be used on a surface which will come into contact with the pipe or fitting.
 - e. Follow manufacturer's recommendations for bringing the hot tool faces into contact

with the outside surface of the end of the pipe and the inside surface of the socket fitting.

- f. Simultaneously remove the pipe and fitting from the tool.
 - g. Inspect the melt pattern for uniformity and immediately insert the pipe squarely and fully into the socket of the fitting until the fitting contacts the cold ring. Do not twist the pipe or fitting during or after the insertion.
 - h. Hold or block the pipe in place during cooling.
6. Electrofusion:
- a. Unless the operation is for a saddle-type electrofusion joint, pipe ends shall be faced square to establish clean, parallel mating surfaces.
 - b. Clamp the pipe and fitting at the proper position in the fixture.
 - c. Connect the electrofusion control box to the fitting and to the power source. Apply the electric current using manufacturer's instructions.
 - d. Allow the joint to cool before removing the clamping fixtures.

3.07 INSTALLATION OF VALVES

- A. Install gate valves conforming to AWWA C500 and UL 262 in accordance with the requirements of AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix (Installation, operation, and Maintenance of Gate Valves) to AWWA C509.
- B. Install gate valves conforming to AWWA C509 in accordance with the requirements of AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix (Installation, Operation, and Maintenance of Gate Valves) to AWWA C509.
- C. Install gate valves on PVC water mains in addition in accordance with the recommendations for appurtenance installation in AWWA Manual M23, Chapter 7, "Installation."
- D. Install check valves in accordance with the applicable requirements of AWWA C600 for valve-and-fitting installation, except as otherwise indicated.
- E. Provide and assemble joints to gate valves and check valves as specified for making and assembling the same type joints between pipe and fittings.

3.08 INSTALLATION OF VALVE AND METER BOXES

- A. Boxes shall be centered over the appurtenance so as not to transmit shock or stress. Covers shall be set flush with the surface of the finished pavement, or as shown in the Construction Documents. Backfill shall be placed around the boxes and compacted to the specified level in a manner that will not damage or displace the box from proper alignment or grade. Misaligned boxes shall be excavated, plumbed, and backfilled at no additional cost to the Owner.

3.09 INSTALLATION OF HYDRANTS

- A. Install hydrants, except for metal harness, plumbed vertical, in accordance with AWWA C600 for hydrant installation and as indicated.
- B. Provide and assemble joints as specified for making and assembling the same type joints between pipe and fittings. Hydrants shall be set so that mounting bolts clear the top of finished grade by three inches so bolts may be easily replaced if needed.
- C. Provide metal harness as specified under pipe anchorage requirements for the respective

pipeline material to which hydrant is attached.

3.10 SERVICE LINE CONNECTIONS TO WATER MAINS

- A. Connect service lines of size shown on plans to the main with a rigid connection or a corporation stop and gooseneck. Install a gate valve on the service line.
- B. Connect service lines to ductile-iron water mains in accordance with AWWA C600 for service taps.
- C. Connect service lines to PVC plastic water mains in accordance with UNI-B-8 and the recommendations of AWWA Manual M231, Chapter 9, "Service Connections."

3.11 HYDROSTATIC PIPELINE TESTING

- A. Requirements:
 - 1. After the pipe has been laid and backfilled, perform hydrostatic pressure tests.
 - 2. Do not conduct tests until at least 12 hours have elapsed since pipe laying and at least 5 days have elapsed since placing of concrete thrust blocks.
 - 3. Fill the pipe with water which shall remain without external application of pressure for 24 hours before tests are conducted.
 - 4. Prior to hydrostatic testing, flush pipe system with fresh water until piping is free of dirt and foreign matter.
 - 5. Apply pressure by a pump and measured by a test gage. All necessary apparatus and labor for conducting the pressure and leakage tests shall be furnished by the Contractor.
 - 6. Ensure the release of air from the line during filling, and prevent collapse due to vacuum when dewatering the line.
 - 7. For pressure test, use a hydrostatic pressure not less than 200 psi. The duration of the test shall not be less than 4 hours with the variation in pressure of not more than 5 psi for the duration of the test.
- B. Leakage Tests:
 - 1. Perform tests at the same time as pressure tests.
 - 2. Leakage rate shall be measured for at least 4 hours with a certified water meter, or other approved method. If requested, meter certification shall be submitted to the Owner for approval prior to testing.
 - 3. Leakage shall not be measured by a drop in pressure in a test section over a period of time.
 - 4. Leakage at mechanical couplings and joints, tapping sleeves, saddles, flanged joints, and copper piping will not be accepted. Correct any visible leaks.
 - 5. Push-on joints: Test ductile iron pipe for leakage in accordance with AWWA C600 as shown in the following table:

TABLE 1

Allowable Leakage per 1000 feet of DIP Pipeline (Gal/Hr)

Average Test Pressure	Nominal Pipe Diameter - Inches
-----------------------------	--------------------------------

Average Test Pressure	Nominal Pipe Diameter - Inches									
(psi)	3	4	6	8	10	12	14	16	18	20
300	0.39	0.52	0.78	1.04	1.30	1.56	1.82	2.08	2.34	2.60
275	0.37	0.50	0.75	1.00	1.24	1.49	1.74	1.99	2.24	2.49
250	0.36	0.47	0.71	0.95	1.19	1.42	1.66	1.90	2.14	2.37
225	0.34	0.45	0.68	0.90	1.13	1.35	1.58	1.80	2.03	2.25
200	0.32	0.43	0.64	0.85	1.06	1.28	1.48	1.70	1.91	2.12

6. When the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.
7. Test polyvinyl chloride pipe for leakage in accordance with the recommendations of the Uni-Bell Plastic Pipe Association (UNI) as shown in the following table:

TABLE 2

Allowable Leakage per 1000 feet or 50 joints of PVC Pipeline (Gal/Hr)

Nominal Pipe Size (inches)	Average Test Pressure in Line (psi.)	
	200	
4	0.38	4
6	0.57	6
8	0.76	8
10	0.96	10
12	1.15	12
14	1.34	14
16	1.53	16
18	1.72	18
20	1.91	20

8. Should any section of new pipe fail to pass either test, locate and repair the defective pipe and repeat the test.

3.12 STERILIZATION AND FLUSHING

A. General:

1. Disinfect domestic water lines, mains, and branches by chlorination in accordance with AWWA C601 and as herein specified.

B. Sterilization Methods:

1. Liquid Chlorine Solution Method:

- a. Flush all foreign matter from mains, branch runs, hydrant runs, and installed services.
- b. Introduce liquid chlorine solution at appropriate locations to assure uniform distribution through the facilities at the proper concentration.
- c. Do not use installed copper service lines to convey the concentrated chlorine solution to the mains.
- d. The sanitizing solution shall be retained in the facilities for a period of 24 hours after which each service, hydrant run, branch run and dead end shall be flushed until:
 - i. Residual chlorine is less than 1 part per million.
 - ii. Residual chlorine is no greater than the concentration of chlorine in the water supplied for flushing.
- e. Chlorine shall be a 1 percent solution (containing 10,000 parts per million available chlorine) or shall be obtained by use of dry chlorine in tablet form firmly attached to inside tope of the pipe.
- f. The required concentration of chlorine in the pipe is 50 parts per million. This concentration may be attained by adding 5 gallons of the chlorine solution to 1,000 gallons of water.
- g. The weight of chlorine or chlorine compound required to make a 1 percent chlorine solution is as follows:

TABLE 3

One-Percent Chlorine Solution Mix

AMOUNT OF PRODUCT COMPOUND		QUANTITY OF WATER (in gallons)
High-Test Calcium Hypochlorite (65-70% Cl)	1 pound	7.50
Chlorinated Lime (32-35% Cl)	2 pounds	7.50
Liquid Laundry Bleach (5.25% Cl)	1 gallon	4.25
Liquid Chlorine (100% available chlorine)	0.62 pounds	7.50

2. HTH Tablet Method:

- a. The required concentration of chlorine in the mains may be obtained by the use of HTH tablets as produced by Olin Mathieson in the following quantities or approved equivalent:

TABLE 4

HTH Tablet (70%) Dosage

Number of Tablets Per Length of Pipe

Length of Section	DIAMETER OF PIPE				
	4 inches	6 inches	8 inches	10 inches	12 inches
13 feet	1	2	3	4	6
18 feet	1	2	3	5	6
20 feet	1	2	3	5	7
30 feet	2	3	5	7	10
36 feet	2	3	5	8	12
40 feet	2	4	6	9	14
100 feet	4	9	15	23	30

- b. Tablets are to be fastened to the inside top surface of each length of pipe using "Permatex No. 1" no earlier than the day pipe is laid.
- c. Tablets shall not be installed in the pipe and left overnight before laying and shall not be accessible at any time for casual pilferage by the general public or by children. Tablets shall be stored in a hermetically sealed container.
- d. The new water lines are to be slowly filled with water. Air is to be exhausted from each dead end, branch run, hydrant run, and installed service.

- e. Water shall be retained for a period of 24 hours, after which each service, hydrant run, branch run and dead end shall be thoroughly flushed to clear foreign matter and until:
 - i. Residual chlorine concentration is less than 1 part per million
 - ii. Residual chlorine is no greater than the concentration of chlorine in the water supplied for flushing.
- B. Bacteriological Testing:
 - 1. Samples shall be gathered and tests conducted at the expense of the Contractor by a laboratory certified by the California Department of Health Services as an Environmental Testing Laboratory (ELAP).
 - 2. Samples are to be taken at representative points as required by the Owner and authorities having jurisdiction.
 - 3. The new water lines shall remain isolated and out of service until satisfactory test results have been obtained that:
 - a. Meet the requirements of the California Department of Health Services, Drinking Water Standards.
 - b. Owner has accepted the results as indicative of the bacteriological condition of the facilities.
 - c. If unsatisfactory or doubtful results are obtained from the initial sampling, repeat the chlorination process until acceptable test results are reported.

END OF SECTION

**SECTION 02518
TURF BLOCK PAVERS**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provide all labor, materials, equipment and services required for and incidental to the installation of a fire access road composed of concrete grass cell pavers.
- B. Related Work included elsewhere:
 - 1. Section 02300: Earthwork and Grading.
 - 2. Section 02900: Planting.
 - 3. Section 02520: Landscape Site Concrete

1.02 QUALITY ASSURANCE

- A. A person who is thoroughly familiar with the type of materials being installed and the methods for their installation shall be present at all times during execution of the work.
- B. Testing and inspection, per Quality Control Section 01400.

1.03 SUBMITTALS, per Section 01300.

- A. Submit manufacturer's standard product data.

1.04 CODE REQUIREMENTS: Conform to the requirements of all applicable local, state and federal building and safety codes, ordinances and regulations.

1.05 PRODUCT HANDLING: Deliver and unload pavers at job site on pallets and bound in such a manner that no damage occurs to the product during hauling, handling or unloading at the job site.

1.06 WARRANTY: Warrant all of the work under this Section to be free of defects of any kind, whether due to workmanship or materials, for a period of one year from the time of substantial completion of the project.

PART 2 - PRODUCTS

2.01 CONCRETE GRASS CELL PAVERS

- A. Concrete grass cell pavers (turf block pavers) shall be Checker Block as manufactured by the Hastings Pavement company, Inc. (800) 874-4717.

2.02 BASE ROCK: Shall conform to ASTM C33; 12" minimum depth, see Civil.

- 2.03 SAND LAYING COURSE: Sand laying course shall conform to the following specifications:

<u>Sieve Size</u>	<u>3/8 in.</u>	<u>No. 4</u>	<u>No. 8</u>	<u>No. 100</u>	<u>No. 200</u>
% passing	100	93-100	61-100	1-12	0-7

Re: CALTRANS Department of Transportation Specifications 90-3.03, Fine Aggregate Gradings:

1. Thickness of sand laying course shall be uniform to ensure an even surface.
2. The sand laying course shall be the responsibility of the paving stone installer.

PART 3 - EXECUTION

- 3.01 BASE: Confirm that base is as specified before beginning work.
- 3.02 SAND LEVELING COURSE: Install 1 1/2 inch maximum layer dry sand over acceptable aggregate base to depth required for flush finish after pavers are installed.
- 3.03 PAVER INSTALLATION
- A. Before installing, clean pavers of all foreign material. Install in accordance with manufacturer's recommendations and as shown and specified.
 - B. Start installation parallel to face of building or as approved by Landscape Architect and proceed forward over the undisturbed sand laying course with pavers in pattern. Saw cut pavers to conform to concrete edge without gaps. Cut pavers clean and uniform.
 - C. Install grass cell pavers plumb and true to line and grade; to coincide and align with adjacent work and elevations.
 - D. Install grass cell pavers hand-tight on the sand leveling course, using string lines to hold pattern lines true.
 - G. Backfill the cells with accepted "Sandy Loam" planting soil per Planting Specification and water settle with a light spray to insure full cells. Plant cells as shown and specified.
- 3.04 CLEAN-UP, per Contract Closeout Section 01700.

- A. Perform the work under this Section so as to keep affected portions of the building and site neat, clean and orderly. Upon completion of the work under this Section, remove immediately all surplus materials, rubbish and equipment associated with or used in the performance of this work.
- B. Reset all disturbed pavers and backfill cells with accepted planting soil.

*** END OF SECTION ***

SECTION 02520

SITE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide Portland cement concrete site work complete, including the following principal items:
 - 1. Seat walls.
 - 2. Curbs, walks and pavements, including aggregate bases.
 - 3. Footings for posts and structures.
 - 4. Saw cut joints.
- B. Related requirements specified elsewhere include:
 - 1. Section 02300, Earthwork and Grading.
 - 2. Section 02630, Storm Drainage.

1.2 QUALITY ASSURANCE

- A. Reference and Standards
 - 1. Soils Reports: Reports of geotechnical investigations by LFR, April 25, 2007..
 - 2. Perform work in accordance with all applicable laws, codes and regulations required by State of California.
 - 3. Reference to "Standard Specifications" shall mean the current Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation, CALTRANS.
 - 4. The American Concrete Institute (ACI): "Manual of Concrete Practice," Parts 1, 2 and 3.
 - 5. "Recommended Practice for Concrete Formwork" (ACI 347R)
 - 6. United States Voluntary Product Standard for Construction & Industrial Plywood (PS 1-95).
 - 7. American Plywood Association's "Guide to Plywood Grades" (APA).
 - 8. West Coast Lumber Inspection Bureau's "Standard Grading Rules No. 16" (WCLIB)
 - 9. Concrete Reinforcing Steel Institute (CRSI): "Manual of Standard Practice" and "Recommended Practice for Placing Reinforcing Bars".
 - 10. American Welding Society: AWS A5.1 and AWS D1.4.
 - 11. Americans with Disabilities Act (ADA), Federal ADA/State of California Title 24 Standards.
 - 12. California Code of Regulations, Title 24, 2001 Edition, also known as California Building Code (CBC).
- B. Stipulations
 - 1. Finish Surface Tolerance: 1/4-inch maximum variation in 10 feet.
 - 2. At no point shall paving surface fail to drain.
 - 3. Finish Concrete Surface Slip Resistance: Shall have a minimum slip resistance coefficient of 0.65 on concrete pavement with less than 5% slope and 0.8 on concrete pavement with more than 5% slope.

4. Walls retaining soil that retain 30 inches or more of soil shall include a subsurface drain behind wall per Section 68 of the Standard Specifications and as accepted by the Owner's Representative.
- C. Testing and Inspection, per Quality Control Section 01400.
- D. Conform to ACI 305 during hot weather and to ACI 306 during cold weather.
- E. Requirements of ACI 301 shall govern work, materials and equipment related to this Section; specifications herein set minimum results required, and references to procedures are intended to establish minimal guides.
- F. The Contractor shall be responsible for quality of concrete in place and shall bear burden of proof that concrete meets minimum requirements.
- G. Placing of concrete by means of pumping will be an acceptable method of placement providing that the Contractor can demonstrate that:
 1. Specified concrete strengths will be met.
 2. Equipment has a record of satisfactory performance under similar conditions and using a similar mix.
 3. Trial batches have been successfully made.
- H. Installer Qualifications: Concrete work shall be by firm with 5 years experience with work of similar scope and quality.
- I. Formwork Design Criteria: Formwork shall conform to ACI 347 and CBC Section 1906A.
 1. Formwork:
 - a. Shall prevent leakage or washing out of cement mortar.
 - b. Shall resist spread, shifting, and settling.
 - c. Shall reproduce accurately required lines, grades and surfaces within tolerances specified.
 2. Safety: The Contractor shall be responsible for adequate strength and safety of all formwork including falsework and shoring.
 3. Formwork allowable tolerances: Formwork shall produce concrete within tolerance limits recommended in ACI 347, unless otherwise noted.

1.3 TESTS

- A. The Owner will select a qualified testing laboratory to take samples for testing during the course of the work as considered necessary. Costs for such tests will be paid by the Owner. Contractor shall cooperate in making tests and shall be responsible for notifying the designated laboratory in sufficient time to allow taking of samples at time of pour.
- B. Should tests show that concrete is below specified strength, Contractor shall remove all such concrete, as directed by the Owner. Full cost of removal of low strength concrete, its replacement with concrete of proper specified strength and testing, shall be borne by Contractor.

- 1.4 COORDINATION: Coordinate items of other trades. Contractor shall be responsible for the proper installation of all accessories embedded in the concrete and for the provision of holes, openings, etc., necessary to the execution of the work of the trades.
- 1.5 SUBMITTALS, per Section 01300.
- A. Samples of all materials under this Division shall be supplied for testing as requested by the Owner.
 - B. Submit color additive manufacturer's color chart and sample chip(s), indicate color additive number and required dosage rate.
 - C. Submit two full-scale mock-up (minimum 3' by 3') sample panels of all concrete finishes and color (with curing compound if any to be used and score joints) indicated on the drawings. Approved samples shall be kept at the job site to serve as a prerequisite for all finishes until acceptance of the Work.
 - D. Submit one pint samples of aggregate for exposed aggregate finished concrete paving in color range as specified.
- 1.6 PRODUCT DELIVERY, STORAGE AND HANDLING
- A. Supply ready mixed concrete throughout. Batch, mix and transport in accordance with ASTM C-94, "Specifications for Ready Mixed Concrete."
 - B. Mix and deliver concrete in quantities that will permit immediate use only.
 - C. Indiscriminate addition of water for any reason will be cause for rejection of the load.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Cement and aggregates shall have proven history of successful use with one another. Sources of cement and aggregate shall remain unchanged throughout work.
- B. Mixes:
 - 1. Ready-mixed concrete shall meet requirements of ASTM C94.
 - 2. The Contractor shall perform tests or assemble the necessary data indicating conformance with specifications.
 - 3. For each mix, submit data showing that proposed mix will attain the required strength in accordance with requirements of CBC Section 1905A.3.
 - 4. Instruct Laboratory to base mix design on use of materials specified and approved by the Owner's Representative.

5. Mix design shall include compression strength test reports per CBC Section 1905A.3.1.
6. Insure mix designs will produce concrete to strengths specified and of uniform density without segregation.
7. If mix yield exceeds 1-cubic yard, modify mix design to no more than one cubic yard, without changing cement content.
8. Introduction of calcium chloride will not be permitted.
9. Mix design shall be in accordance with CBC Section 1905A2.3 Method B.

2.2 FORMWORK MATERIALS

- A. Panel or board forms for Exposed Finish Concrete: Minimum 5/8-inch thick exterior grade plywood with sealed edges, PS 1 grade Plyform Class I and II B-B Exterior. For Exposed Smooth Form-finished Concrete use Medium Density (or better) Overlaid Concrete Form Exterior (MDO), to provide continuous straight, smooth, exposed surfaces without grain patterns. Furnish in largest practicable sizes to minimize number of joints and to conform to a joint system as approved by Owner's Representative. Curbs may be formed with approved metal form systems.
- B. Chamfer Strips: Burke Concrete Accessories, PVC type CSF ½-inch or as otherwise shown, all exposed corners.
- C. Form Release Agent: Must not stain or otherwise adversely affect architectural concrete surfaces. "Nox-Crete Form Coating"; Industrial Synthetics Corp.'s "Synthex"; or equal.
- D. Form Ties: Burke "Penta-Tie," or equal, cone and rod type with 1-inch break-back.

2.3 REINFORCING MATERIALS

- A. Bar Reinforcement: ASTM A615.
 1. #3 and smaller: Grade 40.
 2. #4 and larger: Grade 60.
- B. Wire Fabric Reinforcement: ASTM A185. Size (6" by 6" / W1.4 By W1.4 (#10 ga. by #10 ga.)
- C. Recycled content shall be a minimum of 75% recycled post consumer steel.

2.4 CONCRETE MATERIALS

- A. Portland Cement: ASTM C150, Type II. Use one brand of cement throughout project.
- B. Fly Ash: ASTM C618, Type F.
- C. Aggregates: ASTM C33, materials from established sources with proven history of successful use in producing concrete with minimum shrinkage.

- D. Water: Clear and potable, free from deleterious impurities.
- E. Admixtures:
 - 1. Admixtures are optional; however, a water reducer or plasticizing admixture shall be included in the concrete mix and it must be compatible with color pigments where color pigments are required. Any proposed admixture shall comply with State Section 2603(b) 5 of Part 2, Title 24 CCR.
 - 2. Where more than one admixture is proposed, include statement from admixture manufacturer indicating that admixtures proposed for use are compatible, such that desirable effects of each admixture will be realized.
 - 3. Accelerating admixtures and admixtures containing more than 0.05 percent chloride ions are not permitted. If an accelerator is used, it shall be a non-chloride accelerator.
 - 4. Liquid admixtures shall be considered part of the total water.
 - 5. Refer to Color Additives/Pigments herein for color admixtures.

2.4 CONCRETE MIXES

- A. Concrete mixes shall be approved and shall be in accordance with Caltrans Standard Specifications Section 90. Unless otherwise noted, mix shall be Class 2, 2500 psi, Type II Portland cement and 3/4-inch maximum aggregate.
- B. Cementitious Material: An intimate blend of Portland cement and fly ash. Cementitious material shall include 15% minimum to a maximum of 25% fly ash by weight unless the strength is specified to be achieved on 7 or 14 days.

2.6 ANCILLARY MATERIALS

- A. Aggregate Base: Class II aggregate base conforming to Section 26 of the Standard Specifications and Subgrade Specifications herein.
- B. Expansion Joint Material
 - 1. Fiber Expansion Joint: A non-extruding resilient filler, saturated with high quality bituminous materials having preserving characteristics. Conform to ASTM-D994-71.
- C. Subsurface Drain behind Retaining-Type Walls: All concrete walls that retain 30 inches of soil or more shall include a subsurface drainage system to relieve water pressure in accordance with Section 68 of the CALTRANS Standard Specifications and as shown. If no subsurface drain is shown, provide corrugated polyethylene plastic tubing per 68-1.02K surrounded with an envelope of Class 2 permeable material per 68-1.025 and wrapped with filter fabric per 68-1.028.
- D. Curing Materials for non-colored Concrete:
 - 1. Waterproof Paper: ASTM C171, Type 1, regular. Same as Sisalkraft Division of St. Regis Paper Co.'s "Orange Label", or equivalent.

2. Impervious sheeting: 4 mil white polyethylene laminated to 10 oz. Burlap, ASTM C171, Type 1.1.3, fungus-resistant.
 3. Curing Compound: ASTM C309. Type 1-D, Class B; dissipating resin. Product: Sealtight 1100 Clear-Series by WR Meadows, Burke Azua Resin Cure by Edocol, or equal that will not discolor concrete or affect bonding of other finishes applied thereafter, and which restricts loss of water to not more than 0.500 grams per sq. centimeter of surface when tested per ASTM C156, "Test Method for Water Retention by Concrete Curing Materials."
- D. Grout: Premixed high strength non-shrink grout requiring only addition of water at the site. Burke's "Non-Ferrous, Non-Shrink Grout"; Master Builders "Masterflow 928 Grout", or equal.
- E. Patching Mortar: Mix in proportions by volume of one part cement to two parts fine sand. Provide integrally colored patching mortar as required to match color and finish of colored concrete surfaces.
- F. Abrasive Grains: Fused aluminum oxide granules or crushed emery containing not less than 50% aluminum oxide. Factory graded, rustproof, nonglazing and unaffected by cleaning materials. Subject to compliance with requirements provide one of the following: Sonneborn-Contech's "Frictex NS"; General Abrasive Co., Inc.'s "Fut-Sure"; The Exolon Co.'s "Exolon Anti-Slip"; or equal.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Install all concrete work true to line and grade as indicated on the drawings.
- B. Correct irregularities to the satisfaction of the Owner's Representative.
- C. Plain non-colored, exposed concrete shall contain lampblack, approximately 2 pounds of per cubic yard, as accepted by Owner's Representative.

3.2 PREPARATION

- A. Provide subgrade preparation and the base material installation complete, including clearing, grading, excavation, and filling and dewatering. Take every precaution to obtain a subgrade of uniform bearing power compacted to a minimum of 90% relative compaction as determined by the ASTM D1557 laboratory test procedure and in Sections 19 and 20 of the Caltrans Standard Specifications.
- B. Subgrade shall be kept moist and shall not be allowed to dry out before placement of concrete. Place no material on muddy subgrade.
- C. Aggregate base, where indicated, shall be placed and compacted in conformance with Caltrans Standard Specifications 26-1.04 and 26-1.05.

- D. Obtain approval of subgrade from Owner's Representative prior to placing steel and concrete.

3.3 FORMS

- A. Forms shall be constructed in accordance with ACI 347 and shall be of sufficient strength and sufficiently tight to prevent visible distortion or leakage of mortar and fines.
- B. Forms for exposed surfaces shall be constructed to protect intended finish. Deflection of facing material between studs shall not exceed 0.0025 of the span. Facing material and pattern of joints shall be as approved by the Owner's Representative.
- C. For vertical surface of wall footings below grade, clean cut trench may be used in lieu of form if character of soil will permit installation without sluffing and width of concrete is increased at least 1 inch beyond indicated dimension of each face poured against earth.
- D. Curb and pavement edge forms shall extend full depth of concrete and shall be coordinated with installation of planting root barriers where required. Curves shall be formed with flexible metal or wood made up of thin laminations. Curve forms shall extend one stake space straight beyond tangent point. Where curbs and pavement are adjacent to areas to receive root barriers, provide smooth uniform edges. Remove any excess concrete as required to allow installation of root barriers without gaps between curbs and/or pavement and barriers.
- E. Maintain forms within the following tolerances.
 - 1. Top of Form: Plus or minus 1/8 inch in 10 feet and no abrupt variations; at required elevation to plus 3/8 inch.
 - 2. Face of Form: Plus or minus 1/4 inch in 10 feet longitudinal and no abrupt variations; perpendicular to surface plus or minus 1/8 inch.
- F. Form Ties: Align form ties as accepted by Owner's Representative. Obtain approval of form work from Owner's Representative prior to placing concrete.
- G. Forms may be reused upon cleaning and coating with parting compound to ensure separation from concrete without damage.
- H. After concrete is placed, the following minimum times shall elapse before removal of forms.
 - 1. Walls and benches: 48 hours.
 - 2. Footing sides: 24 hours.
 - 3. Curbs: 1 hour

3.4 REINFORCEMENT

- A. All concrete shall be steel reinforced unless specifically noted to be "not reinforced." If no reinforcement is shown, reinforce in same manner as that shown in similar places.
- B. Fabricate and place reinforcement as indicated on the Drawings and in accordance with ACI "Detailing Manual" SP-66. No reinforcement shall be placed prior to distribution of the approved shop drawings.
- C. Secure reinforcement in position by suitable supports and by wiring at intersections with tie wire. Supports shall be of sufficient number and strength to resist crushing or displacement under full load. Metal shall not extend to surface of concrete.
- D. At time of placing concrete, reinforcing shall be free of excessive rust, mill scale, or other bond reducing matter. Immediately before placing concrete, check and adjust position, support and anchorage.

3.5 CLEANING, PATCHING AND DEFECTIVE WORK

- A. Where concrete is under strength, out of line, level or plumb, or shows objectionable cracks, honeycombing, rock pockets, voids, spalling, exposed reinforcement, signs of freezing or is otherwise defective, and , in the Owner's Representative's judgment, these defects impair proper strength or appearance of the work, the Owner's Representative will require its removal and replacement at the Contractor's expense.
- B. Immediately after stripping and before concrete is thoroughly dry, patch minor defects, form-tie holes, honeycombed areas, etc., with patching mortar colored and textured to match concrete. Remove ledges and bulges.
- C. Compact mortar into place and neatly file defective surfaces to produce level, true planes. After initial set, dress surfaces of patches mechanically or manually to obtain same texture as surrounding surfaces.
- D. Rock Pockets:
 - 1. Cut out to full solid surface and form key.
 - 2. Thoroughly wet before casting mortar.
 - 3. Where the Owner's Representative deems rock pocket too large for satisfactory mortar patching as described, cut out defective section to solid surface, and replace.
- E. Cleaning
 - 1. Insure removal of bituminous materials, form release agents, bond breakers, curing compounds, if permitted and other materials employed in work of concreting that would otherwise prevent proper application of sealants, liquid waterproofing, and other delayed finishes and treatments.
 - 2. Where cleaning is required, take care not to damage surrounding surfaces or leave residue from cleaning agents.

3.6 MIXING AND PLACING CONCRETE

- A. Conform to applicable requirements set forth in Caltrans Standard Specifications Section 90.
- B. Mixes for integrally colored concrete shall have pigment added early enough to ensure complete dispersal and uniform color, but not less than 15 minutes before placing.

3.7 JOINTS AND GROOVES

- A. Plane of joints shall be perpendicular to surface. Where new pavements join existing, joints shall align.
- B. Tooled Joints / Score Joints
 - 1. Form joints in fresh concrete using a jointer to cut the groove so that a smooth, uniform impression is obtained to 1/3 depth of pavement unless shown otherwise.
 - 2. All joints shall be struck before and after brooming. Tool concrete both sides of joint.
- C. Sawn Contraction Joints:
 - 1. General: Provide where shown. Saw cut straight, true, and uniform, 1/8 - inch wide and not less than 1/4 of slab thickness in depth , unless otherwise noted. Cut with a power saw fitted with an abrasive or diamond blade.
 - 2. Commence saw cutting operations after concrete has cured long enough to resist damage by the saw cutting operations and early enough to avoid random contraction cracks.
 - 3. Contractor shall coordinate form removal and sequencing of adjacent concrete placement to minimize unnecessary saw cutting of adjacent surfaces.
 - 4. Contractor shall plan for the use of varying types of saw cutting apparatus to provide acceptable finishes in areas limited in accessibility.
 - 5. Fill saw cut over-runs and inadvertent saw cutting of adjacent surfaces with cement mortar to match color and finish of sawn pavement.
 - 6. If joint pattern not shown, provide joints not exceeding 15 feet in either direction and located to conform to column centerlines, wall corners, etc. as accepted by Owner's Representative.
- D. Expansion Joints and Edging: Provided at the location and intervals as shown on the drawings, and at all locations where concrete paving abuts buildings, curbs or other structures, and not more than 18 feet on center. Specified and shown joint material shall be placed with top edge 1/8" below the paved surface, and shall be securely held in place to prevent movement.

3.9 FINISHING

- A. Flatwork and Curbs
 - 1. Surface Finishes

- a. Float Finish (typical preliminary finishing for slabs to receive other finishes): The surface of the slab shall be screeded and all surface water and laitance removed. Floating shall be started as soon as the screeded surface has stiffened sufficiently. Floating shall be performed by hand using a wood float and shall be the minimum necessary to produce a relatively smooth, level, even-textured surface.
- b. Medium Broom Finish: Obtain by drawing a stiff bristled broom across a floated finish for a nonslip surface. Perform brooming while concrete is still wet enough to receive broom marks to match approved sample. Direction of brooming to be perpendicular to direction of work or as otherwise shown on the drawings.
- c. Brush Finish (typical for curbs): After the front form is removed, exposed surface shall be troweled smooth and then given a uniform light texture with fine brush parallel to line of curb, to match approved sample.
- d. Sandblast Finish: Perform in as continuous an operation as possible, utilizing the same work crew to maintain continuity of finish.

Use an abrasive grit of the proper type and gradation to expose the aggregate and surrounding matrix surfaces to match sample panel, as follows:

Light Cut:	approximately 1/16" depth
Medium Cut:	approximately 1/8" to 3/16" depth
Heavy cut:	approximately 1/2" to 3/4" depth

Blast corners and edge of patterns carefully, using backup boards in order to maintain a uniform corner of edge line.

Use same nozzle, nozzle pressure and blasting technique as used for sample panel.

Maintain control of abrasive grit and concrete dust in each area of blasting. Clean up and remove all expended abrasive grit, concrete dust and debris at the end of each day of blasting operations.

3.12 CURING

- A. Cure non-colored exposed concrete in accordance with Caltrans Standard Specifications Section 90.
- B. Cure colored exposed concrete using Curing Compound for Colored Concrete as specified herein.

- C. When applying Curing Compound, apply after initial set of fresh concrete when bleed water has evaporated from surface using a "Hudson-type" airless sprayer in accordance with manufacturer's specifications.
- D. Only water or curing compounds which impart no permanent color or gloss shall be used for curing concrete.

3.13 CLEANUP: Per Contract Closeout Section 01700.

*** END OF SECTION ***

SECTION 02530

SANITARY SEWER

PART 1 – GENERAL

1.01 SUMMARY

- A. This section describes general requirements, products, and methods of execution relating to on-site sanitary sewerage excluding portions within five feet of buildings unless otherwise noted. Any work within the public right-of-way shall be constructed to the standards of the City of Hayward.
 - 1. Sanitary Sewer System, including piping and structures.
 - 2. Sanitary Sewer Lift Station.
- B. Contractor shall provide all labor, equipment, and materials, unless otherwise noted.
- C. Related Sections:
 - 1. Section 02315 – TRENCHING, BACKFILLING, AND COMPACTING.
 - 2. Section 01355 – LEED CERTIFICATION PROCEDURES.

1.02 SUBMITTALS

- A. Comply with the requirements of Section 01300 – SUBMITTALS.
- B. Product Data: Manufacturer's literature and data, including, where applicable, pressure rating, capacity, labels, or other markings on equipment made to the specified standards for materials, for the following:
 - 1. Piping and fittings.
 - 2. Jointing material.
 - 3. Gaskets, couplings, and sleeves.
 - 4. Precast concrete structures, including manholes.
 - 5. Concrete mix design for sanitary structures.
 - 6. Manhole lids and frames.
 - 7. Steps.
 - 8. Clean-out boxes.

1.03 QUALITY ASSURANCE

- A. Comply with the latest editions of the following Standards and Regulations:
 - 1. American Concrete Pipe Association (ACPA).
 - a. ACPA 01-102 (1988) Concrete Pipe Handbook.
 - b. ACPA 01-103 (1995) Concrete Pipe Installation Manual.
 - 2. American National Standards Institute (ANSI).
 - a. ANSI B18.5.2.1M (1981; R 1995) Metric Round Head Short Square Neck Bolts.
 - 3. American Railway Engineering & Maintenance-of-Way Association (AREMA).
 - a. AREMA 1-5 (2001) Pipelines.
 - 4. American Society for Testing and Materials (ASTM).
 - a. A 123/A 123M (2001a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - b. A 307 (2000) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
 - c. A 47 (1999) Ferritic Malleable Iron Castings.**

- d. A 47M (1990; R 1996) Ferritic Malleable Iron Castings (Metric). **
- e. A 48 (1994ae1) Gray Iron Castings. **
- f. A 48M (1994e1) Gray Iron Castings (Metric). **
- g. A 536 (1984; R 1999e1) Ductile Iron Castings.
- h. A 563 (2000) Carbon and Alloy Steel Nuts.
- i. A 563M (2001) Carbon and Alloy Steel Nuts (Metric).
- j. A 74 (1998) Cast Iron Soil Pipe and Fittings.
- k. A 746 (1999) Ductile Iron Gravity Sewer Pipe.
- l. C 12 (2002) Installing Vitrified Clay Pipe Lines.
- m. C 14 (1999) Concrete Sewer, Storm Drain, and Culvert Pipe.
- n. C 14M (1999) Concrete Sewer, Storm Drain, and Culvert Pipe (Metric).
- o. C 150 (2002) Portland Cement.
- p. C 260 (2001) Air-Entraining Admixtures for Concrete.
- p. C 270 (2001a) Mortar for Unit Masonry.
- q. C 301 (1998) Vitrified Clay Pipe.
- r. C 33 (2001a) Concrete Aggregates.
- s. C 361 (1999) Reinforced Concrete Low-Head Pressure Pipe.
- t. C 361M (1999) Reinforced Concrete Low-Head Pressure (Metric).
- u. C 425 (2002) Compression Joints for Vitrified Clay Pipe and Fittings.
- v. C 443 (2001) Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
- w. C 443M (2001) Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets (Metric).
- x. C 478 (1997) Precast Reinforced Concrete Manhole Sections.
- y. C 478M (1997) Precast Reinforced Concrete Manhole Sections (Metric).
- z. C 494 (____) Chemical Admixtures for Concrete.
- aa. C 564 (1997) Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- ab. C 700 (2002) Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.
- ac. C 76 (2000) Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- ad. C 76M (2000) Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (Metric).
- ae. C 828 (2001) Low-Pressure Air Test of Vitrified Clay Pipe Lines.
- af. C 920 (2002) Elastomeric Joint Sealants.
- ag. C 923 (2000) Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.
- ah. C 923M (1998) Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals (Metric).
- ai. C 924 (1989; R 1997) Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.
- aj. C 924M (1989; R 1998) Testing Concrete Pipe Sewer Liner by Low-Pressure Air Test Method (Metric).
- ak. C 94 (1994) Ready-Mixed Concrete. **
- al. C 94/C 94M (2000e2) Ready-Mixed Concrete.
- am. C 969 (2000) Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
- an. C 969M (2000) Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines (Metric).
- ao. C 972 (2000) Compression-Recovery of Tape Sealant.

- ap. C 990 (2001a) Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealers.
- aq. C 990M (2001a) Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants (Metric).
- ar. D 1784 (1999a) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
- as. D 1785 (1999) Poly(Vinyl Chloride)(PVC) Plastic Pipe, Schedules 40, 80, and 120.
- at. D 2235 (2001) Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
- au. D 2241 (2000) Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
- av. D 2321 (2000) Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
- aw. D 2412 (1996a) Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
- ax. D 2464 (1999) Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
- ay. D 2466 (2001) Poly(Vinyl Chloride)(PVC) Plastic Pipe Fittings, Schedule 40.
- az. D 2467 (2001) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
- ba. D 2680 (2001) Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping.
- bb. D 2751 (1996a) Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
- bc. D 2996 (2001) Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.
- bd. D 2997 (2001) Centrifugally Cast "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.
- be. D 3034 (2000) Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- bf. D 3139 (1998) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
- bg. D 3212 (1996a) Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
- bh. D 3262 (2002) "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe.
- bi. D 3350 (2002) Polyethylene Plastics Pipe and Fittings Materials.
- bj. D 3753 (1999) Glass-Fiber-Reinforced Manholes.
- bk. D 3840 (2001) "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Fittings for Non-pressure Applications.
- bl. D 4101 (2002) Propylene Injection and Extrusion Materials.
- bm. D 412 (1998a) Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers – Tension.
- bn. D 4161 (2001) "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals.
- bo. D 624 (2000) Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
- bp. F 1336 (2002) Poly(Vinyl Chloride) (PVC) Gasketed Sewer Fittings.
- bq. F 402 (1993; R 1999) Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings.
- br. F 405 (1997) Corrugated Polyethylene (PE) Tubing and Fittings.
- bs. F 477 (1999) Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

- bt. F 714 (2001) Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
- bu. F 758 (1995; R 2000) Smooth-Wall Poly(Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage.
- bv. F 794 (1999) Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
- bw. F 894 (1998a) Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe.
- bx. F 949 (2001a) Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings.
- 5. ASME International (ASME).
 - a. B1.20.1 (1983; R 2001) Pipe Threads, General Purpose, Inch.
 - b. B16.1 (1998) Cast Iron Pipe Flanges and Flanged Fittings.
 - c. B18.2.2 (1987; R 1999) Square and Hex Nuts.
 - d. B18.5.2.2M (1982; R 2000) Metric Round Head Square Neck Bolts.
- 6. American Water Works Association (AWWA).
 - a. C104 (1995) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
 - b. C105 (1999) Polyethylene Encasement for Ductile-Iron Pipe Systems.
 - c. C110 (1998) Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm through 1219 mm), for Water.
 - d. C111 (2000) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - e. C115 (1999) Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges.
 - f. C151 (1996) Ductile-Iron Pipe, Centrifugally Cast, for Water.
 - g. C153 (2000) Ductile-Iron Compact Fittings for Water Service.
 - h. C302 (1995) Reinforced Concrete Pressure Pipe, Noncylinder Type.
 - i. C600 (1999) Installation of Ductile-Iron Water Mains and Their Appurtenances.
 - j. C606 (1997) Grooved and Shouldered Joints.
 - k. C900 (1997) Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Distribution.
 - l. M23 (1980) Manual: PVC Pipe - Design and Installation.
 - m. M9 (1995) Manual: Concrete Pressure Pipe.
- 7. California Department of Transportation (CDT): Standard Specifications:
 - a. Section 55:
 - b. Section 64: Plastic Pipe
 - c. Section 70: Miscellaneous Facilities.
 - d. Section 75: Miscellaneous Metal.
- 8. Cast Iron Soil Pipe Institute (CISPI).
 - a. 301 (2000) Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
 - b. 310 (1997) Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
- 9. Uni-Bell PVC Pipe Association (UBPPA).
 - a. UNI-B-3 (1992) Recommended Practice for the Installation of Polyvinyl Chloride (PVC) Pressure Pipe (Nominal Diameters 4-36 Inch).
 - b. UNI-B-6 (1990) Recommended Practice for the Low-Pressure Air Testing of Installed Sewer Pipe.
- 10 City of Hayward Standard Plans and Specifications.

11. American Association of State Highway and Transportation Officials (AASHTO) for H2O Loading.
12. American Concrete Institute (ACI).
13. Other authorities having jurisdiction.

B. System Description: Grades and elevations are to be established with reference to the benchmarks referenced on the Drawings.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage

1. Piping: Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store [plastic piping and jointing materials and] rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.
2. Metal Items: Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.
3. Cement, Aggregate, and Reinforcement: As specified in Section 03300, "Cast-In-Place Concrete."

B. Handling

1. Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition. When handling lined pipe, take special care not to damage linings of pipe and fittings; if lining is damaged, make satisfactory repairs. Carry, do not drag, pipe to trench.

PART 2 – PRODUCTS

2.01 PIPING

- A. Polyvinyl Chloride (PVC) Pipe: PVC pipe conforming to ASTM D3034, SDR [21, 26, 35] with bell-and-spigot type of rubber gasket joints. Bells shall be integral with pipe. Spigot end pipe with separate double hub couplings is not acceptable.
- B. Vitrified Clay Pipe (VCP): VCP and fitting shall conform to ASTM C700, Extra Strength.
- C. High-Density Polyethylene (HDPE) Pipe: HDPE Pipe is NOT an accepted product, and will not be considered for product substitution.

2.02 MANHOLES

- A. Manholes shall be pre-cast concrete of the size and shape shown on the Drawings and shall conform to Sections 70-1.02H of the CDT Standard Specifications and to ASTM C478. Equivalent poured-in-place structures may be used at the Contractor's option. [Concrete shall consist of Type II cement.
- B. Frames and covers shall be cast iron conforming to Section 55-2.03 and 75-1.02 of the CDT Standard Specifications. Manhole covers shall have the words "SANITARY SEWER" in letters not less than 2 inches cast into the cover. The clear opening for all manhole covers shall be 24 inches.

- C. All interior concrete surfaces shall be coated with "Xypex Crystalline" or equal. Use of a water-resistant admix is acceptable, at contractor option.
- D. Frames and lids for manholes shall be match-marked in pairs before delivery to the job site. The lids shall fit into their frames without rocking.
- E. Reinforcing Bars: Reinforcing bars shall be of intermediate grade billet steel conforming to ASTM A615 and shall be of the size shown on the Standard Details or in the Drawings. Bars shall be of the round deformed type, free from injurious seams, flaws, or cracks, and shall be cleaned of all rust, dirt, grease and loose scales.
- F. Portland Cement Concrete: Concrete for manhole bases, inlets, and other concrete structures shall conform to the requirements of CDT Section 90 and as herein specified. The concrete shall be Class 2 containing six (6) sacks of Portland Cement per cubic yard of concrete. The grading of the combined aggregate shall conform with the CDT requirements of the three-quarter inch maximum. The consistency of the fresh aggregate shall be such that the slump does not exceed four inches, as determined by Test Method No. Calif. 520. The concrete shall have a minimum design compressive strength of 3,000 psi after 28 days.

2.03 CLEAN-OUTS

- A. A box shall be provided for each clean-out. Boxes shall be pre-cast concrete with cast iron frame and cover marked "SAN SEWER"; Christy G5C or equal.

PART 3 – EXECUTION

3.01 PIPE INSTALLATION

- A. Pipe shall be installed in conformance with Section 02221, and manufacturer's recommendations.
- B. Pipe laying:
 - 1. No pipe shall be laid until the Geotechnical Engineer inspects and approves the conditions of the bottom of the trench.
 - 2. Pipe laying shall proceed "up grade" with the spigot section of the bell-and-spigot pipe pointing in the direction of the flow.
 - 3. Each section of pipe shall be laid true to line and grade and in such a manner as to form an close concentric joint with the adjoining pipe and to prevent sudden offsets in the flow line.
 - 4. Pipe shall not be laid when the condition of the trench or the weather is unsuitable.
- C. Debris Control:
 - 1. The interior of the sewer pipe shall be kept clean of dirt and debris at all times. When work is not in progress, open ends of pipe and fittings shall be plugged.
 - 2. Where clearing after laying is difficult because of small pipe size, a suitable swab or squeegee shall be kept in the pipe and bulled forward past every joint immediately after joining has been completed.

3.02 POURED-IN-PLACE CONCRETE

- A. Concrete shall be mixed in accordance with applicable provisions of Section 90 of the CDT Standard Specifications.

- B. Construction of concrete structures shall conform to applicable provisions of Section 51 of the CDT Standards Specifications. Unless otherwise noted herein or in the Drawings, exposed surfaces of structures shall be Class 1 surface finish.
- C. Curing shall conform to applicable portions in Section 90 of CDT Standard Specifications. No pigment shall be used in curing compounds. All work shall be subject to inspection. No concrete shall be placed until the Construction Manager has approved the forms and reinforcement.
- D. Concrete shall not be cropped freely where reinforcing bars will cause segregation, nor shall it be dropped freely more than six feet. Spouts, elephant trunks, or other approved means shall be used to prevent segregation.

3.03 PIPELINE AIR TESTING AND FLUSHING

- A. All new sections of sanitary sewer shall be tested using the following procedures:
 - 1. Test is conducted between two consecutive manholes, or as directed by the Owner's representative.
 - 2. The test section of the sewer shall be plugged at each end. One of the plugs used at the manhole shall be tapped and equipped for the air inlet connection for filling the line from an air compressor.
 - 3. All service laterals, stubs, and fittings into the sewer test section shall be properly capped or plugged and carefully braced against the internal pressure to prevent air leakage by slippage and blowout.
 - 4. Connect air hose to tapped plug selected for the air inlet. Connect the other end of the air hose to the portable air control equipment, which consists of valves and pressure gauges used to control the air entry rate into the sewer test section, and to monitor the air pressure in the pipeline. More specifically, the air control equipment includes a shut-off valve, pressure regulating valve, pressure reduction valve, and a monitoring pressure gauge having a pressure range from 0-5 psi. The gauge shall have minimum divisions of 0.10 psi and an accuracy of 0.40 psi.
 - 5. Connect another air hose between the air compressor (or other source of compressed air) and the air control equipment. This completes the test equipment set-up. Test operations may commence.
 - 6. Supply air to the test section slowly, filling the pipeline until a constant pressure of 3.5 psig is maintained. The air pressure must be regulated to prevent the pressure inside the pipe from exceeding 5.0 psig.
 - 7. When constant pressure of 3.5 psig is reached, throttle the air supply to maintain the internal pressure above 3.0 psig for at least 5 minutes. This time permits the temperature of the entering air to equalize with the temperature of the pipe wall. During this stabilization period, it is advisable to check all capped and plugged fittings with a soap solution to detect any leakage at these connections. If leakage is detected at any cap plug, release the pressure in the line and tighten all leaky caps and plugs. Start the test operation again by supplying air. When it is necessary to bleed off the air to tighten or repair a faulty plug, a new 5-minute interval must be allowed after the pipeline has been refilled.
 - 8. After the stabilization period, adjust the air pressure to 3.5 psig and shut-off or disconnect the air supply. Observe the gauge until the air pressure reached 3.0 psig. At 3.0 psig, commence timing with a stopwatch until the pressure drops to 2.5 psig, at which time the stop watch is stopped. The time required, as shown on the stopwatch, for a pressure loss of 0.5 psig is used to compute the air loss.

9. If the time, in minutes and seconds, for the air pressure drop from 3.0 to 2.5 psi is greater than that shown in the following table for the designated pipe size, the section undergoing test shall have passed and shall be presumed to be free of defects. The test may be discontinued at any time.
10. If the time, in minutes and seconds, for the 0.5 psig drop is less than that shown in the following table for the designated pipe size, the section of the pipe shall not have passed the test; therefore, adequate repairs must be made and the line retested.

Requirements for Air Testing

Pipe Size (in inches)	Minutes	Time Seconds
4	2	32
6	3	50
8	5	6
10	6	22
12	7	39
14	8	56
15	9	35
16	10	12
18	11	34
20	12	30

(For larger diameter pipe use the following: Minimum time in seconds = 462 X pipe diameter in feet).

11. For 8 inch and smaller pipe, only: if, during the 5 minute saturation period, pressure drops less than 0.5 psig after the initial pressurization and air is not added, the pipe section undergoing test shall have passed.
12. Multi-pipe sizes: when the sewer line undergoing test is 8 inch or larger diameter pipe and includes 4 inch or 6 inch laterals, the figures in the table for uniform sewer main sizes will not give reliable or accurate criteria for the test. Where multi-pipe sizes are to undergo the air test, the State's representative can compute the "average" size in inches which is then multiplied by 38.2 seconds. The results will give the minimum time in seconds acceptable for a pressure drop of 0.5 psig for the "averaged" diameter pipe.
13. Adjustment Required for Groundwater:
 - a. An air pressure correction is required when the ground water table is above the sewer line being tested. Under this condition, the air test pressure must be increased .433 psi for each foot the ground water level is above the invert of the pipe.
 - b. Where ground water is encountered or is anticipated to be above the sewer pipe before the air testing will be conducted, the following procedure shall be implemented at the time the sewer main and manholes are constructed.
 - i. Install a ½ inch diameter pipe nipple (threaded one or both ends, approximately 10 inch long) through the manhole wall directly on top of one of the sewer pipes entering the manhole with threaded end of nipple extending inside the manhole.

- ii. Seal pipe nipple with a threaded ½ inch cap.
- iii. Immediately before air testing, determine the ground water level by removing the threaded cap from the nipple, blowing air through the pipe nipple to remove any obstruction, and then connecting a clear plastic tube to the pipe nipple.
- iv. Hold plastic tube vertically permitting water to rise in it to the groundwater level.
- v. After water level has stabilized in plastic tube, measure vertical height of water, in feet, above invert of sewer pipe.
- vi. Determine air pressure correction, which must be added to the 3.0 psig normal starting pressure of test, by dividing the vertical height in feet by 2.31. The result gives the air pressure correction in pounds per square inch to be added.

Example: if the vertical height of water from the sewer invert to the top of the water column measures 11.55 feet, the additional air pressure required would be:

$$\frac{(11.55)}{(2.31)} = 5.0 \text{ psig}$$

$$(2.31)$$

- A. Therefore, the starting pressure of the test would be 3.0 plus 5 or 8.0 psig, and the ½ pound drop becomes 7.5 psig. There is no change in the allowable drop (0.5 psig) or in the time requirements established for the basic air test.
- B. After the line has passed the air test, it shall be balled and flushed with water to clean. A metal screen shall be used downstream at the point of connection to the existing system to collect and remove any rock or other debris that is flushed out during cleaning.

3.04 DEFLECTION TESTING

- A. Upon completion of work, perform a deflection test on entire length of installed plastic pipeline. Completed work includes superimposed loads adjacent to and over the pipeline, such as compacted backfill and earthwork, and does not include paving, concrete curbs and gutters, sidewalks, walkways, and landscaping.
- B. Under external loads, deflection of pipe in the installed pipeline shall not exceed 4.5 percent of the average inside diameter of pipe.
- C. Determine whether the allowable deflection has been exceeded by use of a pull-through device or a deflection-measuring device.
- D. Pull-Through Device:
 - 1. Provide a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft.
 - a. Circular sections shall be so spaced on the shaft that distance from external faces of front and back sections will equal or exceed diameter of the circular section.
 - b. Pull-through device may also be of a design approved by the Uni-Bell Plastic Pipe Association, provided that the device meets the applicable requirements specified in this paragraph, including those for diameter of the device.

2. Ball, cylinder, or circular sections shall conform to the following:
 - a. A diameter, or minor diameter as applicable, of 95 percent of the average inside diameter of the pipe; tolerance of plus 0.5 percent will be permitted.
 - b. A homogeneous material throughout, with a density greater than 1.0 as related to water at 39.2 degrees F, and a surface Brinell hardness of not less than 150.
 - c. Center bored and through bolted with a ¼ inch minimum diameter steel shaft having a yield strength of not less than 70,000 pounds per square inch, with eyes or loops at each end for attaching pulling cables.
 - d. Each eye or loop shall be suitably backed with a flange or heavy washer such that a pull exerted on opposite end of shaft will produce compression throughout remote end.
3. Pull-Through Device:
 - a. Pass the pull-through device through each run of pipe, either by pulling it through or flushing it through with water.
 - b. If the device fails to pass freely through a pipe run, replace pipe which has the excessive deflection and completely retest in same manner and under same conditions as specified.

E. Deflection measuring Device:

1. Sensitive to 1.0 percent of the diameter of the pipe being tested and accurate to 1.0 percent of the indicated dimension.
2. Obtain approval of deflection measuring device prior to use.

F. Deflection Measuring Device Procedure:

1. Measure deflections through each run of installed pipe.
2. If deflection readings in excess of 4.5 percent of average inside diameter of pipe are obtained, retest pipe by a run from the opposite direction.
3. If retest continues to show a deflection in excess of 4.5 percent of average inside diameter of pipe, remove pipe which has excessive deflections, replace with new pipe, and completely retest in same manner and under same conditions.

G. Warranty Period Test: Pipe found to have a deflection of greater than 5 percent of average inside diameter when deflection test is performed just prior to end of 1 year warranty period shall be replaced with new pipe and tested as specified for leakage and deflection.

3.05 CLEANING

- A. Thoroughly clean storm drain lines, manholes, catch basins, field inlets, culverts, and similar structures, of dirt, debris, and obstructions of any kind.

3.06 TELEVISION INSPECTION

- A. After completion of the pipe installation, service connections, flushing and cleaning, and prior to placement of pavement, the sewer line shall be televised with a color closed-circuit television with tilt-head camera recorded in VHS format. The original videotape and log sheets shall be provided to the State's representative.
1. The following observations from television inspections will be considered defects in the construction of sewer pipelines and will require correction prior to placement of pavement:
 - a. Low spot (1 inch or greater - mainlines only).

- b. Joint separations (3/4 inch or greater opening between pipe sections).
- c. Cocked joints present in straight runs or on the wrong side of pipe curves.
- d. Chips in pipe ends.
- e. Cracked or damaged pipe.
- f. Dropped joints.
- g. Infiltration.
- h. Debris or other foreign objects.
- i. Other obvious deficiencies.
- j. Irregular condition without logical explanation.

END OF SECTION

SECTION 02630

STORM DRAINAGE

PART 1 – GENERAL

1.01 SUMMARY

- A. This section describes general requirements, products, and methods of execution relating to on-site sanitary sewerage excluding portions within five feet of buildings unless otherwise noted. Any work within the public right-of-way shall be constructed to the standards of the County of Alameda; State of California Department of Transportation; as may be appropriate.
 - 1. Storm drain piping.
 - 2. Storm drain structures including curb inlets, catch basins, area drains, and manholes.
 - 3. Storm drain outfalls.
 - 4. Culverts and headwalls.
 - 5. Storm drain pump station.
- B. Contractor shall provide all labor, equipment, and materials, unless otherwise noted.
- C. Related Sections:
 - 1. Section 02300 – EARTHWORK
 - 2. Section 02315 – TRENCHING, BACKFILLING, AND COMPACTING.
 - 3. Section 02750 – PAVING AND SURFACING.

1.02 SUBMITTALS

- A. Comply with the requirements of Section 01300 – SUBMITTALS.
- B. Product Data: Manufacturer's literature and data, including, where applicable, pressure rating, capacity, labels, or other markings on equipment made to the specified standards for materials, for the following:
 - 1. Piping and fittings.
 - 2. Jointing material.
 - 3. Gaskets, couplings, and sleeves.
 - 4. Precast concrete structures, including manholes and drainage inlets.
 - 5. Concrete mix design for precast and cast-in-place structures.
 - 6. Manhole lids and frames.
 - 7. Manhole steps.
 - 8. Pipe to Structure Connection Seal
 - 9. Drainage inlet grates and frames.

1.03 QUALITY ASSURANCE

- A. Comply with the latest editions of the following Standards and Regulations:
 - 1. American Society for Testing and Materials (ASTM).
 - a. A74: Cast Iron Soil Pipe and Fittings.
 - b. A615: Deformed and Plain Billet-Steel Bars for Reinforcement.
 - c. B32: Solder Metal.
 - d. C76: Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
 - e. C150: Portland Cement.

- f. C478: Precast Reinforced Concrete Manhole Sections.
 - g. C494: Chemical Admixtures for Concrete.
 - h. C920-02: Elastomeric Joint Sealants.
 - i. D2241-00: Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
 - j. D2680-01: Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.
 - k. D2729: Perforated PVC Drain Pipe.
 - l. D3034-00: Type PSM Polyvinyl Chloride (PVC) Sewer pipe and Fittings.
 - m. F1336-02: Poly(Vinyl Chloride) (PVC) Gasketed Sewer Fittings.
 - 2. California Department of Transportation (CDT): Standard Specifications:
 - a. Section 51:
 - b. Section 52:
 - c. Section 55:
 - d. Section 66:
 - e. Section 70:
 - f. Section 72:
 - g. Section 75:
 - h. Section 90:
 - 3. City of Hayward.
 - 4. American Association of State Highway and Transportation Officials (AASHTO) for H20 Loading.
 - 5. American Concrete Institute (ACI).
 - 6. Other authorities having jurisdiction.
- B. System Description: Grades and elevations are to be established with reference to the benchmarks referenced on the Drawings.

PART 2 – PRODUCTS

2.01 PIPING

- A. Polyvinyl Chloride (PVC) Pipe: PVC pipe conforming to ASTM D3034, SDR [21, 26, 35] with bell-and-spigot type of rubber gasket joints. Bells shall be integral with pipe. Spigot end pipe with separate double hub couplings is not acceptable.
- B. Reinforced Concrete Pipe (RCP): RCP shall conform to ASTM C76 with tongue-and-groove or bell-and-spigot joints. Unless indicated otherwise on the plans, all reinforced concrete pipe shall be Class III, 1350-D pipe.
- C. High-Density Polyethylene Pipe (PE): PE 3408, DR 17, conforming to AWWA C906. Rinker Polypipe, or approved equivalent.
 - 1. Socket type fittings shall conform to ASTM D2683.
 - 2. Butt fusion fittings shall conform to ASTM D3261.
 - 3. Electrofusion fittings shall comply with ASTM F1055.
- D. Perforated PVC Pipe: Perforated pipe shall conform to ASTM D2729.

2.02 MANHOLES

- A. Manholes shall be pre-cast concrete of the size and shape shown on the Drawings and shall conform to Sections 70-1.02H of the CDT Standard Specifications and to ASTM C478. Equivalent poured-in-place structures may be used at the Contractor's option.

- B. Frames and covers shall be cast iron conforming to Section 55-2.03 and 75-1.02 of the CDT Standard Specifications. Manhole covers shall have the words "STORM DRAIN" in letters not less than 2-inches cast into the cover. The clear opening for all manhole covers shall be 24 inches.
- C. All interior concrete surfaces shall be coated with "Xypex Crystalline" or equal. Use of a water-resistant admix is acceptable, at Contractor's option.
- D. Frames and grates for manholes and catch basins shall be match-marked in pairs before delivery to the job site. The grates shall fit into their frames without rocking. Grates shall have a maximum opening of one-half inch between bars, unless otherwise noted in the Drawings.
- E. Reinforcing Bars: Reinforcing bars shall be of intermediate grade billet steel conforming to ASTM A615 and shall be of the size shown on the Standard Details or in the Drawings. Bars shall be of the round deformed type, free from injurious seams, flaws, or cracks, and shall be cleaned of all rust, dirt, grease and loose scales.
- F. Portland Cement Concrete: Concrete for manhole bases, inlets, and other concrete structures shall conform to the requirements of CDT Section 90 and as herein specified. The concrete shall be Class "2". The grading of the combined aggregate shall conform with the CDT requirements of the three-quarter inch maximum. The consistency of the fresh aggregate shall be such that the slump does not exceed four inches, as determined by Test Method No. Calif. 520. The concrete shall have a minimum design compressive strength of 3,000 psi after 28 days.

2.03 PIPE TO STRUCTURE CONNECTOR/SEAL

- A. A flexible pipe to manhole connector shall be used for all pipe penetrations and/or cast-in-place concrete structures.
 - 1. The seal shall provide a flexible, positive, watertight connection between pipe and concrete wastewater structures. The connector shall assure that a seal is made between (1) the connector and the structure wall, and (2) between the connector and the pipe. The seal between the connector and the manhole wall shall be made by casting the connector integrally with the structure wall during the manufacturing process in such a manner that it will not pull out during coupling. The seal between connector and pipe will be made by way of a stainless steel take down band compressing the gasket against the outside diameter of the pipe.
 - 2. The connector shall be molded from materials whose physical/chemical properties meet or exceed the physical/chemical resistant properties outlined in ASTM C-923. The connector and stainless steel hardware shall meet or exceed the performance requirements proscribed in ASTM C-923.
 - 3. The connector shall be of size specifically designed for the pipe material being used and shall be installed in accordance with recommendations of the manufacturer.
 - 4. Connectors shall be Z-LOK or G3 connectors manufactured by A-LOK Products Inc. or approved equivalent.

2.04 CLEAN-OUTS

- A. A box shall be provided for each clean-out. Boxes shall be pre-cast concrete with cast iron frame and cover marked "STORM DRAIN"; Christy G5C or equal.

PART 3 – EXECUTION

3.01 PIPE INSTALLATION

- A. Pipe shall be installed in conformance with Section 02315, and manufacturer's recommendations. HDPE pipe shall be installed in conformance with ASTM D2321 and as recommended by the pipe manufacturer.
- B. Pipe laying:
 - 1. No pipe shall be laid until the Geotechnical Engineer inspects and approves the conditions of the bottom of the trench.
 - 2. Pipe laying shall proceed "up grade" with the spigot section of the bell-and-spigot pipe pointing in the direction of the flow.
 - 3. Each section of pipe shall be laid true to line and grade and in such a manner as to form an close concentric joint with the adjoining pipe and to prevent sudden offsets in the flow line.
 - 4. Pipe shall not be laid when the condition of the trench or the weather is unsuitable.
- C. Debris Control:
 - 1. The interior of the sewer pipe shall be kept clean of dirt and debris at all times. When work is not in progress, open ends of pipe and fittings shall be plugged.
 - 2. Where clearing after laying is difficult because of small pipe size, a suitable swab or squeegee shall be kept in the pipe and pulled forward past every joint immediately after joining has been completed.

3.02 POURED-IN-PLACE CONCRETE

- A. Concrete shall be mixed in accordance with applicable provisions of Section 90 of the CDT Standard Specifications.
- B. Construction of concrete structures shall conform to applicable provisions of Section 51 of the CDT Standards Specifications. Unless otherwise noted herein or in the Drawings, exposed surfaces of structures shall be Class 1 surface finish.
- C. Curing shall conform to applicable portions in Section 90 of CDT Standard Specifications. No pigment shall be used in curing compounds. All work shall be subject to inspection. No concrete shall be placed until the Construction Manager has approved the forms and reinforcement.
- D. Concrete shall not be dropped freely where reinforcing bars will cause segregation, nor shall it be dropped freely more than six feet. Spouts, elephant trunks, or other approved means shall be used to prevent segregation.

3.03 PIPELINE FLUSHING

- A. Newly constructed storm drain pipes shall be flushed with water to clean. A metal screen shall be used to collect and remove any rock, silt and other debris that is flushed out during cleaning.

3.04 DEFLECTION TESTING

- A. Upon completion of work, perform a deflection test on entire length of installed plastic pipeline. Completed work includes superimposed loads adjacent to and over the

pipeline, such as compacted backfill and earthwork, and does not include paving, concrete curbs and gutters, sidewalks, walkways, and landscaping.

- B. Under external loads, deflection of pipe in the installed pipeline shall not exceed 4.5 percent of the average inside diameter of pipe.
- C. Determine whether the allowable deflection has been exceeded by use of a pull-through device or a deflection-measuring device.
- D. Pull-Through Device:
 - 1. Provide a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft.
 - a. Circular sections shall be so spaced on the shaft that distance from external faces of front and back sections will equal or exceed diameter of the circular section.
 - b. Pull-through device may also be of a design approved by the Uni-Bell Plastic Pipe Association, provided that the device meets the applicable requirements specified in this paragraph, including those for diameter of the device.
 - 2. Ball, cylinder, or circular sections shall conform to the following:
 - a. A diameter, or minor diameter as applicable, of 95 percent of the average inside diameter of the pipe; tolerance of plus 0.5 percent will be permitted.
 - b. A homogeneous material throughout, with a density greater than 1.0 as related to water at 39.2 degrees F, and a surface Brinell hardness of not less than 150.
 - c. Center bored and through bolted with a ¼ inch minimum diameter steel shaft having a yield strength of not less than 70,000 pounds per square inch, with eyes or loops at each end for attaching pulling cables.
 - d. Each eye or loop shall be suitably backed with a flange or heavy washer such that a pull exerted on opposite end of shaft will produce compression throughout remote end.
 - 3. Pull-Through Device:
 - a. Pass the pull-through device through each run of pipe, either by pulling it through or flushing it through with water.
 - b. If the device fails to pass freely through a pipe run, replace pipe which has the excessive deflection and completely retest in same manner and under same conditions as specified.
- E. Deflection measuring Device:
 - 1. Sensitive to 1.0 percent of the diameter of the pipe being tested and accurate to 1.0 percent of the indicated dimension.
 - 2. Obtain approval of deflection measuring device prior to use.
- F. Deflection Measuring Device Procedure:
 - 1. Measure deflections through each run of installed pipe.
 - 2. If deflection readings in excess of 4.5 percent of average inside diameter of pipe are obtained, retest pipe by a run from the opposite direction.
 - 3. If retest continues to show a deflection in excess of 4.5 percent of average inside diameter of pipe, remove pipe which has excessive deflections, replace with new pipe, and completely retest in same manner and under same conditions.
- G. Warranty Period Test: Pipe found to have a deflection of greater than 5 percent of average inside diameter when deflection test is performed just prior to end of 1 year

warranty period shall be replaced with new pipe and tested as specified for leakage and deflection.

3.05 CLEANING

- A. Thoroughly clean storm drain lines, manholes, catch basins, field inlets, culverts, and similar structures, of dirt, debris, and obstructions of any kind.

3.06 TELEVISION INSPECTION

- A. After completion of the pipe installation, service connections, flushing and cleaning, and prior to placement of pavement, the storm drainage line shall be televised with a color closed-circuit television with tilt-head camera recorded in VHS format. The original videotape and log sheets shall be provided to the Owner.
 - 1. The following observations from television inspections will be considered defects in the construction of sewer pipelines and will require correction prior to placement of pavement:
 - a. Low spot (1 inch or greater - mainlines only).
 - b. Joint separations (3/4 inch or greater opening between pipe sections).
 - c. Cocked joints present in straight runs or on the wrong side of pipe curves.
 - d. Chips in pipe ends.
 - e. Cracked or damaged pipe.
 - f. Dropped joints.
 - g. Infiltration.
 - h. Debris or other foreign objects.
 - i. Other obvious deficiencies.
 - j. Irregular condition without logical explanation.

END OF SECTION

SECTION 02750

PAVING AND SURFACING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes (but is not necessarily limited to):
 - 1. Asphalt Concrete Paving.
 - 2. Concrete Paving.
 - 3. Liquid Asphalt and Asphalt Emulsion.
 - 4. Aggregate Base.
 - 5. Decorative Paving.
- B. Related work furnished under other sections but conforming to the provisions of this section:
 - 1. Subgrade preparation.
 - 2. Aggregate Base installation.
- C. Related Sections:
 - 1. Section 02225 - DEMOLITION.
 - 2. Section 02780 - PAVEMENT MARKING.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. A615: Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 2. C150: Portland Cement.
 - 3. D1557: Moisture Unit Weight Relations of Soils and Aggregate Mixtures Using a 10 lb (4.5 kg) Rammer and 18 in. (457 mm) Drop.
 - 4. D1682: Breaking Loads and Elongation of Textile Fabrics.
- B. California Code of Regulations (CCR): Title 24, Chapter 2-71, Site development Requirements for Handicapped Accessibility.
- C. California Department of Transportation (C.D.T.):
 - 1. Standard Specifications:
 - a. Section 26 Aggregate Bases.
 - b. Section 37 Bituminous Seals.
 - c. Section 39 Asphalt Concrete.
 - d. Section 51 Concrete Structures.
 - e. Section 52 Reinforcement.
 - f. Section 73 Concrete Curbs and Sidewalks.
 - g. Section 90 Portland Cement Concrete.
 - i. Section 92 Asphalts.
 - j. Section 93 Liquid Asphalts.
 - k. Section 94 Asphaltic Emulsions.
 - 2. Traffic Manual.
 - 3. Highway Design.
- D. Institute of Transportation Engineers: Transportation and Traffic Engineering Handbook.

1.03 SUBMITTALS

- A. Requirements: Refer to Section 01330 – SUBMITTAL PROCEDURES.
- B. Asphalt Concrete Paving:
 - 1. Provide two copies of material certificates signed by the material producer and the Contractor, certifying that each material item complies with or exceeds specified requirements.
 - 2. The Contractor shall furnish a certified weight or load slip for each load of material used in the construction of the asphalt concrete pavement.
- C. Concrete Paving: The Contractor shall furnish mill test reports on the cement, reinforcement bars, and aggregates, showing compliance with the respective specifications. The Testing Engineer may make concrete test cylinders and slump tests as deemed necessary to determine compliance with the Specifications.
- D. Liquid Asphalt.
- E. Pavement Reinforcement Fabric.
- F. Tack Coat.
- G. Pavement Reinforcement Mesh.
- H. Structural Geotextile Fabric.
- I. Decorative Concrete Paving: 4' x 4' samples.

1.04 PROJECT CONDITIONS

- A. Liquid Asphalt and Asphalt Emulsion:
 - 1. Prime coat, seal coat, and paint binder shall be applied only when the ambient temperature is above 50° Fahrenheit and when temperature has not been below 35° Fahrenheit for 12 hours immediately prior to application.
 - 2. Prime coat, fog coat, seal coat, and paint binder shall not be applied when base or surfaces are wet or contain excess moisture.
- B. Asphalt Concrete Paving: Asphalt concrete surfaces shall be constructed only when ambient temperature is above 50° Fahrenheit and when base is dry.

1.05 GENERAL DESIGN CRITERIA

- A. Services Areas: Approach ramps, driveways, and paved work areas in excess of 4 percent slope shall be provided with a rough texture for non-skid surface.
- B. Walks and Paths: Concrete exterior slabs (walks, terraces, etc.) shall have a pitch of at least 2 percent.
- C. Pavement Markings: All traffic control striping and pavement markings shall conform to the standards illustrated in the C.D.T. Standard Plans Book issued May 2006 and Project Specifications Section 02780 – PAVEMENT MARKING.

PART 2 - PRODUCTS

2.01 PAVING MATERIALS

- A. Aggregate Base: Aggregate base shall conform to Caltrans Class 2 (R value 78 min) aggregate base, 3/4" maximum size, as specified in Section 26 of the C.D.T. Standard

Specifications.

- B. Aggregate Sub Base: Aggregate sub base shall conform to Caltrans Class 2 (R Value 50 min). as specified in Section 25 of the C.D.T. Standard Specifications.
- C. Asphalt Concrete Paving:
 - 1. Paving asphalt to be mixed with aggregate shall be steam-refined asphalt, PG 64-10, conforming to Section 92 of the C.D.T. Standard Specifications.
 - 2. Mineral aggregate shall be Type B mineral aggregate as specified in Section 39 of the C.D.T. Standard Specifications.
 - 3. Maximum aggregate size shall be as follows:

A.C. Thickness	Max. Ag.
a. ¾" - 1½"	1/2"
b. 2" & 2½"	1/2"
c. 3" & 4"	3/4"
 - 4. Liquid asphalt for prime coat shall be Grade SC-70 in conformance with Section 93 of the C.D.T. Standard Specifications.
 - 5. Asphaltic emulsion for paint binder, fog coat, and seal coat shall be emulsified asphalt, Type SS-1h, conforming to Section 94 of the C.D.T. Standard Specifications.
- D. Portland Cement Concrete:
 - 1. Concrete shall be Class 2 concrete conforming to Section 90 of the C.D.T. Standard Specifications.
 - 2. Cement shall be Type II cement conforming to ASTM C150 as modified by Section 90 of the C.D.T. Standard Specifications.
 - 3. Aggregate shall be ¾-inch maximum size conforming to Section 90 of the C.D.T. Standard Specifications.
 - 4. Water shall be potable and free of organic matter and injurious amounts of oil, acid, alkali, or other deleterious substances.
 - 5. Reinforcing bars shall be deformed and shall conform to ASTM A615.
 - 6. Filled joints, unless noted otherwise on the Drawings, shall be ¼-inch thick, the full depth of the concrete section and conforming to Section 51 of the C.D.T. Standard Specifications.
 - 7. Joint filler shall conform to Section 51 of the C.D.T. Standard Specifications for pre-molded expansion joint filler and expanded polystyrene joint filler.
 - 8. No admixtures will be allowed without prior approval of the Program Manager.
- E. Pavement Reinforcement Fabric: Pavement reinforcement fabric shall meet Caltrans Section 88-1.02, BP Petromat or approved equivalent.
- F. Crack Sealant:
 - 1. Crack sealant shall be rubberized hot-pour type and shall meet ASTM D 3405, Husky 1611 or approved equivalent.
 - 2. Blotting Agent shall be one of: Screened sand, cement, or fly ash.
- G. Tack coat: Tack coat shall meet Caltrans Section 39-4.02.
- H. Pavement reinforcement mesh: Pavement reinforcement mesh for use in Type 2 Overlay shall be Glasgrid Model 8501 or approved equivalent.
- I. Structural geotextile fabric: Structural geotextile fabric shall be Mirafi 550X or approved equivalent.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Subgrade and Aggregate Base:
 - 1. Prepare a subgrade and over excavation paragraph reference 3.4 of Section 02300-EARTHWORK AND GRADING.
 - 2. Aggregate base shall be compacted to 95 percent ASTM D1557. Sections 26-1.04B and 26-1.05 of the C.D.T. Standard Specifications shall apply.
 - 3. Soil sterilant shall be applied to prepared subgrade or after installation of rock or aggregate base uniformly at the rate recommended by the manufacturer.
- B. Crack Sealing:
 - 1. Before sealing, cracks shall be cleared of dirt, dust, and all other deleterious materials to a depth of 1/4-inch to 1/2-inch.
 - 2. Cracks 1/8-inch in width and greater shall be sealed.
 - 3. Application of crack sealer shall be in accordance with the manufacturer's recommendations unless otherwise directed.

3.02 ASPHALT CONCRETE PAVING

- A. General:
 - 1. Asphalt concrete shall be proportioned, mixed, placed, spread, and compacted in conformance with Section 39 of the C.D.T. Standard Specifications.
 - 2. Before placing asphalt concrete on untreated base, a liquid asphalt prime coat shall be applied to the base course in conformance with Section 39 of the C.D.T. Standard Specifications. Prime coat shall be applied at the rate of 0.25 gallons per square yard.
 - 3. Before placing asphalt concrete, an asphalt emulsion tack coat shall be applied to all vertical surfaces of existing pavement, curbs, gutters, construction joints, and all existing pavement to be surfaced, in conformance with Section 39 of the C.D.T. Standard Specifications.
 - 4. Spreading and compacting asphalt concrete shall be performed in accordance with Section 39 of the C.D.T. Standard Specifications.
 - 5. Fog seal shall be applied to all finished surfaces of asphalt concrete pavement at a rate of 0.05 gallons per square yard, in accordance with Section 37 of the C.D.T. Standard Specifications.
 - 6. After fog seal has been applied, ample time shall be allowed for drying before traffic is allowed on the pavement or paint striping is applied.

3.03 CONCRETE CONSTRUCTION

- A. General:
 - 1. All concrete shall be mixed in accordance with applicable provisions of Section 90 of the C.D.T. Standards Specifications.
 - 2. Construction of concrete substructures shall conform to applicable provisions of Section 51 of the C.D.T. Standard Specifications. Unless noted otherwise in the Specifications, all exposed surfaces of structure shall have Class 1 surface finish. Finish shall match adjacent existing concrete paving.
 - 3. Schedule of Locations for Concrete Finish Types:
 - a. Slabs or Stairs to receive toppings and fills: Scratched.
 - b. Exposed Stairs Fills: Nonslip.
 - c. Exterior Paved Areas: Medium Broomed all surfaces <6% Slope.
 - d. Formed Surface to receive paint: Smooth Formed.

- e. Concealed Concrete Surfaces: Rough Formed.
- 4. No pigment shall be used in curing compounds for construction of concrete curbs, gutters, and structures.
- 5. All work shall be subject to field inspection. No concrete shall be placed until the Program Manager has approved the forms and reinforcement.
- 6. Expansion joints on curbs and gutters shall be placed 18 feet on centers, adjacent to structures, and at all returns, and shall be filled with joint filler. Control joints shall be formed 15 feet on centers. The score shall be 1-inch deep minimum.
- 7. Concrete shall not be dropped freely where reinforcing bars will cause segregation, nor shall it be dropped freely more than 6 feet. Spouts, elephant trunks, or other approved means shall be used to prevent segregation.

3.04 FIELD QUALITY CONTROL

A. Asphalt Concrete Paving:

- 1. The specified thickness of the finished pavement shown on the plans and specifications shall be the minimum acceptable.
- 2. Conforms shall form a smooth, pond-free transition between existing and new pavement.
- 3. Depressions in paving between high spots are not to exceed 1/8-inch when measured below a 10 feet long straight edged placed anywhere on surface in any direction.
- 4. The finished asphalt pavement shall have positive drainage without ponding.

3.05 CLEANUP

A. General:

- 1. Surplus material remaining upon completion of paving operations shall become the property of the Contractor, to be removed from the work site and disposed of in a lawful manner.
- 2. Surfaces shall be left in a clean, neat, and workmanlike condition, and all construction waste, rubbish, and debris shall be removed from the work site and disposed of in a lawful manner.

END OF SECTION

SECTION 02780

PAVEMENT MARKING

PART 1 – GENERAL

1.01 SUMMARY:

- A. Provide requirements for materials, fabrications, and installation of traffic control and pavement markings.

1.02 SUBMITTALS:

- A. Submit manufacturer's product data describing application of products and compliance with VOC requirements.
- B. Shop Drawings: Show complete layout and location of pavement markings prior to demolition or obliteration of the existing markings.
- C. Submit samples as follows:
 - 1. Traffic paint.
 - 2. Pavement markers and adhesives.
 - 3. Reflectorized markers and posts.

1.03 DELIVERY, STORAGE AND HANDLING:

- A. Comply with Division 1 requirements, specifications, and the Construction Manager.
- B. Deliver and store packaged products in original containers with seals unbroken and labels intact until time of installation.
- C. Provide proper facilities for handling and storage of products to prevent damage. Where necessary, stack products off ground on level platform, fully protected from weather.

PART 2 – PRODUCTS

2.01 MATERIALS:

- A. Traffic Marking and Symbol Paint: Water-Born, Fast-Dry, Traffic Paint distributed by Fuller-O'Brien Corp. D.J. Simpson (#108-273, White); (#108-280, Blue); or approved equivalent.
- B. Handicapped Symbol Background Paint: Blue Color. Glidden Co. "Glid-Guard Lifemaster Finish No. 5200 /series, Color 1/M 79", or approved equivalent.
- C. Thermoplastic Stripes and Markings:
 - 1. Thermoplastic stripes and markings shall be hot applied conforming to CSS Section 84 and shall be Cataphote-Catatherm brand, Pavemark thermoplastic brand, or approved equal.
 - 2. Thermoplastic stripes and markings shall have a minimum skid friction value of BPN 35.
- D. Pavement Markers and Adhesives:
 - 1. Pavement markers shall be two-way retroreflective "Blue" markers and shall conform to the applicable requirements of CSS Section 85.
 - 2. Adhesive for pavement markers shall be standard set epoxy adhesive conforming to the requirements of CSS Section 95-2.05.

PART 3 – EXECUTION

3.01 INSPECTION:

- A. Examine receiving surfaces and verify that surfaces are clean and proper for installation.
- B. Do not start work until unsatisfactory conditions have been corrected.

3.02 APPLICATION:

- A. Preparation:
 - 1. Clean and prepare surfaces to receive traffic paint in accordance with CSS Section 84-3.05 and these special provisions. Where required, remove existing striping and markings by wet blasting or equivalent method. Do not use dry sandblasting or other dust producing methods.
- B. Traffic Paint:
 - 1. Traffic paint shall be machine applied in accordance with CSS Section 84-3.04.
- C. Striping Layout:
 - 1. Traffic stripe shall be single and double, solid and broken, and of the color to match existing conditions.
 - 2. Traffic striping shall be placed in patterns to match existing conditions, contractor shall document.
- D. Thermoplastic Stripes and Markings:
 - 1. Thermoplastic stripes and markings shall be applied hot in conformance with manufacturer's recommended instructions and the applicable requirements of CSS Section 84-2.06.
- E. Pavement Markers:
 - 1. Pavement markers shall be installed to delineate the location of fire hydrants along the loop road. No markers shall be installed until the surface has been approved by the Engineer and until at least 10 days after the slurry seal on asphalt concrete has been placed. Place markers in accordance with CSS Section 85-1.06.
- F. Apply marking paint in accordance with approved manufacturer's recommendations.
- G. Density of paint coverage shall hide color and texture of substate.
- H. Parking Stripes: Paint four inches wide unless otherwise noted.
- I. Symbol Marking: Paint to match existing conditions.

3.03 CLEANING AND PROTECTION:

- A. Comply with requirements of Section 01710 - CLEANING.
- B. Upon completion of work, remove surplus materials and rubbish and clean off spilled or splattered paint resulting from this work.
- C. Permit no surface traffic until pavement and symbol marking has dried thoroughly.

END OF SECTION

SECTION 02810

IRRIGATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work in this section consists of furnishing, layout and installing an irrigation system.
- B. Related work specified elsewhere includes:
 - 1. Section 02300, EARTHWORK AND GRADING.
 - 2. Section 02900, PLANTING.
 - 3. Electrical drawings and specifications.

1.2 QUALITY ASSURANCE

- A. Manufacturer's Specifications: Follow manufacturer's current printed specifications and drawings in all cases where the manufacturers of articles used in the Contract furnish directions covering points not specified or shown in the drawings.
- B. Ordinances and Regulations: All local, municipal and state laws, codes and regulations governing or relating to all portions of this work are hereby incorporated into and made a part of these Specifications. Anything contained in these Specifications shall not be construed to conflict with any of the above codes, regulations or requirements of the same. However, when these Specifications and Drawings call for or describe materials, workmanship or construction of a better quality, higher standard, or larger size than is required by the above codes and regulations, the provisions of these Specifications and Drawings shall take precedence. Furnish without extra charge additional materials and labor required to comply with above rules and regulations.
- C. References, Codes and Standards:
 - 1. AB 325 State of California Model Water Efficient Landscape Ordinance.
 - 2. Water Use Classification of Landscape Species (WUCOLS).
 - 3. American Society of Irrigation Consultants (ASIC) Design Guidelines.
 - 4. California Landscape Standards, California Landscape Contractors Association, Sacramento, California.
 - 5. CAL-OSHA, title 8, Subchapter 4-Construction Safety Orders and Subchapter 7-General Industry Safety Orders.
 - 6. California Electric Code.
 - 7. California Plumbing Code (UPC) published by the Association of Western Plumbing Officials.
 - 8. NFPA 24, Section 10.4, Depth of Cover.
 - 9. Underwriters Laboratories (UL): Electrical wiring, controls, motors and devices, UL listed and so labeled.
 - 10. American Society of Testing Materials (ASTM).
- D. Furnish without extra charge any additional material and labor when required by the compliance with all above mentioned codes and regulations, though the work be not mentioned in these specifications or shown on the drawings.

- E. Reclaimed Water: Contact water company supplying reclaimed water prior to the commencement of installing the irrigation system to coordinate inspection of the work and to verify all codes and regulations regarding use of reclaimed water. Provide all required signage and other warnings.
- F. Experience: Assign a full-time employee to the job as supervisor for the duration of the Contract with a certified landscape technician, irrigation certification through CLCA or minimum of four (4) years experience in landscape irrigation installation.
- G. Labor Force: Provide a landscape installation and maintenance force thoroughly familiar with, and trained in, the work to be accomplished to perform the task in a competent, efficient manner acceptable to the Owner's Representative.
- H. 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. Carefully investigate the conditions affected all of the work and plan accordingly, and furnish all required fittings. Install system in such a manner to avoid conflicts with planting, utilities and architectural features.
 - 2. Do not install the irrigation system as shown on the Drawings when it is obvious in the field that obstructions, grade differences or discrepancies in arc dimensions exist that might not have been considered in engineering. Bring such obstruction or differences to the attention of the Owner's Representative. In the event this notification is not given, the Contractor shall assume full responsibility for any revision necessary.

1.3 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

- A. The Drawings show, if applicable, existing above and below grade structures and utilities that are known to the Owner. Locate known existing installations before proceeding with construction operations that may cause damage to such installations. Existing installations shall be kept in service where possible and damage to them shall be repaired with no adjustment of Contract Sum. Verify with Owner if As Built drawings are available.
- B. If other structures or utilities are encountered, request Owner's Representative to provide direction on how to proceed with the Work. If a structure or utility is damaged, take appropriate action to ensure the safety of persons and property.
- C. Verify location of existing irrigation systems to be removed and replaced. Maintain any existing systems as required by the Drawings and Specifications, including temporary retention of systems necessary to maintain existing on site and adjacent planting.

1.4 SUBMITTALS, in accordance with Section 01300.

- A. Materials List:
 - 1. Submit required copies of the cut sheets and a complete list of materials proposed for installation, along with any proposed substitutions clearly identified and obtain the Owner Representative's written approval thereof before proceeding. Use only accepted materials and items of equipment.
 - 2. List all materials by manufacturer's name and model number.

B. Substitutions:

1. If the Contractor desires to substitute a product, he shall list each item and note it as a "substitution" and provide the following information:
 - a. Descriptive information describing its similarities to the specified product.
2. If the product is approved and, in the opinion of the Owner's Representative, the substituted product does not perform as well as the specified product, the Contractor shall replace it with the specified product at no additional cost to the Owner.

C. Manuals:

1. Prior to the final acceptance of the irrigation system, furnish three (3) individually bound Operation and Maintenance Manuals to the Owner's Representative for use by the Owner. The manuals shall contain complete enlarged drawings, diagrams and spare parts lists of all equipment installed showing manufacturer's name and address. In addition, each Service Manual shall contain the following:
 - a. Index sheet indicating the Contractor's name, address and phone number.
 - b. Copies of equipment warranties and certificates.
 - c. List of equipment with names, addresses and telephone numbers of all local manufacturer representatives.
 - d. Complete operating and maintenance instructions in sufficient detail to permit operating personnel to understand, operate and maintain all equipment.
 - e. Parts list of all equipment such as controllers, valves, solenoids and heads.

D. Record Drawings:

1. Dimension the location of the following items from two (2) permanent points of reference such as building corners, sidewalks, road intersections, etc.:
 - a. Connection to existing water lines/meter.
 - b. Connection to electrical power.
 - c. Gate valves.
 - d. Routing of sprinkler pressure lines (a dimension at least every 100 feet and as required to identify all changes in direction and location).
 - e. Remote control valves.
 - f. Routing of control valves.
 - g. Quick coupling valves.
 - h. All sleeve locations.
 - i. Routing of all control wiring.
 - j. Include all invert elevations below 12".
2. Deliver a reproducible record drawing to the Architect within seven (7) working days before the date of final review. Delivery of the record drawings shall not relieve the Contractor of the responsibility of furnishing required information in the future.

E. Controller Plan:

1. Provide one Irrigation Diagram plan in each controller housing. The plan shall show the area controlled by each valve in different colors and for orientation, any major permanent structure such as buildings and roads.
2. Charts to be waterproof and hermetically sealed between two pieces of transparent 10 mil thick plastic and installed in each controller on the door as accepted by the Owner's Representative no later than the time of the coverage test of the irrigation system.

F. Maintenance Material - supply the following tools to the Owner:

1. Three (3) sets of specialized tools required for removing, disassembling and adjusting each type of sprinkler, valve or other equipment supplied on this project.
2. Two (2) keys for each type of equipment enclosure.
3. Two (2) keys for each type of automatic controller.
4. Two (2) quick-coupler keys and matching hose swivels for each type of quick-coupling valve installed.
5. All lock keys shall be keyed alike.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Furnish and deliver materials in manufacturer's packaging, bearing original legible labeling.
- B. The Contractor is cautioned to exercise care in handling, loading, unloading, and storing PVC pipe and fittings. All PVC pipe shall be transported in a vehicle which allows the length of the pipe to lie flat so as not to subject it to undue bending or concentrated external load at any point. Any section of pipe that has been dented, cracked, or otherwise damaged shall be discarded and, if installed, shall be replaced with new piping.

1.6 SEQUENCING AND SCHEDULING

- A. Acceptance: Do not install main line trenching prior to acceptance by Owner's Representative of rough grades completed under another Section.
- B. Coordination: Coordinate with the work of other sections to insure the following sequence of events:
 1. Sleeves and Conduits: Installation of all sleeves and conduits to be located under paving and through walls prior to placement of those materials.
 2. Bubbler Heads: Install after placement of tree, but prior to backfill with planter soil mix.
 3. On-Structure Equipment: Install piping and risers after waterproofing is accepted.
 4. Sprinkler Head in Pots: Install riser and seal the penetration of the pot prior to backfill of pot with drainage materials and planter soil mix.
 5. Coordinate work schedule with Owner to avoid disruption of landscape maintenance of existing landscaping.
 6. Install piping prior to soil preparation (planting soil amendment installation).

1.7 WARRANTY

- A. In addition to manufacturer's guarantees and warranties, work shall be warranted for one (1) year from date of final acceptance against defects in material, equipment and

workmanship. Warranty shall also cover repair of damage to any part of the premises resulting from leaks or other defects in materials, equipment and workmanship to the satisfaction of the Owner.

- B. Include a copy of the warranty form in the Operation and Maintenance Manual.

1.8 OPERATION

- A. Routine: Inspect and adjust all spray heads and control valves including raising or lowering of spray head heights to accommodate plant growth and weather conditions.
- B. Controller: Inspect regularly for power interruption and reset clock as required. Adjust station timing to accommodate changes in plant growth and weather conditions.
- C. System Failure: Perform all repairs within one (1) operating period. Replacements to match removed products and materials in all respects. Report promptly all damage not resulting from Contractor's operations. Repair all damage caused by Contractor at no expense to Owner.
- D. Climate Change: Set and program automatic controllers in response to seasonal requirements and requirements of newly planted materials.

PART 2 - PRODUCTS

2.1 PIPE

- A. Pressure Main Line Pipe and Fittings: All PVC fittings shall bear the manufacturer's trademark name, material designation, size, applicable I.P.S. schedule and NSF seal of approval.
- B. All main line pipe shall be solvent welded and shall be schedule 40 unless shown otherwise on the Drawings.
 - 1. PVC Pressure Rated Pipe: ASTM D2241 NSF approved Type I, Grade I, solvent welded PVC with an appropriate standard dimension ratio (S.D.R.).
 - 2. PVC Scheduled Pipe: ASTM D1785 NSF approved, Type I, Grade I, solvent welded PVC.
 - 3. PVC Solvent-weld Fittings: ASTM D2466 Schedule 40, 1-2, II-I NSF approved.
 - 4. Solvent Cement and Primer for PVC solvent-weld pipe and fittings: Type and installation methods prescribed by the manufacturer.
 - 5. Connections between Main Lines and RCVs: Schedule 80 PVC (threaded both ends) nipples and fittings unless required otherwise by local jurisdiction.
 - 6. Valves 2-inch and larger shall be flanged only.
 - 7. Copper pipe shall be Type K or Red Brass where threaded joints are required and Type L otherwise.
- C. All lateral line pipe shall be solvent welded and shall be schedule 40 unless shown otherwise on the Drawings.

2.2 CONTROLLER ENCLOSURES

- A. Type: Use one of the following (unless noted otherwise on the Drawings):
 - 1. Stainless steel, NEMA Type 3 rated, with back panel, padlocking hasp and padlock. See Detail for pedestal construction.

2. Le Meur, (714) 822-5100.
3. "Strong Box" available from John Deere, (800) 347-4272.

2.3 REMOTE CONTROL VALVE: As shown on Drawings and with the following minimum requirements:

- A. Remote control valves shall be those normally manufactured for irrigation systems and shall have a slow, consistent speed of closure through entire closing operation, including last portion. To ensure this, the effective diaphragm working area/valve seating opening ratio must be a minimum 3 to 1.
- B. Shall be mechanically self-cleaning to help prevent diaphragm or solenoid port plugging. To ensure this, the flush rod should be tapered to vary the size of the port opening as the diaphragm raises and lowers, thus allowing trapped material to escape. Rod is to be finished with a serrated surface to help scrub trapped material out. Screens not acceptable.
- C. Shall have removable valve seat so valve can be repaired without removal from irrigation line.
- D. Shall have ability to operate manually without the use of wrenches or special keys.
- E. Shall have one-piece solenoid that attaches directly to valve without shunts or clips that can be lost.
- F. Shall have cross top handle to adjust maximum travel of diaphragm to allow "tuning" of valve and closure.

2.4 BOX FOR REMOTE CONTROL VALVE: Rectangular plastic valve box with lid - Ametek, Brooks, Christy or accepted equal in green color (unless noted otherwise), with non-hinged bolt down lid marked "irrigation". Box body shall have knock outs. Do not saw cut body. Minimum size box as shown on Drawings. Increase box size as required to fit. Valve box lids are to indicate the controller letter and station number of valve as accepted by Owner's Representative. Also refer herein to required polyurethane tag at valve solenoid control wire under Control Wires. Locate the identification in center of the lid. Provide separate box for each valve. Provide H/20 Loading concrete boxes with bolt-down concrete lids for all valves that occur in paved areas.

2.5 CONTROLLER GROUND

- A. Provide each pedestal controller with its own ground rod. Separate the ground rods by a minimum of eight feet. The ground rod shall be an eight foot long by 5/8" diameter U.L. approved copper clad rod or as recommended by controller manufacturer. Install no more than 6" of the ground rod above finish grade. Connect #8 gauge wire with a U.L. approved ground rod clamp to rod and back to ground screw at base of controller with appropriate connector. Make this wire as short as possible, avoiding any kinks or bending. Install within pedestal housing base unless otherwise noted.
- B. Provide each irrigation controller with its own independent low voltage common ground wire.

2.6 CONTROLLER(S): As shown on Drawings and with the following minimum requirements:

- A. Shall be user-friendly. The controller must have a minimum 20-character readout display describing actions or options, or a full visible panel of buttons, dials, or switches that control all different functions separately.
- B. Shall have the ability to start a programmed sequence of valves a minimum of 5 times a day per program.
- C. Shall have ability to easily and quickly change watering schedules due to change in weather.
- D. Shall have the ability to connect to a central control system via additional plug-in boards. The connection to the central control system must be available to any and all of the following for system flexibility: hard wire, telephone, radio, or any combination. Two-way communication of all types of information between the central and the satellite is required.
 Controllers shall be Rainmaster equipment including: (1) SA01-RM8-36 RM DX36 SAT ASSY controller with (1) RDM radio & dome antenna assembly, (1) SA 01-RM6-36 DX36 SAT ASSY controller, (1) FSAV-250B Flow sensing Assembly with N.O.M.V. 2 ½", (2) PMR-CAC promax remote CAC- Receiver assembly, (100') EV-CAB-SEN sensor cable, (100') EV-CAB-COM cable- comm 2 conductor. Equipment is available from United Green Tech, 925-609-2180.

2.7 AUTOMATIC CONTROLLERS & CENTRAL: Work includes a complete and efficient sprinkler irrigation control system ready for use, including, but not limited to: central irrigation software and hardware, laser printer, satellite field controllers, flow meters, master valves, and wiring. This intention is to be met foregoing any deficiency in these plans and specifications.

- A. Hardware (minimum requirements):
 - 1. Rainbird Maxicom (Dell Computer)
 - 2. OptiPlex GX270, 2.80GHz, Pentium 4, 1M Cache, Gigabit NIC, Small Minitower, 533 Front Side Bus (221-6152)
 - 3. 40GB EIDE, 7200 RPM, ATA/100 Hard Drive, GX260 (340-8889)
 - 4. 512MB, Non-ECC, 333MHz DDR 2x256, Dell OptiPlex (311-2864)
 - 5. Dell UltraSharp 1703FP Flat Panel with Height Adjustable Stand, 17.0 Inch VIS, Lat-D/Opti (Latitude D-Family/OptiPlex) (320-0664)
 - 6. Integrated Video - Intel DVMT, GX260/GX270 (320-0428)
 - 7. Dell PS/2 Keyboard in Gray, No Hot Keys, OptiPlex (310-1515)
 - 8. Dell USB 2-Button Optical Mouse with Scroll (310-4126)
 - 9. Integrated Intel Gigabit NIC, 10/100/1000, with Alert Standards Format, GX260/GX270 (430-0353)
 - 10. Laser Jet style Printer
 - 11. 3 ½" floppy drive
 - 12. 48X32 CDRW/DVD Combo, with Roxio Easy CD Creator and DVD Decode, Dell OptiPlex GX270 (313-2298)
 - 13. Integrated Sound Blaster Compatible AC97 Sound, OptiPlex (313-8170)
 - 14. Dell Two Piece Stereo Speaker System for Dell OptiPlex (313-2316)
 - 15. OptiPlex Resource CD (313-7168)
 - 16. Service: Type 3 Contract - Next Business Day Parts and Labor On-Site Response, Initial Year (900-6630). Type 3 Contract - Next Business Day Parts and Labor On-Site Response, 2YR Extended (900-6602)
 - 17. Gold Technical Support Service OptiPlex, 3 Years, 1-866-876-3355 (DELL) (902-4882)

18. All computer cables
19. Uninterruptible power supply
20. Zip backup drive with three minimum 100-megabyte storage cartridges
21. Power supply surge protection
22. 4 separate IRQ channels for communication
23. Radio equipment for communication with satellites
24. Cluster Control Units (CCU) required for full Operation

B. Software:

1. PC Anywhere for Windows remote access package or equal
2. Windows XP Professional Service Pack 1, NTFS, with MediaDell OptiPlex, English, Factory Install (420-2119)
3. Microsoft Office XP (latest version)
4. Controller manufacturer's software
 - a. Windows based
 - b. Multi-tasking
 - c. Help wizards
 - d. Icon based software navigation

C. Satellite Controllers: Capable of operating with manufacturer's central software.

D. Flow Meters: Compatible with Central Control System and as recommended by manufacturer.

E. Hand Held Remote Control: Portable device as manufactured by Central Control System manufacturer capable of operating all control valves.

F. Master Control Valve: Master control valve shall be a 24 VAC, industrial type, solenoid control valve, Griswold 2000 series or equal. Valve shall be equipped with spring loaded packless diaphragm, cast iron body and bronze trim. The valve shall be of the normally closed type and shall be equipped with four-prong (cross) flow control. Valve shall be slow closing without chatter settings or adjustment. Valve shall have a mechanical self-purging internal control system with tapered, serrated, scrubbing rod through diaphragm for positive, variable port opening and cleaning. No solenoid port screens. Valve solenoid shall be corrosion-proof, molded in epoxy to form one integral unit with no connection shunts and shall be 24 VAC, 3 watt maximum.

G. Controller Ground:

1. Provide each pedestal controller with its own ground rod. Separate the ground rods by a minimum of eight feet. The ground rod shall be an eight foot long by 5/8" diameter U.L. approved copper clad rod or as recommended by controller manufacturer. Install no more than 6" of the ground rod above finish grade. Connect #8 gauge wire with a U.L. approved ground rod clamp to rod and back to ground screw at base of controller with appropriate connector. Make this wire as short as possible, avoiding any kinks or bending. Install within pedestal housing base unless otherwise noted.
2. Provide each irrigation controller with its own independent low voltage common ground wire.

2.8 CONTROL WIRES

- A. Connections between automatic controllers and the solenoid-operated electric control valves shall be made with direct burial copper wire 14- AWG-UF 600 volt (minimum size). Pilot wires shall be a color other than white, and shall be a different color for each automatic controller with wires sharing a common trench. Common wires shall be white in color, with a different color stripe for each controller with wiring sharing the same common trench. No stripe is required if multiple controller wiring is not present.
- B. Size of wire shall conform to the remote control valve manufacturer's specification for control wire sizes, but in no case shall the control wire be smaller than #14. Runs over 2,000 lineal feet shall be #12- AWG-UF 600 volt copper wire.
- C. All wire splices are to be made within a valve box, with a copper crimp-type connector, and a "3-M" #DBY splice kit.
- D. Use continuous control wiring between controllers and remote control valves (no splices).
- E. Provide polyurethane tag at valve solenoid control wire that shows the controller number and station number. Also refer to valve box lid identification.
- F. Provide a spare control wire in each RCV box for future.

2.9 SPRAY HEADS

- A. Pop-up as shown on drawings and with the following minimum requirements:.
- B. Shall have approximately 30 psi water pressure coming out of nozzle to prevent "fogging" or misting. Shall have pressure-compensating devices.
- C. Shall have ability to prevent low head drainage. Use heads with integral check valves.
- D. Shall not have spray blocked by turf or shrubbery; use minimum 4" pop-ups in turf areas.

2.10 ROTOR HEADS

- A. As shown on drawings and with the following minimum requirements:
- B. Heads shall have exact matched precipitation rates. Radius and precipitation rates must be the same.

2.11 BUBBLER HEADS

- A. As shown on drawings

2.12 QUICK COUPLER VALVES:

- A. Quick coupler valves shall be as listed on the Drawings with 10" diameter box and lid similar to isolation valve box described below.

2.13 ISOLATION VALVE:

- A. Valves 3 inches and smaller: 125 lb. WSP bronze gate valve with union bonnet, non-rising stem and solid wedge disc. Valves shall be line size.

2.14 DRIP IRRIGATION

- A. Drip Manifold:
1. Pressure Regulator: Preset at 30 psi outlet pressure, ¾" female threaded inlet and outlet, by RainBird, Torro or equal.
 2. Emitters: Xeri-Bug (XB Series) by RainBird, Toro EZ Drip Series, or equal.
 3. Flexible PVC: ASTM D2287 algae-resistant flexible PVC as recommended by manufacturer of Drip Emitters.
 4. Drip tubing: Conform to A. S. A. E. standards for minimum inside diameter and wall thickness, Minimum 2% carbon black, Salco ¾" AR Drip PVC flexible drip hose, or equal.
 5. ¾" Y-filter, 200 mesh.
 6. Toro DL 2000 Air/Vacuum Relief Valves and In-line Spring Check Valves.
 7. ¾" manual PVC ball valve with extra 3' of hose coiled in valve box.
 8. Drip system in accordance with "RainBird Xerigation Low-Volume Landscape Irrigation Design Manual" and as shown on the drawings as required for a complete working system.

2.15 SUBSURFACE DRIP IRRIGATION:

- A. As specified herein and as shown on the drawings and in accordance with manufacturer's recommendations. Provide all miscellaneous valves, filters fittings etc. required for a complete, operable system including the following:
1. Emitters shall be Toro DL 2000 Techline, in-line Teflon impregnated emitter with Netafim Automatic Flush Valves, Toro DL 2000 Air/Vacuum Relief Valves in accordance with "Toro DL-2000 Low-Volume Irrigation Bidding Specifications and Design Details" and as shown on the drawings as required for a complete working system.
- B. Drip Valve Assembly: Size valve box large enough and deep enough to contain assembly and allow convenient access and easy removal of filter screen. Position filter pointed down, approximately 45 degrees.
- C. Pressure regulator: Size regulator in accordance with flow rate. Do not over size. Use factory pre-set regulator at 30 PSI.

2.16 BOX FOR ISOLATION VALVE: 10" diameter plastic, Ametek, Brooks, Christy with bolt down lid marked "irrigation," or accepted equal. Avoid locating valve in paved areas. Provide H/20 Loading concrete box with bolt-down concrete lid if valve is located in paved area. Obtain location approval by Owner's Representative.

2.17 SWING JOINTS

- A. Sprinklers and Bubblers: Use Dura, Lasco or equal pre-assembled swing joints with O-rings.
- B. Quick Coupling Valve: Dura 1-inch 1-A2-1-11-18 pre-assembled swing joint with O-rings and Dura quick lock to receive stabilizing rod.

2.18 BACKFLOW PREVENTION DEVICE

- A. As required by Code and as shown on Drawings. Verify with Owner if Anti-freeze Jacket is required and provide as required.

- B. Riser assemblies from main line burial depth to backflow preventers shall be Schedule 40 brass pipe.
- C. All metallic pipe and fittings installed below grade shall be painted with two coats of Koppers #50 Bitumastic, or approved equal. Pipes may be wrapped with an approved asphaltic tape in lieu of the liquid-applied coating.

2.19 BACKFLOW PREVENTION DEVICE ENCLOSURE

- A. "Smooth Touch" enclosure without sharp edges, by Strong Box, available from V.I.T., Escondido, CA (800) 729-1314 or equal. Coordinate size of enclosure with plumbing for minimum clearance and size. Enclosure to include hasp and staple to receive padlock. Padlock N.I.C.

2.20 Y-STRAINER

- A. "Y"-Strainer upstream of remote control valves, Brass, 150 mesh.

2.20 RCV IDENTIFICATION TAGS: Plastic or brass tags with valve number, approximately 2" by 2" with number imprinted, as accepted by Owner.

2.20 MISCELLANEOUS INSTALLATION MATERIALS

- A. Solvent Cement and Primers for Solvent-weld Joints: Make and type approved by manufacturer(s) of pipe and fittings. Maintain cement proper consistency throughout use.
- B. Pipe and Joint Compound: Permatex: Do not use on sprinkler inlet port.

2.21 MISCELLANEOUS EQUIPMENT/ACCESSORIES

- A. Concrete For Thrust Blocks and Pads: Poured-in-place Class A concrete per Section 90 of the Caltrans Standard Specifications.
- B. Sleeves and Conduits: See Drawings.
- C. Key(s) for Quick-Coupling Valves:
 1. Type: Same manufacturer as Quick-Coupling Valve.

2.22 OTHER EQUIPMENT: As shown on Drawings and required for a fully functional irrigation system.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Sleeves and Conduits: Verify that all installed sleeving and conduits are undisturbed and are free of defects or errors introduced by the work of other sections.
- B. Water Meter/Water Pressure: Test and verify that existing water pressure is the minimum pressure at maximum system g.p.m. to operate the irrigation system as indicated on the drawings.

- C. Stub-outs: Verify that all stub-outs to be provided under another contract are correctly sized, located and installed as noted on Drawings.
- D. Notification: Submit written notification to Owner's Representative within ten (10) working days of above inspections describing all acceptable and non-acceptable site conditions.

3.2 CONNECTIONS TO SERVICES

- A. Provide and coordinate connection to water meter.
- B. Provide and coordinate connection of irrigation controller to electrical power source.

3.3 INSTALLATION

- A. Install irrigation system components in accordance with this Section, with the Drawings, with the manufacturer's recommendations, and with established industry standards. The Contractor shall do nothing that may jeopardize any manufacturer warranty.
- B. Conduits and Sleeves:
 - 1. Coordination: Provide conduits and sleeves and coordinate installation with other trades.
 - 2. Extent: Install conduits and sleeves where control wires and pipes pass under paving or through walls as shown on Drawings. Extend twelve inches (12") beyond edges of paving and walls and cap ends until ready for use.
- C. Excavating and Trenching:
 - 1. Dig trenches wide enough to allow a minimum of three inches (3") between parallel pipe lines. Provide a minimum cover from finish grade as follows:
 - a. 24-inches Deep: Over pipe on pressure side of irrigation control valve, control wires and quick-coupling valves.
 - b. 36-inches Deep: Over all pipe and pipe sleeves under roadways, parking lots, entrance to parking lots and Fire-Access Lanes per NFPA 24, Section 10.4.4.
 - c. 18-inches Deep: Over pipe on non-pressure side of irrigation control valve.
- D. Pipeline Assembly:
 - 1. General:
 - a. Install pipe and fittings in accordance with manufacturer's current printed Specifications.
 - b. Clean all pipes and fittings of dirt, scale and moisture before assembly.
 - 2. Solvent-welded Joints for PVC Pipes:
 - a. Solvents: Use solvents and methods specified by pipe manufacturer.
 - b. Curing Period: Minimum of one (1) hour before applying any external stress on the piping and at least 24 hours before placing the joint under water pressure.
 - 3. Threaded Joints for Plastic Pipes:

- a. Use Permatex on all threaded PVC fittings except sprinkler heads and quick coupler valve ACME threads.
 - b. Joining: Use strap-type friction wrench only. Do not use metal-jawed wrench. Assemble finger tight plus one or two turns.
- 4. Laying of Pipe:
 - a. Bedding On-grade: Remove from trench all rocks or clods. Bed pipe in at least 2 inches of soil excavated from trench. Backfill on all sides of piping to provide a uniform bearing.
 - b. Snaking: Snake pipe from side to side of trench bottom to allow for expansion and contraction. Minimum allowance for snaking is one (1) additional foot per 100 ft. of pipe.
 - c. Moisture Restrictions: Do not lay PVC pipe when there is water in the trench. Do not assemble PVC pipe unless the pipe is dry.
- E. Control Valves:
 - 1. Install in valve boxes where shown on Drawings and group together where practical. Install box flush with finish grade, not necessarily level. If valve occurs in drainage swale, relocate out of drainage swale as approved by Owner's Representative.
 - 2. Where two or more valves are installed adjacent to each other, provide at least six inches (6") separation. Align boxes in a row, perpendicular with pavement edge.
 - 3. Permanently mark valve box lid with 2" black valve number and controller letter or with numbered metal tag inside box as approved by Owner's Representative.
 - 4. Refer to control wiring for required spare wire in each valve box.
- F. Install "Y"-Strainer upstream of remote control valves at backflow preventer.
- F. Sprinkler Head Installation:
 - 1. Pop-up Heads:
 - a. Place all sprinkler heads in planting areas with top of heads set to finish grade or top of mulch as required.
 - b. Place part-circle pop-up sprinkler heads two inches (2") from edge of and flush with top of adjacent walks, header boards, curbs and mowing bands or paved areas and 12 inches (12") from building foundations at time of installation.
 - c. Set all sprinkler heads in turf to allow for settlement. Adjust as required after settlement. Hold heads two inches (2") clear of pavement edge.
 - 2. Bubblers:
 - a. Coordinate installation with planting contractor to insure timely and proper placement of heads at new planting.
- G. Subsurface Irrigation
 - 1. Install emitters at uniform 18 inches on center and 6 inches deep except where shown otherwise. Adjust spacing on slopes to prevent over watering at base of slopes. Install system in accordance with "Toro DL-2000 Low-Volume Irrigation

Bidding Specifications and Design Details” and as shown on the Drawings as required for a complete working system.

2. Provide air/vacuum relief valves at all high points on systems.
3. Provide filter as shown and as recommended by emitters manufacturer.
4. Tape pipe ends during installation and do not allow dirt or debris to enter pipe.
5. Use emitter line with the specified emitter flow rate and emitter spacing. Assemble dripper line to allow water to flow continuously and directly, with no dead ends or dead end loops between control valve and flush valve.
6. Use fittings at sharp bends and do not allow dripper line to kink.
7. Install emitter line around perimeter of planter not more than 3 inches off edge for ground cover and turf, 18 inches maximum for shrub planting.
8. Adjust alternate rows so emitters are spaced in a triangular pattern.
9. Collect water from multiple dripper lines and convey the water to automatic line flush valve.
10. Install flush valve at end(s) of collector laterals so that entire system will flush and be free of dirt and debris.
11. Flush valves shall be open when water is turned on for the first time and after a break in the main or lateral lines. Extend collector lateral as required and locate flush valve at convenient accessible location.
12. Flush the systems weekly through the first month of the maintenance period.
13. Thoroughly saturate soil prior to planting. Provide additional surface watering as required to keep plant root systems moist during planting establishment period.

H. Drip Irrigation:

1. Install system in accordance with “RainBird Landscape Irrigation Design and Specifications Xerigation Products and Details” or equal and as shown on the Drawings as required for a complete working system.
2. Install Toro DL 2000 Air/Vacuum Relief Valves at high points in system.
3. Install manual PVC ball valve with extra 3’ of hose coiled in valve box at end(s) of collector laterals so that entire system will flush and be free of dirt and debris.

I. Automatic Controller:

1. General: Install with lock box cutoff switch per local code and manufacturer's current printed specifications.
2. Connection to Valves: Connect remote control valves to controller in clockwise sequence to correspond with station setting beginning with Stations 1, 2, 3, etc.
3. Labeling: Affix controller letter (i.e., "A") on inside of controller cabinet door with minimum of one-inch (1") high permanent letter.
4. Irrigation Diagram: Affix a non-fading, waterproof copy of irrigation diagram to cabinet door below controller name. Irrigation diagram to be sealed between two plastic sheets, 20 mil. minimum thickness. Use a legible reduced copy of the Record Drawing for the irrigation diagram clearly showing all valves operated by the controller, station, number, valve size, and type of planting irrigated. Color code area operated by each valve.

J. Control Wiring:

1. General: Install control wires in common trenches with sprinkler mains and laterals wherever possible. Lay to the bottom side of pipe line. Provide looped slack at valves. Snake wires in trench to allow for contraction of wires. Tie wires in bundles at 10 ft. intervals.

2. Extra Length: Provide 30 inches (30") extra control wire at each remote control valve splice to facilitate the removal of the remote control bonnet to finish grade without cutting wires.
 3. Spare: Install one unconnected spare control wire running from the controller through each intermediate control valve box.
 4. Size: Minimum size of wire is to be determined strictly by the manufacturer's current printed specifications for remote control valves, but not smaller than #14.
 5. Detection Wire: Install a bare #12 copper wire or greater on top of the PVC supply line for the purpose of possible future mine detection search. Install the control wires on the bottom of the PVC supply line with electrical tape every ten feet (10').
 6. Splicing: Crimp control wire splices at remote control valves. Seal with specified splicing materials. In-line splices will be allowed only on runs exceeding 2500 feet and only in junction boxes.
- K. Closing of Pipe and Flushing of Lines:
1. Capping: Cap or plug all openings as soon as lines have been installed to prevent entrance of materials that would obstruct the pipe. Leave in place until removal is necessary for completion of installation.
- L. Rain Shutoff Switch:
1. Install switch in area not affected by irrigation or rain shadow. Provide wires in rigid conduit as accepted by Owner's Representative.
- M. Detection Wire:
1. Install a bare # 12 copper wire or greater on top of the PVC supply line for the purpose of possible future mine detection search..
- N. RCV IDENTIFICATION TAGS: Install in remote control valve box as recommended by manufacturer and as accepted by Owner's Representative.
- 3.4 MISCELLANEOUS EQUIPMENT
- A. Install miscellaneous equipment with concrete footings, brackets, etc., as required and as recommended by manufacturer.
- 3.5 FIELD QUALITY CONTROL
- A. Testing of Irrigation System:
1. Make hydrostatic tests with risers capped when welded PVC joints have cured at least 24 hours. Center load piping with backfill to prevent pipe from moving under pressure. Keep all couplings and fittings exposed.
 2. Install two (2) pressure gauges at opposite ends of main line system. Pump system up to a minimum of 125 psi the day preceding the scheduled test and verify that pressure is holding. Inspect system early following day and immediately notify Owner's Representative if the test confirmation must be postponed.
 3. Apply continuous static water pressure of 125 psi in accordance with Caltrans Standard Specifications Section 20-5.03H, except after a drop in pressure (5 psi

maximum), then the pressure must stabilize and remain stable for a one (1) hour minimum period before acceptance of the test.

4. Leaks detected during tests shall be repaired and test repeated until system passes tests at no additional cost to Owner.

B. Adjustment of the System:

1. Flush and adjust all sprinkler heads for optimum performance and to prevent overspray onto walks, roadways and buildings. Adjust the arc and radius as applicable.
2. Include as a part of the work any nozzle changes or arc adjustments necessary due to daytime windy conditions during grass establishment period. After grass has been established and watering can be performed during calm early morning or evening hours, make any required adjustments to nozzles and arcs.
3. Set all sprinkler heads perpendicular to finished grades unless otherwise noted on the drawings.
4. When the landscape sprinkler system is completed and before planting, perform a coverage test in the presence of the Owner's Representative to determine if the water coverage for planting areas is adequate.
5. Test controllers individually in the presence of the Owner's Representative and the Landscape Architect. Demonstrate that all control valves operate electronically. Provide vehicles and radio equipment as necessary to expedite this process.
6. Demonstrate to Owner's Representative that irrigation scheduling programmed into controller is adequate for plant requirements without causing runoff, and that scheduling capacities of controller are utilized.

3.6 BACKFILL AND COMPACTING

- A. General: After system is operating and required tests and reviews have been made, backfill excavations and trenches with clean soil, free of debris.
- B. Backfill for All Trenches: Regardless of the type of pipe covered, compact to minimum 95% density under pavements and 85% under planted areas.
- C. Finishing: Dress off areas to finish grades. Re-dress any areas which subsequently settle.
- D. Owner's testing agency will test backfill compaction in areas under paving.

3.7 MAINTENANCE

- A. The entire sprinkler irrigation system shall be under full automatic operation for a period of 2 days prior to any planting.
- B. The Owner's Representative reserves the right to waive or shorten the operation period.
- C. Maintain/repair system for full duration of plant maintenance period.

3.8 REVIEWS PRIOR TO ACCEPTANCE

- A. Notify the Owner's Representative in advance for the following reviews, according to the time indicated:

1. Supply line pressure test and control wire installation - 72 hours.
 2. Coverage and controller test - 72 hours.
 3. Final review - 7 days.
- B. No reviews will commence without record drawings, without completing previously noted corrections, or without preparing the system for review.
- 3.9 FINAL REVIEW AND CLEANUP, per Contract Closeout Section 01700.
- A. Operate each system in its entirety for the Owner's Representative at time of final review. Any items deemed not acceptable by the Owner's Representative shall be reworked to the complete satisfaction of the Owner's Representative.
 - B. Provide evidence to the Owner's Representative that the Owner has received all accessories and equipment as required before final review can occur.
 - C. Final acceptance and start of warranty period will occur no earlier than the end of the plant maintenance period.
 - D. For time of final review, Contractor shall arrange a meeting with the Owner's maintenance personnel to demonstrate the operation of the irrigation systems automatically in order to verify acceptance and to familiarize the maintenance personnel with the system and recommended programming.

*** END OF SECTION ***

SECTION 02700

SITE FURNISHINGS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Furnish and install all site furnishings shown on drawings and specified in accordance with the manufacturer's instructions and as shown on the drawings and as specified
- B. Related requirement specifications elsewhere:
 - 1. Section 02520 Landscape Site Concrete
 - 2. Section 02900 Planting

1.2 REFERENCES

- A. Perform work in accordance with all applicable laws, codes and regulations required by the State of California.
- B. Manufacturer's Instructions: Where required in the Specifications that materials, products, processes, equipment or the like to be installed or applied in accordance with manufacturer's instructions, directions or specifications, or words to this effect, it shall be constructed to mean that said application or installation shall be in strict accordance with printed instructions furnished by the manufacturer of the material for use under conditions similar to those at job site.
- C. Reference Standards:
 - 1. State of California, Business and Transportation Agency, Department of Transportation: "Standard Specifications."
 - 2. Manufacturers' specifications and recommendations.

1.3 COORDINATION

- A. Coordinate items of other trades. Contractor shall be responsible for the proper installation of all accessories embedded in concrete and for the provision of connections, holes, openings, etc., necessary to the execution of the work of the trades.

1.4 SUBMITTALS: Section 01300

- A. Trash Receptacles
- B. Bench

PART 2 MATERIALS

2.1 TRASH & RECYCLING RECEPTACLES

- A. Trash Receptacles: UNIVERSAL RECEPTACLE, 'Round Litter Receptacle, Top Opening' 36-Gallon stainless steel perforated receptacle. Lid: aluminum with black powdercoat finish. Forms + Surfaces, Carpinteria, CA, 800-451-0410.
- B. Recycling Receptacles: UNIVERSAL RECEPTACLE. 'Round Bottle and Can Recycler.' 36-Gallon stainless steel perforated receptacle with recycling . Lid: aluminum with blue powdercoat finish. Forms + Surfaces, Carpinteria, CA, 800-451-0410.

2.2 BENCH

- A. ARCATA Bench. Backless, powdercoat silver frame, polysite gray seat, surface mount embedded. Landscape Forms, Kalamazoo, MI, 888-422-3624.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

- A. Install manufactured items in accordance with the manufacturer's instruction and as shown in the drawings and as specified herein.
- B. Perform all work in accordance with all applicable laws, codes and regulations required by State of California.
- C. Set all work true and square, plumb and level.
- D. Supply all miscellaneous metal units and install as specified herein under the Sections entitled "Miscellaneous Metalwork" and "Galvanizing." Hot-dip galvanize all metal fastenings, angles, etc., after complete fabrication.
- E. Set site furniture, level. Provide spacers under furniture to level as acceptable to Owner's Representative
- F. Transport, store and handle precast units and manufactured items in a manner to avoid hairline cracks, staining or other damage. Store units free of the ground and protected from mud or rain splashes. Cover units, secure covers firmly, and protect the units from dust, dirt or other staining material.

3.2 TRASH RECEPTACLES

- A. Install level and in accordance with the manufacturer's instruction and as shown. Provide spacers under receptacles to level as acceptable to Owner's Representative.

3.3 BENCH

- A. Install in accordance with the manufacturer's instruction and as shown.

3.4 CLEANUP, per Contract Closeout Section 01700.

*** END OF SECTION ***

SECTION 02900

PLANTING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide planting work and planting maintenance complete as shown on the drawings and as specified including staking and layout of the landscaping.
- B. Related work specified elsewhere includes:
 - 1. Section 02300, EARTHWORK AND GRADING
 - 2. Section 02810, IRRIGATION

1.2 QUALITY ASSURANCE

- A. Reference Standards:
 - 1. Manufacturer's recommendations.
 - 2. "Sunset Western Garden Book," Lane Publishing Co., Menlo Park, California; current edition.
 - 3. "American Standards for Nursery Stock," American Association of Nurseryman, 230 Southern Building, Washington, D.C. 20005.
- B. Qualifications:
 - 1. Experience: Assign a full-time employee to the job as foreman for the duration of the Contract who is certified landscape technician, certification through CLCA or minimum of four (4) years experience in landscape installation and maintenance supervision, with experience or training in turf management, entomology, pest control, soils, fertilizers and plant identification.
 - 2. Labor Force: Provide a landscape installation and maintenance force thoroughly familiar with, and trained in, the work to be accomplished to perform the task in a competent, efficient manner acceptable to the Owner.
- C. Requirements:
 - 1. Supervision: The foreman shall directly supervise the work force at all times and be present during the entire installation. Notify Owner's Representative of all changes in supervision.
 - 2. Identification: Provide proper identification at all times for landscape maintenance firm's vehicles and a labor force uniformly dressed in a manner satisfactory to Owner's Representative.
- D. Plant Material Standards

1. Quality and Size of Plants: Conform to the State of California Grading Code of Nursery Stock, No. 1 grade. Use only nursery-grown stock which is free from insect pests and diseases.
 2. Comply with federal and state laws requiring inspection for plant diseases and infestations. Submit inspection certificates required by law with each shipment of plants, and deliver certificates to the Owner. Obtain clearance from the County Agricultural Commissioner as required by law, before planting plants delivered from outside the County in which planted.
- E. Testing Agency: Soil and Plant Laboratory, Inc. 352 Matthew Street (P.O. Box 153), Santa Clara, CA 95052; Tel. (408) 727-0330; or Root Zone Associates, P.O. Box 18911, San Jose, CA 95118; Tel. (408) 264-7024. Components of the test shall include all major nutrients, pH, salinity, boron, sodium, micronutrients, copper, zinc, manganese and iron, adsorption rate, organic content and texture.

1.3 SUBMITTALS, per Section 01300.

- A. Product Data: Manufacturer's current catalog cuts and specifications of the following:
1. Fertilizers
 2. Herbicide
 3. Tree Tie and Stake
 4. Root Barrier
 5. Iron Sulfate
 6. Tree Guy Material
- B. Samples:
1. Plants: Submit typical sample of each variety or entire quantity to site for approval by Landscape Architect.
 2. Organic Mulch: Submit 1-pint sample.
 3. Rock Mulch: Submit 1-pint sample(s).
 4. Organic (Soil) Amendment with Lab analysis.
 6. Bioswale Mineral Component (soil) Backfill
 7. Bioswale Yard Waste Compost
 8. Planting Soil Backfill for Turf Block Pavers
- C. Certificates of Compliance/analytical data from approved laboratory for degree of compliance for the following:
1. Turf Seed Mixes.
 2. Organic amendment.
 3. Bioswale Mineral Component (soil) Backfill. Submit ½ gal. sample of mineral component to soil and plant laboratory for analytical packages as specified in Part 2 – Products below. Upon approval of the Laboratory's recommendations by the Landscape Architect, the recommendations in the report shall become a part of the Specifications.
 4. Bioswale Yard Waste Compost (organic amendment for Bioswale). Submit 1 quart sample of mineral component to soil and plant laboratory for analytical packages as specified in Part 2 – Products below. Upon approval of the

- Laboratory's recommendations by the Landscape Architect, the recommendations in the report shall become a part of the Specifications.
5. Planting Soil Backfill for Turf Block Pavers.
- D. Delivery Receipts: Provide delivery receipts for quantities of organic soil amendments delivered to the site.
- E. Topsoil Analysis: After approval of rough grading and topsoil placement, obtain three representative samples of topsoil taken from accepted site locations at depth of 4" to 6" below finish grade and submit to an accredited Soils Laboratory for "agricultural suitability" analysis report, including particle size, and evaluation of physical and chemical properties of soil and recommendations for adding amendments and fertilizers to the soil.
- F. Subsoil Analysis: Besides the above required soil samples, take one representative sample of any subgrade soil that is to receive a layer of imported planting soil over it. The laboratory report shall include the subgrade soil's total combined silt and clay content for determining the total allowable combined silt and clay content of the imported planting soil specified herein.
- G. Approval of Laboratory Report: Upon approval of the Laboratory's report by the Landscape Architect, the recommendations in the report shall become a part of the Specifications and the quantities of soil amendment, fertilizer and other additives shall be adjusted to conform with the report at no additional cost to the owner. Request Testing Laboratory to send one copy of test results directly to Landscape Architect and one copy to the Owner. Note that there is a minimum quantity of organic amendment specified elsewhere in this specification section.
- 1.4 PROJECT/SITE CONDITIONS
- A. Site Visit: At beginning of work, visit and walk the site with the Owner's Representative to clarify scope of work and understand existing project/site conditions.
- 1.5 WARRANTY AND REPLACEMENT
- A. Pre-Emergence Weed Killer: Warrant the work against weed growth for a period of four (4) months after application.
- B. Warrant all plants and planting to be in a healthy, thriving condition until the end of the maintenance period, and deciduous trees beyond that time until active growth is evident.
- C. Replace all dead plants and plants not in a vigorous condition immediately as directed by the Owner's Representative at Contractor's expense. Install replacement plants before the final acceptance at the size specified.
- D. Warrant all plant material for a period of one year after final acceptance of the maintenance period against plant materials with defects at the time of installation.

- E. Warrant plant installation and maintenance by Contractor against defects for a period of one year.

PART 2 - PRODUCTS

2.1 PLANTS

- A. Plant the variety, quantity and size indicated. The total quantity tabulated on the drawings are considered approximate and furnished for convenience only. Contractor shall perform his/her own plant quantity calculations and shall provide all plants shown on the Drawings.
- B. Tag plants of the type or name indicated and in accordance with the standard practice recommended by the American Association of Nurserymen.
- C. Install healthy, shapely and well rooted plants with no evidence of having been rootbound, restricted or deformed.
- D. Take precautions to ensure that the plants will arrive at the site in proper condition for successful growth. Protect plants in transit from windburn and sunburn. Protect and maintain plants on site by proper storage and watering.
- E. Substitutions will not be permitted, except as follows:
 - 1. If proof is submitted to the Landscape Architect that any plant specified is not obtainable, a proposal will be considered for use of nearest equivalent size or variety with an equitable adjustment of contract price.
 - 2. Substantiate and submit proof of plant availability in writing to the Landscape Architect within 10 days after the effective date of Notice to Proceed.
- F. Trees: Select straight trunks with the leader intact, undamaged and uncut with all old abrasions and cuts completely callused over. Do not prune plants prior to delivery.
- G. Measure trees and shrubs with branches in normal position. Height and spread dimensions indicated refer to the main body of the plant, and not from branch tip to tip.

2.3 GRASSES

- A. Turf Seed: At least 98% pure, weed-free mixture and a minimum of 85% germination, recleaned, Grade A "new Crop" seed, delivered in the original containers, unopened and bearing a guaranteed analysis and dealer's label. Mixture as follows:

Shade/Sun Mix
25% STALLION Perennial Ryegrass
25% CASINO Brand Perennial Ryegrass

25% Creeping Red Fescue
 15% Kentucky Bluegrass
 10% CHATEAU Kentucky Bluegrass
 Seed Rate: 8 pounds/1,000 square feet

2.4 FERTILIZERS

- A. Commercial fertilizer, pelleted or granular form, conform to the requirements of Chapter 7, Article 2, of the Agricultural Code of the State of California for fertilizing materials as follows:

Type A: 6% Nitrogen, 20% Phosphorus Acid and 20% Potash, (6-20-20).

Type B: 21 gram planting tablets 20% Nitrogen, 10% Phosphoric Acid and 5% Potash (20-10-5) available from Agriform or 10gm BestPacks packets 20% Nitrogen, 10% Phosphoric Acid and 5% Potash (20-10-5) available from Best Fertilizer Co.

Type C: Complete fertilizer 21% Nitrogen, 7% Phosphoric Acid and 14% Potash (21-7-14).

If commercial fertilizer having this analysis is not obtainable, other similar commercial fertilizer may be used providing it meets the approval of the Landscape Architect.

- B. Maintenance Fertilizer: Type C

2.5 ORGANIC AMENDMENT:

- A. Ground Redwood or Ground Fir Bark or Pine Bark with the following properties:

<u>Percent Passing</u>	<u>Sieve Designation</u>	
100	9.51 mm	3/8"
50-60	6.35 mm	1/4"
10-20	4.76 mm	No. 4
0-5	2.38 mm	No. 8 8 mesh

Ground Redwood

1. Dry bulk density, lbs. per cu. yd., 270-370
2. Nitrogen stabilized - dry weight basis, min. 0.4%
3. Salinity (ECe): 4.0 maximum
4. Organic Content: 90% minimum
5. Reaction (pH): 4.0 minimum

Ground Fir and/or Pine Bark

1. Dry bulk density, lbs. per cu. yd., 450-580
2. Nitrogen stabilized - dry weight basis, min. 0.5%
3. Salinity (ECe): 4.0 maximum
4. Organic Content: 90% minimum
5. Reaction (pH): 4.0 minimum

- B. Submit sample along with analytical data from an approved laboratory for degree of compliance to the Landscape Architect within two weeks after award of Contract.

2.6 COMPOSTED YARD WASTE AMENDMENT:

- A. The above Ground Redwood or Ground Fir Bark or Ground Pine Bark is the specified organic amendment material required. Acceptance of Composted Yard Waste Amendment in lieu of the above specified amendment material will be considered if the planting soil salinity and soil structure is favorable for the inclusion of recycled yard waste organic matter, as approved by the Landscape Architect. It is the Contractor's responsibility to secure test samples of both the planting soil and the proposed composted yard waste amendment (2 quart samples) and submit to Soils and Plant Laboratory for evaluation and recommendations per code A05-1 for the soil sample and A91-0 for the amendment sample. The composted yard waste amendment sample shall be a grab sample from the currently available material.
- B. Based on the Soils and Plant Laboratory evaluation, the addition of composted yard waste amendment shall not be acceptable if it creates a leaching requirement. The addition of the compost shall result in a final ECe of the amended soil of less than 4.0 dS/m @ 25 degrees C. as determined in a saturation extract. Use the following table to determine the maximum allowable ECe (dS/m of saturation extract) of compost at desired use rate and allowable ECe increase.

DESIRED USE RATE		MAXIMUM ALLOWABLE ECe INCREASE FROM AMENDMENT		
Cu. Yds. Amendment Per 1000 Sq. Ft. for Incorporation to 6" depth	Volume percentage of amendment	1 dS/m	2 dS/m	3 dS/m
		Maximum ECe of Compost		
1	5	14	28	42
2	11	7	14	21
3	16	5	9.5	14
4	22	3.5	7	10.5
5	27	3	5.5	8.5
6	32	2.5	4.5	7

Example: Specification calls for 6 cu. Yrds. Compost per 1000 sq. ft. for incorporation to 6" depth, and site soil has an ECe of 2.0. In order to avoid exceeding ECe of 4 in final blend, compost ECe shall be less than 4.5 dS/m.

- C. Composted Yard Waste Soil Amendment properties as follows:

1. Gradation:

<u>Percent Passing by weight</u>	<u>Sieve Designation</u>	
90	1/2"	
85-100	9.51 mm	3/8"
50-80	2.38 mm	No. 8
		8 mesh

0-40

500 micron

No. 35

32 mesh

2. Organic Content: Minimum 50% based on dry weight and determined by ash method. Minimum 250 lbs. organic matter per cubic yard of compost.
3. Carbon to nitrogen ratio: Maximum 35:1 if material is claimed to be nitrogen stabilized.
4. pH: 5.5 – 8.0 as determined in saturated paste.
5. Soluble Salts: See B. above.
6. Moisture Content: 35-60%.
7. Contaminants: The compost shall be free of contaminants such as glass, metal and visible plastic.
8. Maturity: Physical characteristics suggestive of maturity include:
 - a. Color: Dark brown to black.
 - b. Acceptable Odor: None, soil-like, musty or moldy.
 - c. Unacceptable Odor: Sour, ammonia or putrid.
 - d. Particle Characterization: Identifiable wood pieces are acceptable but the balance of the material shall be soil-like without recognizable grass or leaves.

- D. Submit planting soil and composted yard waste amendment samples along with laboratory report from Soils and Plant Laboratory for degree of compliance as specified above to the Landscape Architect a minimum of 3 weeks prior to beginning soil prep. The laboratory report shall include recommendations for adjusting fertilizer and amendment quantities. Upon approval of the Laboratory's report by the Landscape Architect, the recommendations in the report shall become a part of the Specifications and the quantities of soil amendment and fertilizer shall be adjusted to conform with the report at no additional cost to the owner.

2.6 IRON SULFATE: Dry form.

2.7 PLANT BACKFILL: Except for acid loving plants (Azaleas, Rhododendrons, Ferns, Camellias, etc.), use a mixture of 2 parts soil from the hole, and 1 part amendment with iron added at the following rates:

1 gallon can plants	-	iron, 1/4 cup
5 gallon can plants	-	iron, 1/3 cup
15 gallon can plants	-	iron, 1/2 cup
24" box and larger	-	iron, 1 cup

Mix the iron, amendment and soil thoroughly for use in the top 8 inches of backfill around plants. For acid loving plants, mixture to be 1/2 soil from the hole and 1/2 amendment.

2.8 MULCH

- A. Organic Mulch: Fir or pine bark chips, dark in color; 3/4-inch to 1-inch.
- B. Rock Mulch: Hard, durable smooth river washed stone, 3/4-inch to 1-inch diameter in brown color range, Lin Creek or equal.

- C. Submit samples of organic and rock mulches to the Landscape Architect for approval within two weeks of award of Contract. Resubmit until acceptable to Owner, at no extra cost.
- 2.9 TREE SUPPORT POLES: Peeled lodge pole pine logs, clean, smooth, new, and sized as follows:
- A. Two-inch (2") diameter by eight feet (8') long for trees less than 8' high and 1" caliper.
 - B. Three-inch (3") diameter by eight to ten feet (8' - 10') long for trees greater than 8' high and 1" caliper.
- 2.10 TIES: Rubber strap, 24-inch minimum length without sharp edges adjacent to trunk, V.I.T. cinch-tie, Dublin, CA, (818)882-9530, or approved equal.
- 2.11 TREE GUYING:
- A. For trees up to 3" caliper, 3/16" galvanized steel cable, with rubber tree collar, 12" minimum long, and secured with cable clamp, and attached to anchor for below-grade location, Duckbill Model 40 DTS, or approved equal.
 - B. For trees 3" to 6" caliper, 1/8" galvanized steel cable with rubber tree collar, 21" minimum long, and secured with cable clamp, 3" take-up eye to eye turnbuckle, and attached to anchor for below-grade location, Duckbill Model 68 DTS, or approved equal.
- 2.12 ROOT BARRIER: UB 18-2 as manufactured by Deep Root Corporation (800)458-7668, Root Solutions, Inc. (800) 554-0914, or equal.
- 2.16 PLANTING SOIL (TOPSOIL):
- A. Planting soil is defined as on-site surface soil and soil available from existing topsoil stockpile (contact Campus Maintenance and Operations Dept. for access to soil stockpile). Satisfactory planting soil shall be free of subsoil, clay, lumps, stones, and other objects over 4" in diameter, and without weeds, roots, and other objectionable material.
 - B. Planting soil backfill for Turf Block Pavers shall be a screened imported "Sandy Loam" with a maximum silt and clay content between 25% and 30%.
- 2.27 PRE-EMERGENCE WEED KILLER: Clean non-staining as recommended by a licensed pest control specialist.
- 2.31 BIOSWALE PLANTING SOIL BACKFILL MIX:
- A. Bioswale backfill mix – 18" thick minimum - to receive planting shall be as specified below and as shown in Drawings:



Soil & Plant Laboratory, Inc.
Leaders in Soil & Plant Testing Since 1946
www.soilandplantlaboratory.com

352 Mathew St, Santa Clara, CA 95050
408-727-0330

BIOSWALE SPECIFICATION GUIDELINES

For the filtration of runoff water before it enters the storm drain system

The mineral component shall be classified as USDA sand or loamy sand **and** conform to the following particle size characteristics:

<u>U.S. Sieve</u>	<u>Size, mm</u>	<u>Class</u>	<u>% wt. retained</u>
#10	2.0	gravel	0-10
#35	2.0-0.5	coarse sand	20-35
#270	<0.05	silt and clay	6-12

Rock 1/2 - 1 inch 0-5% by volume with none > 1 inch

Organic 0-3% by weight for below 6 inches.

PERCOLATION RATE

Must fall in the range of 5 to 10 inches per hour as determined by SPL method A06-2.

CHEMISTRY SUITABILITY CONSIDERATIONS

Salinity: Saturation Extract Conductivity (ECe)
Less than 3.0 dS/m @ 25° C.

Sodium: Sodium Adsorption Ratio (SAR)
Less than 6.0

Boron: Saturation Extract Concentration
Less than 1.0 ppm

Reaction: pH of Saturated Paste: 5.5 - 7.8 without high lime content.

To insure conformance submit 1/2 gallon sample for analytical packages; A06-2, A05-1

PROFILE PREPARATION

If organic content of the mineral component is less than 0.6% weight, then it should be blended with *compost in volume proportions of 5% compost to 95% mineral.

After placement the top 6 inches should be blended with *compost. If bulk blended, proportions should be 1 part compost to 4 parts of the above mineral component. If blended in place this would be equivalent to 4-1/2 cubic yards per 1000 square feet for blending to 6 inches.

***Compost** to comply with Yard Waste Compost specifications on the attached form #415. 3/5/07



**YARD WASTE COMPOST
-FORM #415 SPECIFICATION GUIDELINES-**

1) Gradation: A minimum of 90% of the material by weight shall pass a 1/2" screen. Material passing the 1/2" screen shall meet the following criteria.

<u>Percent Passing</u>	<u>Sieve Designation</u>
85 – 100	9.51 mm (3/8")
50 – 80	2.38 mm (No. 8)
0 – 40	500 micron (No. 35)

2) Organic content: Minimum 50% based on dry weight and determined by ash method. Minimum 250 lbs. organic matter per cubic yard of compost.

3) Carbon to nitrogen ratio: Maximum 35:1.

4) pH: 5.5 – 8.0 as determined in saturated paste.

5) Soluble salts: Soluble nutrients typically account for most of the salinity levels but sodium should account for less than 25% of the total. To avoid a leaching requirement, the addition of the compost shall result in a final ECe of the amended soil of less than 4.0 dS/m @ 25 degrees C. as determined in a saturation extract. Use the following table to determine the maximum allowable ECe (dS/m of saturation extract) of compost at the desired use rate.

Desired Use Rate		Salinity (ECe) of On-Site Soil		
Cu. Yds. Amendment per 1000 sq. ft. for incorporation to 6" depth	Volume Percentage of Amendment	3 dS/m	2 dS/m	1 dS/m
		Maximum ECe of Compost		
2	11	7	14	21
3	16	5	9.5	14
4	22	3.5	7	10.5
5	27	3	5.5	8.5

Example: Specification calls for 4 cu. yds. compost per 1000 sq. ft. to a 6" depth, and site soil has an ECe of 2.0. In order to avoid exceeding an ECe of 4 in the final blend, compost ECe should be less than 5.5 dS/m.

6) Contaminants: The compost shall be free of contaminants such as glass, metal and visible plastic. Heavy metals, fecal coliform, and Salmonella sp shall not exceed levels outlined in California Integrated Waste Management regulations.

7) Maturity characteristics:

color: dark brown to black

odor: Acceptable = none, soil-like, musty or moldy Unacceptable = sour, ammonia or putrid

particle characterization: identifiable wood pieces are acceptable but the balance of material should be soil-like without recognizable grass or leaves.

3/5/07

PART 3 - EXECUTION

3.1 FINE GRADING AND SOIL PREPARATION

A. Planting Soil Placement:

1. Inspect planting areas and remove all base rock and other foreign material
Rip all planting areas in two directions full depth of compacted fill (to a

minimum of 6 inches) into undisturbed native soil prior to backfilling. Scarification of any planting area which cannot be accomplished with a tractor shall be accomplished by an alternative method approved by the Owner's Representative to the specified depth to ensure proper drainage.

2. Prior to placing planting soil secure the Owner's Representatives acceptance of the planting areas subgrade condition. After acceptance of the planting areas subgrade condition, uniformly distribute and spread planting soil backfill over scarified subgrade as specified in planting areas and compact to a maximum of 85% relative compaction.
 3. Do not work planting soil in a wet or muddy condition or dump or spread in areas where subgrade is not in proper condition.
 4. Water settling, puddling, and jetting of fill and backfill materials as a compaction method is not acceptable.
 5. Provide a minimum of 12 inches depth in planting areas.
- A. **Planting Soil Placement in Planting Islands and Adjacent to Pavement Areas:** Provide planting soil as a final lift in all planting areas within and adjacent to paved areas and other construction where native site soil has been covered by engineered fill and/or base rock. Remove all engineered fill, base rock and compacted subgrade full depth of compaction and replace with approved planting soil, a minimum lift of 24 inches.
- B. All planting areas soil shall be loose and friable prior to planting. Rip any overly compacted and re-compacted planting areas in two directions full depth of compacted soil prior to planting.
- C. Before proceeding with the work: Carefully inspect all areas and verify all dimensions and quantities. Immediately inform the Landscape Architect of any discrepancy between the drawings and specifications and actual conditions and secure approval to proceed.
- D. Planting operations shall be performed only during periods when beneficial results can be obtained. When excessive moisture or other unsatisfactory conditions prevail, the work shall be stopped until conditions are satisfactory.
- E. Thoroughly wet down the planting areas to settle the soil and confirm irrigation coverage and operation. Allow soil to dry so as to be workable as described herein.
- F. Drag to a smooth, even surface. Grade to form all swales, pitch to catch basins, streets, curb, etc., to ensure uniform surface drainage. Areas requiring grading include adjacent transition areas that shall be uniformly level or sloped between finish elevations.
- G. **Finish Grade:** Hold finish grade and/or mulch surface in planting areas 1/2-inch below adjacent pavement surfaces, tops of curbs, manholes, etc. The subgrade of the mulch in mulched planting areas shall be a minus 2 inches for a distance of 12 to 18 inch from the edge of pavement. The remainder of the planting area shall be graded to receive the required 3 inch layer of mulch.
- H. **Soil Preparation:**

1. Spread organic amendment, iron and Type A fertilizer evenly over installed and rough graded on-site topsoil in all planting areas including turf, ground cover and shrub areas at the following rates:
 - a. Organic Amendment: 6 cubic yards per 1,000 square feet
 - b. Fertilizer: Type A (6-20-20) at 20 lbs. per 1,000 square feet.
 - c. Iron Sulfate: 10 lbs. per 1,000 square feet
 2. In the case of a contradiction between the quantity of organic amendment required by the Contractor-obtained soils laboratory analysis and the specified quantity shown above, the greater of the two quantities shall take precedence.
 3. Rototill above additives into soil 6 to 8 inches deep. Keep iron sulfate off pavement and other surfaces to prevent rust staining. Correct all rust damage to work.
- I. After the rototill work, float areas to a smooth, uniform grade as indicated on the drawings. Slope all planting areas to drain. Roll, scarify, rake and level as necessary to obtain true, even planting surfaces. Remove rocks, sticks and debris 2 inches or larger in size in turf areas and 4 inches or larger in shrub and ground cover areas. Secure approval of the grade by the Landscape Architect before any planting.
- 3.2 BIOSWALE PLANTING SOIL BACKFILL MIX: Install the above specified bioswale backfill mix as shown in Drawings after approval of the drainage material installation.
- 3.2 ROOT BARRIER: Install in continuous sheet parallel and adjacent to curb or pavement edge as required on drawings and in accordance with manufacturer's recommendations.
- 3.4 SEEDED TURF PLANTING
- A. Lightly roll surface and reshape to level humps and hollows. Secure the Landscape Architect's approval before seeding.
 - B. Sow seed at rate noted above. Use an approved seeding method, sowing one-half of the amount in one direction and the remaining one-half in a direction 90 degrees to the first during a windless period. Rake lightly to cover seed. Hydroseeding is also an acceptable turf seeding method.
 - C. Wet seeded areas slowly but thoroughly and keep moist, but not saturated, at all times until the grass has germinated.
 - D. Protect turf areas by erecting fences, barriers and signs necessary to prevent trespass. Keep barriers neat and well maintained.
- 3.8 TREE AND SHRUB PLANTING
- A. Mark tree and shrub locations on site using stakes, gypsum or similar approved means and secure location approval by the Landscape Architect before plant holes are dug. Adjust location as necessary prior to planting.

- B. Test drainage of plant beds and pits by filling with water (minimum 6"). The retention of water in planting beds and plant pits for more than two (2) hours shall be brought to the attention of the Landscape Architect. If rock, underground construction work, tree roots, poor drainage, or other obstructions are encountered in the excavation of plant pits, alternate locations may be selected by Landscape Architect.

- C. Excavate tree, shrub and vine pits as follows:

<u>Excavation for</u>	<u>Width</u>	<u>Depth</u>
Boxed Trees	Box + 24"	Box + 12"
Canned Trees (15 gc)	Can + 18"	Can + 12"
Canned Shrubs/Vines (1 or 5 gc)	Can + 12"	Can + 12"

- D. Break and loosen the sides and bottom of the pit to ensure root penetration and water test hole for drainage as required above.

- E. Backfill plant holes with mix as specified, free from rocks, clods or lumpy material. Backfill native soil free of soil amendments under rootball and foot tamp to prevent settlement. Backfill remainder of the hole with soil mix and place plant tablets or packets (Type B fertilizer) 3 inches below finish grade and 1/2-inch from roots at the following rates:

1 gallon can plant	-	1 tablet or packet
5 gallon can plant	-	3 tablets or packet
15 gallon can plant	-	6 tablets or packet
24-inch box plant	-	6 tablets or packet
36-inch box plant	-	8 tablets or packet

- F. Carefully remove and set plants without damaging the rootball. Superficially cut edge roots vertically on three sides. Remove bottom of plant boxes before planting. Remove sides of boxes after positioning the plant and partially backfilling.

- G. Set plants in backfill with top of the rootball 2 inches above finished grade. Backfill remainder of hole and soak thoroughly by jetting with a hose and pipe section. Water backfill until saturated the full depth of the hole.

- H. Build 6" high watering basin berms around trees and shrubs to drain through rootball. Basins are not required around trees in turf areas.

- I. Stake and/or guy trees as detailed. Drive stake until solid and remove excess stake protruding above top tree tie to prevent rubbing against branches.

- J. Remove any soil from top of plant rootballs and secure Landscape Architect's approval of rootball height prior to mulching.

- K. After approval of rootball height, install as required below.

3.10 MULCH:

- A. Except where rock mulch is required, mulch all tree, shrub and ground cover areas with organic mulch to a 3-inch depth, except adjacent to walkways where soil grade is 2 inches below top of pavement, mulch shall be 2 inches deep.. Hold bark mulch away from base (trunk) of plant 4" or as directed by the Landscape Architect. Individual trees and/or shrubs planted in non-irrigated areas shall, at minimum, receive bark mulch over their watering basin and berm. No mulch is required around trees in turf areas.
 - B. Install rock mulch to depth shown (minimum 3 inches).
- 3.13 ROOT BARRIER: Install in linear fashion along and adjacent to the edges of the planting area as detailed or, if not shown, in accordance with manufacturer's recommendations. Set top of barrier approximately ½-inch above finished soil surface to allow concealment with mulch, as accepted by Owner's Representative.
- 3.16 GROUND COVER PLANTING: Plant in neat, straight, parallel and staggered rows as indicated on plan. Plant first row one-half required ground cover spacing behind adjacent curbs, structures, or other plant bed limits. Plant ground cover to edge of water basins of adjacent trees and shrubs.
- 3.17 PRE-EMERGENCE WEED KILLER: Apply pre-emergence weed killer in all areas to receive ground cover planting. Work shall be done under the supervision of a person licensed by the State of California as a pest control applicator and holding a qualified applicator license or a Qualified Applicator Certificate. Obtain approval of the finish grades prior to applying weed killer and coordinate planting and watering with the pest control specialist prior to planting. Take care to keep weed killer off areas to be seeded.
- 3.18 WATERING: Water all trees, shrubs and ground cover immediately after planting. Apply water to all plants as often and in sufficient amount as conditions may require to keep the plants in a healthy vigorous growing condition until completion of the Contract. Do supplemental hand watering of trees and shrubs during the first 3 weeks of plant establishment.
- 3.19 MAINTENANCE OF PLANTING: Maintain plants from time of delivery to site until final acceptance of landscape installation.
- 3.21 PRE-MAINTENANCE PERIOD REVIEW AND APPROVAL OF PLANTING
- A. Receive approval of the installed planting prior to commencement of planting establishment maintenance period. Notify the Landscape Architect a minimum of seven (7) days prior to requested review. Before the review, complete the following:
 - 1. Complete all construction work.
 - 2. Present all planted areas neat and clean with all weeds removed and all plants installed and appearing healthy.
 - 3. Plumb all tree stakes.
 - 4. Seed all turf areas.
 - 5. No partial approvals will be given.

3.22 PLANTING ESTABLISHMENT MAINTENANCE

A. General Requirements:

1. Maintenance Period: The planting establishment maintenance period required shall be 120 calendar days after all planting is complete, turf is seeded, and installation approved. A longer period may be required if the turf is not thick, vigorous and even and has been mowed a minimum of 4 times, or if the plant material is not acceptably maintained during the maintenance period. The maintenance period may be suspended at any time upon written notice to the Contractor that the landscaping is not being acceptably maintained, and the day count suspended until the landscape is brought up to acceptable standards as determined by the Landscape Architect.
2. Planting establishment maintenance immediately follows, coincides with, and is continuous with the planting operations, and continues through turf installation, and after all planting is complete and accepted; or longer where necessary to establish acceptable stands of thriving plants.
3. Protect all areas against damage, including erosion, trespass, insects, rodents, disease, etc. and provide proper safeguards. Maintain and keep all temporary barriers erected to prevent trespass.
4. Keep all walks and paved areas clean. Keep the site clear of debris resulting from landscape work or maintenance.
5. Repair all damaged planted areas, and replace plants and reseed or resod turf immediately upon discovery of damage or loss.
6. Check sprinkler systems at each watering; adjust coverage and clean heads immediately. Adjust timing of sprinkler controller to prevent flooding.
7. Maintain adequate moisture depth in soil to ensure vigorous growth. Check rootball of trees and shrubs independent of surrounding soils and hand water as required.
8. Keep Contract areas free from weeds by cultivating, hoeing or hand pulling. Use of chemical weed killers will not relieve the Contractor of the responsibility of keeping areas free of weeds over 1-inch high at all times.

B. Tree, Shrub and Ground Cover Maintenance:

1. Maintain during the entire establishment period by regular watering, cultivating, weeding, repair of stakes and ties, and spraying for insect pests. Prune when requested by the Landscape Architect.
2. Keep watering basins in good condition and weed-free at all times.

2. Replace all damaged, unhealthy or dead trees, shrubs, vines and ground covers with new stock immediately; size as indicated on the drawings.

D. Turf:

1. Maintain during the entire establishment period. Cut as frequently as growth of grass requires. Cut to a height of two inches (2"), unless otherwise directed by the Landscape Architect.
2. Maintain constant moisture to a depth of eight inches (8").
3. Trim edges of turf at paving and headerboards at time of second cutting, and at each later cutting.
4. Keep turf areas free of undesirable weeds and grasses by the application of suitable selective weed killers or hand pulling.
5. Reseed all damaged areas as soon as evident.
6. Repair any hollow, settled or eroded areas by filling, rolling and reseeding. If sod is used for repair, it shall match the specified turf mix.

E. Fertilizing:

1. Upon approval and after submitting fertilizer delivery tags, maintenance fertilization shall begin 30 days after planting is complete. Fertilize all turf and ground cover areas by broad-casting Type C (21-7-14) fertilizer at the rate of 5 lbs. per 1,000 square feet evenly throughout. Reapply every forty-five (45) days until acceptable.
2. During the winter, for quick turf greening effect, calcium nitrate (15.5-0-0) may be applied at the rate of 6 lbs. per 1,000 square feet.
3. Early spring and fall substitute a complete fertilizer such as 15-15-15 applied at the rate of 6 lbs. per 1,000 square feet, to help insure continuing adequate phosphorus and potassium.
4. Apply ammonium sulfate fertilizer as necessary to maintain vigorous, green grass between fertilizings mentioned above.
5. Observe plant's color, and if a soil pH imbalance is suspected, take soil samples and obtain laboratory analysis for confirmation. Take necessary action recommended in laboratory analysis such as top dressing with soil sulfur, leaching soil, etc.

3.23 FINAL PLANTING REVIEW AND ACCEPTANCE, per Contract Closeout Section 01700.

- A. At the conclusion of the Maintenance Period, schedule a final review with the Owner, the Owner's maintenance person, and the Landscape Architect. On such date, all project improvements and all corrective work shall have been completed.

If all project improvements and corrective work are not completed, continue the planting establishment, at no additional cost to the Owner, until all work has been completed. This condition will be waived by the Owner under such circumstances wherein the Owner has granted an extension of time to permit the completion of a particular portion of the work beyond the time of completion set forth in the Agreement.

- B. Submit written notice requesting review at least 10 days before the anticipated review.
- C. Prior to review, weed and rake all planted areas, repair plant basins, mow and edge turf, plumb tree stakes, clear the site of all debris and present in a neat, orderly manner.

*** END OF SECTION ***

SECTION 10400

IDENTIFICATION DEVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. General Provisions of the Contract.
- B. Graphics Schedule.
- C. Drawings/Specifications.
- D. Site and/or Floor Plans.

1.02 SUMMARY

- A. This Section includes, but is not limited to, the following:
 - 1. Custom Primary Parking Lot Directional Signage
 - 2. Custom Secondary Parking Lot Directional Signage
 - 3. Parking Entrance Regulatory Sign
 - 4. Route of Accessibility Signage
 - 5. Parking Lot Designation Signage
 - 6. Double-faced Banners
 - 7. Vinyl Graphics/General

1.03 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each sign type of sign.
- B. Shop Drawings: Include plans, specifications, artwork, layouts, letter-styles/symbols and installation details for each type of sign. Obtain written approval(s) prior to production.
- C. Signage contractor must meet with client to confirm in writing all quantities, copy and layouts for all signs prior to production.
- D. Signage contractor to produce and provide any/all drawings, artwork and detail documents necessary to complete the project.
- E. Samples for Verification: Provide actual samples showing finish and sheen. Provide paint manufacturers written specifications and durability guarantee against color fading, chipping and peeling. Provide vinyl letter sample, manufacturers written specifications, and durability guarantee.

- F. Signage Contractor Requirements: Provide written evidence of experience with architectural signage production, fabrication and installation of similar project scope and fabrication methods for a minimum period of five years. Meet signage contractor requirements outlined herein.
- G. It is the sole responsibility of the signage contractor to obtain any/all permits required for any/all signage contained in this project. Signage contractor to obtain, provide, produce and process any/all documentation, and pay all fees required for the permitting process.

1.04 QUALITY ASSURANCE

- A. Bidding Requirements
 - 1. Signage contractor must maintain a current license for all work outlined herein.
 - 2. Signage contractor must provide evidence that they provide Workers Compensation Insurance for all employees working on this project.
 - 3. Signage contractor must provide evidence that they have experience with architectural signage production, fabrication and installation for a period of at least five years - and be able to provide references upon request.
 - 4. Signage contractor must provide evidence of experience with similar projects and materials.
 - 5. The bid must be all-inclusive for all signage in the signage package: Administration; Permits; Documentation; Signage Layouts for Approval; Detail Drawings; All Artwork; Samples for Approval; Engineering; Material Costs; Removal and Disposal Costs; Production Costs; Labor Costs; Installation Costs; Etc.
- B. Design Requirements
 - 1. Design and produce all signs so as to be code compliant where required.
- C. Fabrication and Installation Requirements
 - 1. Signage contractor must meet with client to confirm and approve in writing all quantities, copy and layouts for all signage prior to production.
 - 2. It is the sole responsibility of the signage contractor to produce and provide any/all working drawings, detail documents, artwork, site maps, schematics, floor plans and signage layouts necessary to complete the project.
 - 3. Signage contractor to provide any/all engineering documentation required to complete the project.
 - 4. Any damages incurred during the installation process (broken pipes, damaged electrical, etc.) shall be repaired at the expense of the signage contractor.
 - 5. Aluminum sign components to be properly primed and painted to provide an automotive finish with an exterior performance rating of five years.
 - 6. Vinyl Lettering, Graphics, and Symbols to carry a premium performance rating of five years - exterior durability.
 - 7. Any/all additions to the approved sign program must meet the specifications of similar sign type(s) contained within the Drawings/Specifications section.
 - 8. Note: All signage must conform to the Las Positas Master Signage Standards prepared by Hanzal Morris Design Group, Inc., 216A Spring Street, Pleasanton California 94566 / Telephone 925 461 8609.

D. Quality Assurance

1. Signage contractor is required to guarantee all products provided against color fading, paint peeling and chipping, delaminating, installation failure, and for any other failure due to inferior quality workmanship and/or improper installation for a period of two years.
2. Signage contractor agrees to replace at sole cost and expense, any signage adjudged by an impartial party to be defective or improperly installed. This guarantee to remain in effect for a period of two years from the date of completion.

1.05 PROJECT CONDITIONS

- A. Field Measurements: Where sizes of signs are impacted by dimensions of surfaces or locations on which they are to be installed, verify dimensions by field measurement prior to fabrication. Indicate measurements and signage locations on shop drawings for approval prior to production.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
1. Available Products/Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include, but are not limited to, the manufacturer(s) specified.
 2. Basis-of-Design Product: The design for each sign, or material is based on the product named. Subject to compliance with requirements, provide either the named product or an equal product.
 3. Note: All signage must conform to the Las Positas Master Signage Standards prepared by Hanzal Morris Design Group, Inc., 216A Spring Street, Pleasanton California 94566 / Telephone 925 461 8609.

2.02 CUSTOM PRIMARY PARKING LOT DIRECTIONAL SIGNAGE

- A. General: Provide exterior post and panel signage. Comply with requirements indicated for layouts, quantities, sizes, materials, finishes, color, etc. as specified in the Graphics Schedule and Drawings/Specifications.
Layouts and artwork must be provided for written approval prior to production.
1. Signage Construction: Double aluminum posts with end caps with 1/4" (.25) thick painted aluminum sign faces, and applied reflective or non-reflective vinyl graphics.
Note: End caps for tops of posts must be permanently attached so as to be flush with the outside of the post, with no overhang. Top of sign face must align with top of posts and be permanently attached.

2. Finishes: All aluminum components to be sprayed with proper primer and polyurethane finish approved for aluminum. Finish to carry an outdoor durability rating of a minimum of five years.
3. Reflective Vinyl Graphics: All vinyl lettering, symbols and graphics to carry an outdoor durability rating of a minimum of five years. Installation to be flat and smooth, free of defects, bubbles, and air pockets.
4. Signage Installation: Signs are installed with posts in concrete - 24" below grade.

B. Basis-of-Design Product: Custom Manufactured Product

2.03 CUSTOM SECONDARY PARKING LOT DIRECTIONAL SIGNAGE

A. General: Provide exterior post and panel signage. Comply with requirements indicated for layouts, quantities, sizes, materials, finishes, color, etc. as specified in the Graphics Schedule and Drawings/Specifications.

Layouts and artwork must be provided for written approval prior to production.

1. Signage Construction: Double aluminum posts with end caps with 1/4" (.25) thick painted aluminum sign faces, and applied reflective or non-reflective vinyl graphics.

Note: End caps for tops of posts must be permanently attached so as to be flush with the outside of the post, with no overhang. Top of sign face must align with top of posts and be permanently attached.

2. Finishes: All aluminum components to be sprayed with proper primer and polyurethane finish approved for aluminum. Finish to carry an outdoor durability rating of a minimum of five years.
3. Reflective Vinyl Graphics: All vinyl lettering, symbols and graphics to carry an outdoor durability rating of a minimum of five years. Installation to be flat and smooth, free of defects, bubbles, and air pockets.
4. Signage Installation: Signs are installed with posts in concrete - 24" below grade.

B. Basis-of-Design Product: Custom Manufactured Product

2.04 PARKING ENTRANCE REGULATORY SIGN

A. General: Provide exterior post and panel signage. Comply with requirements indicated for layouts, quantities, sizes, materials, finishes, color, etc. as specified in the Graphics Schedule and Drawings/Specifications.

Layouts and artwork must be provided for written approval prior to production.

1. Signage Construction: Double aluminum posts with end caps with 1/4" (.25) thick painted aluminum sign faces, and applied reflective or non-reflective vinyl graphics.

Note: End caps for tops of posts must be permanently attached so as to be flush with the outside of the post, with no overhang. Top of sign face must align with top of posts and be permanently attached.

2. Finishes: All aluminum components to be sprayed with proper primer and polyurethane finish approved for aluminum. Finish to carry an outdoor durability rating of a minimum of five years.

3. Reflective Vinyl Graphics: All vinyl lettering, symbols and graphics to carry an outdoor durability rating of a minimum of five years. Installation to be flat and smooth, free of defects, bubbles, and air pockets.
4. Signage Installation: Signs are installed with posts in concrete - 36" below grade.

B. Basis-of-Design Product: Custom Manufactured Product

2.05 ROUTE OF ACCESSIBILITY SIGNAGE

- A. General: Provide exterior code compliant post and panel signage. Comply with requirements indicated for layouts, quantities, sizes, materials, finishes, color, etc. as specified in the Graphics Schedule and Drawings/Specifications. Layouts and artwork must be provided for written approval prior to production.
1. Signage Construction: Single aluminum post (unslotted) with end cap and 1/8" (.125") thick painted aluminum sign face. Applied premium reflective vinyl graphics. Note: End caps for tops of posts must be permanently attached so as to be flush with the outside of the post, with no overhang. Top of sign face must align with top of posts and be permanently attached using tamper-proof mechanical fasteners.
 2. Finishes: All aluminum components to be sprayed with proper primer and polyurethane finish approved for aluminum. Finish to carry an outdoor durability rating of a minimum of five years.
 3. Reflective Vinyl Graphics: All vinyl lettering, symbols and graphics to carry an outdoor durability rating of a minimum of five years. Installation to be flat and smooth, free of defects, bubbles, and air pockets.
 4. Signage Installation: Signs are installed with posts in concrete - 24" below grade. Signs must be installed level and plumb.

B. Basis-of-Design Product: Custom Manufactured Product

2.06 PARKING LOT DESIGNATION SIGNAGE

- A. General: Provide exterior panel signage. Comply with requirements indicated for layouts, quantities, sizes, materials, finishes, color, etc. as specified in the Graphics Schedule and Drawings/Specifications. Layouts and artwork must be provided for written approval prior to production.
1. Signage Construction: 1/8" (.125") thick painted aluminum sign faces. Applied premium reflective vinyl graphics.
 2. Finishes: All aluminum components to be sprayed with proper primer and polyurethane finish approved for aluminum. Finish to carry an outdoor durability rating of a minimum of five years.
 3. Vinyl Graphics: All vinyl lettering, symbols and graphics to carry an outdoor durability rating of a minimum of five years. Installation to be flat and smooth, free of defects, bubbles, and air pockets.
 4. Signage Installation: Overlay existing locations as needed. Signs must be installed level and plumb.

B. Basis-of-Design Product: Custom Manufactured Product

2.07 DOUBLE-FACED BANNERS

- A. General: Provide exterior banners with permanent supports attached to existing parking lot light poles. Comply with requirements indicated for layouts, quantities, sizes, materials, finishes, color, etc. as specified in the Graphics Schedule and Drawings/Specifications. Layouts and artwork must be provided for written approval prior to production.
1. Signage Construction: Aluminum tube construction with end caps.
Note: End caps for ends of tubing must be permanently attached so as to be flush with the outside of the tube, with no overhang. Permanently affixed aluminum support structure to be level and plumb. Structure must be designed to hold the banners straight and taught.
 2. Finishes: All aluminum components to be sprayed with proper primer and finish approved for aluminum. Finish to match color of existing light poles and carry an outdoor durability rating of a minimum of five years. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 3. Graphics: Exterior rated banner material with lettering, symbols and graphics to carry an outdoor durability rating of a minimum of five years. Banner fabric must be thick enough to be opaque, so that silk screened graphics applied to both sides will not show through to the opposite side of the banner
 4. Signage Installation: Banners to be affixed to the aluminum supports in such a manner that they can be replaced and/or changed easily.
- B. Basis-of-Design Product: Custom Manufactured Product

2.08 VINYL GRAPHICS/GENERAL

General: Provide individual letters and/or symbols and graphics that comply with requirements indicated for layouts, quantities, sizes, materials, finishes, color, etc. as specified in the Graphics Schedule and Drawings/Specifications.

1. Vinyl Graphics: All reflective and non-reflective vinyl lettering, symbols and graphics to carry a premium outdoor durability rating of five years.
Installation to be flat and smooth, free of defects, bubbles, dust, blemishes and air pockets.
 2. Installation: All signage and graphics to be installed level, plumb, and in accordance with code compliance and manufacturers recommendations.
- B. Basis-of-Design Product: 3M
- C. Manufacturer: 3M / Commercial Products Division, 3M Center, Building 220-6W-06, Post Office Box 33220, St. Paul Minnesota 55133-3220 - Telephone 800 374 6772

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Obtain owner's written acceptance of all signage copy, layouts, and locations prior to production and installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General: Locate signs and accessories where indicated, using mounting methods of types described in compliance with manufacturer's written instructions. During installation, any disrupted wall surfaces, concrete, asphalt and/or ground areas must be patched and repaired. Refer to Plans for general locations.
- B. Install all signs and graphics level, plumb, and at heights instructed or indicated or required by code with sign surfaces free from distortion and other defects in appearance.

3.03 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until written acceptance by owner.

END OF SECTION

SECTION 13700

BASIC SECURITY REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes general administrative and procedural requirements for Sections numbering 137xx , and is intended to supplement, not supercede, the requirements specified in Division 1.
- B. The requirements described herein include the following:
 - 1. References
 - 2. Definitions
 - 3. System Description
 - 4. Submittals
 - 5. Quality Assurance
 - 6. Permits and Inspections
 - 7. Coordination
 - 8. Project Management and Coordination Services
 - 9. Product Delivery, Storage and Handling
 - 10. Warranty
 - 11. Maintenance
- C. Products Supplied But Not Installed Under This Section:
 - 1. None
- D. Products Installed But Not Supplied Under This Section:
 - 1. None
- E. Products Specified But Not Installed Under This Section:
 - 1. None
- F. Products Furnished and Installed Under Another Section:
 - 1. 120V power
 - 2. Conduit and junction boxes
- G. Unit Prices:
 - 1. Submit unit pricing (material, labor, shipping, taxes, and markups) for equipment supplied under this section.
- H. Alternates:
 - 1. ALT-13700-01: Renewable Annual Maintenance Agreement
 - a. Submit a renewable annual maintenance agreement proposal for the servicing and adjustment of the existing security system equipment.
 - b. Perform bi-annual examinations by trained personnel including necessary measurements, adjustments, and parts replacement to keep the equipment in efficient and proper operation.
 - c. Perform maintenance work, except emergency repairs, during regular working hours of regular working days.

- d. Perform emergency repairs on an immediate basis (4 hour response time maximum, 7 days a week, 24 hours a day) when a system or component malfunctions during use.
 - e. Do not subcontract or assign maintenance work unless the Owner has approved such assignment in writing.
- I. Related Sections:
- 1. Consult other Sections, determine the extent and character of related work, and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable installation.
 - 2. Section 13720: Video Surveillance System
 - 3. Section 13735: Intercom System
 - 4. Section 13770: Security System Cabling
 - 5. Section 13780: Security System Labeling
 - 6. Section 13790: Security System Commissioning
 - 7. General and Supplementary Conditions: Drawings and general provisions of Contract and Division 1 of the Specifications, apply to 137xx series Sections.
 - 8. Earthwork: Include trenching, backfilling, boring and soil compaction as required for the installation of underground conduit, in-grade pull boxes, vaults, and bollard foundations. Refer to Division 2, Earthwork.
 - 9. Concrete Work: Include forming, steel bar reinforcing, cast-in-place concrete, finishing and grouting as required for underground conduit encasement, pedestal foundations, and curbs. [Also includes saw-cutting of existing slabs and grouting of conduits in saw-cut.] Refer to Division 3, Concrete.
 - 10. Miscellaneous Metal Work: Include fittings, brackets, backing, supports, rods, welding and pipe as required for support and bracing of raceways, equipment enclosures, cameras, and similar devices. Refer to Division 5, Miscellaneous Metals.
 - 11. Moisture Protection and Smoke Barrier Penetrations: Include membrane clamps, sheet metal flashing, counter flashing, caulking and sealant as required for waterproofing of conduit penetrations and sealing penetrations in or through fire walls, floors, ceiling slabs and foundation walls. Tape and make vapor tight penetrations through vapor barriers at slabs on grade. Refer to Section 07840 Firestopping, and Section 07900 Joint Sealers.
 - 12. Painting: Include surface preparation, priming and finish coating as required for security cabinets, exposed conduit, pull and junction boxes, and devices where indicated as field painted in this Division. Refer to Division 9, Painting.

1.02 REFERENCES

- A. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies mean that latest edition of such publications adopted and published prior to submittal of the bid. Consider such codes or standards a part of this Specification as though fully repeated herein.
- B. Codes: Perform Work executed under this Section in accordance with applicable requirements of the latest edition of governing codes, rules and regulations including but not limited to the following minimum standards, whether statutory or not:
 - 1. National Electric Code (NEC), NFPA 70

2. California Code of Regulations (CCR) Title 24, California Building Standards Code Part 2, Basic Building Regulations and Part 3, California Electrical Code (CEC).
 3. Uniform Building Code (UBC)
 4. Uniform Fire Code (UFC)
 5. National, State, Local and other binding building and fire codes.
 6. FCC Regulations:
 - a. Part 15 – Radio Frequency Devices & Radiation Limits
- C. Standards: Perform Work and furnish materials and equipment under Sections 137xx in accordance with the latest editions of the following standards as applicable:
1. Underwriter's Laboratories (UL): Applicable listing and ratings.
 - a. UL 1076: Proprietary Burglar Alarm Units and Systems

1.03 DEFINITIONS

- A. The Definitions of Division 1 apply to the 137xx sections
- B. In addition to those Definitions of Division 1, the following list of terms as used in this specification defined as follows:
1. "Owner": Chabot – Las Positas Community College District
 2. "Architect": tBP Architecture
 3. "Engineer": TEECOM Design Group
 4. "Furnish": To purchase, procure, acquire, and deliver complete with related accessories.
 5. "Install": To set in place, join, unite, fasten, link, attach, set up or otherwise connect together and test before turning over to the Owner, parts, items, or equipment supplied by contractor or others. Complete installation and make ready for regular operation.
 6. "Provide": To furnish, transport, install, erect, connect, test and turn over to the Owner, complete and ready for regular operation.
 7. "Connect": To install required patch cords, equipment cords, cross-connect wire, etc. to complete an electrical or optical circuit.
 8. "As directed": As directed or instructed by the Owner, or their authorized representative.
 9. "Cabling": A combination of cables, wire, cords, and connecting hardware [e.g., cables, conductor terminations, connectors, outlets, patch panels, blocks, and labeling].
 10. "Security System": The Access Control, Intrusion Monitoring, CCTV, and Intercom Systems
 11. "SEC": Security Equipment Enclosure
 12. "VSS": Video Surveillance System
 13. "ACAMS": Access Control & Alarm Monitoring System

1.04 SYSTEM DESCRIPTION

- A. Overview
1. The Chabot – Las Positas Community College District is renovating parking lots A&B and G&B on the Chabot Campus.
 2. Security at the new facility to consist of video surveillance and emergency blue phone systems.

3. Each parking lot requires video surveillance to view activity during and after campus hours. The emergency blue phone system allows individuals under duress a means to contact local security.
 4. The new systems will connect to the Las Positas exiting head end located on the Las Positas Campus over the District's existing LAN/WAN and phone system.
 5. Refer to individual sections for detailed description of systems.
- B. Custom Device Requirements
1. General: Provide a high level of coordination services to ensure the proper installation and functioning of the security system. Coordinate the installation of the security system with other trades. This may include: review of other's subcontractor's shop drawings, attendance at meetings, providing samples for mockup, and preparation & distribution of written documentation.

1.05 SUBMITTALS

- A. General
1. Provide required submittals in accordance with Conditions of the Contract, and Division 1 Submittal Procedures Section.
 2. Format: Furnish submittal data neatly bound in an 8-1/2" x 11" folder or binder for each specification section with a table of contents listing materials by Section and paragraph number.
 3. Submittals to consist of detailed shop drawings, product specifications, block wiring diagrams, "catalog cuts" and data sheets containing physical and dimensional information, performance data, electrical characteristics, materials used in fabrication, and material finish. Clearly indicate by arrows or brackets precisely what is being submitted on and those optional accessories which are included and those which are excluded.
 4. Label each submittal with the Specification Section Number and provide a cover letter or stamp stating that the submittal has been thoroughly reviewed by the Contractor and complies with the requirements of the Contract Documents. Failure to comply with this requirement will constitute grounds for rejection of data.
 5. Resubmittals: Provide a cover letter with the resubmittal that lists the action taken and revisions made to each product submittal in response to Submittal Review Comments. Failure to include this cover letter will constitute rejection of the resubmittal package and no review will occur.
 6. Prepare diagrams using AutoCAD 2000 compatible software. The following are requirements for drawings:
 - a. Drawing Size: Same size as the project contract drawings with the project title block.
 - b. Text Size: Minimum 3/32 inches high when plotted at full size.
 - c. Symbolology: Identical to the symbols used on the Contract Drawings.
 - d. Backgrounds: Screen background information to allow pertinent drawing information to stand out.
 - e. Line Weights: Use appropriate line weights for devices, raceways, and text to stand out against background information.
- B. Contractor Qualifications: Submit the following for review and comment at the beginning of the project.

1. Resumes of the Project Manager, General Foreman, and Lead Technician(s) indicating role, years of experience, product certifications and training, listing of similar projects the individual performed the role proposed for this project along with client contact information for each.
 2. Certification letters from manufacturers of major system components stating the Contractor is an authorized reseller, installer, and extended warranty provider for the specified security systems.
- C. Product Data: Submit the following for review and comment prior to the purchase and installation of equipment:
1. Product data for products furnished. Include, for each product, the manufacturer, part number, accessories & options selected, color (if applicable), and a brief product description.
 2. Estimated delivery lead times for products.
 3. Seismic Calculations: Include in the product data submittal structural engineers stamped anchorage calculations for floor mounted fully loaded equipment racks/frames/cabinets such that it shall remain attached to the mounting surface after experiencing forces in conformance with CCR, Title 24, Table 23P, Part II and with Section 2312 "Earthquake Regulations" of the "Uniform Building Code" for Seismic Zone 4 Area, Importance Factor of 1.25. Specify proof loads for anchors. A Structural Engineer registered in the State of California shall prepare calculations and shall wet stamp and sign them. Forward calculations to the City of Hayward for review and approval.
- D. Shop Drawings
1. Obtain electronic files containing the contract documents drawing files for use in preparing the shop drawings from the Engineer.
 2. Submit the following for review and approval prior to the installation of equipment:
 - a. Floor Plans: 1/8 inch scale floor and site plans showing the locations of devices and cable routing paths with cable types and quantity called out.
 3. Seismic Calculations: Include anchorage calculations for floor mounted fully loaded equipment racks/frames/cabinets such that it shall remain attached to the mounting surface after experiencing forces in conformance with CCR, Title 24, Table 23P, Part II and with Section 2312 "Earthquake Regulations" of the "Uniform Building Code" for Seismic Zone 4 Area, Importance Factor of 1.25. Specify proof loads for anchors. A Structural Engineer registered in the State of California shall prepare Structural Calculations, and shall wet stamp and sign them. Forward calculations to the City of Hayward for review and approval.
- E. Samples
1. Provide samples as required for proper coordination and installation of custom mounted equipment.

1.06 QUALITY ASSURANCE

- A. General
1. Provide new and unused materials, equipment, and parts comprising the units specified herein of current manufacturer and of highest grade.
 2. Only use products and applications listed in this Division on the project.

B. Substitutions

1. Conform to the general requirements and procedure outlined in Division 1 in the Request For Substitution.
2. Where products are noted as "or equal", a product of equivalent design, construction, and performance is considered. Include in the Product Data submittal: catalog cuts, product information, and pertinent test data required to substantiate that the product is in fact equivalent to that specified.
3. Only one substitution allowed for each product specified. Do not provide substituted material, processes, or equipment without written authorization from the Engineer. Assumptions on the acceptability of a proposed substitution, prior to acceptance by the Engineer, are at the sole risk of the Contractor.
4. The burden of proof rest with the Contractor that the substituted product is equivalent to the specified product. When the Engineer accepts a substitution in writing, it is with the understanding that the Contractor guarantees the substituted product, component, article, or material to be equivalent to the one specified and dimensioned to fit within the construction according to contract documents. Approved substitutions do not relieve the Contractor of responsibilities for the proper execution of the Work, or from provisions of the Specifications.
5. Manufacturers' names and model numbers used in conjunction with materials, processes or equipment included in the Contract Documents are used to establish standards of quality, utility and appearance. Materials, processes or equipment that, in the opinion of the Engineer, are equivalent in quality, utility and appearance will be approved as substitutions to that specified when "or equal" follows the manufacturers' names or model number(s).
6. Whenever material, process or equipment is specified in accordance with a Federal specification, an ASTM standard, an ANSI specification, UL rating or other association standard, present an affidavit from the manufacturer certifying that the product complies with the particular standard specification. When requested by the Engineer, submit support test data to substantiate compliance at no additional cost.
7. Pay expenses, without additional charge to the Owner, in connection with substitution materials, processes and equipment, including the effect of substitution on self, subcontractor's or other Contractor's work.

C. Installer Qualifications

1. A current, active, and valid and C7 or C10 California State Contractors License
2. Minimum five years experience in installation and service of access control, video surveillance, and intrusion detection systems.
3. Minimum five completed projects similar to scope and cost.
4. Evidence of technicians qualified for the work in the form of current manufacturer's training certification.

D. Materials

1. Provide new materials and equipment without defects.
2. Provide only specified products and equipment, or products and equipment that have been approved in writing.

E. Regulatory Requirements

1. Work and materials to conform to the latest rules of National Board of Fire Underwriters wherever such standards have been established and to the regulations of the State Fire Marshal, OSHA and the codes of the governing local municipalities. Conform Work under these specifications to the most stringent of the applicable codes.
2. Provide the quality identified within these specifications and drawings when codes, standards, regulations, etc. allow Work of lesser quality or extent. The Contract Documents address the minimum requirements for construction.

F. Project Management And Coordination Services

1. Provide a project manager for the duration of the project to coordinate this Work with other trades. Coordination services, procedures and documentation responsibility include, but are not limited to, the items listed in this section.
2. Review of Shop Drawings Prepared by Other Subcontractors:
 - a. Obtain copies of shop drawings for equipment provided by others that require telecommunication service connections or interface with Work.
 - b. Perform a thorough review of the shop drawings to confirm compliance with the service requirements contained in the Division 16 contract documents. Document discrepancies or deviations as follows:
 - 1) Prepare memo summarizing the discrepancy.
 - 2) Submit a copy of the specific shop drawing, indicating via cloud, the discrepancy.
 - c. Prepare and maintain a shop drawing review log indicating the following information:
 - 1) Shop drawing number and brief description of the system/material.
 - 2) Date of the review
 - 3) Name of the individual performing the review
 - 4) Indication if follow-up coordination required

G. Drawings

1. Layout: Follow the general layout shown on the Drawings except where other work may conflict with the Drawings.
2. Accuracy: The Drawings show a diagrammatic representation of the system within the constraints of the symbology applied.
3. Detail: The Drawings do not fully represent the entire installation for the Security System. Drawings indicate the layout and location of control console(s) components, as well as location of security devices, i.e. card readers, door locks and contacts, and duress stations. The Drawings do not show conduits, wire and cabling between every system component, equipment, or device.
4. Complete the details necessary for point-to-point design. This allows the Contractor to achieve desired results applying their own procedures and methods. Submit shop drawings for review prior to installation.

H. Role of the Engineer

1. During the construction phase of the project, the Engineer will work with the Contractor to provide interpretation and clarification of project contract documents, process and reply to relevant Requests for Information (RFI), and act as an interface between the Contractor and the Owner.

2. The Owner has retained the Engineer's services to observe the Work for general compliance with the Contract Documents.
3. In summary, the Engineer will perform the following specific services during the design phase:
 - a. Review product submittals and shop drawings for general compliance with the contract drawings and specifications.
 - b. Review changes as they arise, and confirm that the proposed solutions maintain the intended functionality of the system.
 - c. Interpret field problems for Owner, and translate into understandable language.
 - d. Review the testing procedures to confirm compliance with industry-accepted practices.

1.07 PERMITS AND INSPECTIONS

- A. Obtain and pay for permits and inspections required for the work.
- B. Furnish materials and workmanship for this work in conformance with applicable legal and code requirements.
- C. Perform tests required herein, or as may be reasonably required to demonstrate conformance with the Specifications or with the requirements of legal authority having jurisdiction.
- D. Obtain review from compliance officials responsible for enforcement of applicable codes and regulations to establish that the work is in compliance with requirements of reference codes indicated herein.

1.08 COORDINATION

- A. Discrepancies
 1. In the event of discrepancies within the Contract Documents, notify the Engineer within 5 days prior to the Bid Opening to allow the issuance of an Addendum.
 2. If, in the event that time does not permit notification or clarification of discrepancies prior to the Bid Opening, the following applies: The drawings govern in matters of quantity, and the specifications govern in matters of quality. In the event of conflict within the drawings involving quantities, or within the specifications involving quantities, or within the specifications involving quality, the greater quantity and higher quality apply. Note such discrepancies and clarify in the Bid. We will make no additional allowances because of errors, ambiguities, or omissions, which reasonably should have been discovered during the preparation of the Bid.
- B. Job Conditions
 1. Protection: Keep conduits, junction boxes, outlet boxes and other openings closed to prevent entry of foreign matter. Cover equipment, devices, apparatus and protect them against dirt, paint, water, chemical or mechanical damage, before and during construction period. Prior to final acceptance, restore to original condition fixture, apparatus or equipment damaged including restoration of damaged factory applied painted finishes. Protect bright finished surfaces and similar items until in service. No rust or damage will be permitted.

2. Supervision: Personally, or through an authorized and competent representative, supervise the work from beginning to completion and, within reason, keep the same foreman and workmen on the project throughout the project duration.

1.09 PROJECT MANAGEMENT AND COORDINATION SERVICES

- A. Overview: Provide a project manager/engineer for the duration of the project to coordinate the security system work with other trades. Coordination services, procedures and documentation responsibility include at a minimum, the items listed in this section.
 1. Obtain copies of shop drawings for equipment provided by others that require security connections or interface with the security system work.
 2. Prepare and maintain a shop drawing review log indicating the following information:
 - a. Shop drawing number and brief description of the system/material.
 - b. Date of your review.
 - c. Indication if follow-up coordination is required.
- B. Request for Information (RFI)
 1. Thoroughly review the contract documents prior to the preparation and submission of an RFI. If an RFI is submitted, attach 8 1/2" x 11" copies of relevant documents to clarify the issue.
 2. Submit RFIs with your recommended solution.
 3. Prepare and maintain an RFI log using a Microsoft Excel spreadsheet indicating the following information:
 - a. RFI number and brief summary of the issue.
 - b. Date of issuance and receipt of response.
- C. Scheduling of Work
 1. Prepare work schedules for each floor indicating the following information:
 - a. Cable Installation
 - b. SEC Build Out
 - c. Device Installation
 - d. Programming
 - e. Testing
 - f. Other tasks included under the alternate work section of these specifications
- D. Meetings
 1. Conduct or attend coordination meetings with the electrical and other specialty subcontractors to coordinate the installation of the security systems.

1.10 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery
 1. Do not deliver security system components to the site until protected storage space is available. Storage outdoors covered by rainproof material is not acceptable.
 2. Replace equipment damaged during shipping and return to manufacturer at no cost to the Owner.

- B. Storage
 - 1. Store materials in a clean, dry, ventilated space free from temperature extremes.
 - 2. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris, and traffic.
 - 3. Provide heat where required to prevent condensation or temperature related damage.
- C. Handling
 - 1. Handle in accordance with manufacturer's written instructions.
 - 2. Prevent internal component damage, breakage, denting and scoring. Do not install damaged equipment. Replace damaged equipment and return equipment to manufacturer.

1.11 WARRANTY

- A. Provide the Security System as described in this specification with a one-year parts and service warranty at no additional cost to the Owner.
- B. Include in the warranty package, at a minimum, the following:
 - 1. Emergency maintenance service on regular working hour basis
 - 2. Service by factory trained and employed service representatives of system manufacturer
- C. Maintain regular service facilities and provide a qualified technician familiar with this work at the site within four (4) hours of receipt of a notice of malfunction including weekends and holidays. Provide material, devices equipment and personnel necessary for repairs. Install approved temporary, alternate equipment if required by the Owner, complete and operational within twenty four (24) hours after notification of a malfunction, at no additional cost.
- D. Conduct warranty repairs and service at the job site unless in violation of manufacturer's warranty; in the latter event, provide substitute systems, equipment and/or devices, acceptable to the Owner, for the duration of such off-site repairs. Transport warranty substitute and/or test systems, equipment, devices, material, parts and personnel to and from the job site at no additional cost.

1.12 MAINTENANCE

- A. Maintenance Service
 - 1. For the first year of service, conduct quarterly system performance review meetings to review system operation problems and/or defects that occurred during the preceding 3 months. During these performance review meetings, perform the following:
 - a. Visual checks and operational tests of the central processor, local processors, monitors, keyboards, system printers, peripheral equipment, Security System equipment, power supplies, and electrical and mechanical controls.
 - b. Clean system equipment, including interior and exterior surfaces.
 - c. Perform diagnostics on equipment.
 - d. Check and calibrate each security device.
 - e. Run system software and correct diagnosed problems.
 - f. Resolve previous outstanding problems.

2. Provide software and firmware updates issued free of charge by the manufacturer.

PART 2 PRODUCTS

2.01 GENERAL

- A. Material and equipment specified herein have been selected as the basis of acceptable quality and performance and have been coordinated to function as components of the included systems. Where a particular material, device, equipment or system is specified directly, the current manufacturer's specification for same is a part of these specifications, as if completely elaborated herein.
- B. Remove manufacturer identification marks from visible equipment.
- C. Use standard, regularly manufactured, materials and equipment for this and/or other similar systems, and not custom designed especially for this project. Provide systems and components thoroughly tested and proven in actual use. Provide subsystems of one manufacturer.

2.02 BATTERIES

- A. General:
 1. Refer to specific sections for battery back-up requirements in the event of a power failure or emergency.
- B. Manufacturer: Yuasa #YA-NP12A

2.03 MISCELLANEOUS INTERFACE RELAYS

- A. Type: Standard industry control, plug-in type with LED indicator lights to indicate when the relay is energized.
- B. Contacts: Rated for 10 amps at 120VAC.
- C. Coil Operating Voltage: As required, with 24VDC as first choice
- D. Incorporate the following features
 1. Color-coded Test button
 2. Mechanical flag
 3. Snap-on label
 4. Pilot light
 5. 2mm test jacks
 6. Dual contact markings
 7. Snap-on number & letter markers
 8. Solid bus-bar socket construction
- E. Mount relay bases on standard mounting rails
- F. Use these relays for lock power switching application and. Do not use the output contacts on the access controllers since their rating is not adequate.
- G. Manufacturer:
 1. Turck #Releco
 2. Idec
 3. Or Equal

2.04 TAMPER RESISTANT HARDWARE

- A. Provide pinned-allen type hardware for exposed hardware in public spaces.
- B. Provide hardware used in specialty metal surfaces that posses a similar finish color.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Conditions: Verify existing conditions, which have been previously provided under other sections, are acceptable for product installation in accordance with manufacturer's instructions.
- B. Pathways: Verify that pathways and supporting devices, which have been previously provided under other sections, are properly installed, and that temporary supports and devices have been removed.
- C. Field Measurements: Verify dimensions of pathways, including length of pathways. For example, "True Tape" the conduits to verify cable distances.

3.02 FIELD QUALITY CONTROL

- A. Staffing: Provide a qualified foreman who is in charge of the Work and who is present at the job site at times Work is being performed. Perform the Work using skilled technicians under the direction of the foreman. Supervise the work force executing the Work. Perform the installation within the restraints of the construction schedule. Do not change the supervisor during the project without prior written approval from the Owner.
- B. Inspection: Perform inspection after installation. Keep areas of work accessible and notify code authorities, or designated inspectors, of work completion released for inspection. Document completion, and inspection as required.

3.03 INSTALLATION

- A. Perform this work in accordance with acknowledged industry and professional standards and practices and the procedures specified herein.
- B. Provide a complete, operating system. Include devices specified including basic components and accessories, interconnecting wiring and other equipment and installation devices necessary for a complete system as specified.
- C. Manufacturer's Instructions:
 - 1. Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation.
 - 2. Maintain jobsite file of Material Safety Data Sheets (MSDS) for each product delivered to jobsite.
- D. Boxes, Panels, and Enclosures
 - 1. Install boxes, panels, and enclosures square and plumb.
 - 2. Set "flush mounted" units with the face of the cover, bezel or escutcheon in the same plane as the surrounding finished surface.

3. Mount boxes, panels and trim so that there are no gaps, cracks or obvious lines between the trim and the adjacent finished surface and ready them to receive final finish, as applicable.
 4. Install insulating terminations in signal circuit boxes, panels, wireways or enclosures.
- E. Painting
1. Custom paint devices as indicated on the drawings.

3.04 REPAIR/RESTORATION

- A. Replace or repair work completed by others that you deface or destroy, at not cost to the Owner.
- B. Punch List:
1. Inspect installed work in conjunction with the General Contractor and develop a punch list for items needing correction.
 2. Provide punch list to Engineer for review prior to performing punch walk with the Engineer.
- C. Re-Installation:
1. Make changes to the system such that defects in workmanship are correct and cables and the associated termination hardware passes the minimum test requirements.
 2. Repair defects prior to system acceptance.
- D. Painting: Repaint surfaces altered during installation of the security system to match previous conditions.

3.05 CLEANING

- A. Remove temporary coverings and protection of adjacent work areas. Remove unused products, debris, spills, or other excess materials. Remove installation equipment.
- B. Leave finished work and adjacent surfaces in neat, clean condition with no evidence of damage.
- C. Repair or replace damaged installed products.
- D. Legally dispose of debris.
- E. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance.

END OF SECTION

SECTION 13720

VIDEO SURVEILLANCE SYSTEM

PART 1 GENERAL

1.01 SUMMARY

- A. General: Provide engineering, labor, materials, apparatus, tools, equipment, transportation, temporary construction, and special or occasional services as required to make a complete working video surveillance system installation, as described in this specification.
- B. Section Includes:
 - 1. CCTV Monitoring and Recording System
 - 2. CCTV fixed and PTZ cameras, lens, mounts, and housings
 - 3. CCTV power supplies
 - 4. Integration with ACAMS
 - 5. Interfaces and connections to District LAN/WAN to allow remote viewing over District network
- C. Products Supplied But Not Installed Under This Section:
 - 1. None
- D. Products Installed But Not Supplied Under This Section:
 - 1. None
- E. Products Specified But Not Installed Under This Section:
 - 1. None
- F. Products Furnished and Installed Under Another Section:
 - 1. 120V power
 - 2. Network ports in the IDF for video server connectivity via LAN/WAN
- G. Related Sections:
 - 1. Consult other Divisions, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.
 - 2. Section 13700 Basic Security Requirements: includes general project requirements, submittal formats, installation, and warranty requirements.
 - 3. Section 13735 Intercom System: includes product information for the intercom system integration with the video surveillance system.
 - 4. Section 13770 Security System Cabling: includes product information for wire and cable needed to support the video surveillance system.
 - 5. Section 13780 Security System Labeling: includes label types and formats for security devices.
 - 6. Section 13790 Testing/Commissioning: includes the integrating testing/commissioning requirements for the video surveillance system.

1.02 DEFINITIONS

- A. In addition to those Definitions of Division 1, the following list of terms as used in this specification defined as follows:
 - 1. "PTZ": Pan-Tilt-Zoom

1.03 SYSTEM DESCRIPTION

A. Overview

1. The Chabot – Las Positas Community College District plans to renovate parking lots A&B and G&H on the Chabot Campus.
2. The parking lots require video surveillance of the overall lots and each main vehicle entry from the streets surrounding the campus.
3. The video system is monitored through the existing Las Positas Security Office and additional video monitoring workstations local to the Chabot Campus.
4. Provide a fully functioning Video Surveillance and Digital Recording System with live and recorded viewing capabilities integrated with the ACAMS.

B. CCTV Camera System

1. The video surveillance system consists of outdoor analog fixed position and PTZ cameras connected to the closest centralized video servers that encode, store, and stream video over the network for live and archive viewing.
2. Route fixed and PTZ camera control and coaxial video cable in underground conduit to video servers located in either existing Building 1200 or 200.
3. Provide additional 16-camera license video module on the campus enterprise server to manage building cameras. This will allow video management at the existing video management server at Las Positas through the District LAN/WAN.
4. Provide network video servers with 4 analog video inputs each, local hard drive, and network port.
5. Coordinate video server network connections with the District's IT department prior to installation. Provide one network connection for each video server.
6. Provide fixed light pole-mount day/night cameras as indicated on the plans to view two vehicle entrances from Hesperian Blvd. Include environmental housing with heater and blower for each camera.
7. Provide light pole-mount day/night PTZ cameras as indicated on the plans to view the overall lots with a default camera position. Include environmental housing with heater and blower for each camera.
8. Provide fixed camera power supply located adjacent to each camera.
9. Program integration to ACAMS as follows:
 - a. Program video servers to record based on duress intercom activation or select video motion detection. Recorded video will reference associated alarm information and video monitoring workstation will display recorded video clip automatically. Review alarm integration and workstation configuration with the District during the programming meeting.
 - b. Program PTZ cameras to view preset locations upon alarm events. Review each preset location with the District and any specific users in a programming meeting.
 - c. Setup video recorder's built-in video motion detection when ACAMS alarms are not available. Utilize on all cameras viewing the parking lots and program to record during a user-defined schedule. Review each location with the District during the programming meeting.
10. Store archived video for longest period of time allowable on local video server hard drive. Overwrite oldest footage when hard drive reaches maximum capacity and generate an alarm. Coordinate long-term storage solution with Master Plan Project.

- C. Tamper Monitoring
 - 1. Provide additional monitor input points for monitoring the following:
 - a. Tamper switches located within CCTV PTZ dome enclosures.
 - b. Tamper switches located within each security equipment enclosure and wire way.
 - c. Supervision of power supplies and batteries.

1.04 SUBMITTALS

- A. Contractor Qualifications: Submit certifications for the manufacturers of the video surveillance equipment.
- B. Product Data: Submit product information for components specified herein. Refer to Section 13700 for format and requirements.
- C. Shop Drawings:
 - 1. Device placement on floor plans.
 - 2. Point-to-Point Diagrams: Include wiring, points of connection and interconnecting devices between the following:
 - a. Video surveillance system, monitors, and recording equipment
 - b. Devices connected to the system
 - c. Miscellaneous control relays
 - d. Conductors (identify conductors on the point-to-point diagrams with the same tag as the installed conductor)
 - 3. Block Diagram: Show the video surveillance system components, conduit, wire types, and sizes between them, including cabling interties between termination hardware.
 - 4. Custom mounting details

1.05 WARRANTY

- A. Digital Video Recording System
 - 1. Provide a manufacturer's warranty covering repair or replacement of defective parts for a period of three years from the date of shipment from the factory
 - 2. Cameras and support devices
 - 3. Provide a manufacturer's warranty covering repair or replacement of defective parts for a period of one year from the date of shipment from the factory.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Digital Video Recording System
 - 1. The video surveillance recording device is manufactured by Group 4 AMAG Technologies.
 - 2. The system must be compatible with the Districts existing AMAG headend.
- B. Cameras
 - 1. Bosch to match District Standard
- C. Power Supplies
 - 1. Altronix

2.02 VIDEO SOFTWARE

- A. Provide 16-camera license for AMAG video software.
- B. Manufacturer:
 - 1. AMAG: VID-MOD-016

2.03 NETWORK VIDEO SERVER

- A. General
 - 1. Network video server that encompasses recording video, viewing video, reviewing recorded video, and forwarding recorded video to larger servers storing for indefinite periods of time.
 - 2. The video server must be compatible with the Districts existing AMAG Technologies Access Control System for remote viewing and integration with an already developed interface.
 - 3. Up to 4 color, black-and-white, or auto-switching cameras connect to the video server through BNC connectors.
 - 4. The video server shall provide RS-232, RS-485, or RS-422 communications for controlling PTZ/dome devices from various manufacturers. These devices shall be controlled through the local or remote user interface.
 - 5. Servers capture, digitize, store, and forward video. Servers may record full-time, in response to an alarm, or based on a user-defined schedule. Full-time recording refers to 24 hours per day, 7 days per week, 365 days per year.
 - 6. The system simultaneously records, displays live full-frame video, and plays back video through the network. None of the video operations interfere with each other. Live view and video playback through the network does not interrupt the recording process.
 - 7. The video server shall be configurable via integrated web server.
 - 8. The video server must include network interface for viewing, playback, configuration, and alarm management operations of the District LAN/WAN and support 10/100 Base-T operations.
 - 9. Provide AMAG Symmetry Video Management software on client workstations used for video surveillance:
 - a. This application shall be installed on any Windows-based computer with a network connection to the digital video management system(s) for live and recently recorded video.
 - b. The client workstation viewer interface shall allow the user to simultaneously view recorded video from multiple cameras and multiple digital video management systems.
 - c. Multiple workstations can access the digital video management system simultaneously.
 - d. Cameras are viewed in a video window by dragging an icon to the window. Camera combinations are automatically saved for each video window configuration.
 - e. The camera name and time of video capture can be displayed using a menu option. Text position and color shall be user-configurable.
 - f. Cameras shall be organized in a directory tree by their name and grouped together under specific categories. The digital video management system to which they are connected should not interfere with the organization or user interface.

- g. A search utility is necessary in the management software. Recorded video shall be searchable based on alarm, date, time, and camera.
- 10. Standard internet browser based access via Internet Explorer 5.0 or higher on Windows 98, ME, NT, 2000, or XP.

B. Servers

- 1. Use TCP/IP network protocol to communicate to client workstations and video archive server.
- 2. Integrates with AMAG ACAMS Symmetry software and multiNODE control panels at a peer-to-peer level.
- 3. Video Information
 - a. Store the time, date, and source of the video and be available during playback.
 - b. Store for each clip video source, capture date, start time, and stop time. Source identified as either a monitor or a camera.
 - c. Store alarm information in the database on the main server when the video is in response to an alarm condition.
- 4. Recording Configuration
 - a. Use TCP/IP network protocol to communicate to client workstations and video archive server.
 - b. Captures camera signals from fixed cameras, PTZ cameras, infrared cameras, x-ray cameras, and low light cameras. Camera signals may be color, black and white, or both.
 - c. Complete control over video frame rate, resolution, and compression settings on a timed and trigger basis.
- 5. Video Storage
 - a. Video stored in clips on the server's internal hard drive. As the hard drive becomes full, generate an alarm then groom oldest clips to make room for new video.
 - b. Ability to forward video stored on the server's internal hard drive to a larger video archive server through a TCP/IP network connection.
 - c. Video forwarding parameters and schedule are user definable to take place at off-peak times.
 - d. Ability to utilize a variety of network storage devices such as external disk arrays, RAID, and NAS devices for exporting stored video.
 - e. Ability to specify per camera with respect to server configuration, length of time video is stored.
- 6. Alarm recording
 - a. Recording Options
 - 1) Alarm condition in integrated ACAMS
 - 2) Internal video motion detection
 - 3) Alarm condition via activation of an external alarm contact
 - b. Recording programmable by camera and by time and date schedule.
 - c. Allow a mix and match of continuous recording and alarm recording, based on camera input and server network connections.
 - d. Pre and post alarm recording
- 7. Video Motion Detection
 - a. Each video input capable of detecting activity from camera input and to initiate an alarm condition.

- b. Video motion detection areas operator selectable for each camera input. If the scene changes within the alarm area, an alarm condition is initiated.
 - c. Sensitivity adjustment for video motion detection areas.
 - 8. Viewing of both live and archived images, from multiple client workstations.
 - 9. Video server alarm event notification such as video loss or hard drive failure to client workstations.
 - 10. Password protected via user authorization, with profiles assigned by the system administrator, and database tracking of events through the video management software.
 - 11. Mounting
 - a. Wall mountable in a standard AMAG CAB 3 or 4 enclosure.
 - b. Optional standard 19" rack mount configuration with integrated power supply.
- C. Manufacturer:
 - 1. AMAG: G4T-ENVS
 - 2. Provide 80GB or largest hard drive available at time of purchase

2.04 CCTV CAMERA SYSTEM

- A. General
 - 1. Type: Color, solid-state CCD with DSP technology, unless otherwise noted
 - 2. Power: 24 VAC, 60Hz
 - 3. Imager: 1/3 inch format, unless otherwise noted
 - 4. Lens Mount: Accept a "CS" mount auto or manual-iris lens
 - 5. Synch: Adjustable line lock for synchronizing camera to power line. No auxiliary sync cable required.
 - 6. Resolution: 480 TVL minimum resolution (EIA RS-170), unless otherwise noted
 - 7. Minimum Light Level: 0.1 fc imager illumination at full video, unless otherwise noted
 - 8. Lens: Field determine, unless otherwise noted
- B. Fixed Cameras
 - 1. Complete prepackaged unit containing:
 - a. 1/4" high-resolution color CCD camera
 - b. Auto-iris lens
 - c. Vandal-resistant
 - d. Wide dynamic range with automatic day/night switching
 - e. Varifocal Lens of 3 to 9 mm, setting to be field determined
 - 2. Manufacturer:
 - a. Ceiling Mount: Bosch FlexiDome 495 series, VDN-495V03-20 to match campus standards
 - 3. Accessories:
 - a. Pole Mount: Bosch VDA-455WMT w/ pole adapter.
 - b. UTP Adaptor: Bosch VDA-455UTP for distances greater than 1200 feet.
- C. PTZ Dome Cameras
 - 1. Complete prepackaged unit containing:
 - a. 1/3" high-resolution color CCD camera & motorized zoom auto-iris lens
 - b. High-speed pan and tilt that is stepper motor driven (belt-driven not acceptable).

- c. Integral receiver/driver
- d. I/O Board Base
- e. Vandal-resistant
- f. Wide dynamic range with automatic day/night switching
- g. Dome Commands including privacy masking and guard tours
- 2. Manufacturer:
 - a. Exterior: Bosch ENV Series EnviroDome, ENVE120M to match campus standards
- 3. Accessories:
 - a. Power Supply: transformer in camera mount.
 - b. PTZ Pole Mount: Bosch #ENV-PA1 w/ pole adapter #LTC 9541/01
 - c. Heater/blower unit for exterior cameras
 - d. UTP Adaptor: Nitek VB31PT for distances greater than 1200 feet.

2.05 CCTV CAMERA LENSES

- A. General
 - 1. Built from the finest optics available for use on a CCTV surveillance type camera.
 - 2. Contain integral intraspot filters
 - 3. Format to match CCD imager
 - 4. Varifocal
 - 5. Auto-iris connector coordinated with the camera type (i.e., 4-pin vs. 6-pin)
 - 6. CS type mount
 - 7. Manufacturer:
 - a. Pelco
 - b. Cosmicar/Pentax
 - c. Rainbow
 - d. Sony
 - e. Or Equal

2.06 CCTV LIGHTNING PROTECTORS

- A. Video Line Coaxial Cable Protectors
 - 1. Provide on coaxial cables serving exterior cameras.
 - 2. Manufacturer:
 - a. PolyPhaser Corp #IS-75BB/1.5
 - b. DITEK
 - c. Or Equal
- B. PTZ Data Line Protectors
 - 1. Provide on data lines serving exterior PTZ cameras.
 - 2. Manufacturer:
 - a. PolyPhaser Corp #IS-DPHSD
 - b. DITEK
 - c. Or Equal

2.07 POWER SUPPLIES/BATTERY CHARGERS

- A. Exterior Camera Power Supplies
 - 1. Provide a 120 VAC input to 24 VAC output, continuous current, fully supervised power supply for each for each exterior camera.

2. Provide separate transformers and cables for the defroster/heater in each exterior camera housing; i.e. do not connect these loads to the camera power supply. A maximum of two exterior camera defroster/heaters may be connected per power supply.
3. Provide weatherproof power supplies.
4. Manufacturer:
 - a. Pelco # WCS1-4
 - b. Kalatel
 - c. Altronix
 - d. Or Equal

2.08 COAX TO TWISTED PAIR ADAPTERS

- A. General
 1. Utilize active adapters for camera cable distances greater than 1200 feet.
 2. Capable of transmitting or receiving baseband color video signals over unshielded twisted-pair telephone wire up to a distance of 3000 feet with external power at the receiving end.
 3. Connectors:
 - a. User interface Connector: female BNC
 - b. Screw terminals for connection to telephone wire
 4. Manufacturer:
 - a. Nitek #TR560 video receiver
 - b. NVT
 - c. Or Equal

PART 3 EXECUTION

3.01 INSTALLATION

- A. CCTV Cameras
 1. Provide outdoor housing and mounts for exterior cameras.
 2. Field determine exact placement of cameras to ensure complete coverage.
 3. Field determine fixed camera lens size to ensure complete coverage.
 4. Coordinate location with obstructions such as trees to avoid concealment opportunity.
 5. Route watertight flex from junction box to camera housing from below on exterior cameras.
 6. Provide 25 foot cable loop at PTZ location for relocating unit if required post installation
- B. CCTV Power supplies
 1. Do not combine with Access Control & Alarm Monitoring System power supplies.
 2. Provide power supply with weatherproof enclosure for each pole-mounted exterior PTZ camera.
- C. CCTV Digital Recording System
 1. Wall mount CCTV equipment located either Building 200 or Building 1200.
 2. Coordinate power requirements with Electrical.
- D. Pathways
 1. Provide underground conduit in joint trench to light poles with cameras.

2. Route device conduit back to closest IDF room in either Building 200 or Building 1200.
3. Provide underground low voltage pull boxes near light poles with cameras or future camera locations.
4. Provide pathway in light pole for low voltage camera cables.

3.02 PROGRAMMING

- A. Prior to the completion of construction schedule a meeting with the Owner to determine the programming criteria. Discuss the following:
 1. Camera naming
 2. PTZ presets
 3. Recording schedules
 4. CCTV camera call-up & recording features (including video motion detection)
 5. Intercom integration requirements
 6. ACAMS integration requirements
 7. Video archiving schedule
 8. System data base backup
- B. Document the results of the meeting and perform necessary programming to achieve the Owner's requests.
- C. Setup and program the system such that no additional programming required.
- D. Use the camera naming convention agreed upon at in the programming meeting when programming point names into the system.
- E. Perform 2 full system back-ups at completion of initial programming and deliver one copy to the Owner with a Letter of Transmittal explaining information included in back-up and brief description of recovery procedures. Label the second DAT and store onsite. Perform back-ups on a regular bases through the remainder of the project.
- F. Customize menus with the assistance of the factory to "gray-out" features not used on project.
- G. Perform field software changes after the initial programming session to "fine tune" operating parameters and sequence of operations based on revised operating requirements.

3.03 TESTING

- A. Commission the video surveillance system in accordance with Section 13790.

END OF SECTION

SECTION 13735

INTERCOM SYSTEM

PART 1 GENERAL

1.01 SUMMARY

- A. General: Furnish engineering, labor, materials, apparatus, tools, equipment, transportation, temporary construction and special or occasional services as required to make a complete working intercom system installation, as described in these specifications.
- B. Section Includes:
 - 1. Emergency Phone System
 - 2. Interfaces and connections between intercom subsystems to allow communication with one another.
 - 3. Intercom power supplies
- C. Products Supplied But Not Installed Under This Section:
 - 1. None
- D. Products Installed But Not Supplied Under This Section:
 - 1. None
- E. Products Specified But Not Installed Under This Section:
 - 1. None
- F. Products Furnished and Installed Under Another Section:
 - 1. 120V power
 - 2. Telecommunication cabling connectivity between PBX connected intercom locations and the IDF (telecom room)
- G. Related Sections:
 - 1. Section 13700 Basic Security Requirements: for submittal format, warranty, general product requirements, enclosure, power supply, miscellaneous relays, and installation requirements.
 - 2. Section 13720 Video Surveillance System: for interface requirements related to the intercom system
 - 3. Section 13770 Security System Cabling: for cable requirements related to the intercom system.
 - 4. Section 13780 Security System Labeling: for device labeling requirements.
 - 5. Section 13790 Security System Commissioning: for testing requirements related to the intercom systems.

1.02 SYSTEM DESCRIPTION

- A. Intercom System
 - 1. The intercom system consists of freestanding hands free, bollard style, two-way, full duplex communication call stations located as indicated on the drawings.
 - 2. Utilize the Owner's PBX system for dial-up connection.
 - 3. Use intercoms with bright locator always-on blue beacon, and call-indicating high intensity blue strobe.

4. Monitor activation of an intercom using an interface relay and a monitor input point through the access control system.
 5. Activation of an intercom sends a signal to the video surveillance system to initiate camera call up, move PTZ cameras to a specific preset, and record.
- B. Emergency Phone System
1. Provide freestanding emergency intercom units in parking lots at approximately 300' intervals.
 2. Provide blue strobe light at each intercom location.
 3. Utilize the Owner's PBX system for dial-up connection
 4. Blue light always on. Activation of emergency intercom to cause associated blue light to strobe. Light to remain in strobe function until emergency intercom reset.

1.03 SUBMITTALS

- A. Product Data: Submit product information for the intercom systems, including:
1. Emergency Intercom Stations w/ Strobe Light
 2. Power Supplies
 3. Power Supply Sizing Calculations
- B. Shop Drawings: Submit shop drawings containing the following:
1. Device placement on floor plans.
 2. Point-to-Point Diagrams: Include wiring, points of connection and interconnecting devices between the following:
 - a. Intercom System
 - b. Devices connected to the system
 - c. Miscellaneous control relays
 - d. Conductors (identify conductors on the point-to-point diagrams with the same tag as the installed conductor)
 - e. Block Diagram/Riser Diagram: Show the intercom system components, conduit, wire types, and sizes between them, including cabling interties between termination hardware.
 3. Custom mounting details.
- C. Samples: Submit samples of the following devices:
1. Intercom Stations
 2. Emergency Phone Stations
 3. Custom Faceplates

PART 2 PRODUCTS

2.01 COMMUNICATIONS DEVICE (INTERCOM)

- A. Vandal-resistant stainless steel faceplate & metal button.
- B. Built-in autodialer that can call two numbers. If first number doesn't answer or is busy, dials second number.
- C. Signage for ADA compliance.
- D. Auto-answer to allow security to monitor and initiate calls with Emergency Phone.
- E. Options: Ability to automatically identify attendant of location of calling phone by recorded message and digital display.

- F. LED indicator for hearing impaired.
- G. Auxiliary input and outputs to integrate with CCTV, Blue Light/Strobe, and other devices.
- H. Communications Options: Regular phone lines or PBX.
- I. Phone line-powered: no power supply or battery back-up required.
- J. Push button once to call, then speak hands-free.
- K. Manufacturer and model:
 - 1. Code Blue #CB 3100 to match Campus Standard

2.02 PEDESTAL UNIT with blue strobe light

- A. Material: 1/4" stainless steel with **Safety Blue** finish
- B. Weather Resistant: Withstand prolonged exposure to harsh environments.
- C. Vandal Resistant
- D. Accept flush mounted emergency phone
- E. Electrical components hard wired and concealed within the wall mount.
- F. The word "**EMERGENCY**" emblazoned on both sides in reflective **white** letters
- G. ADA compliant
- H. Blue Strobe Light
 - 1. Housed in a vandal resistant, blue polycarbonate refractor housing
 - 2. Refractor housing enclosed in a clear polycarbonate impact-resistant enclosure
 - 3. Light:
 - a. Minimum 7 watt high efficiency, compact fluorescent light
 - b. 10,000 hour lifetime
 - c. Lit at all times
 - 4. Strobe:
 - a. Minimum 1.5 million candlepower
 - b. Flash 70 times per minute when emergency phone activated
 - c. Continue flashing until call completed.
- I. Power Requirements: 120 VAC with step-down transformer
- J. Manufacturer:
 - 1. Code Blue model #CB 5 to match Campus Standard

PART 3 EXECUTION

3.01 INSTALLATION

- A. General: Follow installation guidelines set forth in Section 13700 Basic Security Requirements.
- B. Intercoms:
 - 1. Install square and plumb.
 - 2. Set "flush mounted" units with the face of the cover, bezel or escutcheon in the same plane as the surrounding finished surface.

3. Mount so that there are no gaps, cracks or obvious lines between the trim and the adjacent finished surface and ready them to receive final finish, as applicable.
- C. Emergency Intercoms:
1. Install intercoms and strobe lights, square and plumb.
 2. Set "flush mounted" units so that the face of the cover, bezel or escutcheon located in the same plane as the surrounding finished surface.
 3. Mount so that there are no gaps, cracks or obvious lines between the trim and the adjacent finished surface and ready them to receive final finish, as applicable.

3.02 PROGRAMMING

- A. Prior to the completion of construction, schedule a meeting with the Owner to determine of the programming criteria. Discuss the following issues:
1. Emergency Phone Numbers
 2. Backup Phone Numbers
 3. CCTV camera call-up & recording requirements on activation of intercom
 4. CCTV camera call-up & recording requirements on activation of emergency phone
- B. Program the intercom system as required based on the results of the meeting.

3.03 TESTING

- A. Commission the intercom system in accordance with Section 13790.

END OF SECTION

SECTION 13770

SECURITY SYSTEM CABLING

PART 1 GENERAL

1.01 SUMMARY

- A. General: Furnish engineering, labor, materials, apparatus, tools, equipment, transportation, temporary construction and special or occasional services as required to make a complete working security system installation, as described in these specifications.
- B. Section Includes:
 - 1. Wire and cable
- C. Related Sections:
 - 1. Consult other Sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.
 - 2. Section 13700 Basic Security Requirements: includes general project requirements, submittal formats, installation, and warranty requirements.
 - 3. Section 13780 Security System Labeling: includes label types and formats.
 - 4. Section 16131 Conduit: includes pathway types in different areas of the project.

1.02 SUBMITTALS

- A. Product Data: Submit product information, including:
 - 1. Cable Description and Use
 - 2. Jacket Rating
 - 3. Outside Diameter (of the overall wire or cable)
 - 4. Manufacturer
 - 5. Part Number

PART 2 PRODUCTS

2.01 WIRE AND CABLE

- A. General
 - 1. Provide required wire and cable sized to allow for voltage drop on long runs and effectively shielded as required to allow the routing of 12 & 24V power and video signal cable in the same conduit without interference or signal noise.
 - 2. Cable installed outdoors or in underground conduit must contain a PVC or Polyethylene jacket, flooded to prevent water intrusion.
 - 3. Cables installed outdoors or in underground conduit that transition into the building and run in plenum space to contain a plenum rated (type CMP) jacket and contain water block material to prevent water intrusion.
 - 4. Cables installed indoors to contain a plenum rated jacket (type CMP).
- B. Manufacturers:
 - 1. Westpenn
 - 2. Belden
 - 3. Commscope
 - 4. Or Equal

C. CCTV Coaxial Cable

1. Provide minimum RG-59/U CCTV video coaxial cable between the camera and the monitoring equipment, with the following features:
 - a. 95% percent copper braid
 - b. Foam dielectric
 - c. Solid copper core
 - d. 75 ohm characteristic impedance
 - e. Plenum jacket
2. Manufacturer: West Penn #25815
3. Provide West Penn #825 with a black jacket for CCTV video cross-connect/patch cabling under 15' in length.
4. Indoor/Outdoor or Underground CCTV Coaxial Cable
 - a. Provide minimum RG/U video coaxial cable between the camera and the monitoring equipment with the following features:
 - 1) 95% percent copper braid
 - 2) Foam dielectric
 - 3) Solid copper core
 - 4) 75 ohm characteristic impedance
 - 5) PVC jacketed
 - 6) CM or CMP rating
 - 7) Suitable for indoor and outdoor installation
 - 8) Water blocking material
 - b. Manufacturer:
 - 1) Belden #5439W5 or equal for cable run in underground conduit.

D. Intercom System

1. Communications Cable:
 - a. CAT6 OSP Cable
 - 1) Application: Suitable for outdoor installation within conduit.
 - 2) Conductors:
 - a) Insulated Conductors: 23 AWG solid copper, fully insulated with a polyethylene or equivalent jacket.
 - b) Twisted Pairs: Two insulated conductors "twisted" into a "pair" (twisted pair), individually color-coded to industry standards (ANSI/ICEA Publication S-80-576-1994, and EIA-230).
 - 3) Core & Sheath:
 - a) Cable core (twisted pairs) to contain a tape applied longitudinally (wrapped around it's entirety)
 - b) Center member: non-hydroscopic polyolefin fluted or equal
 - c) Electrical Performance: Meet or exceed TIA/EIA-568B.2-1 requirements for CAT6 OSP cabling.
 - 4) Manufacturer:
 - a) Systimax #1571 004ABK 4/23 R1000
 2. Intercom Activation Cable:
 - a. #18/4 AWG unshielded: Westpenn #25244B

PART 3 EXECUTION

3.01 INSTALLATION

- A. Label cables in accordance with Section 13780 – Security System Labeling.
- B. Secure wire and cable run vertically in conduit for continuous distances greater than thirty (30) feet at the vertical run terminations. Secure non-coaxial cables using screw-flange nylon cable ties or similar approved devices, Thomas and Betts or equivalent. Provide symmetrical clamping devices with split, circular or other wire conforming, nonmetallic bushings for coaxial cables.
- C. Provide wire and cable with a continuous, splice-free sheath for the entire length of run between designated connections or terminations.
- D. Make connections to screw-type barrier blocks with insulated crimp-type spade lugs. Size lugs properly to assure high electrical integrity, i.e., low resistance connections.
- E. Lace, tie or harness wire or cable as required herein, and in accordance with accepted professional practice. Dress, lace or harness wire and cable to prevent mechanical stress on electrical connections; do not support wire or cable from a connection point.
- F. Dress and secure coaxial cables to preclude stress and/or deformation.
- G. Install shielded wiring or route in separate raceways as recommended by the manufacturer's current requirements.
- H. Provide necessary tie wires.
- I. Do not run signal wire and cable in parallel to power (120VAC).
- J. Follow manufacturers recommended guidelines for installation.

3.02 CABLE SUPPORT

- A. Horizontal Support
 - 1. Concrete and Metal construction (Above Ceiling)
 - a. Provide separate and dedicated cable support system for security cable runs. Anchor cable support system to structural ceiling. Support and tie cables at a maximum of 5-foot intervals.
 - 2. Wood Construction (above ceiling and no ceiling)
 - a. Support cable utilizing appropriately sized drive rings or "D" rings.
 - b. Fasten rings to structural ceiling.
 - c. Install drive rings at approximately 5 foot intervals.
 - d. Route cable through drive rings and cable tie at 10 foot intervals, or every other drive.
- B. Vertical Support
 - 1. Riser Systems
 - a. Route cable through conduit in vertical riser systems.
 - b. Terminate conduit at each stacked closet in a lockable junction box. Use 12"x10"x8" junction box as a minimum.
 - c. Fastened entire cable group to the inside of junction box at every other floor or approximately every 24 feet.

- d. Fasten cable in Junction box utilizing cable ties equipped with eyelets designed to accept screws for fastening or approved equivalent method.
- 2. Vertical cable on floor space not in riser system
 - a. Route cable from below suspended ceiling devices to above ceiling when possible.
 - 1) Provide conduit and firestoppping for cable routed in fire rated wall assemblies.
 - 2) Provide conduit for cable routed from below ceiling devices to above ceiling on concrete tilt up style walls.
 - b. Cable routed vertically from devices with no suspended ceiling.
 - 1) Provide conduit stub from device junction box to 14 feet A.F.F minimum.

END OF SECTION

SECTION 13780

SECURITY LABELING

PART 1 GENERAL

1.01 SUMMARY

- A. General: Furnish engineering, labor, materials, apparatus, tools, equipment, transportation, temporary construction and special or occasional services as required to make a complete working security system installation, as described in these specifications.
- B. Section Includes:
 - 1. Labeling of wire, cable, security devices, enclosures, and raceways.
- C. Related Sections:
 - 1. Consult other Sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.
 - 2. Section 13700 Basic Security Requirements: includes general project requirements, submittal formats, warranty, and installation requirements.

1.02 SUBMITTALS

- A. Product Data: Submit the following:
 - 1. Product information for components specified herein.
 - 2. List of equipment (wire, cable, devices, enclosures, and raceways) and the corresponding text for the label.

PART 2 PRODUCTS

2.01 NAMEPLATES

- A. Engraved, plastic laminated nameplates, signs, and instruction plates. Engrave stock melamine plastic laminate 1/16 inch minimum thickness for signs up to 20 square inches, or 8 inches in length; 1/8 inch thick for larger sizes. Use white letters for engraved nameplates and punch for mechanical fasteners.

2.02 LABELS

- A. Manufacturer:
 - 1. Brady
 - 2. Thomas and Betts
- B. Wire and Cable Labels:
 - 1. Self-laminating adhesive laser labels.
 - 2. Machine printable with a laser printer.
 - 3. Printable area: X inches by X inches.
 - 4. Cable size: 0.16 – 0.32" OD
 - 5. Color: white with black lettering
 - 6. Manufacturer: Brady wire marking labels WML-211-295 and WML-311-292
- C. Device Labels:
 - 1. Self-laminating, type on tape, adhesive labels. Use Helvetica 12 pt text

PART 3 EXECUTION

3.01 INSTALLATION

A. General Requirements

1. Label the security system components. The components include, but are not limited to, the following:
 - a. Equipment Enclosures
 - b. Conduits
 - c. Security Devices
 - d. Batteries
 - e. Wires and Cables
 - f. Equipment Racks
 - g. Terminal Blocks
 - h. Relays
 - i. Patch panels, and the termination positions within the patch panels.
2. Labels to coincide with device IDs used on the record drawings.
3. Degrease and clean surfaces to receive nameplates and labels
4. Install nameplates parallel to equipment lines. Secure nameplates to equipment fronts using machine screws.

B. Equipment Enclosures

1. Label SEC and CEC enclosures associated with the security system with a nameplate.
2. Mount label on exterior of door, centered horizontally, and positioned one-third of the door height vertically from the top.
3. Color: Green background with White lettering.
4. Example: Line 1: "SEC-01" (1/2 inch high letters)
 Line 2: "Security Equipment Enclosure" (1/4 inch high letters)

C. Conduits

1. Write the destination for every conduit entering a junction box, SEC, and CEC enclosure, or wireway using a black permanent ink marker next to the conduit inside the box.
2. Example: "To SEC-01"

D. Security Devices

1. Label devices associated with the security system with a permanent machine generated, laminated, label. Use 12 point Helvetica text with a clear background. Use white or black lettering depending upon the color of the device.
2. Label each device in a concealed location with the system point number and address.

E. Batteries

1. Label power supply batteries with the month and year they were installed.
2. Example: "April 2007"

F. Wire and Cable

1. Identify wire and cable clearly with permanent machine-generated labels wrapped about the full circumference within one (1) inch of each connection.

2. Indicate the cable ID designated on the associated field or shop drawings or run sheet, as applies.
 3. Assign wire or cable designations consistently throughout a given system; i.e., each wire or cable to carry the same labeled designation over its entire run, regardless of intermediate terminations.
 4. Provide labels where wire and cable first enter and exit from conduit, junction or distribution boxes; locate labels within six (6) inches of the point of exit.
 5. Positional labels so they are clearly visible without the need to remove wire management or other obstructions.
 6. Label cables at both ends of a run and within pull and junction boxes using machine generated wrap-around labels.
 7. See Item 3.02 for examples
- G. Equipment Racks
1. Provide one label plate per rack. Permanently affix label plate and center the label plate on the rack's front top angle.
 2. Example: "SECURITY RACK 01"
- H. Terminal Blocks
- I. Relays
- J. Patch Panels
1. Label individual ports on the patch panels.
 2. Example: "V01 V02 V03 ..."

3.02 CABLE LABEL FORMAT

- A. From Panel to Field Device
1. Line 1: Device Type and Device Number
 2. Line 2: Panel ID – Port Number
 3. Example: K 001
PANEL 2 – IN1
 4. Standard Device Types
 - a. K = Camera
 - b. IC = Intercom
 - c. R = Relay Output
 - d. A = Alarm Point
 5. Standard Port #s
 - a. IN = Video Input
- B. Miscellaneous Examples:
1. From Intercom Unit to IDF room block
 - a. IC001
 - b. BLOCK#
- C. Communications Cable
1. Line 1: Communication Type and Direction
 2. Line 2: Panel ID
 3. Example: RS485 TO
PANEL 2

4. Typical Communication Types
 - a. 100BASE-T
 - b. RS 485
 - c. RS 232
 - d. RS 422
 - e. SNET
 - f. 20mA

END OF SECTION

SECTION 13790

SECURITY SYSTEM COMMISSIONING

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. General: Furnish engineering, labor, materials, apparatus, tools, equipment, and transportation required to test a completed security system installation as described in these specifications.
- B. Base Bid Work
 - 1. Full testing of a completed security system which includes:
 - a. A complete pretest of the security system
 - b. A final walk test with the Engineer and/or Owner
 - c. Test Results Record Documentation
- C. Related Sections:
 - 1. Section 13700 Basic Security Requirements: for submittal format.

1.02 SUMMARY OF SYSTEM COMMISSIONING ACTIVITIES

- A. Overview
 - 1. The purpose of system commissioning is to ensure the security system operates properly when it is needed most. Security systems are very complex from both an equipment and programming standpoint, and thorough testing is necessary to ensure correct operation.
 - 2. Perform testing activities after-hours or on weekends when the system is "quiet" and the building is generally unoccupied. This will minimize the amount of irrelevant activity in the system activity reports that will be used as a record of the pre and final test results.
- B. Pre-Test
 - 1. Perform a 100% pre-test of system aspects to verify correct operation prior to scheduling the final test. The pre-test will help to make the final test run smoothly when demonstrating the system's operation to the Owner and Engineer.
 - 2. Document the results of the pre-test using the approved test forms and submit a copy to the Engineer along with the system activity reports
- C. Final Test
 - 1. Perform a final test of the system in the presence of the Engineer and/or Owner to demonstrate correct operation of the security system.

1.03 SUBMITTALS

- A. Operation and Maintenance Manuals: Submit the following for review and comment at the completion of the project:
 - 1. Functional Design Manual: Includes a detailed explanation of the operation of the system.
 - 2. Hardware Manual which includes:
 - a. Pictorial parts list and part numbers

- b. Pictorial and schematic electrical drawings of wiring systems, including devices, control panels, instrumentation and annunciators
 - c. Telephone numbers for the authorized parts and service distributors
 - d. Include service bulletins
 - 3. Software Manual which includes:
 - a. Use of system and applications software
 - b. Initialization, start-up, and shut down procedures
 - c. Alarm Reports
 - 4. Operator's Manual which fully explains procedures and instructions for the operation of the system and includes:
 - a. Computers and peripherals
 - b. System start up and shut down procedures
 - c. Use of system, command, and applications software
 - d. Recovery and restart procedures
 - e. Graphic alarm presentation
 - f. Use of report generator and generation of reports
 - g. Data entry operator commands
 - h. Alarm messages and reprinting formats
 - i. System access requirements
 - 5. Maintenance Manual which includes:
 - a. Instructions for routine maintenance listed for each component, and a multi-page summary of component's routine maintenance requirements.
 - b. Detailed instructions for repair of the security system.
 - c. A summary of the software licenses, including license numbers, quantity of clients, summary of the software options provided and database capabilities.
 - d. A summary of the TCP/IP address used and which system component they are associated with. Include the gateway address, subnet mask, DNS server, and host name information.
 - 6. Test Results Manual, which includes the document results of tests, required under this Specification, organized by System, Function, and Device.
 - 7. Record Drawings Manual which includes 11"x17" prints of record drawings as described below.
- B. Record Drawings: Submit the following for review and comment at the completion of the project:
- 1. Drawings to fully represent installed conditions including actual locations of devices, actual cable and terminal block numbering, and correct wire sizing as well as routing. Record changes in the work during the course of construction on blue or black line prints.
 - 2. Include drawings submitted as part of the Shop Drawing package, plus additional information required to accurately document installed conditions.
 - 3. Include the following additional information:
 - a. Device addresses & IP address information.
 - b. Settings for each camera (lens specs, mm setting, auto shutter setting, and other available camera settings, etc.)
 - 4. Final acceptance will not be made until the Engineer approves the record drawings.

1.04 QUALITY ASSURANCE

- A. Provide a project manager to coordinate the security system commissioning work with other trades.

PART 2 PRODUCTS

2.01 NOT USED

PART 3 EXECUTION

3.01 SCHEDULING

- A. Coordinate security commissioning with the General Contractor, and provide specific information on pre-test and final-testing activities to be entered into the overall project construction schedule.

3.02 TESTING REQUIREMENTS

- A. Site Tests
 - 1. Perform a 100% pretest of the system prior to final testing by the Engineer. Provide the Engineer with a minimum of a 5-day notice prior to scheduling testing.
 - 2. At the conclusion of the work on a floor, test the system on that floor to verify proper operation and reporting of devices.
 - 3. Work with the Districts IT Department to coordinate network connections required to support the video servers and phone lines to support the intercom stations.
 - 4. At the completion of the work, test the entire system to verify proper operation. At a minimum, include these tests:
 - a. CCTV Recording System Test: Test the recording system for correct programming, alarm recording, and event retrieval. Verify correct integration with the Intercom system for alarm call-up. Test and verify CCTV system viewable from workstations.
 - b. CCTV Camera Test: Review cameras for proper coverage, quality of video, etc.
 - c. Duress Intercom Test: Test duress intercom stations for correct dial-up and communication to the main Security Office. Verify correct integration with the CCTV system.
 - d. Battery and UPS Load Test: Disconnect AC power to security system equipment to verify battery operation functions and system remains fully operational.
- B. Test Preparation
 - 1. Provide device identification numbers that differ from or were not included on the original contract drawing set.
 - 2. Provide a complete systems point list.

3. Provide paper and toner for the printer so that an event log can be printed out and attached to the test reports as verification of test sequence and systems response.
4. During testing, provide a minimum of three technicians familiar with the installation to assist with the test. Stage the technicians as follows: one at the host, one at the device being tested, and one runner responsible to furnishing tools, step ladders, etc.
5. Provide radios for use by the Engineer and Owner during testing.
6. Provide pre-programmed access cards for use during testing. Provide one card for each access level.

3.03 TEST PROCEDURES

- A. Refer to the test forms for testing procedures for each type of device/system.

3.04 DOCUMENTATION

- A. Provide a full-sized blueline drawing containing a detailed wiring diagram (layout of equipment/elevation, complete parts list, and a complete wiring diagram for each video server enclosure) for each SEC. Fold the diagram and place it inside a clear plastic pocket affixed to the inside door of the SEC.
- B. Provide a service log on the inside door of each SEC. Include columns for the following information: date of service, description of work performed, service technician(s), service company in the service log. Place the service log inside a separate clear plastic pocket affixed to the inside door of the SEC.

3.05 DEMONSTRATION

- A. On completion of the acceptance test, instruct the owner's representatives, at a time convenient to them, in the operation and testing of the system.
- B. Utilize the database for the project during training to give the users a project specific example to learn from.
- C. Provide a minimum of 16 hours of on-site training by factory-trained representatives. Maintain a sign in sheet with names and dates of persons trained and forwarded to owner upon completion of training.
- D. Provide for two Owner's representatives to attend factory certification training (off-site) for both the following systems:
 1. Intercom System
 2. Digital CCTV Recording System

END OF SECTION

SECTION 16487
OUTDOOR LIGHTING SYSTEMS

PART 1 - GENERAL

1.01 CONDITIONS & REQUIREMENTS:

- A. Refer to the General Conditions and Supplementary General Conditions.
- B. Provisions of this Section apply to all Sections of Division 16.

1.02 DEFINITIONS (APPLICABLE TO DRAWINGS AND SPECIFICATIONS):

- A. Above Grade: Not buried in ground and not embedded in concrete slab on grade.
- B. Below Grade: Buried in ground or embedded in concrete slab on grade.
- C. Concealed: Inside building above grade and located within walls, furred spaces, crawl spaces, attics, above suspended ceilings, etc.. In general, any item not visible or directly accessible.
- D. Connect (verb): Make electrical connections including conduit, wire and other accessories.
- E. Electrolier: Complete assembly of luminaire and mounting pole or arm.
- F. Exposed: Either visible or subject to mechanical or weather damage, indoors or outdoors, including areas such as mechanical and storage rooms. In general any item that is directly accessible without removing panels, walls, ceilings, or other parts of structure.
- G. Furnish: Supply and deliver a specified item.
- H. Install: Place, secure and connect as required to make fully operational.
- I. Luminaire: Complete lighting unit, not including the mounting pole or arm.
- J. Engineer: Representative of the District with overall responsibility for the project.
- K. Provide: Furnish and install as defined above; perform work.
- L. Underground: Buried in ground, including under building slabs.
- M. Use (verb): Furnish and install as defined above.
- N. Wiring: Electrical raceway, conductors and connections.

- 1.03 SCOPE OF WORK: Furnish and install all materials and equipment and provide all labor to complete the work shown on the drawings and/or specified for a complete installation. Items not specifically mentioned, but reasonably inferred for a complete installation including all accessories required for testing are included. It is the intent of the drawings and specifications that all systems are complete, and ready for operation.
- 1.04 RELATED WORK: Trenching, Backfilling, and Compacting: See Civil Specifications
- 1.05 CODE COMPLIANCE:
- A. All work and materials shall comply with the latest rules, codes and regulations, including, but not limited to the following:
 - 1. Occupational Safety and Health Act Standards (OSHA).
 - 2. California Electrical Code (CEC), 2004.
 - 3. California Building Code (CBC), 1998
 - 4. Applicable Federal, State and local laws and regulations.
 - B. Code compliance is mandatory. Nothing in these Drawings and Specifications implies acceptance of work not conforming to these codes. Where work is shown to exceed minimum code requirements, comply with drawings and specifications.
 - C. Do not conceal any work until after inspection and approval by proper authorities. If work is concealed without inspection and approval, open and restore the concealed areas and make the required modifications without cost to the District.
- 1.06 PERMITS AND FEES: Arrange for required inspections and pay all permit and inspection fees except DSA fees are handled by the District.
- 1.07 CONDITIONS AT SITE:
- A. Visit and become familiar with the site prior to submission of bid. No allowance will be made for conditions that could reasonably be anticipated.
 - B. Arrange for location of public utility and District's existing services prior to excavation. Promptly repair lines that are damaged as a result of this work at no expense to and the complete satisfaction of the District.
- 1.8 DRAWINGS AND SPECIFICATIONS:
- A. All drawings and all Divisions of these specifications shall be considered as a whole and all electrical work is included under this Division.

- B. Drawings are diagrammatic and indicate the general arrangement of equipment and wiring. Most direct routing of conduits and wiring is not assured. Exact requirements shall be governed by architectural, structural and mechanical conditions of the job. Consult all other drawings in preparation of the bid. Include extra lengths of wiring or addition of pull or junction boxes, etc., required by field conditions bid. Check all information and report any apparent discrepancies before submitting bid.
- C. Right is reserved to make change up to ten feet in location of any equipment prior to roughing-in without increasing contract cost.

1.09 SAFETY:

- A. The Contractor is solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work. This requirement applies continuously and is not limited to normal working hours.
- B. No act, service, drawing review, or construction review is intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.

1.10 HAZARDOUS MATERIALS:

- A. Handling and abatement of hazardous or toxic materials, including asbestos and polychlorinated biphenyls (PCBs), is not included in the electrical Scope of Work.
- B. If hazardous materials are discovered or suspected, protect the equipment from damage and report the conditions to the Engineer.

1.11 CHANGES BY CONTRACTOR: Submit scaled drawing(s) prior to installation of any proposed modifications to equipment layouts, device locations, conduit routing, or conductor groupings. Any approved modifications will be reissued to the Contractor as either a change order or clarification depending on value to the contract.

1.12 RECORD DRAWINGS:

- A. Maintain a separate set of electrical drawings at the job site at all times to be used as record drawings. Keep this set current with all changes and additions and deliver to the Engineer at the completion of the job. Keep the record drawings clean.

1.13 GUARANTEE:

- A. Guarantee workmanship and materials (except lighting ballasts) for one year after date of Substantial Completion. Guarantee ballasts for two years. Make repairs and replace defective materials at no charge to District.
- B. Furnish manufacturers' warranties to the Engineer

PART 2 - PRODUCTS

2.01 MATERIAL APPROVAL:

- A. The design, manufacture and testing of electrical equipment and materials shall conform to or exceed latest applicable NEMA, IEEE and ANSI standards.
- B. All materials shall be new and listed and labeled by Underwriters Laboratories (UL). Materials that are not covered by UL testing standards shall be tested and accepted by an independent testing laboratory or a governmental agency, which laboratory shall be acceptable to the Engineer and code enforcing authority.

2.02 SHOP DRAWINGS AND MATERIALS LIST:

- A. Submit shop drawings and product descriptive literature as specified for review:
 - 1. Conduit
 - 2. Wire and Cable
 - 3. Splicing Materials
 - 4. Luminaires and Poles that are furnished by the Contractor including color samples if non-standard finishes are shown on the Drawings
 - 5. Electrical Enclosures and Controls
 - 6. Underground pullboxes and lids
- B. The material list shall not include items where no specific manufacturer is shown in the Specifications. Where manufacturers are shown, the material list shall include only one manufacturer for each type of equipment or system.
- C. Review of submittals is for general conformance to design concept and general compliance with Contract Documents. Review comments do not relieve the Contractor from responsibility for compliance with Contract Documents.
- D. Mark all proposed deviations from specifications prominently in the submittals. Deviations not so marked may be disallowed before or after installation of equipment.
- E. Confirm confirming and correlate all quantities and dimensions, select fabrication processes and techniques of construction. Where dimensions of proposed equipment differ significantly from that shown on contract documents, submit scaled drawings showing proposed layout of equipment with shop drawing submittal.

2.03 MATERIALS:

- A. Conduit:
 - 1. Plastic Conduit: Plastic conduit shall be Schedule 40, PVC approved for use as nonmetallic raceway. Fittings shall be of the same manufacturer and installed with the recommended solvent cement. Schedule 20 and Type DB conduits are not permitted.

2. Rigid Steel Conduit:

- a. Rigid steel conduit shall be full weight, pipe size, hot-dip galvanized inside and out, wrapped with 20 mil pipe wrap with 50 percent overlap or PVC coated.
- b. Couplings shall be UL listed, threaded type, wrapped or PVC coated. Threadless couplings are not permitted.

B. Wire: All wire except fixture wire shall be THWN, stranded copper.

C. Concrete: Class IB, 3000 psi at 28 days, or better. Special Inspection is not required.

D. Reinforcing Steel: ASTM a615, Grade 60. Keep reinforcing bars at least 3" away from any edge.

2.04 EQUIPMENT:

A. All electrical equipment shall be new and UL listed and labeled.

B. Certain Luminaires, poles, and accessories may be furnished to the Contractor by the District as directed by the Engineer. Furnish all other materials, including anchor bolts, and all labor for a complete installation.

C. If luminaires are furnished by the Contractor, confirm, by shop drawing submittal, with the Engineer the exact model number, refractor type, light distribution pattern, and voltage. Multi-tap ballasts and individual photocell are not compatible with 480 volt systems. Do not substitute poles or luminaires from other manufacturers if a specific manufacturer is shown on the Drawings.

D. Pullboxes: Pullboxes shall be Christy N16, Utility Vault 1730, or as otherwise noted with covers or lids as shown on the Drawings. Substitutions shall be only as specifically approved. Lids and covers shall be marked "ELECTRICAL." (Note that the N16-61J steel cover adds about 1/4" to the height of the box).

E. Contactors: Provide lighting contactors sized in according to load requirements but in no case smaller than NEMA size 1 (30 ampere). Control circuits shall be 120 volt only.

F. Enclosures: Enclosures shall be NEMA 1 for dry locations and NEMA 12 or 3R for manholes or damp locations. Provide specific enclosures as shown on the Drawings.

G. Circuit Breakers: Provide thermal magnetic breakers with interrupting rating adequate for the application.

H. Ballasts: Ballasts shall be constant wattage, high power factor type. Provide multi-tap ballasts for 120, 208, 240, and 277 volt circuits. Provide 480 volt ballasts for 480 volt circuits.

I. Fuses for individual luminaires:

1. Fuse holders: Buss Tron type HEB (single pole) for circuits with one ungrounded conductor, or type HEX (two-pole) for circuits with two ungrounded conductors (208 and 480 volts).
2. Fuses: 5-ampere; Buss KTK

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Locations of luminaires and electrical wiring indicated on the drawings are generally diagrammatic. Specific locations will be established by the Engineer. Do not change electrolier locations without approval by the Engineer.
- B. Pruning of trees and shrubs in construction areas will be accomplished as directed by the Engineer. Do not cut any trees or shrubs except as specifically directed..
- C. Conduit and Pullbox Installation:
 1. Underground conduits for lighting shall be PVC, Schedule 40, 1½ inch minimum size with solvent weld couplings, except conduits from concrete pullboxes to pole bases shall be 1 inch minimum and stubbed up 6 inches from bottom of pullbox.
 2. Minimum depth to top of conduit shall be 24 inches. Clear trench of rocks and loose dirt and install conduit with 3 inches of smooth sand all around or flowable backfill as shown on the drawings.
 3. Field-cut ends of rigid steel conduits shall be reamed smooth. Running threads shall not be used.
 4. Insulated throat grounding bushings shall be installed at each end of all metallic conduit runs. Terminations of PVC conduits at pullboxes shall be provided with endbells or suitable bushings and stubbed up 6 inches from bottom of pullbox.
 5. Pullboxes shall be installed firmly on a bedding of gravel and shall be set at grade in pavement and two inches above grade in unpaved areas. Provide a pullbox adjacent to each luminaire. Do not locate pullboxes in streets or roadways unless specifically directed. Use Utility Vault 1730 Boxes in traffic areas. Use Christy N16 and N30 boxes only where not subject to damage by vehicles.
- D. Wiring:
 1. Wire shall be sized in accordance with the drawings, but in no case smaller than No. 10 AWG, except fixture wire shall not be smaller than No. 16 AWG. Color coding shall be phase A - black, B - red, C - blue, for 208Y/120 volts and A - brown, B - orange, C - yellow for 480Y/277 volts; neutral - white, and ground - green. Color coding shall be orange, orange, green for 480 volt, single-phase

systems.

2. Splices in wires No. 6 and smaller shall be made with twist-on, expandable, spring-type, solderless connectors with insulated metal shell, Scotchlok or approved equal. Splices in pullboxes and other damp locations shall be epoxy encapsulated with Sotchcast or approved equal waterproof material. Alternate: CalTrans Standard is acceptable: Crimp type C-connectors, taped and painted
3. Splices in wires No. 4 and larger shall be made with copper split-bolt connectors, enveloped in insulating putty (Scotchfil or approved equal), taped, and painted with Scotchkote or approved equal. Exception: Compression sleeves insulated with approved heatshrink or coldshrink watertight kits may be used.
4. Splices in equipment grounding conductors shall be made with uninsulated, copper split-bolt connectors.
5. Provide each electrolier with an individual fuse in a weatherproof fuse holder described above. Install fuses in the concrete pullboxes adjacent to the luminaire. Do not install fuses behind the handholes in the poles.
6. Grounding:
 - a. Metal poles and metallic parts of luminaires shall be grounded.
 - b. Ground wires shall be connected to grounding studs, where provided, with compression lugs.
 - c. $\frac{3}{4}$ "X 10' ground rods shall be provided where shown on the Drawings.
 - d. An equipment grounding conductor shall be run with phase and neutral wires in each conduit and shall interconnect all ground rods and electroliers. Grounding conductors shall be sized according to the California Electric Code, except minimum size shall be No. 10 AWG, copper.

E. Electrolier Installation:

1. Inspect used luminaires, poles, and accessories that are furnished to the Contractor by the District and note defective, broken, or missing parts. Notify the Engineer in writing immediately of any defects.
2. Inspect electroliers removed from existing installations as part of the work prior to reinstallation at a new location. Any damage, serious deterioration of paint, unsuitable ballast or lamp, or missing parts shall be reported in writing to the Engineer. No such electrolier shall be reinstalled until the Engineer has determined it to be suitable.
3. All electroliers shall be secured in a truly plumb position and grouted at the base.

4. After installation of new electroliers, repair all areas of damaged paint using equivalent and matching paint.
 5. Each foundation from which an electrolier has been removed and that is to be abandoned shall have all projections above the concrete removed flush and conduits grouted. Grind all burrs and sharp edges smooth.
 6. Electrolier foundations shall be constructed as shown on the Drawings and as recommended by the manufacturer. Use manufacturer's template for anchor bolt spacing.
 7. Observe markings (such as "street side" and "house side") on the luminaires and install as indicated on the Drawings.
 8. Where electroliers or pullboxes are removed, provide new conduit, conductors, and pullboxes and maintain existing lighting circuits. Coordinate with the Engineer to resolve questions regarding existing circuits. Exact location and routing of existing circuits may not be shown on the Drawings and will require field investigation.
- F. Identification: Label each power pedestal or source panelboard as shown on Drawings. Label each electrolier with corresponding source and circuit number using materials and numbering schemes as directed by the Engineer.

3.03 FIELD QUALITY CONTROL

- A. Test each completed system and verify that controls and every electrolier are fully operational.
- B. All switching of existing circuits shall be performed by the District's personnel; however, the Contractor shall independently verify that all circuits are safely de-energized.

END OF SECTION

APPENDIX A

SIGN PROGRAM

INCLUDES: SIGN GRAPHICS AND SCHEDULE

December 19, 2007

SIGN PROGRAM

**PARKING LOT WAYFINDING SIGN PROGRAM
CHABOT COLLEGE
HAYWARD, CALIFORNIA**

**Prepared By
McCRACKEN & McCRACKEN
618 Fourth Street, Suite 214
Santa Rosa, California 95404-4414**

**Telephone 707 528 8681
Facsimile 707 569 1713
Email mc2@sonic.net
URL <http://sonic.net/mc2>**

Bid Documents

McCRACKEN & McCRACKEN**GRAPHICS SCHEDULE**

618 Fourth Street, Suite 214
 Santa Rosa, California 95404

Tel 707 528 8681
 Fax 707 569 1713
 URL <http://sonic.net/mc2>

PARKING LOT WAYFINDING SIGN PROGRAM
 CHABOT COLLEGE, HAYWARD, CA
 DSA #00-0000 / DSA FILE NO. 0-00

Code	Quantity	Description	Legend
A1	1	Custom Primary Parking Lot Directional Signage - Double-faced / Double Post & Panel (Located In Lot H)	(campus logo) Lot H Accessible Parking (w/arrow left - arrow right on opposite side) (Confirm Legend)
A2	1	Custom Primary Parking Lot Directional Signage - Double-faced / Double Post & Panel (Located In Lot G)	(campus logo) Lot G Student Parking (w/arrow left - arrow right on opposite side) (Confirm Legend)
A3	1	Custom Primary Parking Lot Directional Signage - Double-faced / Double Post & Panel (Located In Lot G)	(campus logo) Lot G Student Parking (w/arrow left - arrow right on opposite side) (Confirm Legend)
A4	1	Custom Primary Parking Lot Directional Signage - Double-faced / Double Post & Panel (Located In Lot H)	(campus logo) Lot H Accessible Parking (w/arrow left - arrow right on opposite side) (Confirm Legend)
A5	1	Custom Primary Parking Lot Directional Signage - Double-faced / Double Post & Panel (Located In Lot A)	(campus logo) Lot A (w/arrow left - arrow right on opposite side) (Confirm Legend)
A6	1	Custom Primary Parking Lot Directional Signage - Double-faced / Double Post & Panel (Located In Lot A)	(campus logo) Lot A (w/arrow left - arrow right on opposite side) (Confirm Legend)
A7	1	Custom Primary Parking Lot Directional Signage - Double-faced / Double Post & Panel (Located In Lot B)	(campus logo) Lot B Accessible Parking (w/arrow left - arrow right on opposite side) (Confirm Legend)
A8	1	Custom Primary Parking Lot Directional Signage - Double-faced / Double Post & Panel (Located In Lot B)	(campus logo) Lot B Student Parking (w/arrow up on West side) (Confirm Legend)
A9	1	Custom Primary Parking Lot Directional Signage - Double-faced / Double Post & Panel (Located In Lot B)	(campus logo) Accessible Parking (w/arrow left - arrow right on opposite side) (Confirm Legend)

Signage fabricator must confirm and approve all quantities and legends with client prior to production. Revisions: 12.19.07 / JMc

* Per Title 24 / ADA / Code Compliance

IDENTIFICATION DEVICES 10400-1

McCRACKEN & McCRACKEN**GRAPHICS SCHEDULE**

618 Fourth Street, Suite 214
 Santa Rosa, California 95404

Tel 707 528 8681
 Fax 707 569 1713
 URL <http://sonic.net/mc2>

PARKING LOT WAYFINDING SIGN PROGRAM
 CHABOT COLLEGE, HAYWARD, CA
 DSA #00-0000 / DSA FILE NO. 0-00

Code	Quantity	Description	Legend
A10	1	Custom Primary Parking Lot Directional Signage - Double-faced / Double Post & Panel (Located In Lot B)	(campus logo) Lot B Accessible Parking (w/arrow left - arrow right on opposite side) (Confirm Legend)
A11	1	Custom Primary Parking Lot Directional Signage - Double-faced / Double Post & Panel (Located In Lot B)	(campus logo) Accessible Parking (w/arrow left - arrow right on opposite side) (Confirm Legend)
B1	TBD	Custom Secondary Parking Lot Directional Signage - Double-faced / Double Post & Panel	(campus logo) (Copy To Be Determined) (Confirm Legend)
B2	TBD	Custom Secondary Parking Lot Directional Signage - Double-faced / Double Post & Panel	(campus logo) (Copy To Be Determined) (Confirm Legend)
B3	TBD	Custom Secondary Parking Lot Directional Signage - Double-faced / Double Post & Panel	(campus logo) (Copy To Be Determined)
B4	TBD	Custom Secondary Parking Lot Directional Signage - Double-faced / Double Post & Panel	(campus logo) (Copy To Be Determined) (Confirm Legend)
B5	TBD	Custom Secondary Parking Lot Directional Signage - Double-faced / Double Post & Panel	(campus logo) (Copy To Be Determined) (Confirm Legend)
B6	TBD	Custom Secondary Parking Lot Directional Signage - Double-faced / Double Post & Panel	(campus logo) (Copy To Be Determined) (Confirm Legend)

Signage fabricator must confirm and approve all quantities and legends with client prior to production. Revisions: 12.19.07 / JMc

* Per Title 24 / ADA / Code Compliance

IDENTIFICATION DEVICES 10400-1

McCRACKEN & McCRACKEN**GRAPHICS SCHEDULE**

618 Fourth Street, Suite 214
 Santa Rosa, California 95404

Tel 707 528 8681
 Fax 707 569 1713
 URL <http://sonic.net/mc2>

PARKING LOT WAYFINDING SIGN PROGRAM
 CHABOT COLLEGE, HAYWARD, CA
 DSA #00-0000 / DSA FILE NO. 0-00

Code	Quantity	Description	Legend
C1	1	Parking Entrance Regulatory Sign - Single-faced / Double Post & Panel Located At Primary Parking Lot Entrances (Per Las Positas Signage B1 Standards)	(campus logo) Lot G... etc. (Confirm Legend)
C2	1	Parking Entrance Regulatory Sign - Single-faced / Double Post & Panel Located At Primary Parking Lot Entrances (Per Las Positas Signage B1 Standards)	(campus logo) Lot G... etc. (Confirm Legend)
C3	1	Parking Entrance Regulatory Sign - Single-faced / Double Post & Panel Located At Primary Parking Lot Entrances (Per Las Positas Signage B1 Standards)	(campus logo) Lot A... etc. (Confirm Legend)
C4	1	Parking Entrance Regulatory Sign - Single-faced / Double Post & Panel Located At Primary Parking Lot Entrances (Per Las Positas Signage B1 Standards)	(campus logo) Lot B... etc. (Confirm Legend)
<hr/>			
D1	3	Route Of Accessibility Signage* - Custom Vehicular/Pedestrian Code Compliant Signage / Single-faced / Single Post (Located At AC Transit Drop-off)	(symbol w/arrow up) (Confirm Legend)
D2	TBD	Route Of Accessibility Signage* - Custom Vehicular/Pedestrian Code Compliant Signage / Single-faced / Single Post (Location TBD)	(symbol w/arrow left) (Confirm Legend)
D3	TBD	Route Of Accessibility Signage* - Custom Vehicular/Pedestrian Code Compliant Signage / Single-faced / Single Post (Location TBD)	(symbol w/arrow right) (Confirm Legend)

Signage fabricator must confirm and approve all quantities and legends with client prior to production. Revisions: 12.19.07 / JMc

* Per Title 24 / ADA / Code Compliance

IDENTIFICATION DEVICES 10400-1

McCRACKEN & McCRACKEN**GRAPHICS SCHEDULE**

618 Fourth Street, Suite 214
Santa Rosa, California 95404

Tel 707 528 8681
Fax 707 569 1713
URL <http://sonic.net/mc2>

PARKING LOT WAYFINDING SIGN PROGRAM
CHABOT COLLEGE, HAYWARD, CA
DSA #00-0000 / DSA FILE NO. 0-00

Code	Quantity	Description	Legend
E1	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot G)	G12 (Confirm Legend)
E2	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot G)	G13 (Confirm Legend)
E3	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot G)	G14 (Confirm Legend)
E4	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot G)	G8 (Confirm Legend)
E5	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot H)	H2 (Confirm Legend)
E6	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot H)	H1 (Confirm Legend)
E7	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot G)	G15 (Confirm Legend)
E8	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot G)	G9 (Confirm Legend)
E9	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot G)	G5 (Confirm Legend)

Signage fabricator must confirm and approve all quantities and legends with client prior to production. Revisions: 12.19.07 / JMc

* Per Title 24 / ADA / Code Compliance

IDENTIFICATION DEVICES 10400-1

McCRACKEN & McCRACKEN**GRAPHICS SCHEDULE**

618 Fourth Street, Suite 214
Santa Rosa, California 95404

Tel 707 528 8681
Fax 707 569 1713
URL <http://sonic.net/mc2>

PARKING LOT WAYFINDING SIGN PROGRAM
CHABOT COLLEGE, HAYWARD, CA
DSA #00-0000 / DSA FILE NO. 0-00

Code	Quantity	Description	Legend
E10	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot G)	G10 (Confirm Legend)
E11	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot G)	G11 (Confirm Legend)
E12	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot G)	G6 (Confirm Legend)
E13	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot G)	G7 (Confirm Legend)
E14	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot G)	G4 (Confirm Legend)
E15	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot G)	G3 (Confirm Legend)
E16	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot G)	G2 (Confirm Legend)
E17	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot G)	G1 (Confirm Legend)
E18	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot A)	A9 (Confirm Legend)

Signage fabricator must confirm and approve all quantities and legends with client prior to production. Revisions: 12.19.07 / JMc

* Per Title 24 / ADA / Code Compliance

IDENTIFICATION DEVICES 10400-1

McCRACKEN & McCRACKEN**GRAPHICS SCHEDULE**

618 Fourth Street, Suite 214
Santa Rosa, California 95404

Tel 707 528 8681
Fax 707 569 1713
URL <http://sonic.net/mc2>

PARKING LOT WAYFINDING SIGN PROGRAM
CHABOT COLLEGE, HAYWARD, CA
DSA #00-0000 / DSA FILE NO. 0-00

Code	Quantity	Description	Legend
E19	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot E)	E4 (Confirm Legend)
E20	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot E)	E8 (Confirm Legend)
E21	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot E)	E7 (Confirm Legend)
E22	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot B)	B4 (Confirm Legend)
E23	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot B)	B3 (Confirm Legend)
E24	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot B)	B8 (Confirm Legend)
E25	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot B)	B7 (Confirm Legend)
E26	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot A)	A3 (Confirm Legend)
E27	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot A)	A6 (Confirm Legend)

Signage fabricator must confirm and approve all quantities and legends with client prior to production. Revisions: 12.19.07 / JMc

* Per Title 24 / ADA / Code Compliance

IDENTIFICATION DEVICES 10400-1

McCRACKEN & McCRACKEN**GRAPHICS SCHEDULE**

618 Fourth Street, Suite 214
Santa Rosa, California 95404

Tel 707 528 8681
Fax 707 569 1713
URL <http://sonic.net/mc2>

PARKING LOT WAYFINDING SIGN PROGRAM
CHABOT COLLEGE, HAYWARD, CA
DSA #00-0000 / DSA FILE NO. 0-00

Code	Quantity	Description	Legend
E28	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot A)	A2 (Confirm Legend)
E29	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot A)	A1 (Confirm Legend)
E30	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot A)	A5 (Confirm Legend)
E31	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot B)	B2 (Confirm Legend)
E32	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot B)	B1 (Confirm Legend)
E33	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot B)	B5 (Confirm Legend)
E34	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot B)	B6 (Confirm Legend)
E35	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot B)	B12 (Confirm Legend)
E36	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot B)	B11 (Confirm Legend)

Signage fabricator must confirm and approve all quantities and legends with client prior to production. Revisions: 12.19.07 / JMc

* Per Title 24 / ADA / Code Compliance

IDENTIFICATION DEVICES 10400-1

McCRACKEN & McCRACKEN**GRAPHICS SCHEDULE**

618 Fourth Street, Suite 214
Santa Rosa, California 95404

Tel 707 528 8681
Fax 707 569 1713
URL <http://sonic.net/mc2>

PARKING LOT WAYFINDING SIGN PROGRAM
CHABOT COLLEGE, HAYWARD, CA
DSA #00-0000 / DSA FILE NO. 0-00

Code	Quantity	Description	Legend
E37	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot B)	B13 (Confirm Legend)
E38	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot B)	B10 (Confirm Legend)
E39	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot B)	B15 (Confirm Legend)
E40	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot B)	B9 (Confirm Legend)
E41	1	Parking Lot Designation Signage - 3-Sided Sign Attached To Light Poles (Located In Lot B)	B14 (Confirm Legend)
F1	11	Double-faced Banner(s) - Attached To Light Poles (Located Along Primary Parking Lot Thoroughfare)	(campus logo w/colorful seasonal design) (Confirm Legend)

Signage fabricator must confirm and approve all quantities and legends with client prior to production. Revisions: 12.19.07 / JMc

* Per Title 24 / ADA / Code Compliance

IDENTIFICATION DEVICES 10400-1

DRAWINGS / SPECIFICATIONS

McCRACKEN & McCRACKEN 618 Fourth Street Suite 214 Santa Rosa California 95404 Telephone 707 528 8681 Email mc2@sonic.net

Project / Code

Parking Lot Wayfinding Sign Program
Chabot College, Hayward, California /
11000

Sign Code / Description

A1 (Typical)/ Custom Primary Parking Lot
Directional Signage
(Shown As Sign Type A-1 On Hanzal
Morris Las Positas Master Signage
Standards Documents)

Quantity

Per Graphics Schedule

Material

.25" Aluminum Panels / 3" Square Extruded
Aluminum Posts (See Notation)

Color

Primed And Painted With Polyurethane
Enamel Paint, Satin Finish (See Notation)

Legend

Lucida Grande Bold Letterstyle As Shown
(See Notation)

Installation / Location

(See Notation) / See Plan(s) For
Location(s)

Illumination / Voltage

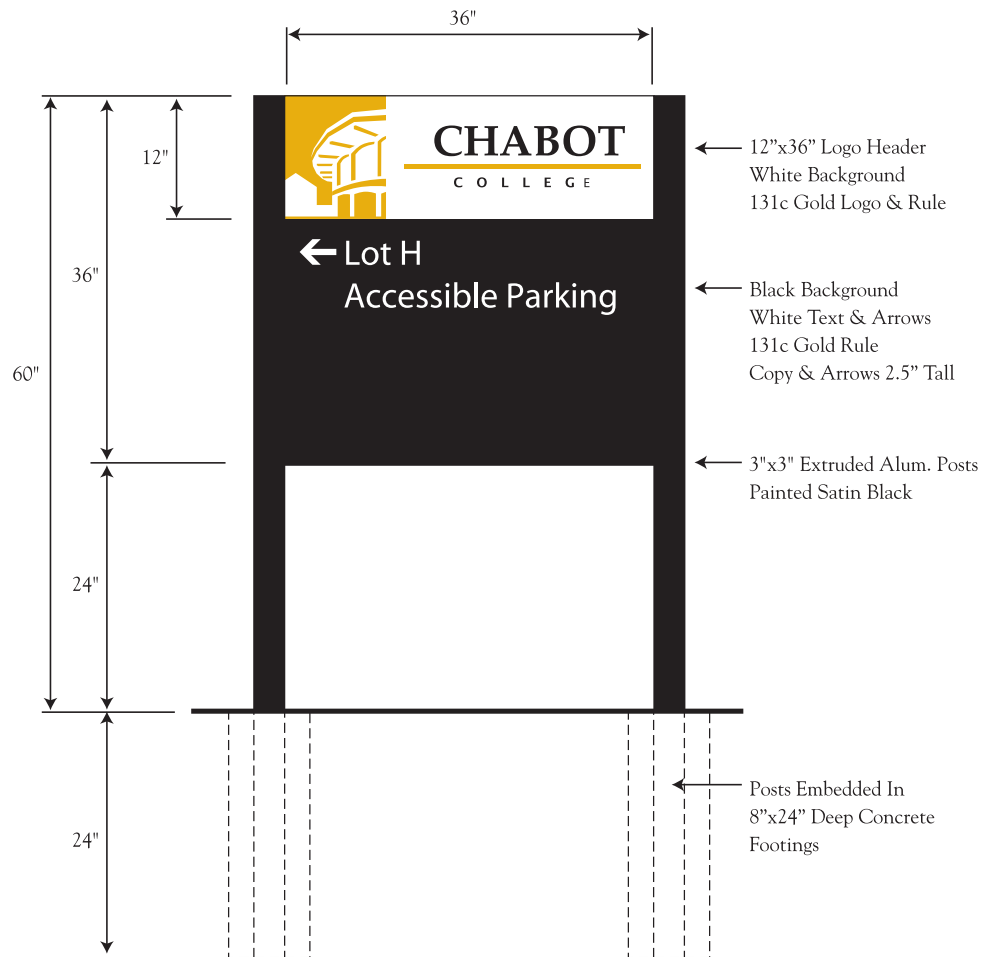
N/A

Scale

NTS

Revised

12.19.07 / Mc2



Note: All Signage Must Conform To The Las Positas Master
Signage Standards Prepared By Hanzal Morris Design Group, Inc.

Project / Code
Parking Lot Wayfinding Sign Program
Chabot College, Hayward, California /
11000

Sign Code / Description
B1 (Typical)/ Custom Secondary Parking
Lot Directional Signage
(Shown As Sign Type A-2 On Hanzal
Morris Las Positas Master Signage
Standards Documents)

Quantity
Per Graphics Schedule

Material
.25" Aluminum Panels / 3" Square Extruded
Aluminum Posts (See Notation)

Color
Primed And Painted With Polyurethane
Enamel Paint, Satin Finish (See Notation)

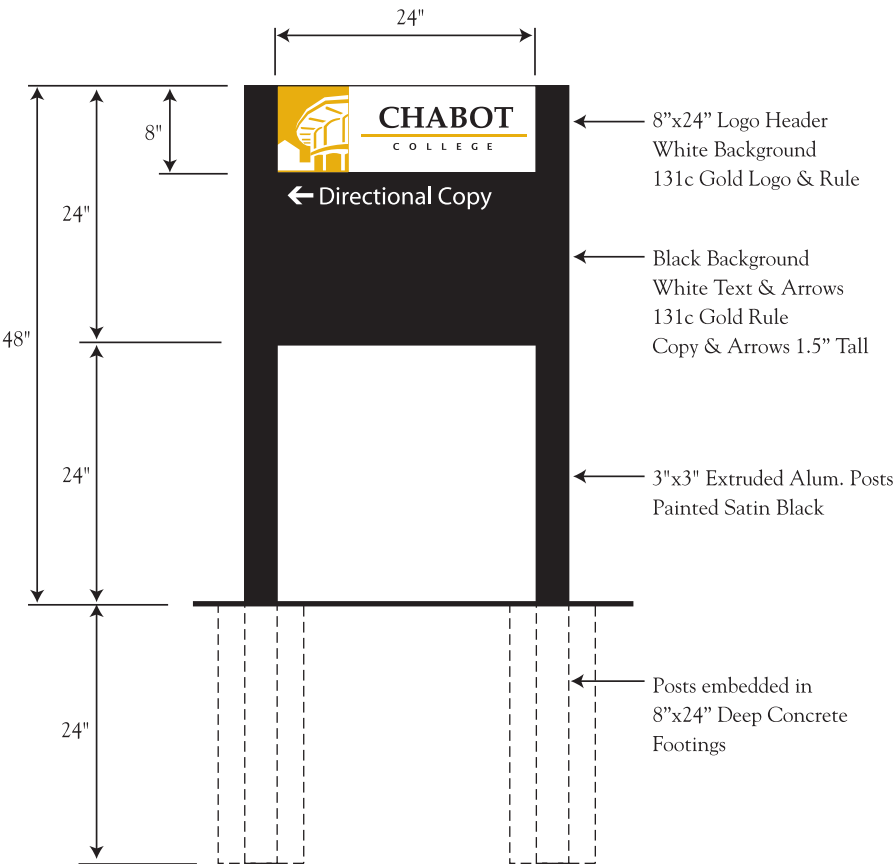
Legend
Lucida Grande Bold Letterstyle As Shown
(See Notation)

Installation / Location
(See Notation) / To Be Determined

Illumination / Voltage
N/A

Scale
NTS

Revised
12.19.07 / Mc2



Note: All Signage Must Conform To The Las Positas Master
Signage Standards Prepared By Hanzal Morris Design Group, Inc.

DRAWINGS / SPECIFICATIONS

McCRACKEN & McCRACKEN 618 Fourth Street Suite 214 Santa Rosa California 95404 Telephone 707 528 8681 Email mc2@sonic.net

Project / Code

Parking Lot Wayfinding Sign Program
Chabot College, Hayward, California / 11000

Sign Code / Description

C1 (Typical)/ Parking Entrance Regulatory Sign
(Shown As Sign Type B-1 On Hanzal Morris Las Positas Master Signage Standards Documents)

Quantity

Per Graphics Schedule

Material

.25" Aluminum Panels / 3" Square Extruded Aluminum Posts (See Notation)

Color

Primed And Painted With Polyurethane Enamel Paint, Satin Finish (See Notation)

Legend

Lucida Grande Bold Letterstyle As Shown
(See Notation)

Installation / Location

(See Notation) / See Plan(s) For Location(s)

Illumination / Voltage

N/A

Scale

NTS

Revised

12.19.07 / Mc2



Note: All Signage Must Conform To The Las Positas Master Signage Standards Prepared By Hanzal Morris Design Group, Inc.

DRAWINGS / SPECIFICATIONS

McCRACKEN & McCRACKEN 618 Fourth Street Suite 214 Santa Rosa California 95404 Telephone 707 528 8681 Email mc2@sonic.net

Project / Code

Parking Lot Wayfinding Sign Program
Chabot College, Hayward, California / 11000

Sign Code / Description

D1 (Typical)/ Route Of Accessibility Signage

Quantity

Per Graphics Schedule

Material

.125" Aluminum Panel / 2" Square Extruded
Aluminum Post / Premium Reflective Vinyl

Color

Primed And Painted With Polyurethane
Enamel Paint, Satin Black Finished Post,
Endcap, And Back Side Of Sign Panel /
Accessible Blue Background With White
Graphics

Legend

Per Code As Shown

Installation / Location

Posts In Concrete / See Plan(s) For
Location(s)

Illumination / Voltage

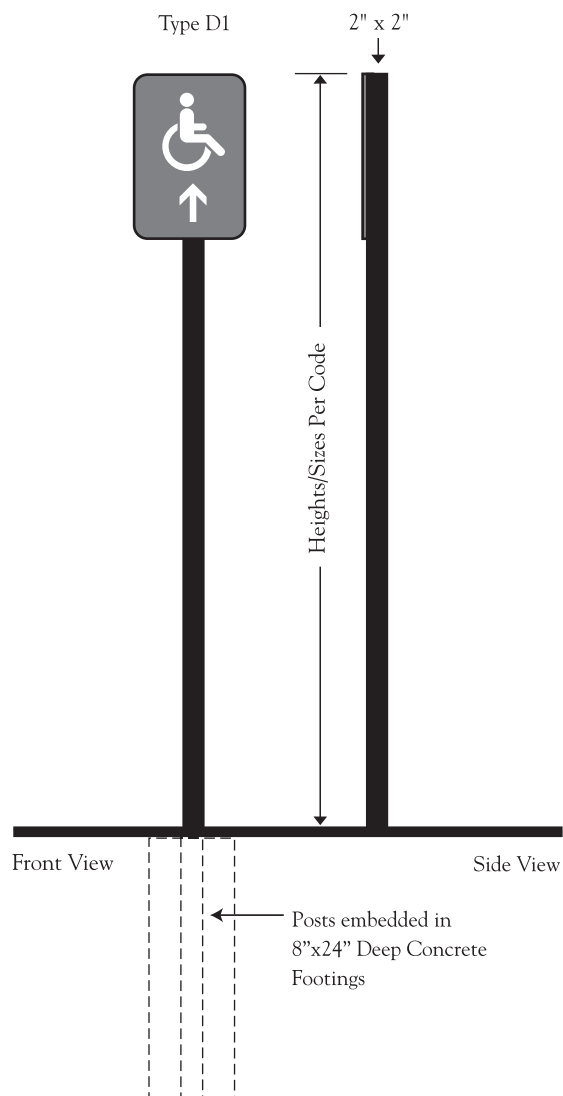
N/A

Scale

NTS

Revised

12.19.07 / Mc2



DRAWINGS / SPECIFICATIONS

McCRACKEN & McCRACKEN 618 Fourth Street Suite 214 Santa Rosa California 95404 Telephone 707 528 8681 Email mc2@sonic.net

Project / Code

Parking Lot Wayfinding Sign Program
Chabot College, Hayward, California / 11000

Sign Code / Description

E3 (Typical)/Parking Lot Designation
Signage
(Shown As Sign Type C-4 On Hanzal
Morris Las Positas Master Signage
Standards Documents)

Quantity

Per Graphics Schedule

Material

.125" Aluminum Panels (See Notation)

Color

Primed And Painted With Polyurethane
Enamel Paint, Satin Finish (See Notation)

Legend

As Shown (See Notation)

Installation / Location

(See Notation) / See Plan(s) For Location(s)

Illumination / Voltage

N/A

Scale

NTS

Revised

12.19.07 / Mc2



Note: All Signage Must Conform To The
Las Positas Master Signage Standards
Prepared By Hanzal Morris Design Group,
Inc.



McCRACKEN & McCRACKEN 618 Fourth Street Suite 214 Santa Rosa California 95404 Telephone 707 528 8681 Email mc2@sonic.net

Project / Code
Parking Lot Wayfinding Sign Program
Chabot College, Hayward, California / 11000

Sign Code / Description
F1 (Typical)/ Double-faced Banners

Quantity
Per Graphics Schedule

Material
.125" Thick Aluminum Tubing With End
Caps / Premium Exterior Rated Banner
Material

Color
Aluminum Tubing And End Caps To Match
Color Of Light Poles / Silk-screened Graphics
To Be Determined

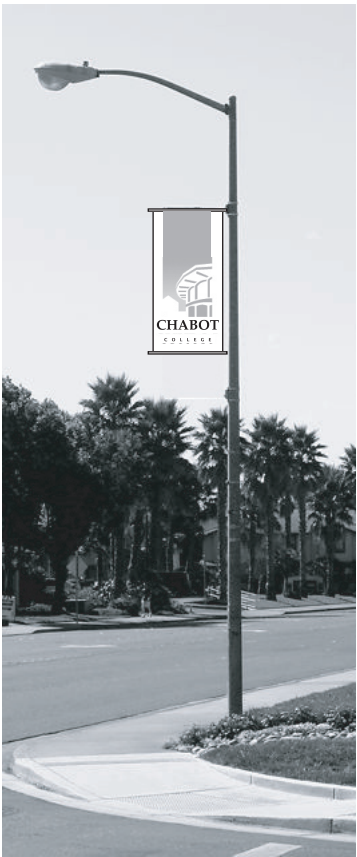
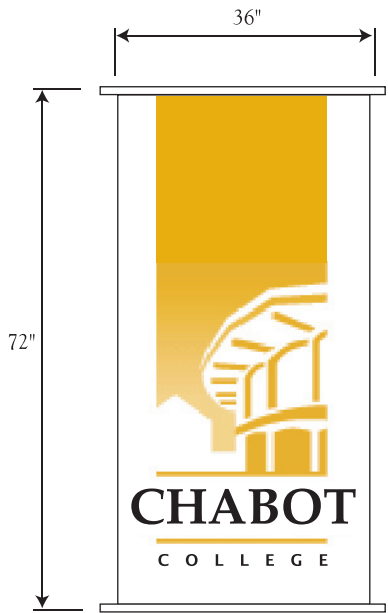
Legend
Typical Example Shown

Installation / Location
Banners To Be Affixed To The Aluminum
Supports In Such A Manner That They Can
Be Replaced And/Or Changed Easily / See
Plan(s) For Location(s)

Illumination / Voltage
N/A

Scale
NTS

Revised
12.19.07 / Mc2



BID PROPOSAL - Revised

TO: **CHABOT-LAS POSITAS COMMUNITY COLLEGE DISTRICT**, a California Community College District, acting by and through its Board of Trustees ("the District").

FROM:

(Name of Bidder)

(Address)

(City, State, Zip Code)

(Telephone/Telecopier)

(E-Mail Address of Bidder's Representative(s))

(Name(s) of Bidder's Authorized Representative(s))

1. Bid Proposal:

1.	Base Bid Item A. Amount CSSC Documents	\$
2.	Base Bid Item B Amount Parking Lot Phase 3	\$
3.	Owner's Unspecified Allowance	\$ 1,000,000.00
4.	Total Bid Proposal Amount (Line 1 plus Line 2 plus Line 3)	\$

1a. Alternates (ADD):

1.	Demountable Walls - CSCI	\$
----	--------------------------	----

- 1.1 Bid Proposal Amount.** The undersigned Bidder proposes and agrees to perform the Contract including, without limitation, providing and furnishing any and all of the labor, materials, tools, equipment and services necessary to complete in a workmanlike manner all of the Work and other obligations required by the Contract Documents for the sum of _____ Dollars (\$ _____) (Line 4 of Table above). The Bidder confirms that it has checked all of the above figures and understands that neither the District nor any of its agents, employees or representatives shall be responsible for any errors or omissions on the part of the undersigned Bidder in preparing and submitting this Bid Proposal. The

Bidder confirms that the bid proposal includes the Owner's Non-Specified Allowance in the amount of One Million Dollars and No Cents (\$1,000,000.00).

1.2 Owner's Unspecified Allowance. Bidder shall include in Bid Proposal the stipulated sum of One Million Dollars (\$1,000,000.00) for unspecified work to be performed ONLY at the determination and direction of the District. Work performed at the determination and direction of the District under this Allowance shall be documented by Contractor and submitted to Construction Manager per the requirements specified in Article 9 of the General Conditions. Contractor shall include a separate line item in Contractor's Schedule of Values as "Allowance" with the value of One Million Dollars (\$1,000,000.00). At closeout of Contract, any funds remaining in the Allowance shall be credited to Owner through a Change Order.

1.3 Acknowledgment of Bid Addenda. The Bidder confirms that this Bid Proposal incorporates and is inclusive of, all items or other matters contained in Bid Addenda issued by or on behalf of the District.

_____ **Addenda Letters.** _____ received, acknowledged
(initial) and incorporated into this Bid Proposal.

1.4 Alternate Bid Items. The Bidder's price proposal(s) for Alternate Bid Items is/are set forth in the form of Alternate Bid Item Proposal included herewith. Price proposal(s) for Alternate Bid Item(s) will form the basis for the District's award of the Contract for the above-identified Bid Package. Specific Alternate Bid Item will be incorporated into the scope of Work of the Contract at the District's discretion.

2. Documents Accompanying Bid. The Bidder has submitted with this Bid Proposal the following: (a) Bid Security; (b) Subcontractors List; (c) Statement of Qualifications; (d) Certification of Pre-Bid Site Visit; (e) Non-Collusion Affidavit; and (f) Letter of Assent (PSA). The Bidder acknowledges that if this Bid Proposal and the foregoing documents are not fully in compliance with applicable requirements set forth in the Call for Bids, the Instructions for Bidders and in each of the foregoing documents, the Bid Proposal may be rejected as non-responsive.

3. Award of Contract. If the Bidder submitting this Bid Proposal is awarded the Contract, the undersigned will execute and deliver to the District the Contract in the form attached hereto within ten (10) days after notification of award of the Contract. Concurrently with delivery of the executed Agreement to the District, the Bidder awarded the Contract shall deliver to the District: (a) Certificates of Insurance evidencing all insurance coverages required under the Contract Documents; (b) the Performance Bond; (c) the Labor and Material Payment Bond; (d) the Certificate of Workers' Compensation Insurance; and (e) the Drug-Free Workplace Certificate. Failure of the Bidder awarded the Contract to strictly comply with the preceding may result in the District's rescission of the award of the Contract and/or forfeiture of the Bidder's Bid Security. In such event, the District may, in its sole and exclusive discretion elect to award the Contract to the responsible Bidder submitting the next lowest Bid Proposal, or to reject all Bid Proposals.

4. Contractor's License. The undersigned Bidder is currently and duly licensed in accordance with the California Contractors License Law, California Business & Professions Code §§7000 et seq., under the following classification(s) _____ bearing License Number(s) _____, with expiration date(s) of _____. The Bidder certifies that: (a) it is duly licensed, in the necessary class(es), for performing the Work of the Contract Documents; (b) that such license shall be in full force and effect throughout the duration of the performance of the Work under the Contract Documents; and

(c) that all Subcontractors providing or performing any portion of the Work shall be so properly licensed to perform or provide such portion of the Work.

5. **Acknowledgment and Confirmation.** The undersigned Bidder acknowledges its receipt, review and understanding of the Drawings, the Specifications and other Contract Documents pertaining to the proposed Work. The undersigned Bidder certifies that the Contract Documents are, in its opinion, adequate, feasible and complete for providing, performing and constructing the Work in a sound and suitable manner for the use specified and intended by the Contract Documents. The undersigned Bidder certifies that it has, or has available, all necessary equipment, personnel, materials, facilities and technical and financial ability to complete the Work for the amount bid herein within the Contract Time and in accordance with the Contract Documents.

(Corporate Seal)

By: _____
(Signature)

(Typed or Printed Name)
Title: _____

SECTION - 01810

GENERAL SYSTEMS COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to the Work of this Section.
- B. Specific commissioning requirements are given in LEED SDA section requirements in Division 1 and the following sections of these specifications.
 - 1. 01355, LEED Certification Procedures
 - 2. 01810, General Systems Commissioning Requirements
 - 3. 15040, Acceptance Testing and Documentation
 - 4. 15950, Controls
 - 5. 15990, Testing, Adjusting and Balancing
 - 6. 15995, Commissioning of HVAC Systems
 - 7. 16080, Commissioning of Electrical Systems

1.02 SUMMARY

- A. Commissioning is a comprehensive and systematic process to verify that the building systems perform as designed to meet the Owner's requirements. Commissioning during the construction, acceptance, and warranty phases is intended to achieve the following specific objectives:
 - 1. Verify and document that equipment is installed and started per manufacturer's recommendations and to industry accepted minimum standards.
 - 2. Verify and document that equipment and systems receive complete operational checkout by installing Trade Contractors.
 - 3. Verify and document equipment and system performance.
 - 4. Verify the completeness of operations and maintenance materials.
 - 5. Ensure that the owner's operating personnel are adequately trained on the operation and maintenance of building equipment.
- B. The commissioning process does not take away from or reduce the responsibility of the system designers or installing Trade Contractors to provide a finished and fully functioning product.
- C. The commissioning process shall meet the requirements of LEED-NC 2.2 Pre-requisite EA 1.0 and Credit EA 3.0

1.03 COORDINATION

- A. Commissioning Team. The members of the commissioning team consist of the Commissioning Provider (CP), the Owner's Representative (PM), the General Contractor (GC or Contractor), the Design Team (A/E), the Mechanical Trade Contractor (MTC), the Electrical Trade Contractor (ETC),

the Test and Balance representative (TAB), the Controls Trade Contractor (CTC), the Owner's staff, and any other installing Trade Contractors or suppliers of equipment.

- B. Management. The Commissioning Provider is under contract with the Architect. The CP shall report commissioning process results directly to the Owner's Representative or as directed by the Owner's Representative.
- C. Scheduling. The CP will work with the PM to schedule commissioning activities. The GC shall integrate all commissioning activities into the master construction schedule. All parties will address scheduling issues in a timely manner in order to expedite the commissioning process.

1.04 COMMISSIONING PROCESS

- A. The following activities describe the commissioning tasks during construction and the general order in which they occur. The commissioning provider coordinates all activities.
 - 1. Scoping Meeting. All members of the design and construction team that will be involved in the commissioning process meet and agree on the scope of work, tasks, schedules, deliverables, and responsibilities for implementation of the Commissioning Plan.
 - 2. Commissioning Plan. The commissioning plan provides guidance in the execution of the commissioning process. The Specifications take precedence over the Commissioning Plan.
 - 3. Submittals. Equipment documentation is submitted to the CP during normal submittals, including detailed start-up procedures.
 - 4. Start-Up/Pre-Functional Checklists. The CP works with the Subs to develop startup plans and documentation formats, including providing the Subs with pre-functional checklists to be completed during the startup process.
 - 5. Functional Performance Testing. The CP develops specific equipment and system functional performance test procedures. The Subs review the procedures. The procedures are executed by the Subs, under the direction of, and documented by the CP.
 - 6. Deficiencies and Resolution. The CP documents items of non-compliance in materials, installation or operation. The items are corrected at the Sub's expense and the equipment or systems are retested.
 - 7. Operations and Maintenance Documentation. The CP reviews the O&M documentation for completeness.
 - 8. Training. The CP reviews and coordinates the training provided by the Subs and verifies that it is completed.
 - 9. Seasonal Testing. Deferred or seasonal testing is conducted, as required.

1.05 RESPONSIBILITIES

- A. The responsibilities of various parties in the commissioning process are provided in this section. It is noted that the services for the Project Manager, Design Team, and Commissioning Provider are not provided for in this contract. That is, the General Contractor is not responsible for providing their

services. Their responsibilities are listed here to clarify the commissioning process.

B. Commissioning Provider (CP)

1. The CP is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CP may assist with problem-solving non-conformance or deficiencies, but ultimately that responsibility resides with the Construction Manager and the Design Team. The primary role of the CP is to develop and coordinate the execution of a testing plan, observe and document that systems are functioning in accordance with the documented design intent and the Contract Documents.
2. Construction and Acceptance Phase
 - a. Coordinate and direct all commissioning activities in a logical and efficient manner. Work with the GC and PM to ensure that commissioning activities are being scheduled.
 - b. Create, update and revise, as necessary, the Commissioning Plan.
 - c. Plan and conduct a commissioning scoping meeting.
 - d. Request and review additional information required to perform commissioning tasks, including O&M materials, Trade Contractor start-up and checkout procedures, and sequences of operation.
 - e. Review Trade Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the A/E reviews.
 - f. Develop start-up and checkout plan with Trade Contractors. Review pre-functional checklists.
 - g. Perform site visits, as necessary, to observe component and system installations. Attend selected planning and job-site meetings to obtain information on construction progress.
 - h. Review completed pre-functional checklist and start-up reports for PM approval.
 - i. Coordinate any start-up requirements with TAB Trade Contractor.
 - j. Write the functional performance test procedures for equipment and systems. Submit to PM and A/E for review.
 - k. Coordinate, witness, and document functional performance tests performed by installing Trade Contractors. Coordinate retesting as necessary until satisfactory performance is achieved.
 - l. Maintain a master deficiency and resolution record. Provide the PM and GC with written progress reports and test results with recommended actions.
 - m. Review the training of the Owner's operating personnel
 - n. Develop system manual.
 - o. Review the preparation of the O&M manuals.
 - p. Provide a final commissioning report.

3. Warranty Period

- a. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.
- b. Assist in the development of a preventative maintenance plan and review as-built documentation.
- c. Provide the Owner with a manual that contains information required for re-commissioning building systems.
- d. Review building operation with Owner's O&M staff, including resolution of outstanding commissioning-related issues, within 10 months after substantial completion.

C. Design Team (A/E)

1. Construction and Acceptance Phase

- a. Attend the commissioning scoping meeting and selected commissioning team meetings.
- b. Perform normal submittal review, construction observation, as-built drawing preparation, O&M manual preparation, etc., as contracted.
- c. Provide design narrative and control sequences documentation requested by the CP.
- d. Coordinate resolution of system deficiencies identified during commissioning, according to the contract documents.
- e. Prepare and submit final as-built design intent documentation for inclusion in the O&M manuals. Review and approve the O&M manuals.
- f. Optional: Review the equipment start-up and pre-functional checklists. Review the functional test plans. Witness performance testing.

2. Warranty Period

- a. Coordinate resolution of design non-conformance and design deficiencies identified during warranty period commissioning.

D. Owner's Project Manager (PM)

1. Construction and Acceptance Phase

- a. Attend commissioning scoping meeting and additional meetings, as necessary.
- b. Arrange for facility operating and maintenance personnel to attend various field commissioning activities and field training sessions according to the Commissioning Plan.
- c. Provide final approval for the completion of the commissioning work.

2. Warranty Period

- a. Ensure that any seasonal or deferred testing and any deficiency issues are addressed.

E. General Contractor (GC)

1. Construction and Acceptance Phase

- a. Facilitate the coordination of the commissioning work by the CP.

- b. Furnish a copy of all construction documents, addenda, change orders and approved submittals and shop drawings related to commissioned equipment to the CP.
- c. In each purchase order or subcontract written, include requirements for submittal data, O&M data, commissioning tasks and training.
- d. Ensure that all Subs execute their commissioning responsibilities according to the Contract Documents and schedule.
- e. Attend a commissioning scoping meeting and other necessary meetings scheduled by the CP to facilitate the commissioning process.
- f. Coordinate the training of owner personnel.
- g. Prepare O&M manuals, according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.

2. Warranty Period

- a. Ensure that Trade Contractor execute required seasonal or deferred functional performance testing.
- b. Ensure that Trade Contractors correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for issues identified in seasonal testing.

F. Mechanical, Controls and TAB Trade Contractors. The commissioning responsibilities applicable to each of the mechanical, controls and TAB Trade Contractors are as follows:

1. Construction and Acceptance Phases

- a. Attend a commissioning scoping meeting and other meetings necessary to facilitate the Commissioning process.
- b. Provide the CP with normal cut sheets and shop drawing submittals of commissioned equipment.
- c. Provide additional requested documentation, prior to normal O&M manual submittals, to the CP for development of start-up and functional testing procedures.
- d. Assist (along with the A/E design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
- e. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the pre-functional checklists from the CP for all commissioned equipment. Submit to CP for review and approval prior to startup.
- f. During the startup and initial checkout process, execute the mechanical-related portions of the pre-functional checklists for all commissioned equipment. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CP.
- g. Address current A/E punch list items before functional testing. Air and water TAB shall be completed with discrepancies and problems

remedied before functional testing of the respective air- or water-related systems.

- h. Perform functional performance testing under the direction of the CP for specified equipment in Section 1.06.
- i. Provide software and access codes related to the building control system to the CP as needed for verification of system performance.
- j. Correct deficiencies (differences between specified and observed performance) as interpreted by the CP, GC and A/E and retest the equipment.
- k. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
- l. Provide training of the Owner's operating personnel as specified.
- m. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

2. Warranty Period

- a. Execute seasonal or deferred functional performance testing, witnessed by the CP, according to the commissioning plan.
- b. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

G. Electrical Trade Contractors. The commissioning responsibilities applicable to the Electrical Trade Contractor are as follows:

1. Construction and Acceptance Phases

- a. Attend a commissioning scoping meeting and other necessary meetings scheduled by the CP to facilitate the Commissioning process.
- b. Provide normal cut sheets and shop drawing submittals to the CP of commissioned equipment.
- c. Provide additional requested documentation to the CP for development of start-up and functional testing procedures.
- d. Assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
- e. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the pre-functional checklists from the CP. Submit manufacturer's detailed start-up procedures and the full start-up plan and procedures to CP for review.
- f. During the startup and initial checkout process, execute and document the electrical-related portions of the pre-functional checklists provided by the CP for all commissioned equipment. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CP.
- g. Address current A/E punch list items before functional testing.
- h. Perform functional performance testing under the direction of the CP for specified equipment in Section 1.06.

- i. Provide software and access codes related to the building control system to the CP as needed for verification of system performance.
 - j. Correct deficiencies (differences between specified and observed performance) as interpreted by the CP, GC and A/E and retest the equipment.
 - k. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
 - l. Provide training of the Owner's operating personnel as specified.
 - m. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.
2. Warranty Period
- a. Execute seasonal or deferred functional performance testing, witnessed by the CP, according to the specifications.
 - b. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

H. Equipment Suppliers

- 1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
- 2. Assist in equipment testing per agreements with Trade Contractors.
- 3. Provide information requested by CP regarding equipment sequence of operation and testing procedures.

1.06 SYSTEMS TO BE COMMISSIONED

- A. The following marked systems will be commissioned in this project. All general references to equipment in this document refer only to equipment that is to be commissioned.

System	LEED	Non-LEED
HVAC (including natural ventilation)		
Chillers		
Pumps	X	
Cooling tower		
Boilers		
Piping systems	X	
Ductwork	X	
Variable frequency drives	X	
Air handlers	X	
Packaged units (AC and HP)	X	
Terminal units (air)	X	
Unit heaters	X	
Heat exchangers	X	
Computer room units	X	

System	LEED	Non-LEED
Fume hoods		
Lab room pressures		
Specialty fans	X	
Testing, Adjusting and Balancing	X	
Chemical treatment systems		
HVAC control system (including natural ventilation)	X	
Fire and smoke dampers		
Equipment sound control	X	
Equipment vibration control	X	
Egress pressurization		
ELECTRICAL		
Generator		
Sweep or scheduled lighting controls	X	
Daylight dimming controls	X	
Lighting occupancy sensors	X	
Power quality		
Security system		
Emergency power system		
UPS systems		
Fire and smoke alarm		
Fire protection systems		
Communications system		
Public address/paging		
Distribution Cable		
Main Breaker		
Ground Fault Detection		
Automatic Transfer Switch		
OTHER		
Service water heaters	X	
Service water booster pumps	X	
Refrigeration systems	X	
Kitchen Equipment		
PV System (add alternate - not included in AEC's Cx proposal)	N/A	

PART 2 – PRODUCTS

2.01 TEST EQUIPMENT

- A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Trade Contractor for the equipment being tested.
- B. Datalogging equipment or software required to test equipment will be provided by the CP, but shall not become the property of the Owner.
- C. All testing equipment shall be of sufficient quality and accuracy to test or measure system performance with the required by the Contract Documents.

PART 3 – EXECUTION

3.01 MEETINGS

- A. Pre-Installation Conference. Commissioning shall include a scoping meeting where all members of the design and construction team to be involved in the commissioning process meet and agree on the scope of work, tasks, schedules, deliverables, and responsibilities for implementation of the Commissioning Plan.
- B. Progress Meetings. Progress meetings during equipment start-up and functional performance testing shall include commissioning coordination in addition to the standard meeting format.

3.02 REPORTING

- A. The CP will provide regular reports to the PM with increasing frequency as construction and commissioning progresses.
- B. The CP compiles a final Commissioning Report that summarizes the procedures, findings, conclusions, and recommendations of the commissioning process.

3.03 SUBMITTALS

- A. The CP shall review submittals related to the commissioned equipment for conformance to the Contract Documents as it relates to the commissioning process, to the functional performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of functional testing procedures.
- B. The CP shall receive a copy of the standard submittals for equipment to be commissioned.
- C. The CP may require additional documentation necessary for the commissioning process. The Contractor will receive a written request from the commissioning provider for specific equipment or system information.

3.04 START-UP, PRE-FUNCTIONAL CHECKLISTS AND INITIAL CHECKOUT

- A. The following procedures apply to all equipment to be commissioned, according to Section 1.06, Systems to be Commissioned.
- B. General. Pre-functional Checklists are developed and completed for all major equipment and systems being commissioned. The checklist captures equipment nameplate and characteristics data, confirming the as-built status of the equipment or system. These checklists also ensure that the systems are complete and operational, so that the functional performance testing can be scheduled. The checklists are created by the CP and completed (filled out) by the installing Trade Contractor.
- C. Start-up and Initial Checkout Plan. The CP shall assist the commissioning team members responsible for startup of any equipment in developing detailed start-up plans for all equipment. The primary role of the CP in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures have been completed.

- D. Pre-functional Checklists. The CP shall create pre-functional checklists, based primarily on the manufacturer's startup and initial checkout procedures are created. Each checkout item shall have a place to document that proper installation has occurred. Once the pre-functional checklist is completed by the installing Trade Contractor, this signifies to the commissioning team that the equipment is properly installed per manufacturer's procedures, and the controls and TAB are complete and the equipment is ready for final functional performance testing. The Trade Contractor determines which Sub is responsible for executing and documenting each of the line item tasks.
- E. Sensor Calibration. Calibration of all sensors shall be included as part of the pre-functional checklists performed by the Trade Contractors.
- F. Execution of Pre-functional Checklists and Startup.
1. Trade Contractors and vendors schedule startup and checkout with the PM, GC and CP.
 2. The CP shall verify the installation and performance of commissioned equipment. The procedures for each piece of primary equipment shall be verified, unless there are multiple units, sampling strategy may be used as approved by the PM. See below.
 3. For lower-level components of equipment, the CP shall observe a sampling of the pre-functional and start-up procedures. The sampling procedures are identified in the commissioning plan.
 4. The Trade Contractors and vendors shall execute startup and provide the CP with a signed and dated copy of the completed start-up and pre-functional checklists.
 5. Only individuals that have direct knowledge and witnessed that a line item task on the pre-functional checklist was actually performed shall initial or check that item off.
- G. Deficiencies, Non-Conformance and Approval in Checklists and Startup.
1. The Trade Contractors shall clearly list any outstanding items of the initial start-up and pre-functional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies are provided to the CP within two days of test completion.
 2. The CP reviews the report and recommends approval to the PM. The CP shall work with the Trade Contractors and vendors to correct and retest deficiencies or uncompleted items. The CP will involve the PM and others as necessary.
- H. Sample Pre-functional Checklists.

CONTINUED ON FOLLOWING PAGES

Pre-functional Test Verification Form: Mechanical

Facility Name: **Building Commissioning Project**

Equipment Name	Location	Area Served	Drawing No	Manufacturer	Model No
AHU	roof	offices	'M' drawings	Trane	

General: To be filled out by installing contractor, and kept onsite during project. The checklist will be completed and turned in prior to Functional Performance Testing.

Instruction: Fill in Unit Information as as listed below, then check the appropriate box as as items are verified and deemed acceptable. Add comments if needed and explain any exceptions taken.

Installation Checks	Contractor			Comment
	Yes	No	N/A	
Electrical power complete	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Permanent label attached	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Casing condition OK	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Access doors installed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Maintenance access OK	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Correct valve type installed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Pneumatic or electric wiring complete	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Clearances from combustibles meet manuf guidelines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Suspension Checked. Unit must be secure and level	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Power disconnects installed and labeled	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Manufacturer's installation manual followed for startup procedures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Copy of Filled out Manufacturer's procedures attached	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Test Adjust and Balance Complete, with deficiencies corrected	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
TAB preliminary report attached for this equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Notes

****By signing, I have verified that the above equipment is installed per the manufacturer's instructions, and the design documents, and is ready for final testing by the commissioning agent.**

Signature**

Date

Mechanical Contractor

General Contractor

Pre-functional Test Verification Form: Control

Facility Name: **Building Commissioning Project**

<i>Equipment Name</i>	<i>Location</i>	<i>Area Served</i>	<i>Drawing No</i>	<i>Manufacturer</i>	<i>Model No</i>
AHU	roof	offices	'M' drawings	Trane	

General: To be filled out by installing contractor, and kept onsite during project. The checklist will be completed and turned in prior to Functional Performance Testing.

Instruction: Fill in Unit Information as listed below, then check the appropriate box as items are verified and deemed acceptable. Add comments if needed and explain any exceptions taken.

<i>Installation Checks</i>	<i>Contractor</i>			<i>Comment</i>
	<i>Yes</i>	<i>No</i>	<i>N/A</i>	
Safety interlocks wired and tested	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Correct valve type installed for controller	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Start/stop wiring complete	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Thermostat wiring complete	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Thermostat setpoint per specification	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Operation with thermostat tested	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Copy of completed point to point checkout attached	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Notes

****By signing, I have verified that the above equipment is installed per the manufacturer's instructions, and the design documents, and is ready for final testing by the commissioning agent.**

Signature**

Date

Control Contractor	_____	_____
General Contractor	_____	_____

3.05 FUNCTIONAL PERFORMANCE TESTING

- A. Objectives and Scope. The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested.
- B. Development of Test Procedures. Before test procedures are written, the CP shall obtain all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. The CP shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Prior to execution, the CP shall provide a copy of the test procedures to the Trade Contractors who shall review the tests for feasibility, safety, equipment and warranty protection. The CP shall review Owner-contracted or factory testing which the CP is not responsible to oversee and shall determine what further testing may be required to comply with the Contract Documents. Redundancy of testing shall be minimized.

The test procedure forms developed by the CP shall include the following information:

- 1. System and equipment or component name(s).
 - 2. Equipment location and ID number.
 - 3. Date.
 - 4. Project name.
 - 5. Participating parties.
 - 6. Reference to the specification section describing the test requirements.
 - 7. A copy of the specific sequence of operations.
 - 8. Instructions for setting up the test.
 - 9. Special cautions, alarm limits, etc.
 - 10. Specific step-by-step procedures to execute the test.
 - 11. Acceptance criteria of proper performance with a Yes / No check box.
 - 12. A section for comments.
 - 13. Signatures and date block for the CP.
- C. Test Methods.
 - 1. Functional performance testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone data loggers. The CP will determine which method is most appropriate.
 - 2. Setup. Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The Trade Contractors executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the

specified conditions. At completion of the test, the Trade Contractor shall return all affected building equipment and systems, due to these temporary modifications, to their pre-test condition.

3. Sampling. Multiple identical pieces of non-life-safety or non-critical equipment may be functionally tested using a sampling strategy. The sampling strategy will be developed by the CP and approved by the PM. If, after three attempts at testing the specified sample percentage, failures are still present, then all remaining units are tested at the Trade Contractors' expense.
- D. Coordination and Scheduling. The Trade Contractors shall provide sufficient notice to the CP regarding their completion schedule for the pre-functional checklists and startup of all equipment and systems. The CP will schedule functional tests through the PM, GC and affected Trade Contractors. The CP shall direct, witness and document the functional testing of all equipment and systems. The Trade Contractors shall execute the tests.
- E. Problem Solving. The CP will recommend solutions to problems found; however the burden of responsibility to solve, correct and retest problems is with the GC, Trade Contractors and A/E team.
- F. Sample Functional Test Forms (developed during construction phase).

CONTINUED ON FOLLOWING PAGES

Functional Performance Testing Procedure		
System:	South Main and Upper Level Perimeter Primary Air Conditioning and Delivery System	
Title:	Occupied Schedule, Pressure, Temperature, and CO2 Control with no airside economizer, and optimum start	
Equipment Tag:	AHU-1 and IF-1	
Participants:	Name	Organization
Date: _____		
Comments:	<p>{1} Submitted sequence discusses increasing the VFD speed on the injection fan to keep the zone with the highest CO2 concentration below 850 ppm. There is also monitoring of the outside air CO2 concentration. The intent is to keep concentrations inside at no more than 530 ppm above the outdoor air CO2 concentration. It would be best (to achieve the LEED credit) to make the <u>high CO2 zone setpoint = 530 ppm above ambient</u>. {2} Space pressure sensor is not used in any sequence. <u>What will assure a positive building pressure?</u> Is there a minimum VFD speed for IF-1 to assure exhaust air is made up? {3} AHU-1 discharge air Temp reset schedule mentioned with no indication of <u>what variable controls the DAT reset</u>. (Is it the critical zone vav damper position? The return air temperature? The outside air temp?).</p> <p>{4} In unoccupied mode, to avoid negative pressurization, <u>which EF's</u> will be off and on with timed override button on VAV's served by this unit? {5} HW coil is open in freeze alarm, and closed in unoccupied mode. <u>How is this accomplished?</u> {6} <u>Is there a morning cool down or night purge?</u></p>	
Sequence:	<p>Variable air volume, Chilled water coil cooling, Heating water coil heat, with CO2 control, See Long submittal and FPT events for sequence elaboration.</p> <p>Event #1 unit enable</p> <p>Event #2 Heating Coil control</p> <p>Event #3 Humidity Monitoring (N/A)</p> <p>Event #4 Chilled Water Coil Control</p> <p>Event #5 airside economizer cooling (N/A)</p> <p>Event #6 pressurization (of the space, and also of the main HVAC duct)</p> <p>Event #7 alarms and safeties</p> <p>Event #8 unoccupied mode & optimum start</p>	

Functional Performance Testing Procedure				
System:	South Main and Upper Level Perimeter Primary Air Conditioning and Delivery System			
Title:	Occupied Schedule, Pressure, Temperature, and CO2 Control with no airside economizer, and optimum start			
Equipment Tag:	AHU-1 and IF-1			
Equipment Schedule			AHU-1 and IF-1	
Record time-of-day and setpoints and note any deviation from design.				
DAY	DESIGN	ACTUAL		
Monday	7:00 AM to 5:00 PM			
Tuesday	7:00 AM to 5:00 PM			
Wednesday	7:00 AM to 5:00 PM			
Thursday	7:00 AM to 5:00 PM			
Friday	7:00 AM to 5:00 PM			
Saturday	unoccupied			
Sunday	unoccupied			
Holiday	unoccupied			
DDC Parameters			AHU-1 and IF-1	
Record values for current setpoints, control parameters, limits, delays, lockouts, etc. and note any deviation from design.				
Parameter	Design	Value programmed in BAS		
IF-1 VFD speed CO2 reset	60hz@highCO2, 30hz@lowCO2			
IF-1 VFD speed space pressure reset	60hz@0.02", 30hz@0.05"			
IF-1 speed criteria selection	highest call b/w CO2 and SP			
Highest Zone CO2 set point	Amb Concentration + 530 PPM			
duct pressure set point	1.25 in.w.g. 2/3rds down duct			
DAT set point reset	55°F@75FRAT, 65°F@65FRAT			
heating coil discharge set point	55°F@75FRAT, 65°F@65FRAT			
Outside air minimum position	? IF-1 X cfm			
Dirty filter alarm differential pressure	?			
Space pressure set point	0.03 to 0.06 in.w.g.			
Sensor Installation Check			AHU-1 and IF-1	
Verify that sensor is installed and in an appropriate location. If calibration is in question, use a reference temperature or humidity sensor to test the following sensors. Place the reference sensor as close as possible to the tested sensor.				
Sensor	Installation?	Location?	Notes	
OA CO2				
IF-1 DAT				
RAT				
CO2				
AHU-1 DAT				
Actuator Stroke Checks			AHU-1 and IF-1	
Override each actuator from fully closed to fully open. Remove power and note fail position. Note excessive linkage slop and inadequate sealing.				
Component	Fully Open	Fully Closed (bypass)	Fail Position	Notes
OSA Damper				
HWW(2 pos)				
CHWW(module)				
Face/Bypass				

Functional Performance Test					
System:		South Main and Upper Level Perimeter Primary Air Conditioning and Delivery System			
Title:		Occupied Schedule, Pressure, Temperature, and CO2 Control with no airside economizer, and optimum start			
Tag:		AHU-1 and IF-1			
Pass	Fail	Event #	Description of Event Testing	Expected Results	Remarks
		1a	Using the equipment schedule, call for an unoccupied mode	Unit shuts down (AHU-1, IF-1, and EF? , dampers move to fail position), <u>HV coil is closed.</u>	
		1b	Using the equipment schedule, call for an occupied mode	Dampers open to operating position, after delay, fans energize, fan status (airflow switch IF&AHU) is on.	
		1c	Turn off unit (IF & AHU) at disconnect on roof.	Fan status mismatch alarm reads at DDC Front End.	
		1d	Turn Unit (IF & AHU) Back on at disconnect	Unit runs, alarm clears.	
		2a	Override IF-1 DATsp to be 5°F warmer than actual	Heating water coil modulates open to supply warmer discharge air	
		2b	Override IF-1 DATsp to be 5°F cooler than actual	Heating water coil modulates closed to supply warmer discharge air	
		4	Override AHU-1 DATsp to be 5°F below actual	Chilled Water Coil modulates to maintain DAT set point, heating coil is closed.	
		6a	override space pressure setpoint to be 0.03 in.w.g. less than actual. Outside air damper closes to minimum.	with low ppm in the highest CO2 zone, IF-1 speed reduces to meet lower pressure set point	
		6b	override space pressure setpoint to be 0.03 in.w.g. more than actual.	with low ppm in the highest CO2 zone, IF-1 speed increases to meet higher pressure set point.	
		6c	override duct pressure setpoint to be 0.5 in.w.g. less than actual.	AHU-1 VFD ramps down to maintain set point.	
		6d	override duct pressure setpoint to be 0.5 in.w.g. more than actual.	AHU-1 VFD ramps up to maintain set point.	

Functional Performance Test					
System:	South Main and Upper Level Perimeter Primary Air Conditioning and Delivery System				
Title:	Occupied Schedule, Pressure, Temperature, and CO2 Control with no airside economizer, and optimum start				
Tag:	AHU-1 and IF-1				
Pass	Fail	Event #	Description of Event Testing	Expected Results	Remarks
		7a	Disable fire alarm call out. Trip the smoke detector	Unit trips off and smoke alarm shows on DDC front end.	
		7b	disconnect controller LAN wires	Comm Loss Major alarm is communicated to DDC front end.	
		7c	Lower the set point on the CO2 control to 300 ppm below actual in the high zone.	Injection fan speed increases, heating and cooling coils maintain their respective DATsp	
		7d	disconnect DAT sensor	Sensor failure major alarm is communicated to DDC front end.	
		7e	Override high discharge static pressure set point to 0.5 in.w.g. less than actual.	high discharge static pressure alarm is communicated to DDC front end. Manual reset required.	
		7f	Override IF-1 DAT to 37°F	OA dampers shut, IF-1 is de-energized. HWC damper in full bypass, HWV open, alarm at front end.	
		8a	Optimum Start: Trend lowest ZAT, IF-1, and AHU-1 fan status every 15 minutes after the scheduled unocc time begins and until 1 hr post occ.	Verify that Unit does not energize in unoccupied cooling mode and associated EF's stay off)	
		8b	override unit to unoccupied mode. Override average ZAT to 45°F	Verify that Unit does not energize in unoccupied heating mode and associated EF's stay off)	
			See other trends next page		

Functional Performance Test - DDC TRENDING					
System:		South Main and Upper Level Perimeter Primary Air Conditioning and Delivery System			
Title:		Occupied Schedule, Pressure, Temperature, and CO2 Control with no airside economizer, and optimum start			
Tag:		AHU-1 and IF-1			
Pass	Fail	Trend #	Description of Trend	Expected Results	Remarks
		1a	DAT every 15 mins for two days including times of water side economizer operation, CHW cooling, and heating	To verify water side economizer operation, and space temperature control.	
		1b	MAT every 15 mins for two days including times of water side economizer operation, CHW cooling, and heating	To verify water side economizer operation, and space temperature control.	
		1c	RAT every 15 mins for two days including times of water side economizer operation, CHW cooling, and heating	To verify water side economizer operation, and space temperature control.	
		1d	ZAT every 15 mins for two days including times of water side economizer operation, CHW cooling, and heating	To verify water side economizer operation, and space temperature control.	
		1e	OAT every 15 mins for two days including times of economizer operation, heating, and DX cooling.	To verify Bypass Damper control	
		1f	HW Coil DAT every 15 mins for two days including times of economizer operation, heating, and DX cooling.	To verify Bypass Damper control	
		1g	Bypass damper position every 15 mins for two days including a time of economizer operation, and low building pressure.	To verify Bypass Damper control	
		1h	IF-1 Fan VFD speed every 15 mins for two days including a time of economizer operation, and low building pressure.	To verify pressurization and CO2 sequences	
		1j	AHU-1 Fan VFD speed every 15 mins for two days including a time of economizer operation, and low building pressure.	To verify duct pressure control sequence	
		1k	high zone and CO2 ambient CO2 every 15 mins for two days including a time of low CO2 level and High CO2 level.	To verify CO2 control operation	
		2	Space Pressure every half hour for two days	0.03 to 0.07 occupied	

3.06 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

- A. Documentation. The CP shall witness and document the results of all functional performance tests using forms developed for that purpose. Prior to testing, these forms may be provided to the GC for review and approval if the GC desires.
- B. Non-Conformance.
 - 1. The CP shall record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported to the PM on a standard form.
 - 2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CP. In such cases the deficiency and resolution will be documented on the procedure form.
 - 3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures.
 - 4. As tests progress and a deficiency is identified:
 - a. When there is no dispute on the deficiency and the responsibility to correct it:
 - i. The CP documents the deficiency and the Trade Contractor's response and intentions the testing continues. The Trade Contractor corrects the deficiency and notifies the CP that the equipment is ready to be retested.
 - ii. The CP reschedules the test and the test is repeated.
 - b. If there is a dispute about a deficiency or who is responsible:
 - i. The deficiency shall be documented on the non-compliance form and a copy given to the PM and GC.
 - ii. Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E team.
 - iii. Final acceptance authority is with the Owner.
 - iv. The CP documents the resolution process.
 - v. Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency and notifies the CP that the equipment is ready to be retested. The CP reschedules the test and the test is repeated until satisfactory performance is achieved.
 - 5. Cost of Retesting.
 - a. The cost for the Trade Contractor to retest a pre-functional or functional test, if they are responsible for the deficiency, shall be theirs. If they are not responsible, any cost recovery for retesting costs shall be negotiated with the GC.
 - b. The time for the **CP, PM, and/or A/E** to direct any retesting required because a specific pre-functional checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be back charged to the GC, who

may choose to recover costs from the party responsible for executing the faulty pre-functional test.

- C. Approval. The CP notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test is made later after review by the CP. The CP recommends acceptance of each test to the PM. The PM gives final approval on each test, providing a signed copy to the CP and the Trade Contractor.

3.07 OPERATION AND MAINTENANCE MANUALS

- A. Standard O&M Manuals.
 - 1. CP assists in preparation, review and approval of O&M. Prior to substantial completion, the CP shall review the O&M manuals, documentation and redline As-Built Drawings for systems that were commissioned to verify compliance with the Contract Documents. The CP will communicate deficiencies in the manuals to the PM.
- B. Commissioning Record in O&M Manuals.
 - 1. The CP is responsible to compile, organize and index all commissioning data by equipment into labeled, indexed and tabbed, three-ring binders and deliver it to the PM. Three copies of the manuals shall be provided. The manuals shall include the Commissioning Plan, Final Commissioning Report, System Type, Startup and Pre-functional checklists, Functional Performance Tests, trending and analysis, approvals and corrections, training plan, records, and approvals.

3.08 TRAINING OF OWNER PERSONNEL

- A. The GC shall be responsible for training coordination and scheduling and for ensuring that training is completed.
- B. The CP shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.
 - 1. The specific training requirements of **Owner's** personnel by Trade Contractor and vendors are specified in Division 15 and Division 16.
 - 2. For the primary HVAC equipment, the Controls Trade Contractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others. See Section 01 70 00 for details of training procedures.

3.09 DEFERRED TESTING

- A. Seasonal Testing. During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this contract. The CP shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the appropriate Trade Contractor, with facilities staff and the CP witnessing. Any final adjustments to the O&M manuals and as-builts due to the testing will be made by the Trade Contractor.

END OF SECTION

SECTION 03345

CONCRETE FINISHES

PART 1 GENERAL

1.01 SECTION INCLUDES:

- A. Finishing for the following concrete surfaces:
 - 1. Smooth Finished Concrete Surfaces (S5), (S3)
 - 2. Formed Vertical Concrete Surfaces (S2)
 - 3. Exposed Aggregate Finished Concrete Surfaces (S1)

1.02 RELATED SECTIONS

- A. Section 03300: Cast-In -Place Concrete.
- B. Section 07190: Water Repellents.

1.03 SUBMITTALS

- A. See Section 01300 - Submittals, for submittal procedures.
- B. Submittals:
 - 1. Color Additives:
 - a. Submit product data and manufacturer's instructions for Color additives used in precast panels. All other products are listed under Section 03470.
 - b. Submit color additive manufacturer's color chart; indicate color additive number and required dosage rate. Sample chip set shall indicate general color and may vary from concrete finished in field according to Specifications.
 - 2. Form liners:
 - a. Submit product data for formliners used for formed vertical concrete surfaces.
 - b. Submit shop drawings, showing elevations of ribbed formed surfaces, indicating start point of form liner and direction of ribbing.
- C. Contractor to submit the following for approval prior to start of Work:
 - 1. Written description of equipment to be used and procedure to be followed in producing the exposed aggregate finish.
 - 2. Two copies each of the manufacturer's written instructions for applying the retardant coating (if used) and the clear sealer.
 - 3. For Blasting method, type of nozzle, nozzle pressure, type and gradation of abrasive, blasting technique, safety procedures and containment methods and procedures used with all abrasive blasting or water blasting operations.
 - 4. The method and materials used to collect, contain and dispose of the concrete surface mortar removed from the finish surface, and the chemical agent residue and abrasives used to remove the concrete surface mortar.
 - 5. See paragraph 1.05 for Test panel requirements.

1.04 QUALITY ASSURANCE

- A. Exposed Concrete: Intent is to leave exposed Concrete exactly as formed with a smooth finish and articulated panel and construction joints, and tie holes as detailed. Work shall meet the standard exhibited by areas of sample panels approved by the Architect.
- B. Exposed Aggregate Finish: Aggregates, materials, dimensions or other features affecting the Work shall be approved prior to start of Work. Finish panels in exposed aggregate finish in areas as indicated on Drawings.

1.05 Test Panels

- A. Provide Test panels as described in Section 03470.
- B. Locate on the perimeter of the site where it will not interfere with the construction.
- C. Test panel may not remain as part of the Work.
- D. Test panel must remain until Work is completed and approved, and removed at the completion of the project.

1.06 PRE-INSTALLATION MEETING

- A. Convene one week before starting work of this section.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Furnish materials conforming to Sections 03300 and 03470, as applicable with the following requirements:
 - 1. Color Admixture for Integrally Colored Concrete: Color additives shall contain pure, concentrated mineral pigments specially processed for mixing into concrete and complying with ASTM C979. Colors will be selected by the Architect from manufacturer's standards. Dosage rate shall be based on weight of Portland cement, fly ash and other cementitious materials, at a minimum of 3% color by weight (ie. 3% of 94 lbs design mix = approx. 2.8 lbs.). Provide one of the following products or equal product approved according to Section 01630.
 - a. Davis Colors.
 - b. L.M. Scofield; Chromix Admixture
 - c. Admixtures, Inc.; Colorfull

2.02 FORM LINERS

- A. Manufacturers:
 - 1. Fitzgerald Formliners; Product Pattern 14327, Fluted Rib: www.formliners.com.
- B. Pattern: As indicated on drawings.

PART 3 EXECUTION

3.01 FINISHING FORMED CONCRETE SURFACES:

- A. Finish formed surfaces as soon as practicable after removal of forms. After repair of defects, surfaces shall be given one of the following finishes:

1. As-Cast Finish: After repair of surface defects and filling of the tie-holes, surfaces shall be left as-cast.
2. Surface Preparation for Concrete to be Painted: Fins, rough spots, stains, and hardened mortar shall be removed by carefully rubbing with a fine abrasive stone to a smooth even surface. Excess form sealer shall be removed by carefully scrubbing surface with 5 to 10 percent solution of muriatic acid.
3. Sacked (Grout Cleaned) Finish: Prepare surfaces as specified for concrete to be painted, apply a slurry as follows: Slurry shall be proportioned 1 part cement to 1-1/3 parts sand, passing a No.16 sieve, by damp, loose volume, mixed with enough water to form a grout having the consistency of thick paint. Prior to applying slurry to surfaces, dampen concrete sufficiently to prevent water absorption. Spread slurry over surfaces with clean sponge rubber float to completely fill all holes and imperfections. Float surface vigorously, and while slurry is still plastic, remove excess grout. Allow to dry, and then rub with burlap to completely remove dry grout so that no visible grout film remains. The entire cleaning operation for any area must be completed the day it is started.

3.02 FINISH - TILT-UP UNITS

- A. Finish exposed surfaces of panels as indicated on drawings and as per approved Test panels.
- B. Grade A - Architectural Finish:
 1. Smooth Finish (S3, S5):
 - a. Panel surfaces must be free of voids, holes, pockets, and other surface deformations greater than 1/8 inch and must not telegraph imperfections from the casting surface, including floor joints.
 - b. Cracks in excess of 1/32 inch width are not acceptable.
 - c. Reveals may not deviate from their correct position by more than 1/8 inch in 10 feet.
 - d. Repairs must not be apparent from a minimum distance of 10 feet.
 2. Ribbed Form Lined (S2):
 - a. Utilize specified form liner from above.
 - b. Secure form as recommended by form liner manufacturer.
 - c. Coat form with form oil as recommended by form liner manufacturer.
 - d. Leave forms in place as long as practical. Remove forms and lift panels when concrete has reached a consistent age to maintain uniformity of curing conditions throughout Project
 - e. Upon removal of form: Repair damaged concrete as described under smooth Finish in paragraph 3.02 B 1.
 - f. Formwork with repairs, patches or defects which would result in adverse effects to the concrete finish shall not be used.
 - g. Forms and form joints shall remain completely watertight.
 3. Medium Exposed Aggregate Finish (S1):
 - a. The exposed aggregate finish shall be obtained the following method as necessary to provide the exposed aggregate finish:
 - 1) Abrasive Blasting
 - a) Panel surface to be finished as exposed aggregate shall be

- abrasive blasted to remove surface mortar.
 - b) Adjacent materials and finishes shall be protected from dust, dirt and other damage during abrasive blasting operations.
 - c) Corners and edges shall be carefully blasted using back-up boards to maintain a uniform corner or edge line.
 - d) The abrasive blasting shall be done in as continuous an operation as possible, utilizing the same work crew to main continuity of finish on each surface or area of work.
 - e) Blasting method shall follow approved written submittal as noted in 1.03 C.3 above.
 - f) Contractor shall provide suitable enclosures for the collection of grit and dust from the abrasive blasting operation.
- b. After receiving approval on the exposed aggregate finish, a 10 percent muriatic acid wash shall be applied to the exposed aggregate surfaces. Surfaces shall be flushed thoroughly with water following a 5 to 10 minute interaction period between the acid solution and the surface.
 - c. All stains and streaks on the exposed aggregate surface shall be removed before applying the clear sealer.
 - d. See Section 03470 for additional information on patching and sealing.
- C. Interior Finish: Floated.
 - D. Painting at Pilaster (S4): Prepare surfaces to be painted as specified in Section 09900.

END OF SECTION

SECTION 03470

TILT-UP PRECAST CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Section Includes:
 - 1. Furnish and install all jobcast tilt-up precast concrete and related work as shown and specified.
 - 2. Comply with all requirements of Section 03100, 03200 and 03300 for the work of this section except where different requirements are stated below. Comply with all additional requirements included below. In case of conflict, the requirements of this section take precedence.
- B. Related Sections:
 - 1. Section 03100 - Concrete Formwork
 - 2. Section 03200 - Concrete Reinforcement
 - 3. Section 03300 - Cast-in-Place Concrete
 - 4. Section 03345 - Concrete Finishes
 - 5. Section 01355 - LEED Certification Procedures for Recycled and Local Content

1.02 REFERENCES

- A. Requirements of GENERAL CONDITIONS and DIVISION NO.1 apply to all Work in this Section.
- B. Published specification, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to work of this section where cited by abbreviations noted below (latest editions apply).
 - 1. California Building Code (CBC), 2001 Edition.
 - 2. American Society for Testing and Materials (ASTM).
 - 3. American Concrete Institute's
 - a. Building Code Requirements for Reinforced Concrete (ACI 318).
 - 4. American Welding Society's
 - a. "Mild Steel Covered Arc-Welding Electrodes" (AWS A5.1).
 - b. "Reinforcing Steel Welding Code: (AWS D1.4).
 - 5. Prestressed Concrete Institute Publications.

1.03 QUALITY ASSURANCE

- A. Except where different requirements are specified, comply with the requirements of the Prestressed Concrete Institute Document PCI MNL-117 for manufacturing, testing, and dimensional tolerances for fabrication and erection.
- B. Qualifications for Production; Contractor shall show evidence of at least 5 years experience in the production of job cast concrete tilt-up panels. Workmen shall be proficient in production operations and shall be under the direct supervision of a competent foreman at all times.
 - 1. To the extent practical, the same batch plant, trucks, and drivers shall be used for all concrete delivered to Project. Interiors of concrete mixers shall be

thoroughly cleaned before batching colored concrete.

- C. Qualifications for Welding:
 - 1. Quality welding processes and welding operators qualified in accordance with AWS Standard Qualification Procedure, and in accordance with AWS D1.4.
 - 2. Provide certification that welders to be employed in the work have satisfactorily passed AWS qualification test within the previous 12 months.
- D. In addition to the designed reinforcement shown in the drawings, provide design for the erection of all precast using the services of a licensed civil or structural engineer. Contractor's design includes, but is not necessarily limited to the following:
 - 1. Anchorage, inserts, anchor bolts, lifting devices, and attachments to building structure.
- E. Design all concrete mixes. Comply with guidelines of ACI 318.
- F. Owner's testing laboratory will perform all testing and inspection functions specified in Section 03200 and 03300.
- G. No tilt-up panels are to be cast on construction joints, electrical floor outlets, or any other surface irregularity in slabs on grade that would telegraph through to finished surface of tilt-up panels.
- H. Do not place concrete during adverse weather unless approved measures are taken to prevent damage.
 - 1. Do not place concrete during rain, when rain is forecast, or when standing water is present on casting slab.
 - 2. During periods of dry wind, low humidity, high temperature, or other conditions causing rapid drying, protect fresh concrete with an evaporation retardant (monomolecular film) applied immediately after screeding and bull floating.
 - 3. Hot Weather: Conform to ACI 305. Give proper attention to concrete materials, production method, handling, placing, protection and curing to prevent excessive concrete temperatures or water evaporation. To extent practical, place concrete early in the day.
 - 4. Cold Weather: Conform to ACI 306. Provide adequate equipment to heat concrete materials and protect concrete during freezing or near-freezing weather. Concrete materials and reinforcement, forms, fillers, and ground or casting slabs with which concrete is to come in contact shall be free from frost. If shelters are used, the type of fuel used for heating shall not weaken or discolor the concrete surface.
- I. To the extent practical, all panels for a building elevation shall be poured in a single day to minimize variations in appearance.

1.04 SUBMITTALS

- A. Submit list of all products to be used.
- B. Submit concrete mix designs as evidence that design requirements have been met, but not for formal review and approval.
- C. Submit shop drawings to the Architect for review. Show panel dimensions, finish, locations of openings and penetrations, reveals, embedments, reinforcing steel,

pick-up reinforcement and devices, anchors, bracing systems and details.

- D. Submit structural design calculations stamped by the Contractor's licensed civil or structural engineer as evidence that the design requirements have been met, but not for formal review and approval. Contractor is responsible for all lifting methods and devices and all cracking or other damage to panels. Such devices shall not be visible on finish surfaces.
- E. Samples:
 - 1. Begin the entire process at least 30 days prior to commencement of casting. Make re-submittals promptly so as not to delay construction.
 - 2. Submit the following samples for color assurance prior to test panel casting:
 - a. Three (3) bagged samples of aggregate to ensure color selection.
 - b. Three (3) 6X6 inch square of integral concrete color to ensure color selection.
 - 3. Prepare and submit minimum of three (3) 4 sq. ft. test panels, which include typical edge detail, reveal strip, and a corner section, displaying variety of aggregate and matrix colors, gradations and textures. Test panels will be reviewed for color, texture and aggregate, as well as for workmanship and joint treatment. Test panel shall show minimum of light and medium sandblast, and penetrating sealer over entire panel, including edges and reveals. Repeat process until test panel is approved.
 - 4. Test panel will be reviewed from the same date of casting as the finished panels (ie 14 days after casting), for the comparison of concrete color for acceptability within tolerance. Submit this test panel for review at the job site. When the test panel is approved, it will become the standard of the work.
- F. The Owner's Testing Agency shall submit reports on tests and inspections performed to the Owner, Architect and Contractor.
- G. Submit LEED documentation to achieve LEED Credit MR4.1 and MR4.2 for recycled content. See section 01355 - LEED Certification Procedures.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Use same cement, aggregate, and sand for all precast concrete.
- B. Cement: ASTM C150, Type II, gray Portland cement.
- C. Flyash: ASTM C618, Type F. Use light colored fly ash to the extent possible
- D. Aggregates: ASTM C33.
 - 1. The Aggregate used for the Medium Exposed Aggregate Finish described in Section 03445 and indicated on the Drawings shall be approved by the Architect/Engineer. Gravel of predominately rounded particles shall be used, except that when indicated or approved by Architect/Engineer in writing, crushed stone may be used. The aggregate shall be large enough to remain firmly anchored in the face of the final product. Depth shall be ¼-inch minimum to ½-inch maximum, unless otherwise directed by Architect/Engineer.

2. Contractor will stockpile the required quantity of aggregate for this project, to ensure the consistency of the exposed finish, after the test panel is approved. Assure that enough inventory of each material is available to meet Project requirements and contingencies. When necessary, segregate Project materials to avoid contamination or shortages.
 3. Coarse Aggregates: Uniformly graded from ¾-inch to 3/8-inch per ASTM C33 Table 2.
 - a. Material: granite
 - b. Color range: predominately grey, with less than 25% of red and pink.
 4. Fine Aggregates: crushed grey granite.
- E. Air entraining agent: ASTM C260.
- F. Corrosion Inhibitor Admixture: Sika Ferroguard 901.
- G. Water Reducing, Retarding Admixture: ASTM C494, Type D. Same as W.R. Grace's "Daratard-17," Master Builders' "Pozzoliith R," Sika's "Plastiment," or equal product substituted per Section 01630.
- H. Inserts:
1. Cast in plates, angles, etc. which are exposed on exterior: mild steel, hot dip galvanized ASTM A123.
 2. All other cast in plates, angles, etc.: mild steel free of mill scale and loose rust.
 3. Bolts, panel inserts and other accessories: electroplated galvanized by the Burke Company or equal product substituted per Section 01630.
 4. Insert for recessed hose bibs.
- I. Bond breaker: Non staining type which will not affect application of finish; Burke Super Bond Breaker or equal product substituted per Section 01630. Bond breaker must be compatible with curing compound and surface retarder.
- J. Cast in reglets: Superior "Cushin-Lock" type B-4 PVC reglet or Fry "Original" PVC reglet.
- K. Sealant and Caulking: as specified in Section 07900.
- L. Touch up paint for welded galvanized surfaces: ZRC Chemical Product Co. ZRC cold galvanized compound.
- M. Curing Compound: Water based liquid membrane curing compound complying with ASTM C309, Type I and ID, Class B, compatible with colored concrete.
- N. Color Admixture: as specified in Section 03345.
- O. Surface Retarder: as required per method of achieving exposed aggregate finish in face down casting.
- P. Panel edge: a chamfer groove shall be used along all edges of each panel, size as indicated on Drawings.
- Q. Penetrating Sealer: Sika Corp, "Sikagard 701W" or equal.
- R. LEED Credits: The contractor is responsible for executing the steps necessary to document the Fly Ash content for the purposes of obtaining LEED certification

credits. Please refer to specification sections: 01355 – LEED Certification Procedures for more specific and additional requirements.

2.02 MIXES

- A. Design all mixes to meet the requirements of specification section 03300.

PART 3 - EXECUTION

3.01 CASTING

- A. At Contractor's option, panel may be poured on a portion of the building floor slab, or on a waste slab with minimum thickness of 3-1/2 inches and a smooth level surface equal to the building slab. Panels may be stack cast provided the Contractor's detailing allows for it. If waste slab is used, remove it after completion of precast work and complete site work in that area. If building slab is used, restore it to equal condition of remainder of building slab, replacing it entirely if required.
- B. In general, comply with requirements of PCI MNL-117 and Specification section(s) 03100, 03200, and 03300. Place concrete to avoid cold joints within panels. Provide 3/4 inch minimum cover for all reinforcing.
- C. Locate all embedded items accurately, taking special care that reglets line up from panel to panel.
- D. Perform all welds to comply with AWS provisions.
- E. Finishes: as described in Section 03345.

3.02 COORDINATION AND INSPECTION

- A. Coordinate erection of precast concrete products with other job-site operations. Provide all hoisting required to install the panels.
- B. Do not handle panels until sufficient strength has been attained to prevent cracking.
- C. Prior to installation, verify all dimensions and conditions. Notify Architect of all discrepancies or defects which affect this work. Do not proceed until discrepancies and defects have been resolved or corrected. Installation of panels constitute acceptance of all conditions.

3.03 ERECTION

- A. Install all panels level, plumb, in line and true within the noncumulative and individual tolerances allowed by PCI MNL-117. Secure each panel neatly and securely as shown. Dry pack or grout under precast panels where noted on the drawings with Master Builder's "Set Grout" or approved equivalent.
- B. Take care to avoid staining, chipping, cracking or damage by welding or by any other source.
- C. Perform all welding by AWS certified welders. Maintain an approved fire extinguisher within reach at all welding operations.
- D. Touch up all welded surfaces with cold galvanized compound at galvanized items.
- E. Grout all horizontal joints as shown using grout as specified in Section 03300. Brace all panels until grout has reached sufficient strength to support panels and

until all steel connections can be made.

- F. At connections to structure that have oversized holes, provide washers to cover oversized holes.
- G. Provide shims as noted and weld together to hold shims in place.
- H. After installation but before cleaning and sealant work, repair all slight defects as required in Section 03300. Patching for repair and through bolting shall match finish exactly. Replace all badly damaged units. Architect will be sole judge of degree of damage or mismatch of finish which will require replacement.

3.04 CLEANING, SEALANT, PROTECTION AND CLEANUP

- A. After installation clean all surfaces using methods and materials which will not damage the panels or adjacent construction.
- B. Seal all joints between precast panels with sealant using materials and methods as specified in Section 07900.
- C. Protect all precast panels throughout construction and repair all damage.
- D. Patchwork: Where there are visible cracks in precast panels, provide test patch on test panel for review by Architect, for approval prior to patching. Use the same materials and techniques that were approved on the test panel. Make patches with a stiff mortar made with materials from the same sources as the concrete. Adjust mortar mix proportions so dry patch matches dry adjacent concrete. Add white cement to mortar mix if necessary to lighten it. With exposed aggregate finishes, add aggregate to mortar mix so patches will have the same texture and appearance as adjacent concrete.
- E. Clean and prepare all surfaces to receive penetrating sealer per manufacturer's installation instructions. Preliminary site test application shall be performed on test panel sample to determine effective coverage and performance. Acceptance of sealer on test panel is required prior to application.
- F. Apply sealer per manufacturer's application instructions. Mask all adjacent surfaces prior to application.
- G. On completion, remove all debris and clean up all adjacent areas resulting from this work.

3.05 GUARANTEE

- A. Contractor shall guarantee his work for one year against failure due to faulty materials and workmanship and shall repair same without cost to owner. Submit written warranties/guarantees in accordance with Section 01700 contained in this project manual.

END OF SECTION

SECTION 13735

INTERCOM SYSTEM

PART 1 GENERAL

1.01 SUMMARY

- A. General: Furnish engineering, labor, materials, apparatus, tools, equipment, transportation, temporary construction and special or occasional services as required to make a complete working intercom system installation, as described in these specifications.
- B. Section Includes:
 - 1. Emergency Phone System
 - 2. Interfaces and connections between intercom subsystems to allow communication with one another.
 - 3. Intercom power supplies
- C. Products Supplied But Not Installed Under This Section:
 - 1. None
- D. Products Installed But Not Supplied Under This Section:
 - 1. None
- E. Products Specified But Not Installed Under This Section:
 - 1. None
- F. Products Furnished and Installed Under Another Section:
 - 1. 120V power
 - 2. Telecommunication cabling connectivity between PBX connected intercom locations and the IDF (telecom room)
- G. Related Sections:
 - 1. Section 13700 Basic Security Requirements: for submittal format, warranty, general product requirements, enclosure, power supply, miscellaneous relays, and installation requirements.
 - 2. Section 13720 Video Surveillance System: for interface requirements related to the intercom system
 - 3. Section 13770 Security System Cabling: for cable requirements related to the intercom system.
 - 4. Section 13780 Security System Labeling: for device labeling requirements.
 - 5. Section 13790 Security System Commissioning: for testing requirements related to the intercom systems.

1.02 SYSTEM DESCRIPTION

- A. Intercom
 - 1. The intercom system consists of freestanding hands free, bollard style, two-way, full duplex communication call station located in the Phase 3 parking lot upgrade area. Reference CSSC site plan for location.
 - 2. Utilize the Owner's PBX system for dial-up connection.
 - 3. Utilize underground conduit system in lot A/B to connect phone to Building 1200.

4. Use intercom with bright locator always-on blue beacon, and call-indicating high intensity blue strobe.
 5. Monitor activation of an intercom using an interface relay and a monitor input point through the access control system.
 6. Activation of an intercom sends a signal to the video surveillance system to initiate camera call up, move PTZ cameras to a specific preset, and record.
- B. Emergency Phone System
1. Provide freestanding emergency intercom unit.
 2. Provide blue strobe light at each intercom location.
 3. Blue light always on. Activation of emergency intercom to cause associated blue light to strobe. Light to remain in strobe function until emergency intercom reset.

1.03 SUBMITTALS

- A. Product Data: Submit product information for the intercom systems, including:
1. Emergency Intercom Stations w/ Strobe Light
 2. Power Supplies
 3. Power Supply Sizing Calculations
- B. Shop Drawings: Submit shop drawings containing the following:
1. Device placement on floor plans.
 2. Point-to-Point Diagrams: Include wiring, points of connection and interconnecting devices between the following:
 - a. Intercom System
 - b. Devices connected to the system
 - c. Miscellaneous control relays
 - d. Conductors (identify conductors on the point-to-point diagrams with the same tag as the installed conductor)
 - e. Block Diagram/Riser Diagram: Show the intercom system components, conduit, wire types, and sizes between them, including cabling interties between termination hardware.
 3. Custom mounting details.
- C. Samples: Submit samples of the following devices:
1. Intercom Stations
 2. Emergency Phone Stations
 3. Custom Faceplates

PART 2 PRODUCTS

2.01 COMMUNICATIONS DEVICE (INTERCOM)

- A. Vandal-resistant stainless steel faceplate & metal button.
- B. Built-in autodialer that can call two numbers. If first number doesn't answer or is busy, dials second number.
- C. Signage for ADA compliance.
- D. Auto-answer to allow security to monitor and initiate calls with Emergency Phone.
- E. Options: Ability to automatically identify attendant of location of calling phone by recorded message and digital display.

- F. LED indicator for hearing impaired.
- G. Auxiliary input and outputs to integrate with CCTV, Blue Light/Strobe, and other devices.
- H. Communications Options: Regular phone lines or PBX.
- I. Phone line-powered: no power supply or battery back-up required.
- J. Push button once to call, then speak hands-free.
- K. Manufacturer and model:
 - 1. Code Blue #CB 3100 to match Campus Standard

2.02 PEDESTAL UNIT with blue strobe light

- A. Material: 1/4" stainless steel with Safety Blue finish
- B. Weather Resistant: Withstand prolonged exposure to harsh environments.
- C. Vandal Resistant
- D. Accept flush mounted emergency phone
- E. Electrical components hard wired and concealed within the wall mount.
- F. The word "EMERGENCY" emblazoned on both sides in reflective white letters
- G. ADA compliant
- H. Blue Strobe Light
 - 1. Housed in a vandal resistant, blue polycarbonate refractor housing
 - 2. Refractor housing enclosed in a clear polycarbonate impact-resistant enclosure
 - 3. Light:
 - a. Minimum 7 watt high efficiency, compact fluorescent light
 - b. 10,000 hour lifetime
 - c. Lit at all times
 - 4. Strobe:
 - a. Minimum 1.5 million candlepower
 - b. Flash 70 times per minute when emergency phone activated
 - c. Continue flashing until call completed.
- I. Power Requirements: 120 VAC with step-down transformer
- J. Manufacturer:
 - 1. Code Blue model #CB 5 to match Campus Standard

PART 3 EXECUTION

3.01 INSTALLATION

- A. General: Follow installation guidelines set forth in Section 13700 Basic Security Requirements.
- B. Intercoms:
 - 1. Install square and plumb.
 - 2. Set "flush mounted" units with the face of the cover, bezel or escutcheon in the same plane as the surrounding finished surface.

3. Mount so that there are no gaps, cracks or obvious lines between the trim and the adjacent finished surface and ready them to receive final finish, as applicable.
- C. Emergency Intercoms:
1. Install intercoms and strobe lights, square and plumb.
 2. Set "flush mounted" units so that the face of the cover, bezel or escutcheon located in the same plane as the surrounding finished surface.
 3. Mount so that there are no gaps, cracks or obvious lines between the trim and the adjacent finished surface and ready them to receive final finish, as applicable.

3.02 PROGRAMMING

- A. Prior to the completion of construction, schedule a meeting with the Owner to determine of the programming criteria. Discuss the following issues:
1. Emergency Phone Numbers
 2. Backup Phone Numbers
 3. CCTV camera call-up & recording requirements on activation of intercom
 4. CCTV camera call-up & recording requirements on activation of emergency phone
- B. Program the intercom system as required based on the results of the meeting.

3.03 TESTING

- A. Commission the intercom system in accordance with Section 13790.

END OF SECTION

SECTION 15240

MECHANICAL EQUIPMENT SOUND, VIBRATION AND SEISMIC CONTROL

PART 1 GENERAL

1.01 SUMMARY

- A. Work Included: Materials and installation of seismic restraint devices and related items. Provide complete vibration isolation systems in proper working order.
- B. Supply and install the following:
 - 1. Vibration isolation for all rotating equipment, inertia bases, and equipment support frames.
 - 2. Vibration isolation for piping and ductwork, including resilient attachments.
 - 3. Seismic restraints for all vibration isolated equipment, piping and ductwork.
- C. Supervision and inspection of installed vibration isolators and associated hardware.

1.02 CERTIFICATION DATA

- A. Bidders on the air handling devices and fans, terminal units, and sound attenuators must supply the appropriate inlet, outlet, radiated, discharge, and loss or regenerated octave band sound power level data, measure in accordance with the applicable ASHRAE or ANSI Specifications at a certified laboratory. The units selected should meet the Specification criteria of the tables in this Section and Equipment Schedules on Drawings. Do not consider units in excess of the listed values as appropriate for use on this project.

1.03 SEISMIC CONTROL AND RESTRAINT

- A. Mechanical Equipment:
 - 1. Brace or anchor mechanical equipment to resist horizontal force acting in any direction using CBC 2001.
 - 2. Vibration Isolated Equipment: Provide factory fabricated seismic restrained vibration isolating components. Earthquake resistant designs for mechanical equipment, i.e., air handling units, water heaters, blowers, motors, ductwork, mechanical and plumbing piping, to conform to the regulations of the CBC 2001. Where standard factory fabricated components are not available, provide properly designed custom components which meet the requirements herein.
 - 3. Provide any restraints noted on Drawings for Division 15 work.

B. Anchorage:

1. Where anchorage details are not shown on Drawings, the field installation subject to approval of the project structural engineer and DSA inspector.
2. All equipment bracing and anchorage shall comply with ISAT guidelines and seismic design criteria.
3. In other cases, retain a professional structural engineer licensed in the state in which the work will be done to provide shop drawings of seismic bracing for ductwork/equipment/water heaters. Professional engineer to design and provide wet stamped (sealed) shop drawings for equipment, ductwork, water heaters, and piping seismic bracing. Submit shop drawings and calculations along with equipment submittals.
4. The restraints which are used to prevent disruption of the function of the piece of equipment because of the application of the horizontal force to be such that the forces are carried to the frame of the structure in such a way that the frame will not be deflected when the apparatus is attached to a mounting base and equipment pad, or to the structure in the normal way, utilizing the attachments provided. Secure equipment to withstand a force in any direction.

C. Specify the seismic bracing and anchorage of piping in Section 15140 "Supports and Anchors."

D. Provide earthquake bumpers to prevent excessive motion during starting and stopping of equipment and for earthquake bracing. Install bumpers after equipment is in operation to allow proper placement and alignment and ensure that bumpers are not engaged during normal system operation.

1.04 ISOLATORS

- A. Isolators for a single piece of equipment to have approximately equal spring deflection.
- B. Ends of springs remain parallel during deflection.
- C. For each spring, provide built-in equipment leveling bolt.
- D. Equipment must be mounted absolutely level.
- E. Springs must be selected for additional 50 percent capacity to solid.
- F. Provide sheet neoprene pad, type E-1, minimum 1/4-inch thickness, bonded to underside of baseplate or spring to serve as noise breaker. Select pad area to achieve a static deflection between 0.04 and 0.06 inch.
- G. Design isolators installed out-of-doors to provide restraint due to wind loads of 30 lbs. psf, applied to any surface of equipment, without failure.
- H. Install isolators to be easily adjustable or removed for replacement.

- I. Use matching height-saving brackets as required to achieve a 1-1/2-inch clearance (plus or minus 1/2 inch) between base and housekeeping pad.
- J. Springs must be rigidly attached, by welding or other acceptable means, to base plate and top plate except for spring hangers.
- K. Design springs for minimum ratio of horizontal to vertical spring stiffness of 0.8 and minimum ratio of spring diameter to spring operating height of 0.8.
- L. Roof- or floor-mounted spring isolators to have bolt holes in bases and be anchored to structure with isolated restraining bolts. Isolate bolts from base with neoprene grommets and neoprene washers. Anchor bolts not to compress neoprene grommets and washers more than 10 percent of normal thickness.
- M. Bases sized to include equipment and motor without overhang.
- N. Structural beam or channel members to form perimeter framing. Beam depth 1/12th longest span except for maximum spans less than 6 feet to be 6 inches.
- O. Use diagonal beam or channel braces equal to 1/2 depth of perimeter beam when longest beam dimension exceeds 8 feet.
- P. Mount isolated motor-driven equipment with motors on common base of sufficient rigidity to maintain permanent alignment.
- Q. Bases to have clearance of 1-1/2 inches between top of floor and underside of base.

1.05 RUSTPROOFING

- A. General: Design vibration isolation hardware or treat for corrosion resistance.
- B. Isolators exposed to weather to have steel parts zinc electroplated, PVC coated, plus coating of neoprene or bitumastic paint. Etch aluminum components for outdoor installation and paint with industrial grade enamel.
- C. Nuts, bolts and washers zinc electroplated.
- D. Structural steel bases thoroughly cleaned of welding slag, primed with zinc chromate and finished with two coats of industrial enamel.

1.06 ELECTRICAL CONNECTIONS

- A. Make electrical connections to mechanical equipment motors through a flexible conduit designed to reduce motor vibration transfer into the rigid conduit which is directly attached to the building structure.
- B. Flexible Conduit: Sufficiently long to provide a 360 degree loop in the flex between the motor and the rigid conduit. Route conduit through side of equipment roof curb and attaching flexible conduit. Caulk around curb penetration water tight.
- C. Provide a soft neoprene bushing at the connection point between the flex and the rigid conduit to break the metal-to-metal contact.

- D. Ground wires from vibrating equipment to be flexible with sufficient slack to prevent vibration transfer. Ground wires must not directly contact structural membranes (floors, walls or ceilings) of the building.

1.07 QUALITY ASSURANCE

- A. Coordinate the size, location, and special requirements of vibration isolation equipment and systems with building systems. Coordinate plan dimensions of final selections and mechanical equipment with size of housekeeping pads.
- B. Supply and install any incidental materials needed to meet the requirements stated herein.
- C. Vibration isolation hardware must not be concealed until approval is obtained from the owner's field representative.
- D. Verify specified clearances; plumb installation of hanger rods and lack of interference (e.g., no contact is permitted with gypsum board, framing, ceiling wires, conduit, ducts, and piping).
- E. Verify proper vibration isolator loading and deflection.
- F. Vibration isolation supplier to generate punch list report for Construction Administrator's review.

1.08 SUBMITTALS

- A. Provide a complete description of products to be supplied including product data, dimensions and specifications. Provide installation instructions for each product.
- B. Provide a complete tabulation showing for each piece of vibration isolator supporting equipment the following:
 - 1. The equipment identification mark.
 - 2. The isolator type with rated load.
 - 3. The actual load per isolator.
- C. Provide fabrication/shop drawings of steel rails, inertia bases, steel base frames, reinforcing, vibration isolator mounting attachment method, unitary straps and location of equipment attachment bolts.
- D. Provide structural calculations for isolator seismic restraint for mechanical/plumbing equipment, sealed by a professional structural engineer, and registered in the state of California.
- E. Shop Drawings; see Section 01330, 15010 and Division 1.

PART 2 PRODUCTS

2.01 METAL PARTS INSTALLED OUT-OF-DOORS

- A. Cold dip galvanized, cadmium plated or neoprene coated after fabrication.

2.02 SEISMIC RESTRAINTS FOR PIPING AND DUCTWORK

- A. Use the document "Seismic Restraints Manual Guidelines for Mechanical Systems." Secure piping, ductwork, and the like to withstand a force in any direction.
- B. Sway bracing is not required for pipes that are installed on very short hangers (12 inches or less).
- C. Secure HVAC and plumbing piping bracing at every fourth hanger transversely and every eighth hanger longitudinally.
- D. As approved by code authority, use a bracing system manufactured by Superstrut, Mason, or Pipe Shields Inc., or approved.
- E. Design restraints to meet CBC standards. Provide structural engineering calculations sealed by a professional engineer registered in state of California.

2.03 EQUIPMENT

- A. Provide a means to prohibit excessive motion of mechanical equipment during an earthquake.
- B. Provide mechanical equipment, both hanging and base mounted, with mounting connection points of sufficient strength to resist lateral seismic forces equal to 0.5 of equipment operating weight.
- C. Design restraints to meet CBC standards. Provide structural engineering calculations sealed by a professional engineer registered in state of California.

2.04 FLOOR SPRING AND NEOPRENE (FSN)

- A. Freestanding and laterally stable without any housing. Spring diameter: Not less than 0.8 of the compressed height of the spring at the design load. Provide mounts with leveling bolts.
- B. Unhoused steel spring isolators with springs supported on resilient neoprene pads or cups. Lateral and vertical restraints to be accomplished by slack cables at each isolator. Braided steel slack cables and their attachments must be capable of withstanding an acceleration of 1 g in any direction.
- C. Spring Element in the Isolator: Set in a neoprene cup and have a steel washer to distribute the load evenly over the neoprene.
- D. Manufacturers: Supply vibration isolation mounts by a single manufacturer. Acceptable suppliers are as follows: Mason Type SLFH, Kinetics Type FDS-B, Vibrex Type RMS, and RMSG.

2.05 FLOOR SPRING AND NEOPRENE, TRAVEL LIMITED (FSNTL)

- A. Freestanding and laterally stable without any housing. Spring Diameter: Not less than 0.8 of the compressed height of the spring at the design load. Provide mounts with leveling bolts and vertical travel limit stops to control extension when weight is removed. Travel limit Stops: Capable of serving as blocking during erection of the equipment. Provide a minimum clearance of 1/4 inch around restraining bolts and between the limit stops and the spring to avoid interference with the spring action.
- B. Vertically restrained spring isolators incorporating a welded metal housing with neoprene grommets around the restraining bolts to prevent metal-to-metal contact. Isolators are to be capable of withstanding acceleration of 0.5 g in all directions.
- C. Manufacturers: Supply vibration isolation mounts by a single manufacturer. Acceptable suppliers are as follows: Mason Type SLR Series 100, Kinetics Type FLS, and Vibrex Type RMLS-EQ.

2.06 NEOPRENE PAD (NP)

- A. One layer of 5/16-inch thick ribbed or waffled neoprene, 40 to 50 durometer. Size pads for loading between 40 and 50 PSI.
- B. NP Isolators: Amber/Booth type NR.
- C. Manufacturers: Supply vibration isolation mounts by a single manufacturer. Acceptable suppliers are as follows: Amber/Booth Co. - A.B., Korfund Dynamics - K.D., Mason Industries, Inc. - M.I., Peabody Noise Control Inc. - P.N.C., Vibration Mountings & Controls, Inc. - V.M. &C., IAC, Koppers, Vibrex.

2.07 HANGER SPRING AND NEOPRENE (HSN)

- A. Freestanding, laterally stable steel spring and a neoprene element in series, contained within a steel housing. Provide a neoprene neck bushing (or other means) where the hanger rod passes through the hanger housing to prevent the rod from contacting the hanger housing. Provide spring diameters and hanger housing lower hole sizes large enough to permit the hanger rod to swing through a 30 degree arc before contacting the housing. Neoprene Element: 0.3 inch minimum static deflection.
- B. Spring isolation hangers containing a steel spring in series with a deflected neoprene element. The spring shall be seated in a neoprene cup with a washer to evenly distribute the load to the cup. The hole in the bottom of the spring housing must allow up to 30 degrees of misalignment vertically for the hanger rod. At equipment, lateral restraint is to be accomplished by slack cables.
- C. Manufacturers: Supply vibration isolation mounts by a single manufacturer. Acceptable suppliers are as follows: Mason Type 30N, Kinetics Type SRH, and Vibrex Type HXA.

2.08 SPRING ISOLATOR – CLASS “A – R”

- A. Class “A” spring isolators and independent seismic restraints (in lieu of slack cables)

to limit horizontal movement with neoprene padded snubbers to prevent metal-to-metal contact. Isolators and restraints must be capable of withstanding an acceleration of 1 g in all directions.

- B. Acceptable Products: Mason Type Z-1225, Kinetics Type KSS, and Vibrex Type SR 3500.

2.09 SPRING ISOLATOR – CLASS “F”

- A. Pipe isolators with clamps attached to unboxed steel spring isolators with neoprene pads and independent seismic restraints to limit horizontal movement with neoprene padded snubbers to prevent metal-to-metal contact. Isolators and restraints must be capable of withstanding an acceleration of 1 g in all directions.
- B. Acceptable Product: Vibrex Type PG-EQ.

2.10 SPRING ISOLATOR – CLASS “R”

- A. Vibration isolation roof curb having adjustable, removable and laterally stable steel springs and tube steel support curb. The lower member shall consist of a steel tube supporting steel springs suspending the floating upper frame. All directional neoprene snubber bushings shall be a minimum of 1/4-inch-thick. Steel springs shall rest on 1/4-inch neoprene pads. Provide leveling bolts. Hardware must be cadmium plated or galvanized and the springs plated or provided with a corrosion-resistant finish.
- B. Acceptable Products: Mason Type RSC, and Kinetics Type ESR.

2.11 SPRING ISOLATOR – CLASS “R – L”

- A. Vibration isolation roof curb having adjustable, free standing, and laterally stable steel springs and continuous steel support frames above and below the isolators. The lower frame shall support steel springs suspending the floating upper frame. All directional neoprene snubber bushings shall be a minimum of 1/4-inch-thick. Steel springs shall rest on 1/4-inch neoprene pads. Provide leveling bolts. Hardware must be cadmium plated or galvanized and the springs plated or provided with a corrosion-resistant finish.
- B. Acceptable Product: Mason Type ISC.

2.12 SPRING ISOLATOR – CLASS NPH

- A. Vibration isolation hangers containing deflected neoprene hangers capable of 0.20-inch static deflection. Hangers shall consist of a neoprene element with a bushing in the housing to prevent metal-to-metal contact with the hanger rod. At equipment and pipe trapezes, lateral restraint is to be accomplished by slack cables.
- B. Acceptable Products: Mason Type HD, Kinetics Type RH-B&C, and Vibrex Type HSS.

2.13 SPRING ISOLATOR – CLASS NM

- A. Neoprene mounts shall be deflected capable of 0.30-inch static deflection or greater. Neoprene coat all metal surfaces to prevent corrosion and incorporate friction pads under base plate. Provide bolt holes in top plate to bolt equipment to isolator.
- B. Acceptable Products: Mason Type ND, Kinetics Type RD, and Vibrex Type DD.

2.14 SPRING ISOLATOR – CLASS CNPM

- A. Captive neoprene mounts capable of 0.20-inch static deflection in compression, 0.175-inch static deflection in tension and 0.125-inch deflection in shear.
- B. Acceptable Product: Mason Type BR.

2.15 SPRING ISOLATOR – CLASS NP

- A. Vibration isolation shall be 3/4-inch-thick ribbed or waffled neoprene pads. The pads shall be 40-50 durometer and selected for 40-50 psi loading and selected for 0.125-inch deflection.
- B. Acceptable Products: Mason Type SW, Kinetics Type NGB, and Vibrex Type ISO-Cube.

2.16 RESILIENT – CLASS “G – 1”

- A. Three-quarter inch nominal thickness resilient pipe sleeve between pipe and clamp or hanger.
 - 1. Operating temperature at or below 180° F and outside plenums: Armacell AP Armaflex Pipe Insulation, or equivalent.
 - 2. Operating temperature above 180° F, or in plenums: Preformed glass fiber pipe insulation not exceeding 6 pcf.

2.17 RESILIENT – CLASS “G – 2”

- A. Manufactured insulated hanger: Stoneman Trisolator Series 100 and 500 (310-323-7682), Hydro-craft Econo-isolator (702-566-8798), or approved equivalent.

2.18 RESILIENT – CLASS “G – 3”

- A. Manufactured resilient attachment for water pipes one inch and less diameter: LSP Products Group, Acousto-Plumb (775-884-4242).

2.19 FLEXIBLE DUCT CONNECTIONS (FDC)

- A. Neoprene loaded vinyl material or neoprene loaded canvas with vapor barrier. Flame spread rating of 25 or less, and a smoke spread rating of 50 or less, per ASTM E84. Not affected by temperatures as low as minus 10F, or as high as 200F.
- B. Flexible Connections: Ventglas manufactured by Ventfabrics, Amatex, or approved.

2.20 FLEXIBLE PIPE CONNECTIONS (FPC)

- A. Straight, double sphere shape fabricated of multiple plies of nylon cord, fabric and neoprene, vulcanized so as to become inseparable and homogenous. Able to accept compressive, elongative, transverse and angular movements.
- B. Select and fit to suit the system temperature, pressure and fluid type. Do not use rods or cables to control extension of the connector.
- C. Pipe Sizes 2 Inches or Smaller: Threaded female union couplings on each end. Larger sizes: Metallic flange couplings.
- D. Flexible connections for the air distribution system shall be fabricated from glass fabric coated with neoprene or other approved material and weighing a minimum 30 oz. per square yard. The minimum clear dimension of the flexible connectors, not including the clamping section, shall be 6 inches.
- E. Flexible connectors for piping systems shall be rated for operating pressure, temperature and fluid type. At water piping, provide:
 - 1. Inside diameter 2-1/2 inches and larger: Mason Type Safeflex SFDEJ.
 - 2. Inside diameter 3/4 inch to 2 inches: Mason Type MFTFU.
 - 3. Inside diameter 1/2 inch: Mason Type RMM.
- F. Select thrust restraints incorporating steel springs having an operating static deflection that is equal to the static deflection of vibration isolators supporting the equipment. Provide a minimum of two thrust restraints to restrain forces acting along the axis of thrust and prevent skewing or rotation of equipment during operation: Compression thrust restraint: Mason WBI.
- G. Refrigerant Pipe: Flexonics 301 bronze, minimum 18-inch live length.
- H. Connections to match piping system.

2.21 GROMMETS

- A. Combine a neoprene washer and sleeve.
- B. Isogrommets manufactured by MBPS, Inc.
- C. Series W by Barry Controls, or approved.
- D. Neoprene Durometer: Between 40 and 50. Grommets: Specially formed to prevent fastening bolts from directly contacting the isolator base plate.

2.22 RESILIENT NONHARDENING SEALANT

- A. Sealants for Acoustical Purposes: DAP acoustical sealant.
- B. Manufacturers: Pecra, Tremco, USG, or approved.
- C. Sealant to meet LEED EQ Credit 4.1.

2.23 FOAM RUBBER

- A. Foam Rubber Sheets: Armstrong Armaflex, or approved.

2.24 SNUBBERS

- A. Heavy duty construction to withstand 1.0G acceleration. Neoprene coated.

2.25 SEISMIC PIPE LOOPS

- A. General: Seismic connectors for straight pipe runs to be designed with sufficient live length on each flexible leg to provide the minimum movement in directions as required by movement allowed at joint. Verify with structural total movement required in planes and list with submittal.
- B. Materials: Type 321 stainless steel hose and braid, with carbon steel elbows and ends. Flanged connectors will be used in steel piping 2-1/2 inches or larger, and threaded connectors for piping smaller than 2-1/2 inches. Carbon steel FNPT drain port will be utilized on connectors. For copper piping systems, manufacture connectors with bronze hose and braid and copper elbows and sweat ends. Guide seismic connectors per manufacturer's guidelines.
- C. Pressure Rating: 150 PSI.
- D. Manufacturers: Unisource, Metraflex, or approved.

2.26 ACOUSTICAL WRAP

- A. Sound barrier material, designed specifically for sound control, apply for duct/pipe lag material, for indoor or outdoor use. 2.54 mm (0.10 inch) thick barium sulfate loaded limp vinyl sheet bonded to a thin layer of reinforced aluminum foil, on one or both sides:

- 1. Nominal density: 1.0 lb./ft²
- 2. Thermal Conductivity K: 0.29 BTU-in/hr-ft²-°F
- 3. Rated service Temperature range: -40°F to 220°F
- 4. Flamespread: 10 (ASTM E84)
- 5. Smoke Developed: 40 (ASTM E84)
- 6. Minimum STC: 27
- 7. Corrosion resistance: most oil, grease, acids and mid alkalis

- B. Sound Transmission Loss (STC):

Frequency	125	250	500	1000	2000	4000	STC
Transmission Loss dB	15	19	21	28	33	37	2

- C. Manufacturers: Kinetic Noise Control, Inc. (KNM-100AL), Thermafiber Industrial Felt, or approved.

2.27 ACCESS PANELS

- A. Provide flush mounting access panels as required for service of fire dampers, cleanouts, valves, and the like, and other items requiring maintenance or inspection. Where access panels are located in fire-rated assemblies of building, rate access panels accordingly. Ceiling access panels to be minimum 24x24 (or required and approved size). Wall access panels to be minimum 12x12 (or required and approved size).
- B. Manufacturers: Milcor, Karp, Elmdor, In-Ryko, Acudor, or approved. Provide two keys for each set of locks provided.

PART 3 EXECUTION

3.01 APPLICATION

- A. General:
 - 1. Install flexible duct connections at fan unit intakes, fan unit discharges, and wherever else shown on Drawings.
 - 2. Install flexible pipe connections (FPC) at pipe connections to vibration isolated equipment.
 - 3. Isolate miscellaneous pieces of mechanical equipment, i.e., storage tanks, and expansion tanks from the building structure by NP or HN isolators.
 - 4. Provide mounts for equipment installed outdoors for wind loads of 30 lbs. psf applied to any exposed surface of the isolated equipment.
 - 5. Under no circumstances destroy isolation efficiency by bolting the isolators to the roof or floor or equipment. If bolting is necessary, provide rubber grommets and washers to isolate the bolt from the base plate.
 - 6. Building Penetrations: Isolate water piping and ductwork penetrating wall, ceilings, floors or shafts from the structure by piping isolator or by 3/8-inch thick foamed rubber insulation. Install units flush with finished structure face, using one for each side as required. Cut units to length if longer than structure thickness. Caulk around pipe or duct at equipment room wall.
 - 7. Hot and Cold Plumbing Pipes: Isolate hot and cold water piping in plumbing chases and walls behind plumbing fixtures, which are adjacent to occupied areas, from the structure by a piping isolator, Cush-A-Strip S-716, or a 6-inch section of 3/8-inch thick foamed plastic between the hanger and pipe.
Contractor's Option: Acousto-Plumb System using plastic bushings.
 - 8. Pipe and Duct Hangers in Equipment Rooms: Support water and ducts connected to rotating equipment within the equipment rooms on spring and neoprene hangers. The first three hangers from a piece of vibrating equipment to have a minimum of 1/2 the static deflection of that of the equipment isolators. Other isolators should have a minimum of 1/4 the static deflection of that of the equipment.

- B. Drain Service Piping Connected to Vibration Isolated Equipment: Do not contact the building structure or other nonisolated system unless it is resiliently mounted as described above.

3.02 VIBRATION ISOLATION EQUIPMENT INSTALLATION

- A. General: Install vibration isolation equipment in accordance with the manufacturer's written instructions.
- B. Isolation Mounts:
 - 1. Squarely align vibration isolators above or below mounting points of the supported equipment.
 - 2. If a housekeeping pad is provided, install isolators such that they bear on the housekeeping pad and the isolator base plate rests entirely on the pad.
 - 3. Connect hanger rods for vibration isolated support to structure. Provide intermediate members as necessary.
 - 4. Position vibration isolation hanger elements as high as possible in the hanger rod assembly but not in contact with the building structure. Install hangers so that the hanger housing may rotate a full 360 degrees about the rod axis without contacting any object.
 - 5. Where parallel running pipes are hung together on a trapeze which is isolated from the building, provide isolator deflections for the largest determined by provisions for pipe isolation. Do not mix isolated and nonisolated pipes in the same trapeze.
 - 6. Install resiliently isolated pipes such that they do not contact any rigid building structure or equipment.
 - 7. Install FSNTL isolators such that the installed and operating heights of vibration isolated equipment are identical. Install limit stops so that they are out of contact during normal operation.
 - 8. Adjust leveling bolts and hanger rod bolts so the isolated equipment is level and in proper alignment with connecting ducts or pipes.
- C. Inertia Bases: Unless otherwise indicated, provide a minimum operating clearance of 1-1/2 inches between structural steel frames and the concrete housekeeping pad or floor beneath the equipment. Position isolator mounting brackets so that the required clearance is maintained. Check the clearance space to ensure that no construction debris has been left to short circuit or restrict the proper operation of the vibration isolation system.
- D. Flexible Duct Connections: Squarely align sheet metal ducts or plenum openings with the fan discharge, fan intake or adjacent duct section prior to installation of the flexible connection, so that the clear length is approximately equal all the way around the perimeter. Install connections such that the fan unit or adjacent duct section is able to move 1 inch in any direction without causing metal-to-metal contact or

stretching taught the flexible connection. Install the connections so that the clear space between ducts is a minimum of 4 inches, and the connection has a minimum of 1-1/2 inches of slack material. Install flexible connections per ISAT.

- E. Flexible Pipe Connections: Install flexible pipe connections to minimize initial misalignment.
- F. Foam Rubber: Provide foam rubber sheets between fan bases and roof mounted equipment curbs and between rooftop mounted HVAC equipment and their curbs.
- G. Anchorage: Adequately anchor or brace mechanical equipment, piping and ductwork to resist displacement due to seismic action.
- H. Suspend the vibration isolators supporting piping and equipment from structural members.
- I. Provide a minimum of one-inch clearance between the building structure and vibration isolated supports, ducts, pipes, and equipment.
- J. Provide 2-inch minimum clearance under vibration-isolated equipment and the top of the housekeeping pad and/or steel equipment support frames.
- K. Subsequent to proper alignment, fasten all vibration isolators to the structure. Use bolts where holes are provided in the mounting flange; otherwise, adhere using structural adhesive. Where mounting flanges are steel, use neoprene grommets and washers to isolate anchor bolts from base plates.
- L. Do not use vibration isolation components to straighten or connect misaligned sections of piping or ductwork.
- M. Align spring isolation hanger rods to clear the hanger box under all operating conditions.
- N. Any bracing or supports for mechanical ductwork, piping, and equipment shall not bridge or reduce the effectiveness of vibration isolators.
- O. Install flexible connectors at all connections to vibration-isolated equipment.
- P. Install slack cables at all vibration isolated equipment that is to be restrained using steel braided cables appropriately sized and attached for the loads.
- Q. Level vibration isolated equipment under rated design operating conditions while maintaining the isolation criteria. Isolators shall be plumb and aligned during operation.

3.03 DUCTWORK ISOLATION

- A. Support all medium and high-pressure ductwork and plenums in or above all spaces with an NC 25 or less rating, as defined in Section 15990, using Class NPH or Class NM isolators selected to provide a static deflection of 0.25 inches.
- B. Support all ductwork in shaft and within 30 feet of fans, air handlers or packaged

units using Class NPH or Class NM isolators selected to provide a static deflection of 0.25 inches.

- C. Sheet metal band supports are not permitted on ducts suspended on vibration isolators. Use threaded rods or other indicated support.
- D. Do not suspend ducts from piping, plumbing, conduits, or related supports.

3.04 PIPING ISOLATION

- A. Vibration isolate all pipes in sound-rated construction except vents, gas, and sprinkler lines. Do not allow piping, plumbing, or vent stacks to contact gypsum board.
- B. Do not suspend plumbing or piping from ducts, conduits, or related supports.
- C. Isolate pipes 3 inch diameter and greater attached to the inlet and discharge of prime movers and pressure-reducing valves using Class FSN or HSN isolators selected to provide one inch static deflection for the first six points of support.
- D. Isolate the remainder of pipes 3-inch diameter and greater using Class NPH or CNM isolators selected to provide a static deflection of 0.2 inches. Use Class NP resilient pads under pipe elbows supported from the floor.
- E. Pipes less than 3 inches diameter attached to primer movers and pressure-reducing valves are to be isolated for a minimum of 25 feet from the inlet and discharge. Use Class NPH isolators for vibration isolation hangers and Class NM for floor-supported mounts selected to provide a static deflection of 0.2 inches. Use Class NP resilient pads under pipe elbows supported from the floor. Where these pipes have 3/4-inch-thick or greater resilient thermal insulation between the pipe and the pipe hanger, vibration isolators are not required.
- F. Domestic water lines and HVAC piping in sound-rated construction are to be isolated using Class "G-1," "G-2" or "G-3" resilient attachments as appropriate.
- G. Waste pipes and rain water leaders in sound-rated spaces are to be attached using Class "G-1" resilient attachments in horizontal isolator runs and in vertical runs Class NM underneath the supporting clamps. Use Class NP resilient pads under pipe elbows supported from the floor.
- H. All other individual pipes in sound-rated construction shall be isolated using Class "G-1" resilient attachments in walls and Class "G-2" attachments beneath floors and above ceilings. For pipes less than 3 inches in diameter with resilient thermal insulation between the pipe and pipe support, resilient attachments are not required.
- I. All other grouped pipes shall be isolated by using Class NPH vibration isolators supporting trapeze hangers and selected to provide a static deflection of 0.2 inches. Grouped floor-supported pipes shall be isolated using Class CNM isolators selected to provide a static deflection of 0.15 inches. Where vertical orientation of the isolator attachment base is required, use Class CNM vibration isolator.

3.05 ADJUSTING AND CLEANING

- A. Clean each vibration isolator. Verify that each is working freely, and that there is no debris in the immediate vicinity of the unit that could short circuit unit isolation.

3.06 ACCESS PANELS

- A. Install wall and ceiling access panels to provide access to concealed valves, fans, motors, shock arrestors, fire dampers, terminal units, coils and other mechanical items needing service. Provide access panels at locations required or specified herein. Coordinate locations/sizes of access panels with Architect prior to work.

END OF SECTION