SECTION 28 23 00

VIDEO SURVEILLANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes a video surveillance system consisting of cameras, digital video recorder, data transmission wiring, and a control station with its associated equipment.

1.3 DEFINITIONS

A. AGC: Automatic gain control.

B. BNC: Bayonet Neill-Concelman - type of connector.

C. B/W: Black and white.

D. CCD: Charge-coupled device.

E. FTP: File transfer protocol.

F. IP: Internet protocol.

G. LAN: Local area network.

H. MPEG: Moving picture experts group.

I. NTSC: National Television System Committee.

J. PC: Personal computer.

K. PTZ: Pan-tilt-zoom.

L. RAID: Redundant array of independent disks.

M. TCP: Transmission control protocol - connects hosts on the Internet.

N. UPS: Uninterruptible power supply.

O. WAN: Wide area network.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Video surveillance system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include dimensions and data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For video surveillance. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes.

3. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.

4. UPS: Sizing calculations.

5. Wiring Diagrams: For power, signal, and control wiring.

C. Equipment List: Include every piece of equipment by model number, manufacturer, serial number, location, and date of original installation. Add pretesting record of each piece of equipment, listing name of person testing, date of test, set points of adjustments, name and description of the view of preset positions, description of alarms, and description of unit output responses to an alarm.

D. Seismic Qualification Certificates: For video surveillance, cameras, camera-supporting equipment, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Field quality-control reports.

F. Operation and Maintenance Data: For cameras, power supplies, infrared illuminators, monitors, videotape recorders, digital video recorders, video switches, and control-station components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Lists of spare parts and replacement components recommended to be stored at the site for ready access.

G. Warranty: Sample of special warranty.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NECA 1.

C. Comply with NFPA 70.

D. Electronic data exchange between video surveillance system with an access-control system shall comply with SIA TVAC.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Control Station: Rated for continuous operation in ambient temperatures of 60 to 85 deg F (16 to 29 deg C) and a relative humidity of 20 to 80 percent, noncondensing.

2. Interior, Controlled Environment: System components, except central-station control unit, installed in air-conditioned interior environments shall be rated for continuous operation in

ambient temperatures of 36 to 122 deg F (2 to 50 deg C) dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.

3. Interior, Uncontrolled Environment: System components installed in non-air-conditioned interior environments shall be rated for continuous operation in ambient temperatures of 0 to 122 deg F (minus 18 to plus 50 deg C) dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type 3R enclosure.

4. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 deg F (minus 34 to plus 50 deg C dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 110 mph. Use NEMA 250, Type 3R enclosure.

5. Security Environment: Camera housing for use in outdoor areas where surveillance equipment may be subject to physical violence.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of cameras, equipment related to camera operation, and control-station equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. Video-signal format shall comply with NTSC standard, composite interlaced video. Composite video-signal termination shall be 75 ohms.

B. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.

C. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station, control-unit alarm display shall identify tamper alarms and indicate locations.

2.2 STANDARD CAMERAS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AXCESS International Inc.
2. Bosch Security Systems, Inc.
3. CBC (AMERICA) Corp.
4. COP-USA.
5. Crest Electronics, Inc.
6. Elbex Ltd.; Elbex America Inc.
7. ELMO.
8. EverFocus Electronics Corporation.
9. GENWAC; a brand of Watec Cameras.

10. GE Security, Inc.
11. Hitachi, Ltd.
12. Honeywell International Inc.; Honeywell Video Systems.
13. Hunt Electronics USA, Inc.
14. Ikegami Electronics (USA) Inc.
15. JVC Americas Corp.; JVC Professional products.
16. Merit Li-Lin (USA) Corp.
17. Panasonic Corporation of North America; Panasonic Security Systems.
18. Pelco.
19. Pixera Corporation.
20. Safety Vision.
21. Samsung Opto-Electronics.
22. SANYO North America Corporation.
23. Telpix Electronics, Inc.
24. Toshiba Corporation; Surveillance products.
25. Trinus Systems Inc.
26. Tyco International Limited; Sensormatic products.
27. VELTEK.
28. Vicon Industries, Inc.
29. Videology Imaging Solutions, Inc.
30. Visiontech.
31. Watec America Corporation.

B. Automatic Color Dome Camera: Assembled and tested as a manufactured unit, containing dome assembly, color camera, motorized pan and tilt, zoom lens, and receiver/driver.

1. Comply with UL 639.
2. Pickup Device: CCD interline transfer, 380,000 768(H) by 494(V) pixels.
3. Horizontal Resolution: 480 lines.
4. Signal-to-Noise Ratio: Not less than 50 dB, with camera AGC off.
5. With AGC, manually selectable on or off.
6. Sensitivity: Camera shall provide usable images in low-light conditions, delivering an image at a scene illumination of 6 lux at f/2.0 with camera AGC off.
7. Sensitivity: Camera shall deliver 1-V peak-to-peak video signal at the minimum specified light level. Illumination for the test shall be with lamps rated at approximately 2200-K color temperature, and with camera AGC off.
8. Manually selectable modes for backlight compensation or normal lighting.
9. Pan and Tilt: Direct-drive motor, 360-degree rotation angle, and 180-degree tilt angle. Pan-and-tilt speed shall be controlled by operator. Movement from preset positions shall be not less than 300 degrees per second.

10. Preset Positioning: Eight user-definable scenes, each allowing 16-character titles. Controls shall include the following:

    a. In "sequence mode," camera shall continuously sequence through preset positions, with dwell time and sequencing under operator control.

    b. Motion detection shall be available at each camera position.

    c. Up to four preset positions may be selected to be activated by an alarm. Each of the alarm positions may be programmed to output a response signal.

11. Scanning Synchronization: Determined by external synch over the coaxial cable. Camera shall revert to internally generated synchronization on loss of external synch signal.

12. White Balance: Auto-tracing white balance, with manually settable fixed balance option.

13. Motion Detector: Built-in digital.

14. Dome shall support multiplexed control communications using coaxial cable recommended by manufacturer.

2.3 REINFORCED DOME CAMERAS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Extreme CCTV Surveillance Systems.

B. Camera: Designed for high-abuse locations, with a weathertight surface mounting, impact-resistance polycarbonate dome, and heavy-gage, 6061 T6 aluminum body.

1. Suitable for exterior environment, rated for continuous operation in ambient temperatures of minus 40 to plus 122 deg F (minus 40 to plus 50 deg C) dry bulb and up to 85 percent relative humidity.

2. Pickup Device: CCD interline transfer, 290,000 510(H) by 492(V) pixels.

3. Horizontal Resolution: 350 lines.

4. Signal-to-Noise Ratio: Not less than 46 dB.

5. With AGC and automatic backlight compensation.

6. Sensitivity: Camera shall provide usable images in low-light conditions, delivering an image at a scene illumination of 6 lux at f/2.0.

7. Scanning Synchronization: Determined by external synch over the coaxial cable. Camera shall revert to internally generated synchronization on loss of external synch signal.

8. White Balance: Auto-tracing white balance.

2.4 LENSES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Bosch Security Systems, Inc.

2. CBC (AMERICA) Corp.

3. COP-USA.

4. Crest Electronics, Inc.

5. Elbex Ltd.; Elbex America Inc.
6. GENWAC; a brand of Watec Cameras.
7. GE Security, Inc.
8. Hitachi, Ltd.
9. Honeywell International Inc.; Honeywell Video Systems.
10. Hunt Electronics USA, Inc.
11. International Space Optics; Rainbow CCTV products.
12. Panasonic Corporation of North America; Panasonic Security Systems.
13. Pelco.
14. Samsung Opto-Electronics.
15. SANYO North America Corporation.
16. Tamron USA, Inc.; Industrial Optics Division.
17. Telpix Electronics, Inc.
18. Tyco International Limited; Sensormatic products.
19. VELTEK.
20. Vicon Industries, Inc.
21. Videology Imaging Solutions, Inc.
22. Watec America Corporation.

B. Description: Optical-quality coated lens, designed specifically for video-surveillance applications and matched to specified camera. Provide color-corrected lenses with color cameras.

1. Auto-Iris Lens: Electrically controlled iris with circuit set to maintain a constant video level in varying lighting conditions.
2. Fixed Lens: With calibrated focus ring.
3. Zoom Lens: Motorized, remote-controlled unit, rated as "quiet operating." Features include the following:
   a. Electrical Leads: Filtered to minimize video signal interference.
   b. Motor Speed: Variable.
   c. Lens shall be available with preset positioning capability to recall the position of specific scenes.

2.5 POWER SUPPLIES

A. Low-voltage power supplies matched for voltage and current requirements of cameras and accessories, and of type as recommended by manufacturer of camera, infrared illuminator, and lens.

1. Enclosure: NEMA 250, Type 3R

2.6 CAMERA-SUPPORTING EQUIPMENT

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Bosch Security Systems, Inc.

2. CBC (AMERICA) Corp.
3. COP-USA.
4. Crest Electronics, Inc.
5. Elbex Ltd.; Elbex America Inc.
6. ELMO.
7. EverFocus Electronics Corporation.
8. GENWAC; a brand of Watec Cameras.
9. GE Security, Inc.
10. Honeywell International Inc.; Honeywell Video Systems.
11. Ikegami Electronics (USA) Inc.
12. Merit Li-Lin (USA) Corp.
13. Panasonic Corporation of North America; Panasonic Security Systems.
14. Pelco.
15. Samsung Opto-Electronics.
16. SANYO North America Corporation.
17. Telpix Electronics, Inc.
18. Tyco International Limited; Sensormatic products.
19. VELTEK.
20. Vicon Industries, Inc.
21. Videolarm.
22. Video Mount Products.
23. Visiontech.
24. Wren Associates Limited.

B. Minimum Load Rating: Rated for load in excess of the total weight supported times a minimum safety factor of two.

C. Pan-and-Tilt Units: Motorized units arranged to provide remote-controlled aiming of cameras with smooth and silent operation, and equipped with matching mounting brackets.

1. Panning Rotation: 0 to 355 degrees, with adjustable stops.
2. Tilt Movement: 90 degrees, plus or minus 5 degrees, with adjustable stops.
3. Speed: 12 degrees per second in both horizontal and vertical planes.
4. Wiring: Factory prewired for camera and zoom lens functions and pan-and-tilt power and control.
5. Built-in encoders or potentiometers for position feedback, and thermostat-controlled heater.
6. Pan-and-tilt unit shall be available with preset positioning capability to recall the position of a specific scene.

D. Mounting Brackets for Fixed Cameras: Type matched to items supported and mounting conditions. Include manual pan-and-tilt adjustment.

E. Protective Housings for Fixed and Movable Cameras: Steel or 6061 T6 aluminum enclosures with internal camera mounting and connecting provisions that are matched to camera/lens combination and mounting and installing arrangement of camera to be housed.

1. Tamper switch on access cover sounds an alarm signal when unit is opened or partially disassembled. Central-control unit shall identify tamper alarms and indicate location in alarm display. Tamper switches and central-control unit are specified in Division 28 Section "Intrusion Detection."

2. Camera Viewing Window: Lexan window, aligned with camera lens.

3. Duplex Receptacle: Internally mounted.

4. Alignment Provisions: Camera mounting shall provide for field aiming of camera and permit removal and reinstallation of camera lens without disturbing camera alignment.

5. Built-in, thermostat-activated heater and blower units. Units shall be automatically controlled so the environmental limits of the camera equipment are not exceeded.

6. Sun shield shall not interfere with normal airflow around the housing.

7. Mounting bracket and hardware for wall or ceiling mounting of the housing. Bracket shall be of same material as the housing; mounting hardware shall be stainless steel.

8. Finish: Housing and mounting bracket shall be factory finished using manufacturer's standard finishing process suitable for the environment.

9. Enclosure Rating: NEMA Type 3R.

2.7 MONITORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Bosch Security Systems, Inc.

2. CBC (AMERICA) Corp.

3. COP-USA.

4. Crest Electronics, Inc.

5. Elbex Ltd.; Elbex America Inc.

6. ELMO.

7. EverFocus Electronics Corporation.

8. GENWAC; a brand of Watec Cameras.

9. GE Security, Inc.

10. Hitachi, Ltd.

11. Honeywell International Inc.; Honeywell Video Systems.

12. Hunt Electronics USA, Inc.

13. Ikegami Electronics (USA) Inc.

14. International Space Optics; Rainbow CCTV products.

15. JVC Americas Corp.; JVC Professional products.

16. Merit Li-Lin (USA) Corp.

17. Panasonic Corporation of North America; Panasonic Security Systems.

18. Pelco.
19. Samsung Opto-Electronics.
20. SANYO North America Corporation.
21. Tatung Company of America, Inc.
22. Telpix Electronics, Inc.
23. Toshiba Corporation; Surveillance products.
24. Trinus Systems Inc.
25. Tyco International Limited; Sensormatic products.
26. VELTEK.
27. Vicon Industries, Inc.

B. Color:

1. Metal cabinet units designed for continuous operation.
2. Screen Size (Diagonal Dimension): 24".
3. Horizontal Resolution: 300 lines.
4. Minimum Front Panel Devices and Controls: Power switch; power-on indicator; and brightness, contrast, color, and tint controls.
5. Degaussing: Automatic.
6. Mounting: Single, 14-inch (356-mm), vertical, EIA 19-inch (483-mm) electronic equipment rack or cabinet complying with CEA 310-E.
7. Electrical: 120-V ac, 60 Hz.

2.8 DIGITAL VIDEO RECORDERS

A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

B. Basis-of-Design Product: Subject to compliance with requirements, provide [product indicated on Drawings] <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

1. AXCESS International Inc.
2. Bosch Security Systems, Inc.
3. CBC (AMERICA) Corp.
4. COP-USA.
5. Crest Electronics, Inc.
6. Dedicated Microcomputers Limited; Dedicated Micros USA.
7. Elbex Ltd.; Elbex America Inc.
8. EverFocus Electronics Corporation.
9. GE Security, Inc.
10. Hitachi, Ltd.
11. Honeywell International Inc.; Honeywell Video Systems.
12. Ikegami Electronics (USA) Inc.

13. JVC Americas Corp.; JVC Professional products.
14. Panasonic Corporation of North America; Panasonic Security Systems.
15. Pelco.
16. Samsung Opto-Electronics.
17. SANYO North America Corporation.
18. Tyco International Limited; Sensormatic products.
19. VELTEK.
20. Vicon Industries, Inc.
21. <Insert manufacturer's name>.

C. Description: Digital, time-lapse type, full-frame and motion recorder, with removable hard drive.

1. Recording Time: 400 hours minimum.
2. Resolution: 720 by 480 lines, minimum.
3. Programming shall be from trackball and push buttons on face of the recorder, settings shall be displayed on any video monitor connected to the recorder. Programming shall include the following:
   a. Motion analysis graph.
   b. Password protection.
   c. Alarm and timer controls.
   d. Continuous recording option.
   e. Time-lapse operating modes.
   f. Search video by time, event, or motion.
4. Programming: SmartMedia card for software updating, image archiving, and image transfer to a PC.
5. Storage: 1 TB, removable hard drive. Software shall permit hot-swapping drives.
6. Compression: MPEG-2.
7. Time and Date Generator: Records time (hr:min:sec) and date legend of each frame.
8. Audio Recording: 70 to 7000 Hz. Phono and microphone input; phono output.
9. Mounting: Standard 19-inch (483-mm) rack complying with CEA 310-E, or freestanding desktop.

2.9 DIGITAL SWITCHERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AXCESS International Inc.
2. Bosch Security Systems, Inc.
3. CBC (AMERICA) Corp.
4. Communications Specialties, Inc.
5. Convision Systems GmbH.
6. COP-USA.

7. Crest Electronics, Inc.
8. Dedicated Microcomputers Limited; Dedicated Micros USA.
9. Elbex Ltd.; Elbex America Inc.
10. EverFocus Electronics Corporation.
11. GE Security, Inc.
12. Honeywell International Inc.; Honeywell Video Systems.
13. Hunt Electronics USA, Inc.
14. Ikegami Electronics (USA) Inc.
15. JVC Americas Corp.; JVC Professional products.
16. Merit Li-Lin (USA) Corp.
17. Panasonic Corporation of North America; Panasonic Security Systems.
18. Pelco.
19. Samsung Opto-Electronics.
20. SANYO North America Corporation.
21. Telpix Electronics, Inc.
22. Toshiba Corporation; Surveillance products.
23. Trinus Systems Inc.
24. Tyco International Limited; Sensormatic products.
25. VELTEK.
26. Vicon Industries, Inc.

B. Quad Switch: For displaying images from four cameras on a single monitor. Provide color switcher if one or more cameras or monitors are in color.

1. Controls: Unit-mounted front panel.
2. Resolution: 720 by 480.
3. Modes: Auto, manual, and alarm. In manual mode, each channel can also be viewed in single display mode. In the event of an alarm, alarming channel shall automatically switch to full screen. If several alarms are activated, channels in alarm shall be in auto-switching mode.
4. Channel Loss Alarm: Audible buzzer; occurrence details shall be recorded.
5. Time: Indicate date and time.
6. Timing of Auto-Switcher: 1 to 30 seconds, selectable.
7. Mounting: Standard 19-inch (483-mm) rack complying with CEA 310-E, or freestanding desktop.

C. Manual Switch Bank: Low-loss, high-isolation, multiple-video switch to allow manual switching of multiple quad switches and cameras to a single output. Switches shall be illuminated.

D. Sequential Switchers: Automatically sequence outputs of multiple cameras to single monitor and videotape recorder.

1. Switching Time Interval: Continuously adjustable, 5 to 20 seconds minimum, with manual override.

2. Skip-Sequential-Hold Switch: One for each camera, with LED to indicate active camera.

3. Camera Identification Legend: Either on-screen message or label at skip-sequential switch.

4. Alarm Switching: In the event of an alarm, alarming channel shall automatically switch the monitor to full screen.

5. Mounting: Standard 19-inch (483-mm) rack complying with CEA 310-E.

E. PTZ Controls: Arranged for multiple-camera control, with switches to select camera to be controlled.

1. Pan-and-Tilt Control: Joystick type.

2. Zoom Control: Momentary-contact, "in-out" push button.

3. Automatic-Scan Control: A push button for each camera with pan capability that places camera in automatic-scanning mode.

2.10 CONTROL STATIONS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AXCESS International Inc.

2. Bosch Security Systems, Inc.

3. CBC (AMERICA) Corp.

4. COP-USA.

5. Crest Electronics, Inc.

6. Elbex Ltd.; Elbex America Inc.

7. GE Security, Inc.

8. Honeywell International Inc.; Honeywell Video Systems.

9. Panasonic Corporation of North America; Panasonic Security Systems.

10. Pelco.

11. Samsung Opto-Electronics.

12. SANYO North America Corporation.

13. Tyco International Limited; Sensormatic products.

14. VELTEK.

15. Vicon Industries, Inc.

B. Description: Heavy-duty, freestanding, modular, metal furniture units arranged to house electronic equipment. Coordinate component arrangement and wiring with components and wiring of other systems.

C. Equipment Mounting: Standard 19-inch (483-mm) rack complying with CEA 310-E.

D. Normal System Power Supply: 120 V, 60 Hz, through a locked disconnect device and an isolation transformer in central-station control unit. Central-station control unit shall supply power to all components connected to it unless otherwise indicated.

E. Power Continuity for Control Station: Batteries in power supplies of central-station control units and individual system components shall maintain continuous system operation during outages of both normal and backup ac system supply.

1. Batteries: Rechargeable, valve-regulated, recombinant, sealed, lead-acid type with nominal 10-year life expectancy. Capacity adequate to operate portions of system served including audible trouble signal devices for up to four hours and audible and visual alarm devices under alarm conditions for an additional 10 minutes.

2. Battery Charger: Solid-state, fully automatic, variable-charging-rate type. Charger shall recharge fully discharged battery within 24 hours.

F. Annunciation: Indicate change in system condition and switching of system or component to backup power.

2.11 SIGNAL TRANSMISSION COMPONENTS

A. Cable: Coaxial cable elements have 75-ohm nominal impedance. Comply with requirements in Division 28 Section "Conductors and Cables for Electronic Safety and Security."

B. Video Surveillance Coaxial Cable Connectors: BNC type, 75 ohms. Comply with requirements in Division 28 Section "Conductors and Cables for Electronic Safety and Security."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to camera installation, and other conditions affecting installation.

B. Examine roughing-in for LAN, WAN, and IP network before device installation.

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

3.2 WIRING

A. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."

B. Wiring Method: Install cables in raceways.

1. Conceal raceways and wiring except in unfinished spaces.

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

D. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

E. For LAN connection and fiber-optic and copper communication wiring, comply with Division 27 Sections "Communications Backbone Cabling" and "Communications Horizontal Cabling."

F. Grounding: Provide independent-signal circuit grounding recommended in writing by manufacturer.

3.3 VIDEO SURVEILLANCE SYSTEM INSTALLATION

A. Install cameras and infrared illuminators level and plumb.

B. Install cameras with 84-inch- (2134-mm-) minimum clear space below cameras and their mountings. Change type of mounting to achieve required clearance.

C. Set pan unit and pan-and-tilt unit stops to suit final camera position and to obtain the field of view required for camera. Connect all controls and alarms, and adjust.

D. Install power supplies and other auxiliary components at control stations unless otherwise indicated.

E. Install tamper switches on components indicated to receive tamper switches, arranged to detect unauthorized entry into system-component enclosures and mounted in self-protected, inconspicuous positions.

F. Avoid ground loops by making ground connections only at the control station.

1. For 12- and 24-V dc cameras, connect the coaxial cable shields only at the monitor end.

G. Identify system components, wiring, cabling, and terminals according to Division 26 Section "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.

2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video-surveillance equipment for acceptance and operational testing as follows:

a. Prepare equipment list described in "Submittals" Article.

b. Verify operation of auto-iris lenses.

c. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.

d. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Additionally, set zoom to full wide angle and aim camera at an object 50 to 75 feet (17 to 23 m) away. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.

e. Set and name all preset positions; consult Owner's personnel.

f. Set sensitivity of motion detection.

g. Connect and verify responses to alarms.

h. Verify operation of control-station equipment.

3. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.

4. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.

E. Video surveillance system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 1 month of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Tasks shall include, but are not limited to, the following:

1. Check cable connections.

2. Check proper operation of cameras and lenses. Verify operation of auto-iris lenses and adjust back-focus as needed.

3. Adjust all preset positions; consult Owner's personnel.

4. Recommend changes to cameras, lenses, and associated equipment to improve Owner's use of video surveillance system.

5. Provide a written report of adjustments and recommendations.

3.6 CLEANING

A. Clean installed items using methods and materials recommended in writing by manufacturer.

B. Clean video-surveillance-system components, including camera-housing windows, lenses, and monitor screens.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain video-surveillance equipment.

***** END OF SECTION *****

SECTION 28 31 11

DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Heat detectors.
5. Notification appliances.
6. Remote annunciator.
7. Addressable interface device.
8. Digital alarm communicator transmitter.
9. System printer.

1.3 DEFINITIONS

A. LED: Light-emitting diode.

B. NICET: National Institute for Certification in Engineering Technologies.

1.4 SYSTEM DESCRIPTION

A. Non-coded addressable system, with automatic sensitivity control of certain smoke detectors and multiplexed signal transmission, dedicated to fire-alarm service only.

1.5 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Fire-alarm control unit and raceways shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.6 SUBMITTALS

A. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect. The contractor shall pay for all plan review fees.
2. Shop Drawings shall be prepared by persons with the following qualifications:
   a. Trained and certified by manufacturer in fire-alarm system design.
   b. NICET-certified fire-alarm technician, Level IV minimum.
   c. Licensed or certified by authorities having jurisdiction.

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

C. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.

1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.

2. Include voltage drop calculations for notification appliance circuits.

3. Include battery-size calculations.

4. Included complete wiring diagrams for the fire alarm system including all devices.

5. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.

6. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.

7. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.

8. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

D. Delegated-Design Submittal: For smoke and heat detectors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Drawings showing the location of each smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the detector.

2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72.

E. Qualification Data: For qualified Installer.

F. Seismic Qualification Certificates: For fire-alarm control unit, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

G. Field quality-control reports.

H. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.

3. Record copy of site-specific software.

4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:

   a. Frequency of testing of installed components.

   b. Frequency of inspection of installed components.

   c. Requirements and recommendations related to results of maintenance.

   d. Manufacturer's user training manuals.

5. Manufacturer's required maintenance related to system warranty requirements.

6. Abbreviated operating instructions for mounting at fire-alarm control unit.

7. Copy of NFPA 25.

I. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.

2. Program Software Backup: On magnetic media or compact disk, complete with data files.

3. Device address list.

4. Printout of software application and graphic screens.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level IV technician.

C. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL.

F. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:

1. Notify Architect no fewer than 14 days in advance of proposed interruption of fire-alarm service.

2. Do not proceed with interruption of fire-alarm service without Architect's written permission.

1.9 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning with Substantial Completion, provide software support for two years.

C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion.

Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.10 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.
2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.
3. Smoke Detectors, Fire Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than 1 unit of each type.
4. Detector Bases: Quantity equal to 5 percent of amount of each type installed, but no fewer than 1 unit of each type.
5. Keys and Tools: One extra set for access to locked and tamper proofed components.
6. Audible and Visual Notification Appliances: 10 of each type installed.
7. Fuses: Five of each type installed in the system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product by the following:

1. NOTIFIER; a Honeywell company.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices[**and systems**]:

1. Manual stations.
2. Heat detectors.
3. Flame detectors.
4. Smoke detectors.
5. Duct smoke detectors.
6. Verified automatic alarm operation of smoke detectors.
7. Automatic sprinkler system water flow.
8. Heat detectors in elevator shaft and pit.
9. Fire-extinguishing system operation.
10. Fire standpipe system.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm notification appliances.
2. Identify alarm at fire-alarm control unit and remote annunciator.

3. Transmit an alarm signal to the remote alarm receiving station.
4. Activate voice/alarm communication system.
5. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
6. Close smoke dampers in air ducts of designated air-conditioning duct systems.
7. Activate emergency lighting control.
8. Record events in the system memory.
9. Record events by the system printer.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:
1. Valve supervisory switch.

D. System trouble signal initiation shall be by one or more of the following devices and actions:
1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of primary power at fire-alarm control unit.
4. Ground or a single break in fire-alarm control unit internal circuits.
5. Abnormal ac voltage at fire-alarm control unit.
6. Break in standby battery circuitry.
7. Failure of battery charging.
8. Abnormal position of any switch at fire-alarm control unit or annunciator.

E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators. Record the event on system printer.

2.3 FIRE-ALARM CONTROL UNIT

A. General Requirements for Fire-Alarm Control Unit:
1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.
   a. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
   b. Include a real-time clock for time annotation of events on the event recorder and printer.
   c. Provide complete BACnet communication with owners building systems.
2. Addressable initiation devices that communicate device identity and status.
   a. Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at fire-alarm control unit.
   b. Temperature sensors shall additionally test for and communicate the sensitivity range of the device.
3. Addressable control circuits for operation of mechanical equipment.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and

supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 3 line(s) of 80 characters, minimum.

2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.

C. Circuits:

1. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class A.

   a. Initiating Device Circuits: Style D.

   b. Notification Appliance Circuits: Style Z.

   c. Signaling Line Circuits: Style 2.

   d. Install no more than 50 addressable devices on each signaling line circuit.

2. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class B.

   a. Initiating Device Circuits: Style A.

   b. Notification Appliance Circuits: Style W.

   c. Signaling Line Circuits: Style 4.5.

   d. Install no more than 50 addressable devices on each signaling line circuit.

3. Serial Interfaces: Two RS-232 ports for printers.

D. Stairwell Pressurization: Provide an output signal using an addressable relay to start the stairwell pressurization system. Signal shall remain on until alarm conditions are cleared and fire-alarm system is reset. Signal shall not stop in response to alarm acknowledge or signal silence commands.

1. Pressurization starts when any alarm is received at fire-alarm control unit.

2. Alarm signals from smoke detectors at pressurization air supplies have a higher priority than other alarm signals that start the system.

E. Smoke-Alarm Verification:

1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.

2. Activate an NRTL-listed and -approved "alarm-verification" sequence at fire-alarm control unit and detector.

3. Record events by the system printer.

4. Sound general alarm if the alarm is verified.

5. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.

F. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.

G. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

H. Printout of Events: On receipt of signal, print alarm, supervisory, and trouble events. Identify zone, device, and function. Include type of signal (alarm, supervisory, or trouble) and date and time of occurrence. Differentiate alarm signals from all other printed indications. Also print system reset event, including same information for device, location, date, and time. Commands initiate the printing of a list of existing alarm, supervisory, and trouble conditions in the system and a historical log of events.

I. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

J. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

1. Batteries: Sealed lead calcium.

K. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.4 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Single-action mechanism, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.

2. Station Reset: Key- or wrench-operated switch.

3. Indoor Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.

2.5 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.

2. Detectors shall be four-wire type.

3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.

5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.

6. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.

7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.

a. Rate-of-rise temperature characteristic shall be selectable at fire-alarm control unit for 15 or 20 deg F (8 or 11 deg C) per minute.

b. Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F (57 or 68 deg C).

c. Provide multiple levels of detection sensitivity for each sensor.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.

2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

a. Primary status.

b. Device type.

c. Present average value.

d. Present sensitivity selected.

e. Sensor range (normal, dirty, etc.).

C. Ionization Smoke Detector:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.

2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

a. Primary status.

b. Device type.

c. Present average value.

d. Present sensitivity selected.

e. Sensor range (normal, dirty, etc.).

D. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.

2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

a. Primary status.

b. Device type.

c. Present average value.

d. Present sensitivity selected.

e. Sensor range (normal, dirty, etc.).

3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.

4. Each sensor shall have multiple levels of detection sensitivity.

5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.

6. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.6 HEAT DETECTORS

A. General Requirements for Heat Detectors: Comply with UL 521.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of **135 deg F (57 deg C)** or a rate of rise that exceeds **15 deg F (8 deg C)** per minute unless otherwise indicated.

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.

2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.7 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Individually addressed, connected to a signaling line circuit, equipped for mounting as indicated and with screw terminals for system connections.

B. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.

C. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet (3 m) from the horn, using the coded signal prescribed in UL 464 test protocol.

D. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.

1. Rated Light Output:

a. 177 cd.

b. 15/30/75/110 cd, selectable in the field.

2. Mounting: Wall mounted unless otherwise indicated.

3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.

4. Flashing shall be in a temporal pattern, synchronized with other units.

5. Strobe Leads: Factory connected to screw terminals.

6. Mounting Faceplate: Factory finished, white.

2.8 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

1. Mounting: Surface cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.9 ADDRESSABLE INTERFACE DEVICE

A. Description: Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.

2.10 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632 and be listed and labeled by an NRTL.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.
4. Manual test report function and manual transmission clear indication.
5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.
2. Address of the supervisory signal.
3. Address of the trouble-initiating device.
4. Loss of ac supply or loss of power.
5. Low battery.
6. Abnormal test signal.
7. Communication bus failure.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.11 SYSTEM PRINTER

A. Printer shall be listed and labeled by an NRTL as an integral part of fire-alarm system.

2.12 DEVICE GUARDS

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.

1. Factory fabricated and furnished by manufacturer of device.
2. Finish: Paint of color to match the protected device.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72 for installation of fire-alarm equipment.

B. Equipment Mounting: Install fire-alarm control unit on concrete base with tops of cabinets not more than 72 inches (1830 mm) above the finished floor. Retain first subparagraph below if Project requires seismic bracing. Retain first paragraph below if spacing is not indicated on Drawings. It is recommended that detector spacing and location be determined by a professional engineer, based on the listing of detectors and on space/ceiling-plane configurations.

C. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.

D. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

E. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.

F. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling.

G. Device Location-Indicating Lights: Locate in public space near the device they monitor.

H. Fire-Alarm Control Unit: Surface mounted, with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

I. Annunciator: Install with top of panel not more than 72 inches (1830 mm) above the finished floor.

3.2 CONNECTIONS

A. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet (1 m) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Smoke dampers in air ducts of designated air-conditioning duct systems.

2. Supervisory connections at valve supervisory switches.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.4 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.5 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by Architect and authorities having jurisdiction.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.

a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.

b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.

4. Test audible appliances for the private operating mode according to manufacturer's written instructions.

5. Test visible appliances for the public operating mode according to manufacturer's written instructions.

6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

F. Fire-alarm system will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

H. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

I. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

***** END OF SECTION *****

SECTION 31 00 00

EARTHWORK

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Requirements apply to this SectioN.

1.02 SCOPE OF WORK

The Work of this Section includes all earthwork required for construction of the Work. Earthwork shall include, but not be limited to the loosening, removing, loading, transporting, depositing and compacting in its final location of all materials wet and dry, as required for the purposes of completing the work specified in the Contract Documents which shall include, but not be limited to: the sawcutting and removal of A.C. pavement, P.C.C. concrete and underlying material to a subbase design grade indicated on the Plans, the installation of subbase material to a subbase grade beneath A.C. pavement and concrete infrastructure, the excavation of pipeline trenches, the installation of backfill material within pipeline trenches, excavations for above-grade and below-grade structures, backfill requirements for material to be placed beneath above-grade and below-grade structures, backfill requirements for the areas surrounding above-grade and below-grade structures, backfilling of manholes and catch basins, construction of earth embankments, backfilling of depressed areas, abandoned ponds or depressed areas resultant from demolition, the disposal of excess excavated materials, borrow of materials to make up deficiencies for fills; and all other incidental earthwork, all in accordance with the requirements of the Contract Documents.

Principal work items included in this Section are:

A. Site preparation, clearing and grubbing.

B. Preparation of fill areas.

C. Excavation and controlled fill construction.

D. Structural excavation and backfills.

E. Disposal of surplus and/or unsuitable materials.

F. Dust control and drainage control.

G. Grading

H. Clean-up.

1.03 REFERENCE STANDARDS

ASTM C 131	Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM D 75	Practice for Sampling Aggregates
ASTM D 422	Method for Particle-Size Analysis of Soils
ASTM D 698	Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb (2.49-kg) Rammer and 12-in (304.8-mm) Drop
ASTM D 1556	Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	Test Method for Moisture-Density Relations of Soils Using Rammer and Drop
ASTM D 1682	Test method for Breaking Load and Elongation of Textile Fabrics

ASTM D 2419	Test method for Sand Equivalent Values of Soil and Fine Aggregate
ASTM D 2487	Classification of Soils for Engineering Purposes
ASTM D 2922	Test Method for Density of Soil in Places by Nuclear Methods (Shallow Depth)
ASTM D 3017	Test method for Water Content of Soil and Rock in Place by Nuclear Methods
ASTM D 3776	Test Method for Mass Per Unit Area (Weight) of Woven Fabric
ASTM D 4253	Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Plate
ASTM D 4254	Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density
ASTM D 4751	Test Method for Determining the Apparent Opening Size of a Geotextile
CAL-OSHA	Title 8 General Industry Safety Orders

1.04 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00.

1.05 SUBMITTALS

Provide in accordance with Section 01 33 00.

1.06 DEFINITIONS

A. Site: The property owned by the County of Riverside.

B. Controlled Fill: Compacted suitable fill material in all areas of the site requiring filling to grade as shown on the Plans.

C. Structural Fill: Compacted suitable fill material which will support a structure or some part of a structure. This includes support material for P.C.C. structures and pads

D. Structural Backfill: Compacted suitable material placed between the wall of a structure and construction excavation slope up to finished grade.

E. Suitable Material: As specified herein shall be any material imported or excavated from the cut areas that is, in the opinion of the Engineer, suitable for use in constructing fills.

F. Waste Excavation: Also Surplus Material. Material from project excavations which is not suitable for use in backfill or compacted fills or is in excess of that required to be used for backfill or to construct fills.

G. Pipe Zone Backfill: Material suitable for placement below or surrounding the pipe to a given vertical distance above the pipe as required by the pipe section.

H. Pipe Trench Backfill: Material suitable for placement from the pipe zone to finish grade or to pavement subbase material.

1.07 SITE INVESTIGATION

A. Soil Investigation Report: A Geotechnical Report has been prepared for this project and is available for review at the Construction Manager's office. The Soils Report is not a part of the Contract Documents and is for information only.

B. Contractor's Responsibility: The Contractor shall carefully examine the site and make all inspections necessary in order to determine the full extent of the work required to make the completed Work conform to the Plans and Specifications. The Contractor shall satisfy himself/herself as to the nature and location of the Work, conditions, the conditions of the existing ground surface, and the character of equipment and facilities needed prior to and

during prosecution of the Work. The Contractor shall satisfy himself/herself as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered. The Contractor shall review water table conditions. Any inaccuracies or discrepancies between the actual field conditions and the Plans, or between the Plans and Specifications must be brought to the Engineer's attention in order to clarify the exact nature of the Work to be performed.

C. Existing Elevations: All existing elevations illustrated on the Plans are approximate. The Contractor shall recognize and acknowledge the condition that the bid lump sum price shall include all earthwork activities irrespective of the possible localized difference in contour elevations and actual ground; and that there will be no additional compensation from the Owner for earthwork changes, engineering, or field staking in this regard.

1.08 SAFETY

The Contractor shall familiarize himself/herself with, and shall at all times conform to, the regulations of the "OSHA General Industry Occupational Safety and Health Standards", and "OSHA Safety and Health Regulations for Construction Safety Orders" and "Trench Construction Safety Orders" of the State of California, Department of Industrial Relations, Division of Occupational Health and Safety. A copy of these documents shall be kept on the job site.

1.09 ENVIRONMENTAL SAFEGUARDS AND REGULATIONS

The Contractor shall comply with regulations in force at all times to prevent pollution of air and water. The Contractor shall be responsible for the construction of Project Environmental Control facilities in accordance with Section 01560 of Division 1, as applicable.

1.10 GEOTECHNICAL TESTING

The County of Riverside shall provide the services of a qualified Geotechnical Consultant to perform the required earthwork geotechnical testing specified within the contents of the Plans and Specifications. The cost for the Geotechnical Testing shall be borne by the County of Riverside. A copy of all tests shall be forwarded to the Engineer within four (4) days after the testing is complete. Geotechnical Earthwork Testing shall include in-situ native soil compaction testing, moisture-density soils testing, compaction testing, gradation testing, sand equivalent testing and similar testing. The Contractor shall bear the cost of retest and re-inspection of re-worked material due to faulty work.

1.11 STANDARDS FOR SOIL CLASSIFICATION, PROPERTIES AND TESTS

A. Earthwork and Embankment:

1. Classification - ASTM D 2487.
2. Physical Properties - ASTM D 854, D 2216.
3. Compaction - Modified Proctor ASTM D 1557-91.

B. Backfill for Trench:

1. Classification - ASTM D 2487.
2. Compaction - Modified Proctor ASTM D 1557-91.
3. Field Density Test - ASTM 1556-82; D 2937-83, D 2922-81 (as approved by Engineer).

C. Structural Fill and Backfill:

1. Classification - ASTM D 2487.
2. Attenberg Limits - PlastiOwner Index and Liquid Limit ASTM D 4318.
3. Compaction - Modified Proctor ASTM D 1557-91.
4. Physical Properties - ASTM D 854, D 2216.

5. Field Density Test - ASTM D 1556-82, D 2937-83, D 2922-81 (as approved by Engineer).

D. Controlled Fills:

1. Classification - ASTM D 2487.
2. Physical Properties - ASTM D 854, D 2216.
3. Compaction - Modified Proctor ASTM D 1557-91.
4. CBR - ASTM D 1883 (R-Value - ASTM 2844).
5. Field Density Test - ASTM D 1556-82, D 2937-83, D 2922-81 (as approved by Engineer).

E. Earth Embankments and Berms:

1. Classification - ASTM D 2487.
2. Physical Properties - ASTM D 854, D 2216.
3. Compaction - Modified Proctor ASTM D 1557-91
4. CBR - ASTM D 1883.
5. Field Density Test - ASTM D 1556-82, D 2937-83, D 2922-81 (as approved by Engineer).

F. Borrow:

1. Classification - ASTM D 2487.
2. Other properties - as determined by requirements at point of use.

G. Pipe Trenches:

1. Classification - ASTM D 2487.
2. Physical Properties - ASTM D 854, D 2216.
3. Compaction - Modified Proctor ASTM D 1557-91.
4. CBR - ASTM D 1883.
5. Field Density Test - ASTM D 1556-82, D 2937-83, D 2922-81 (as approved by Engineer).

1.12 COMPACTION

The maximum dry density, optimum moisture content and field density of each soil type used in the controlled compacted fill shall be determined as stated in Section 1.09 above.

1.13 INSPECTION

Observation and compaction tests shall be obtained by the Geotechnical Consultant engaged by the County of Riverside during the filling and compacting operations.

The Geotechnical Consultant shall be required to be present at the site on a full-time basis for several work activities and conduct intermittent testing for other work activities. The following chart indicates the earthwork items which will require full time or intermittent geotechnical testing.

ITEM NO.	ITEM	GEOTECHNICAL TESTING
1.	Excavation and scarification process	Full-time Inspection GEOTECHNICAL

ITEM NO.	ITEM	TESTING
2.	Backfill for Water Pipe, Storm Drainage Pipe, Sanitary Sewer Pipe and Irrigation Pipe Trenches. The Specification requires that the backfill be compacted in lifts. Additional lifts shall not be allowed to be placed until previous lifts have been satisfactorily tested for compaction.	Intermittent Testing
3.	Backfill for Electrical Conduit Trenches. The specification requires that the backfill be compacted in lifts. Additional lifts shall not be allowed to be placed until previous lifts have been satisfactorily tested for compaction. This requirement shall be strictly enforced and the Contractor shall be required to remove all backfill from the electrical conduit trench if this specification is violation.	Intermittent Testing
4.	Over excavation and recompaction of subgrade material	Intermittent Testing
5.	Installation of Class 2 Base for Site Grading.	Intermittent Testing
6.	Installation of Granular Sand for P.C.C. Infrastructure Subbase Material	Intermittent Testing
7.	Installation of Granular Sand for Water Pipelines, Stormwater Drainage Pipelines and Sanitary Sewer pipelines.	Intermittent Testing
8.	Existing Retention Basin Preparation	Intermittent Testing
9.	Building Pad Preparation	Intermittent Testing

1.14 CLOSE-OUT: also comply with the requirements of Section 01 78 00 – Contract Closeout.

A. Reports: None Required.

B. As-Builts: Comply with the requirements of Section 01 78 00 – Contract Closeout.

C. Operation and Maintenance Data: None required.

D. Extra Materials: None required.

E. Extended Warranty: Comply with the requirements of General Condition Article 3.5.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Engineered Fill Material: Materials for engineered fill shall consist of any material imported or excavated from the *cut areas* that, in the opinion of the Engineer, is appropriate for use in constructing fills. The on-site soils are suitable for use as compacted fill. Native and imported materials should be placed in lifts no greater than 8 inches in loose thickness, uniformly moisture conditioned to between optimum moisture and 4% over optimum moisture, and re-compacted to at least 90% of ASTM D1557 maximum density, except in the building pad when it shall be at least 95%.

Imported fill soils should consist of non-expansive (Expansion Index less than 10) granular soils that meet the USCS classifications of SM, SP-SM, with a maximum rock size of 3

inches, and 5 to 35% passing the No. 200 sieve. The geotechnical engineer should approve the fill soils prior to importing.

In areas other than the building pad which are to receive concrete slabs and asphalt concrete pavement, the ground surface should be over-excavated to a depth of 12 inches, uniformly moisture conditioned to ±2% over optimum moisture, and re-compacted to at least 90% of ASTM D1557 maximum density.

Trench Backfill: On-site soil free of debris, vegetation, and other deleterious matter may be suitable for use as utility trench backfill. Backfill within roadways should be placed in layers not more than 6 inches in thickness, uniformly moisture conditioned to between optimum moisture and 4% over optimum moisture, and mechanically compacted to a minimum of 90% of the ASTM D1557 maximum dry density except for the top 12 inches of the trench which shall be compacted to at least 95%. Trench backfill should only be placed and compacted after encapsulating buried pipes with suitable bedding and pipe envelope material.

Representative samples of material to be used for fill shall be tested in the laboratory by the Geotechnical Engineer in order to determine the maximum density, optimum moisture content, sand equivalent and classification of the soil. In addition, the Geotechnical Engineer shall determine the approximate bearing value of a recompacted saturated sample by direct shear tests or other tests applicable to the particular soil.

During grading operations, soil types other than those analyzed in the report of the soil investigation may be encountered by the Contractor. The Geotechnical Engineer shall be consulted to determine the suitability of these soils. The Contractor shall bear the expenses of the Geotechnical investigation.

B. Structural Fill Material: Materials shall consist of crushed rocks, Class 2 Base, granular sand, decomposed granite (crusher fines) or fine gravel either imported or manufactured from excavated onsite rocky material.

The crushed aggregate, granular sand, decomposed granite (crusher fines) or fine gravel shall be uniformly graded. The following gradations shall apply:

1. Granular Sand:

   Clean granular sand free of clay, shale and deleterious material. Sand shall be compacted to 95 percent of maximum density at optimum water content per ASTM D 1557 unless otherwise noted on the Plans. The material shall conform to a sand equivalent of 30 or greater. The maximum amount of material passing the Number 200 sieve shall be 5 percent. The sand shall conform to the following gradation percentages:

SIEVE SIZE	GRANULAR SAND (% PASSING)
3/8"	100
No. 4	98-90
No. 8	90-75
No. 10	75-60
No. 16	60-50
No. 30	50-38
No. 40	38-29
No. 50	29-19
No. 100	19-7
No. 200	5-0

The Contractor shall supply a 5-gallon sample of sand material to the material testing laboratory within five (5) days after the Notice to Proceed is issued. The gradation, sand equivalent and maximum density of the sand material shall be determined. The test results shall be forwarded to the Engineer. The cost of testing shall be incurred by the Contractor. The gradation of the granular sand shall be determined and the test results forwarded to the Engineer prior to the delivery of the granular sand material to the Site. Prior to the placement of sand the native subbase grade shall be checked and approved by the Engineer.

Crusher fines shall be allowed to be utilized in lieu of sand if approved by the Engineer.

2. Crusher Fines:

Crusher fines shall consist of decomposed granite indigenous to the Imperial Valley. Crusher fines utilized for this project shall conform to the following gradation requirements:

SIEVE SIZE	PERCENT PASSING
5/8"	100
No. 4	80-100
No. 8	50-85
No. 30	30-50
No. 200	4-15

The sand equivalent shall be 20 or greater.

The Contractor shall supply a five-gallon sample of crusher fines material to the material testing laboratory within five (5) days after the Notice to Proceed is issued. The Gradation and Maximum Density of the crusher fines material shall be determined. The test results shall be forwarded to the Engineer for approval prior to the delivery of the material to the Site. The cost of the testing shall be incurred by the Contractor.

3. Fine Gravel:

Clean fine gravel free of clay, shale and deleterious material. Fine gravel shall be compacted with a plate compactor with one pass in maximum 1 foot lifts. Additional lifts shall not be added until previous lifts shall have been passed over by the plate compactor. The maximum amount of material passing the ¼" Sieve shall be 2 percent. The fine gravel shall conform to the following gradation percentages:

SIEVE SIZE	PERCENT PASSING
3/8"	100
1/4"	0-2

The Contractor shall supply a five-gallon sample of fine gravel material to the material testing laboratory within five (5) days after the Notice to Proceed is issued. The Gradation and Maximum Density of the fine gravel material shall be determined. The test results shall be forwarded to the Engineer for approval prior to the delivery of the material to the Site. The cost of the testing shall be incurred by the Contractor.

4. Class 2 Base:

The Class 2 Base material shall conform to Caltrans Section 26, Latest Edition, for 25mm maximum base material. The gradation requirements are as follows:

SIEVE SIZE	CLASS 2 BASE (%PASSING)
1"	100
¾"	87-100
No. 4	30-65
No. 30	5-35
No. 200	0-12

The sand equivalent shall be 25 or greater. An angular aggregate is to be used. Class 2 Base material shall be compacted to 95 percent of maximum density according to ASTM D 1557, unless otherwise noted on the Plans or Details. The tolerance for the Class 2 Base between design subgrade elevation and actual subgrade elevation as constructed in the field shall be plus or minus 0.02 feet as referenced from the design subgrade. Prior to the placement of Class 2 Base, the native subbase grade shall be checked and approved by the Engineer. The native subbase grade shall be within plus or minus 0.05 feet of native subbase design grade prior to the placement of Class 2 Base.

The Contractor shall supply a 5-gallon sample of the Class 2 Base to the material testing laboratory within four (4) days of the Notice to Proceed. The material shall be delivered to the testing laboratory to determine the maximum density, gradation, R-value, sand equivalent and durability index of the Class 2 Base. A copy of the test results shall be forwarded to the Engineer by the Geotechnical Consultant for review. The gradation of the Class 2 Base shall be determined and the test results forwarded to the Engineer for approval prior to the delivery of the Class 2 Base material to the Site. *Class 2 Base utilizing recycled materials shall not be allowed.*

C. Structural Backfill Material: Structural Backfill Material shall consist of the same material listed with the Structural Fill Material item above.

PART 3 – EXECUTION

3.01 GENERAL

The Work performed under this Specification shall be constructed to the lines, grades, elevations, slopes and cross-sections indicated on the Plans, specified herein, and/or directed by the Owner. Slopes, graded surfaces, and drainage features shall present a neat uniform appearance upon completion of the Work.

It shall be the Contractor's responsibility (1) to maintain adequate safety measures and working conditions; and (2) to take all measures necessary during the performance of the Work to protect the entire project area and adjacent properties which would be affected by this Work from storm damage, flood hazard, caving of trenches and embankments, and sloughing of material, until final acceptance by the Owner. It shall be the Contractor's responsibility to maintain completed areas until the entire project area is in satisfactory compliance with the job specification.

Utility lines and structures indicated on the Plans which are to remain in service shall be protected by the Contractor from any damage as a result of his/her operation. Where utility lines or structures not shown on the Plans are encountered, the Contractor shall report them to the Owner before proceeding with the Work. The Contractor shall bear the cost of repair or replacement of any utility lines or structures which are broken or damaged by his/her operations.

3.02 REMOVALS, CLEARING AND GRUBBING

A. Clearing: Clearing consists of the complete removal of objectionable materials and obstructions above and below the ground surface including tree stumps, brush, grass, vegetative matter and other objectionable materials within the project limits. All brush and

organic material shall be removed before placing any earth fills. It shall be the Contractor's responsibility to save and protect all trees that lie outside the construction area.

B. Grubbing: Grubbing consists of the complete removal of stumps, including tap roots or lateral roots 1-1/2 inches or more in diameter, and the removal of brush, grass or weeds to depths below the natural ground as specified herein. Stumps shall be grubbed to a depth of 3 feet and grass or weeds shall be grubbed to a depth of 6 inches below the natural ground surface, or to the depths as determined in the field by the Engineer at the time of construction.

C. Protection: Existing items not designated to be demolished or removed shall be protected from damage. Any such item damaged by the Contractor shall be restored or replaced immediately at the Contractor's expense.

D. Debris and Waste Material: All debris and waste material resulting from demolition, clearing and grubbing shall be removed from the site and disposed of by the Contractor.

3.03 DUST CONTROL

The Contractor shall take all steps possible to prevent and reduce dust arising from the construction activity. Section 01560 Project Environmental Controls elaborates on dust control requirements.

3.04 CARE OF DRAINAGE WATER

Contractor shall take care of drainage water from the construction operations, and of stormwater and/or wastewater reaching the construction area from any source, so that damage is not incurred to the excavation, pipe or structures. The Contractor shall be responsible for any damages to persons or property on or off the Site due to such drainage water or to the interruption or diversion of such stormwater or wastewater on account of his/her operation.

Such grading shall be accomplished as may be necessary to prevent surface water from flowing into excavations, and any water accumulating therein shall be removed by pumping or by other reviewed methods.

Protection of the site during construction shall be the responsibility of the Contractor. Completion of a portion of the project shall not preclude that portion or adjacent areas from the requirements for site protection until such time as the entire project is complete.

3.05 EXCAVATION

A. General: The Contractor shall perform all excavation necessary or required as illustrated on the Plans. The excavation shall include the removal and disposal of all earth materials of whatever nature encountered, which shall include both rock excavation and common excavation when both are present, and shall include the furnishing, placing and maintaining of shoring and bracing necessary to safely support the sides of the excavations. The Work shall also include all pumping, ditching and other required methods for the removal or exclusion of water. See Division 2 Section 02150 Sheeting, Shoring and Bracing.

B. Excavation for Structures: Structure excavation shall include the removal of all materials of whatever nature encountered, including all obstructions of any nature that would interfere with the proper execution and completion of the Work. The removal of such materials shall conform to the lines and grades shown on the Plans and/or herein specified. Temporary structure excavations shall at all times conform to the Requirements of the State of California, Division of Occupational Health and Safety, and pertinent requirements contained in referenced Geotechnical Investigation Report and Specification Section 02150 - Sheeting, Shoring and Bracing.

All trench excavations should conform to CalOSHA requirements for Type C soil. The contractor is solely responsible for the safety of workers entering trenches. Temporary excavations with depths of 4 feet or less may be cut nearly vertical for short duration. Temporary slopes should be no steeper than 1.5H:1V. Sandy soil slopes should be kept moist, but not saturated, to reduce the potential of raveling or sloughing.

Trench excavations deeper than 4 feet will require shoring or slope inclinations in conformance to Cal/OSHA regulations for Type C soil. Surcharge loads of stockpiled soil or construction materials should be set back from the top of the slope a minimum distance equal to the height of the slope. All permanent slopes should not be steeper than 3:1 to reduce wind and rain erosion. Protected slopes with ground cover may be as steep as 2:1. However, maintenance with motorized equipment may not be possible at this inclination.

Existing Retention Basin Preparation: Loose soils at the bottom of the retention basin should be removed. The exposed natural sub-grade should be scarified to a depth of 8 inches, uniformly moisture conditioned to ±2% over optimum moisture, and re-compacted to at least 90% of ASTM D1557 maximum density. Fill should be placed and compacted on benches cut into the side slopes of the basin.

Building Pad Preparation: The existing surface soils within the building pad area, outside the top of the basin side slopes, should be removed to 4 feet below the lowest foundation grade or 5 feet below the existing grade (whichever is deeper), extending five feet beyond all exterior wall/column lines. The exposed sub-grade should be scarified to a depth of 8 inches, uniformly moisture conditioned to ±2% over optimum moisture, and re-compacted to at least 90% of ASTM D1557 maximum density.

Loose soils existing below depths of 5 feet, such as those found to a depth of 10 feet within the south-east corner of the proposed building pad area (refer to soil boring B-4 location of the Geotechnical Investigation Report), will require removal and replacement with compacted fill. After the over-excavation of the loose soils, a minimum related compaction of 85% of the exposed soils in the building limits and five feet laterally beyond, should be present prior to placement of engineered fill. If 85% relative compaction is not encountered, then additional removals will be required until 85% relative compaction is attained. After verification of 85% relative compaction of the exposed sub-grade soils, the engineered building pad should be constructed in accordance with above paragraph.

Moisture Control and Drainage: The moisture condition of the building pad should be maintained during trenching and utility installation until concrete is placed or should be rewetted before initiating delayed construction. If soil drying is noted, a 2 to 3 inch depth of water may be used in the bottom of footings to restore footing subgrade moisture and reduce potential edge left.

Auxiliary Structures Foundation Preparation: Auxiliary structures such as free standing or retaining walls should have the existing soil beneath the structure foundation prepared in the manner recommended for the building pad except the preparation needed only to extend 3 feet below and beyond the footing.

Contingent upon locations, all surfaces to receive compacted fill shall be scarified, brought to near optimum moisture content and compacted to required percentage of relative compaction as specified herein unless otherwise indicated on the Plans.

Rough grade excavations for structures and footings will be inspected by the Geotechnical Engineer to verify that the excavations extend into satisfactory soils and are free of loose and disturbed materials.

3.06 CONTROLLED FILL

A. General: Controlled fill shall consist of native material, granular sand, Class 2 Base, crusher fines or other material as indicated on the Plans. The subbase grade shall be excavated to within plus or minus 0.05 feet of design grade prior to the placement of controlled fill. The design subbase grade shall be field verified and approved by the Engineer prior to the placement of the controlled fill material. The Engineer shall determine the number and location of points to check for the subbase grade elevation compliance. Prior to the Engineer's inspection of the subbase grade, the Contractor shall establish bluetop stakes on a 20-foot by 20-foot grid across the area controlled fill is to be placed.

If the controlled fill consists of native material it shall be placed in maximum 8-inch lifts and compacted to 90 percent of maximum density (except in the building pad when it shall be at least 95%) at optimum water content per ASTM D 1557 unless otherwise required by the Geotechnical Report. Additional native soil lifts shall not be placed until previous lifts have attained the specified compaction requirement and are approved by both the on-site geotechnical representative and the Engineer.

Granular sand, Class 2 Base and crusher fine controlled fill material shall be placed in maximum 8-inch lifts and compacted to 95 percent of maximum density at optimum water content per ASTM D 1557. Additional granular sand, Class 2 Base or crusher fine lifts shall not be placed until previous lifts have attained the specified compaction requirement and are approved by both the on-site geotechnical representative and the Engineer.

B. Preparing Areas To Be Filled: All vegetation and objectionable material shall be removed by the Contractor from the surface upon which the fill is to be placed and any loose and porous soils shall be removed or compacted to a depth specified by the Geotechnical Engineer. The surface shall then be plowed or scarified to a minimum depth of 6 inches until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

When placing fill in horizontal lifts adjacent to areas sloping steeper than 5:1 (horizontal:vertical), horizontal keys and vertical benches shall be excavated into the adjacent slope area. Keying and benching shall be sufficient to provide at least 6-foot wide benches and a minimum of 4 feet vertical bench height within the firm natural ground, firm bedrock or engineered compacted fill. No compacted fill shall be placed in an area subsequent to keying and benching until the area has been reviewed by the Geotechnical Engineer. Material generated by the benching operation shall be moved sufficiently away from the bench area to allow for the review of the horizontal bench prior to placement of fill.

After the foundation for the fill has been cleared, plowed or scarified, it shall be disced or bladed by the Contractor until it is uniform and free from large clods, brought to the proper moisture content and compacted as specified.

C. Placing, Spreading and Compacting Fill Material: The fill material shall be placed by the Contractor in thin layers that when compacted shall not exceed 8 inches for granular sand, Class 2 Base, crusher fines and native material. Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to obtain uniformity of material in each layer.

When the moisture content of the fill material is below that required by the Geotechnical Engineer, water shall be added by the Contractor until the moisture content is increased or decreased as required for the specified compaction.

When the moisture content of the fill material is above that required by the Geotechnical Engineer, the fill material shall be aerated by the Contractor by blading, mixing, or other satisfactory methods until the moisture content is as required for the specified compaction.

After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted by the Contractor to the specified density. Compaction shall be accomplished by sheepsfoot rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers or other types of acceptable compacting equipment. Equipment shall be of such design that it shall be able to compact the fill to the specified density. Compaction shall be continuous over the entire area and the equipment shall make sufficient passes over the material to ensure that the desired density has been obtained.

Compacted fill slopes shall be overbuilt and cut back to grade, exposing the firm, compacted inner core. The slopes shall be overbuilt a minimum of five feet (5'). If the desired compaction is not achieved, the existing slope shall be overexcavated and reconstructed. The amount of overbuilding shall be increased until the desired compaction is achieved on the slope. The Contractor shall provide thorough mechanical compaction to the outer edge of the overbuilt slope surface. There shall be no excessive loose soil on the slopes.

The Contractor shall provide and maintain adequate erosion control facilities during the construction of the fill areas. The erosion control facilities shall be maintained in optimum condition until the permanent drainage system and vegetation is complete. The facilities shall be inspected following significant rainfall, repairs made and excess sediment removed. It shall be the Contractor's responsibility to prevent the discharge of sediment off-site or to adjacent watercourses.

3.07 STRUCTURE FILL AND STRUCTURE BACKFILL MATERIAL

A. Placement of Structure Backfill: Before beginning backfilling, all foreign material, including water, shall be removed from the space to be backfilled and the area to be backfilled shall be inspected and approved by the Geotechnical Engineer. Sloping sides of the excavated space shall be stepped to prevent wedging action of the backfill against the structure. No backfill shall be placed around or upon any structure until it is proven that the concrete has attained satisfactory strength in accordance with the Division 3 of Technical Specifications and that the structure as a whole is adequate to receive backfill. The compressive strength shall be determined by tests on representative cylinders cured under conditions similar to those prevailing at the site.

B. General: Structure fill and structure backfill shall consist of granular sand, Class 2 Base, crusher fines or other material as indicated on the Plans. The subbase grade shall be excavated to within plus or minus 0.05 feet of design grade prior to the placement of structure fill and structure backfill. The design subbase grade shall be field verified and approved by the Engineer prior to the placement of the structure fill or structure backfill material. The Engineer shall determine the number and location of points to check for the subbase grade elevation compliance. Prior to the Engineer's inspection of the subbase grade the Contractor shall establish bluetop stakes on a 20-foot by 20-foot grid across the area which structure backfill is to be placed.

Granular sand, Class 2 Base and crusher fine structure fill and structure backfill material shall be placed in maximum 8-inch lifts and compacted to 95 percent of maximum density at optimum water content per ASTM D 1557. Additional granular sand, Class 2 Base or crusher fine lifts shall not be placed until previous lifts have attained the specified compaction requirement and are approved by both the on-site geotechnical representative and the Engineer.

C. Placing, Spreading and Compacting Fill Material: The structural fill and structural backfill material shall be placed by the Contractor in thin layers that when compacted shall not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to obtain uniformity of material in each layer.

When the moisture content of the fill material is below that required by the Geotechnical Engineer, water shall be added by the Contractor until the moisture content is as required for the specified compaction.

When the moisture content of the fill material is above that required by the Geotechnical Engineer, the fill material shall be aerated by the Contractor by blading, mixing, or other satisfactory methods until the moisture content is as required for the specified compaction.

After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted by the Contractor to the specified density. Compaction shall be accomplished by sheepsfoot rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers or other types of acceptable compacting equipment. Equipment shall be of such design that it shall be able to compact the fill to the specified density. Compaction shall be continuous over the entire area and the equipment shall make sufficient passes over the material to ensure that the desired density has been obtained.

Compacted fill slopes shall be overbuilt and cut back to grade, exposing the firm, compacted inner core. The slopes shall be overbuilt a minimum of five feet (5'). If the desired compaction is not achieved, the existing slope shall be overexcavated and reconstructed.

The amount of overbuilding shall be increased until the desired compaction is achieved on the slope. The Contractor shall provide thorough mechanical compaction to the outer edge of the overbuilt slope surface. There shall be no excessive loose soil on the slopes.

The Contractor shall provide and maintain adequate erosion control facilities during the construction of the fill areas. The erosion control facilities shall be maintained in optimum condition until the permanent drainage system and vegetation is complete. The facilities shall be inspected following significant rainfall, repairs made and excess sediment removed. It shall be the Contractor's responsibility to prevent the discharge of sediment off-site or to adjacent watercourses.

3.08 ESTABLISHMENT OF SUBBASE GRADE, SUBGRADE OR FINISH GRADE

Finish Grade is defined as the finish surface grade. For instance, the top of an A.C. or P.C.C. paved surface is referred to as finish grade.

Subgrade is defined as the grade of the material beneath the finish surface. For instance, the top of Class 2 Base grade beneath an A.C. or P.C.C. paved surface is referred to as subgrade.

Subbase is defined as the grade of the material beneath the base material. For instance, the top of native material beneath the Class 2 Base subgrade material of an A.C. or P.C.C. paved roadway is the subbase grade.

Finish grade surfaces are to be graded to within plus or minus 0.02 feet from design grade as illustrated on the Grading Plans. The Contractor shall place bluetop stakes on a 20-foot x 20-foot grid across the top of the finish grade surface during final grading. A bluetop stake is defined as a stake placed at the finish grade elevation within the tolerance of plus or minus 0.02 feet of finish grade. The Engineer shall obtain elevations across finish grade surfaces at locations determined by the Engineer prior to accepting and approving the finish grade surfaces. The Contractor shall rework areas not conforming to the finish surface grade tolerance as required. Work items to occur after the establishment of finish grade shall not occur until the Engineer has approved the finish grade.

Subgrade surfaces are to be graded to within plus or minus 0.02 feet from design grade as illustrated on the Grading Plans. Bluetop stakes shall be placed on a 20-foot x 20-foot grid pattern across rectangular or square facilities such as parking lots and access roads. The Engineer shall obtain elevations across the subgrade surfaces at locations determined by the Engineer prior to accepting and approving the subgrade surfaces. The Contractor shall rework areas not conforming to the subgrade tolerance as required. Work items to occur after the establishment of subgrade shall not occur until the Engineer has approved the finish subgrade.

Subbase surfaces are to be graded to within plus or minus 0.05 feet of subbase design grade as illustrated on the Grading Plans. Bluetop stakes shall be placed on a 20-foot x 20-foot grid pattern across rectangular or square facilities such as parking lots, access roads, sludge beds, structures, building pads, etc. The Engineer shall obtain elevations across the subbase surfaces at locations determined by the Engineer prior to accepting and approving the subbase surfaces. The Contractor shall rework areas not conforming to the subbase design grade tolerance as required. Work items to occur after the establishment of subbase grade shall not occur until the Engineer has approved the subbase grade.

3.09 COMPACTION TEST SCHEDULE

The following **compaction test(s)** shall apply to this project:

ITEM NO.	ITEM
1.	Excavation and scarification process
2.	Backfill for Water Pipe, Storm Drainage Pipe, Sanitary Sewer Pipe and Irrigation Pipe Trenches. The Specification requires that the backfill be compacted in lifts. Additional lifts

shall not be allowed to be placed until previous lifts have been satisfactorily tested for compaction.

3. Backfill for Electrical Conduit Trenches. The specification requires that the backfill be compacted in lifts. Additional lifts shall not be allowed to be placed until previous lifts have been satisfactorily tested for compaction. This requirement shall be strictly enforced and the Contractor shall be required to remove all backfill from the electrical conduit trench if this specification is violation.

4. Over excavation and Recompaction of Subgrade Material

5. Installation of Class 2 Base for Site Grading.

6. Installation of Granular Sand for P.C.C. Infrastructure Subbase Material

7. Installation of Granular Sand for Water Pipelines, and Stormwater Drainage Pipelines and Sanitary Sewer pipelines.

8. Existing Retention Basin Preparation

9. Building Pad Preparation

3.10 CLEAN-UP

Upon completion of Work in this Section, all rubbish and debris shall be removed from the site. All construction equipment and implements of service shall be removed and the entire area involved shall be left in a clean, neat and acceptable condition.

*****END OF SECTION*****

SECTION 31 10 00

CLEARING

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract requirements and Division 1, General Conditions apply to this section.

1.02 SCOPE OF WORK

Work included: The site shall be cleared and grubbed in preparation for the required Work of this Contract, as specified herein.

1.03 QUALITY ASSURANCE

Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

PART 2 -- PRODUCTS

2.01 MATERIALS

Provide materials, not specifically described but required for proper completion of the work of this Section, as selected by the Contractor subject to the acceptance of the Architect.

PART 3 -- EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Correct conditions detrimental to timely and proper completion of the Work.

C. Do not proceed until unsatisfactory conditions are corrected.

D. Beginning of installation means acceptance of conditions.

3.02 PROTECTION

A. Protect existing utilities indicated or made known.

B. Protect trees and shrubs, where indicated to remain, by providing a fence around the tree or shrub of sufficient distance away and of sufficient height so trees and shrubs will not be damaged in any way as part of this Work.

C. Protection of persons and property:

1. Barricade open depressions and holes occurring as part of this Work, and post warning lights on property adjacent to or with public access.

2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.

3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by operations under this Section.

D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

E. Maintain access to the site at all times.

3.03 CLEARING

Strip the site of roots, shrubs, grass, grass roots, or any other organic material. Remove roots of shrubs to depth of 24 inches and roots of trees completely. Contractor shall visit the site prior to Bid to ascertain extent of existing to be removed.

3.04 DISPOSAL

General:

1. Remove brush, grass, roots, trash, and other material from clearing operations.
2. Dispose away from the site in a legal manner - consider green recycling facilities in the area.
3. Do not store or permit debris to accumulate on the job site.

3.05 UTILITIES

A. Coordinate with utility companies and agencies as required.

B. Where utility cutting, capping, or plugging is required, perform such work in accordance with requirements of the utility company or governmental agency having jurisdiction.

*****END OF SECTION*****

SECTION 31 23 00

EXCAVATING, BACKFILLING AND COMPACTING

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract requirements and Division 1, General Conditions apply to this section.

1.02 SCOPE OF WORK

Work included: Excavate for foundations, backfill and compact as necessary as shown on the Drawings, as specified herein, and as needed to meet the requirements of the construction shown in the Contract Documents.

1.03 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Use equipment in size, capacity, and numbers to accomplish the work of this Section in a timely manner.

C. In addition to complying with requirements of governmental agencies having jurisdiction, comply with the directions of the Geotechnical Engineer of Record engaged by the Owner.

1.04 SUBMITTALS

A. Provide in accordance with Section 01 33 00.

B. Submit proposed Products to Architect.

PART 2 -- PRODUCTS

2.01 SOILS MATERIALS: FILL AND BACKFILL

A. Provide soil materials free from organic matter and deleterious substances, containing no rocks or lumps larger than 2" in their greatest dimension, and equal to the on-site material.

B. Fill material is subject to the acceptance of the Geotechnical Engineer of Record, and is that material removed from excavations or imported from off-site borrow areas, predominantly granular, non-expansive soils free from roots and other deleterious matter.

C. Imported materials shall be tested and accepted by the Geotechnical Engineer of Record before being brought to the site.

D. Cohesion-less material used for structural backfill: Provide sand free from organic material and other foreign matter, and as accepted by the Geotechnical Engineer of Record.

E. Provide granular base under building slabs. Fine aggregate shall comply with requirements of Section 03300 of these Specifications.

2.02 OTHER MATERIALS

Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the acceptance of the Architect.

PART 3 -- EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Correct conditions detrimental to timely and proper completion of the Work.

C. Do not proceed until unsatisfactory conditions are corrected.

D. Beginning of installation means acceptance of conditions.

E. If the Contractor encounters conditions at the site that (a) are materially different from those indicated in the contract plans or in specifications, or (b) could not have been reasonably anticipated as inherent in the work of the character provided in the contract, the Contractor shall immediately notify the Owner verbally and in writing within 24 hours. This notification shall be a condition precedent before any negotiations for "changed or differing site conditions" can proceed. If the Owner determines that conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performance of any part of the work under this contract, then negotiations shall commence between Owner and Contractor to provide equitable adjustment to Owner or Contractor resulting therefrom.

3.02 PROCEDURES

A. Utilities:

1. Unless shown to be removed, protect active utility lines shown on the Drawings or otherwise made known to the Contractor prior to excavating. If damaged, repair or replace at no additional cost to the Owner.

2. If active utility lines are encountered, and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.

3. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Architect and secure his instructions.

4. Do not proceed with permanent relocation of utilities until written instructions are received from the Architect.

B. Protection of persons and property:

1. Barricade open holes and depressions occurring as part of the Work, and post warning lights on property adjacent to or within public access.

2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.

3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this Section.

C. De-watering:

1. Remove all water, including rain water, encountered during trench and sub-structure work to an approved location by pumps, drains, and other approved methods.

2. Keep excavations and site construction area free from water.

D. Use means necessary to prevent dust from becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

E. Maintain access to adjacent areas at all times.

3.03 EXCAVATING

A. Perform excavating of every type of material encountered within the limits of the Work to the dimensions and elevations indicated and specified herein.

B. Excavated materials: Transport to, and place in, fill or embankment areas within the limits of the Work; dispose of such excess material away from the site in a location arranged and paid for by the Contractor.

C. Excavate and backfill in a manner and sequence that will provide proper drainage at all times.

D. Unauthorized excavation:

1. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific instruction from the Architect or the Soils Engineer.

2. Under footings, foundations, or retaining walls:

a. Sub-excavate and re-compact earth materials in the affected area as directed by the Soils Engineer.

b. When acceptable to the Soils Engineer, lean concrete fill may be used to bring the bottom elevation to proper position.

3. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations, unless otherwise directed by the Soils Engineer.

E. Stability of excavations:

1. Slope sides of excavations to 1:1 or flatter, unless otherwise directed by the Soils Engineer.

2. Shore and brace where sloping is not possible because of space restrictions or stability of the materials being excavated.

3. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

F. Shoring and bracing:

1. Provide materials for shoring and bracing as may be necessary for safety of personnel, protection of work, and compliance with requirements of governmental agencies having jurisdiction.

2. Maintain shoring and bracing in excavations regardless of the time period excavations will be open.

3. Carry shoring and bracing down as excavation progresses.

G. Excavating for structures:

1. Conform to elevations and dimensions shown within a tolerance of 0.10 ft.

2. Where concrete is anticipated to be placed directly against earth surfaces, widen excavations by one inch at each contact surface beyond that specified on the plans.

3. In excavating for footings and foundations, take care to create accurate and straight planes and shapes.

a. Excavate by hand tools to final grade where necessary.

b. Trim bottoms to required lines and grades to leave solid base to receive concrete.

H. Excavating for pavements:

1. Cut surface under pavements to comply with cross-sections, elevations, and grades.

3.04 FILLING AND BACKFILLING

A. General:

1. For each classification listed below, place acceptable soil material in layers to required subgrade elevations.
2. In excavations, use satisfactory excavated or borrowed material.
3. Under asphalt pavements, use sub-base materials.

B. Placing and compacting:

1. Place backfill and fill materials in layers not more than 8" in loose depth.
2. Before compacting, moisten or aerate each layer as necessary to provide the optimum moisture content.
3. Compact each layer to required percentage of maximum density for area.
4. Do not place backfill or fill material on surfaces that are muddy, frozen, or containing frost or ice.
5. Place backfill and fill materials evenly adjacent to structures, to required elevations.
6. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around the structure to approximately the same elevation in each lift.

C. Backfill excavations as promptly as progress of the Work permits but not until completion of the following:

1. Acceptance of construction below finish grade including, where applicable, damp-proofing and waterproofing.
2. Inspecting, testing, approving, and recording locations of underground utilities.
3. Removing concrete formwork.
4. Removing shoring and bracing, and backfilling of voids with satisfactory materials.
5. Removing trash and debris.
6. Placement of horizontal bracing on horizontally supported walls.

3.05 COMPACTING

A. Control soil compaction for any areas disturbed during construction to provide the minimum percentage of density specified for each area as determined according to ASTM D1557. Soils Engineer's recommendations found in the Soils Report will take precedence.

B. Provide not less than the following maximum density of soil material compacted at optimum moisture content for the actual density of each layer of soil material in place, and as approved by the Soils Engineer.

1. Structures: Compact each layer of fill and material or backfill material at 90% of maximum density.
2. Lawn and unpaved areas:
3. Compact the top 8" of subgrade and each layer of fill material or backfill material at 90% of maximum density.
4. Compact the upper 12" of filled areas, or natural soils exposed by excavating, at 85% of maximum density.
5. Paving: Compact each layer of fill material or backfill material at 95% of maximum density.

C. Moisture control:

1. Where subgrade or layer of soil material must be moisture-conditioned before compacting, uniformly apply water to surface of subgrade or layer of soil material to prevent free water appearing on surface during or subsequent to compacting operations.
2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compacting to the specified density.
3. Soil material that has been removed because it is too wet to permit compacting 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 as determined by moisture-density relation tests approved by the Soils Engineer.

3.06 GRADING

A. General:

1. Smooth the finished surfaces within specified tolerance.
2. Compact with uniform levels or slopes between points where elevations are shown on the Drawings, or between such points and existing grades.

B. Grading outside building lines:

1. Grade areas adjacent to buildings to achieve drainage away from the structures, and to prevent ponding.
2. Finish the surfaces to be free from irregular surface changes, and:
   a. Shape the surface of areas scheduled to be under walks to lines, grade, and cross-section, with finished surface not more than 0.10 ft. above or below the required subgrade elevation.
   b. Shape the surface of areas scheduled to be under pavement to line, grade, and cross-section, with finished surface not more than 0.05 ft. above or below the required subgrade elevation.

3.07 MAINTENANCE

A. Protection of existing graded areas:

1. Protect existing graded areas from traffic and erosion, and keep free from trash and weeds;
2. Repair and re-establish grades in settled, eroded and rutted areas to the specified tolerances.

B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction.

*****END OF SECTION*****

SECTION 31 32 00

SOIL STABILIZER

PART 1 -- GENERAL

1.01 SUMMARY

Division 0, Contract requirements and Division 1, General Conditions apply to this section.

1.02 SCOPE OF WORK

A. Perform all soil stabilization of soils as shown on the Drawings and as specified herein.

B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to, Special Conditions, and Sections in Division 1 of these Specifications.

1.03 CONDITIONS AT SITE

A. Visit the site. Examine and note all conditions as to the character and extent of Work involved.

B. Perform selective demolition and excavation work per Sections 02 41 00, 31 00 00 and 31 23 00 of these specifications.

1.04 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00.

1.05 SUBMITTALS

Provide in accordance with Section 01 33 00.

PART 2 -- PRODUCTS

2.01 MATERIALS

A. Provide an organic-based chemical stabilizer that is a mixture of surfactant, buffer, and polyquaternaryamine in a polar vehicle.

B. Provide "Soil Sta" as manufactured by Soil Sta, Inc. (214) 271-3243 or approved equal.

PART 3 -- EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Correct conditions detrimental to timely and proper completion of the Work.

C. Do not proceed until unsatisfactory conditions are corrected.

D. Beginning of installation means acceptance of conditions.

3.02 PREPARATION

A. Drill holes in slab at a 10'-0" grid.

B. Excavate perimeter foundation at 10'-0" on center with 3'-0" x 3'-0" x 3'-0" holes.

3.03 APPLICATION

A. Mix at a dilution of 1:50. Apply, with spray, at all areas of flat work at 1/8 gallon per square foot.

B. Pressure inject soil stabilizer per manufacturer's recommendations.

3.04 CLEAN-UP

Remove all debris and excess material from site.

*****END OF SECTION*****

SECTION 32 11 00

STABILIZED DECOMPOSED GRANITE

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract requirements and Division 1, General Conditions apply to this section.

1.02 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00.

1.03 SUBMITTALS

A. Provide in accordance with Section 01 33 00.

B. Sieve analysis of aggregate for road and fire lanes.

C. Samples and or shop drawings for the following:

1. Aggregate for strength and color – road and fire lane

D. Construction Samples:

1. Construct mock-up panels or areas for each different type of paving system as specified herein to demonstrate ability to archive types of setting bed, joints, pattern, color and texture required herein.

2. Stalok® Paving Material for aggregate road and fire lane surfacing: Construct a 12'x24' sample of finished path as directed by the Owner's Representative on site.

3. General:

a. Schedule mock-up construction so that mock-up can be accepted a minimum of 30 days prior to the application of paving surfaces represented by the mock-up.

b. Locate mock-up panel(s) in areas as directed by the Owner's Representative.

c. Continue to construct mock-ups until acceptable mock-up is produced (at no cost to the Owner). Acceptable mock-up shall be standard for texture, color and workmanship.

d. Use same setting bed and joint mixes used in accepted mock-up in final work unless otherwise directed by Owner's Representative.

e. Protect accepted mock-ups from damage until completion and acceptance of the work represented by the mock-ups.

f. Remove mock-up panel(s) from the site at completion of the project, unless otherwise instructed by Owner's Representative.

1.03 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty executed by the installer agreeing to repair or replace components of Stalok® Paving Material that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:

1. Premature wear and tear, provided the material is maintained in accordance with manufacturer's written maintenance instructions.
2. Failure of system to meet performance requirements.

C. Warranty Period: Contractor shall provide warranty for performance of product. Contractor shall warranty installation of product for the time of one year from completion.

D. Contractor shall provide, for a period of sixty days, unconditional maintenance and repairs as required.

PART 2 -- SUMMARY

A The work of this Section consists of all paving work and related items as indicated on the drawings and or as specified herein and includes, but is not limited to, the following items:

1. Stalok® Paving Material aggregate road and fire lane surfacing

B Related Sections:

1. Section 02100 – Site Preparation
2. Section 02200 – Earthwork
3. Section 02230 – Granular Materials

C General Provisions

1. All of the contract documents, including General and Supplementary Conditions and Division I General Requirements, apply to the work of this Section.
2. Examine all drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.
3. Coordinate work with that of all those affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

2.01 PERFORMANCE REQUIREMENTS

The following standards and definitions are applicable to the work of this Section to the extent referenced herein:

1. Standard Specifications: Highway Department, Standard Specifications for Highways and Bridges, latest edition.
2. ASTM: American Society for Testing and Materials.
3. AASHTO: American Association of State Highway and Transportation Officials.

2.02 PROJECT/SITE CONDITIONS

Field Measurements: Each bidder is required to visit the site of the work to verify the existing conditions. No adjustments will be made to the Contract Sum for variations in the existing conditions.

1. Where surfacing is indicated to fit with other construction, verify dimensions of other construction by field measurements before proceeding with the work.

2.03 QUALITY ASSURANCE

Installer Qualifications: Installer to provide evidence to indicate successful experience in installation of Stalok® Paving Material or approval by manufacturer.

PART 3 -- PRODUCTS

3.01 MANUFACTURERS

Stalok® Paving Material is provided by the following manufacturer:

1. Stabilizer Solutions, Inc. 33 South 28th St., Phoenix, AZ 85034; phone (602) 225-5900, (800) 336-2468; fax (602) 225-5902; website www.stabilizersolutions.com; email info@stabilizersolutions.com

3.02 MATERIALS

Aggregate Specifications

1. Crushed stone shall consist of inert materials that are hard, durable, with stone free from surface coatings and deleterious materials. Gradation requirements shall be as follows:

U.S. Sieve No.	Percent Passing by Weight
# 1/2"	98 – 100
# 3/8"	90 – 100
# 4	65 – 80
# 8	48 – 63
# 16	40 – 49
# 30	30 – 40
# 50	20 – 27
# 100	10 – 18
# 200	10 – 12

2. R-value minimum of 70 determined by ASTM D 2488 Methodology (R-value is a measure of wear resistance).
3. Sand equivalent – an engineering measurement of the proportion of sand to silt and clay, will stay at a range of 30-55. As determined by ASTM D 2419 methodology.
4. Dense graded crushed stone base shall be furnished and installed as required and specified under Section 02200, Earthwork and Section 02230 Granular Materials to a 6" compacted depth.

PART 4 -- EXECUTION

4.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Correct conditions detrimental to timely and proper completion of the Work.

C. Do not proceed until unsatisfactory conditions are corrected.

D. Beginning of installation means acceptance of conditions.

4.02 PREPARATION

A. Make any corrections necessary to base furnished and installed under Section 02200 Earthwork and Section 02230 Granular Materials to bring gravel to the sections and elevations shown on the drawings.

B. Pre-soak base material with water prior to installing Stalok® Paving Material as needed to compact base.

4.03 BLENDING

A. Stalok® Paving Material is a solely owned patented process.

B. Blending procedures are performed only by a licensed Stalok® Paving Material blender and can only be sold through licensed Stalok® Paving Material Dealers.

4.04 PLACEMENT/COMPACTION

Place Stalok® Paving Material at a 2" compacted depth. Using a Paver Box, Paver, Crawler Paver, Asphalt Paver, Drag Box Paver, Pavement Profiler, Slip Form Paver, Pav-Saver Place Spreader or Equal Compact Stalok® Paving Material.

1. Compaction can be achieved by a 5-ton double-drum roller
2. Compact material making 8 to 10 passes.
3. Use plate compactor on edges and hard to get areas.
4. Loose material shall not be present on final surface.

4.05 WATERING

Water the surface area with a light spray following compaction. Contractor shall take care as to not disturb the aggregate surface with the spray action.

4.06 INSPECTION

Finished surface shall be uniform and solid, with no evidence of chipping or cracking. Dried, compacted paving material shall be firm to full depth with no soft areas. Loose material shall not be presented on the surface and no ruts shall be present.

4.07 MAINTENANCE

Remove debris, such as paper, grass clippings, leaves or other organic material by mechanically blowing or hand raking the surface as needed. Any plowing program required during winter months shall involve the use of a rubber baffle on the plow blade or wheels on the plow that lifts the blade 1/4" off the paving surface.

4.08 REPAIRS

A. Excavate damaged area to the depth of the Stalok® Paving Material and square-off sidewalls.

B. If area is dry, moisten damaged portion lightly and scarify.

C. Apply lightly moistened pre-blended Stalok® Paving Material to excavated area to finish grade.

D. Compact with an 8" to 10" hand tamp or 1000 lb. Roller.

*****END OF SECTION*****

SECTION 32 12 16

ASPHALT CONCRETE PAVING

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Requirements apply to this Section.

1.02 SCOPE OF WORK

Requirements specified in the Specifications form a part of this Section. Provide labor, equipment, tools and materials to accomplish asphalt concrete paving as indicated on the Plans and/or on the Proposal forms.

1.03 PAVEMENT REMOVAL AND REPLACEMENT

A. General: Pavement removal and replacement for all public roads, including aggregate base and temporary paving where required, shall comply with all requirements of the agency issuing the Encroachment Permit. In roads established under formation of a special road district, the specifications of the Encroachment Permit shall apply. Any private roads and streets, including driveways in which the surface is removed or damaged, shall be restored to the original grade and crown by the Contractor in accordance with the paving requirements described herein. Removed or damaged sections shall be restored with the type of improvements (or better) conforming to that which existed at the time the Contractor entered upon the work.

It shall be the responsibility of the bidder to satisfy himself as to the existing pavement sections prior to submitting his bid.

B. Pavement Cutting: Pavement shall be cut to a straight edge parallel to the pipe alignment, curb and gutter, barrier curb, pavement edge, etc., prior to excavation. Method of pavement cutting shall be sawcutting for the full depth of the pavement. Under no circumstances shall excavation be started prior to sawcutting of the pavement. If the adjacent pavement is disturbed during the Contractor's operation, the pavement shall be recut on straight lines to remove the damaged pavement before resurfacing. Portland cement concrete pavement and sidewalk shall also be saw cut full depth as required.

C. Asphalt Concrete Pipe Trench Pavement: Where required by the agency issuing the Encroachment Permit or other agency having jurisdiction, and where specified in the Contract Documents, an asphalt concrete cap shall be placed in the area of the pipe trench or pipe excavation area. The installation of the asphalt concrete pavement shall be in accordance with the specifications and policies of the agency having jurisdiction. In the event the agency requirements conflict with the Plan requirements, the most stringent will apply.

1.04 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00.

1.05 SUBMITTALS

Provide in accordance with Section 01 33 00.

1.06 TEMPORARY PAVEMENT

Install temporary pavement in accordance with the requirements of the agency issuing the Encroachment Permit. Steel plates may be allowed to cover excavation areas within road right of ways as approved by the governing agency and Engineer.

1.07 CLOSE-OUT: also comply with the requirements of Section 01 78 0 – Contract Closeout.

A. Reports: None required.

B. As-Builts: None required.

C. Operation and Maintenance Data: None required.

D. Extra Materials: None required.

E. Extended Warranty: Comply with the requirements of General Condition Article 3.5.

PART 2 – PRODUCTS

2.01 ASPHALT CONCRETE PAVING

A. MIX: Caltrans, Type A, ¾ inch aggregate gradation except for parking lot areas. Parking Lot areas shall use Caltrans Type A ½ inch aggregate gradation.

B. THICKNESS: 3" min.; or greater as specified on the Plans.

C. AGGREGATE SIZE: 3/4" (1/2 inch aggregate gradation for parking areas) per Caltrans Section 39.

D. ASPHALT CONTENT: 4% to 8% by weight per the A.C. Mix Design.

E. PRIME COAT: Per Caltrans Section 39-4.02.

2.02 ASPHALT CONCRETE CAP

A. MIX: Caltrans, Type A, ¾ inch aggregate gradation except for parking lot areas. Parking Lot areas shal use Caltrans Type A ½ inch aggregate gradation.

B. THICKNESS: 3" or greater as specified on the Plans.

C. AGGREGATE SIZE: 3/4" aggregate gradation maximum, fine (1/2 inch aggregate gradation for parking area).

2.03 FOG SEAL

A. SPECIFICATION: Caltrans Section 37.

B. MATERIAL: Slow setting, mixing type asphaltic emulsion per Caltrans Section 94-1.01B.

2.04 ASPHALT CONCRETE BERMS (Not Applicable)

PART 3 – EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Verify that specified items may be installed in accordance with the approved design.

C. Correct conditions detrimental to timely and proper completion of the Work.

D. Do not proceed until unsatisfactory conditions are corrected.

E. Beginning of installation means acceptance of conditions.

3.02 ASPHALT CONCRETE PAVING

A. Asphalt Concrete shall be applied with a vibratory machine. The grade of all asphalt bitumen shall be PG 70-10. The minimum bitumen shall be in accordance with the approved mix design. The Asphalt Concrete shall be compacted to 95 percent of maximum density per ASTM D-1559. The temperature of the asphalt when delivered to the application site shall range between 285° *F* and 359° *F*. The finished surface shall be within ± 0.02 feet of finish design grade with maximum high and low variance occurring in a maximum of 10 horizontal feet.

B. Rollers of the vibratory, steel wheel or pneumatic-tired type may be used. They shall be in good condition, capable of operating at slow speeds to avoid displacement of the bituminous mixture. The number, type and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition. The use of equipment which causes excessive crushing of the aggregate shall not be permitted.

C. After spreading, the mixture shall be thoroughly and uniformly compacted by rolling. The surface shall be rolled when the mixture has attained sufficient stability so that the rolling does not cause undue displacement, cracking or shoving. The sequence of rolling operations and the type of rollers used shall be at the discretion of the Contractor.

D. The speed of the roller shall, at all times, be sufficiently slow to avoid displacement of the hot mixture. Any displacement occurring as a result of reversing the direction of the roller or from any other cause shall be corrected at once.

E. Rolling shall continue until the roller marks are eliminated, the surface is of uniform texture and true to grade and cross-section and the required field density is obtained.

F. To prevent adhesion of the mixture to the roller, the wheels shall be kept properly moistened, but excessive water will not be permitted.

G. In areas not accessible to the roller, the mixture shall be thoroughly compacted with hot hand tampers.

H. Any mixtures that become loose and broken, mixed with dirt, or in any way defective, shall be removed and replaced with fresh hot mixture and immediately compacted to conform to the surrounding area. This work shall be done at the Contractor's expense.

I. The Contractor shall pay for all costs associated with the preparation of the Marshall Mix Design, compaction tests and extraction/gradation tests required for this project. The Contractor shall incur all costs relative to the preparation of the Marshall Mix Design. The density testing relative for this project is to be performed by the Owners Material Testing Consultant.

J. A sample of the bituminous mix shall be obtained each morning pavement operations are occurring. The sample shall be obtained by the material testing consultant. The maximum density of the sample shall be determined. The results of the test shall be used to base the field density tests against. An extraction from the sample shall be taken to determine the percentage of bitumen in the mix. The gradation of the sample shall also be obtained. Density tests shall be taken during the rolling operation. The pavement shall continue to be rolled until the desired density is obtained. The costs associated with the testing shall be borne by the Contractor. The Contractor shall provide two (2) sets of test reports to the Engineer. A field technician provided by the material testing consultant shall be made available during the asphalt placement to continuously monitor the density of the asphalt if so required by the Engineer.

   1. Application: Mixing transporting and placing of asphalt concrete shall be in accordance with all applicable provisions of Caltrans Section 39. Asphalt concrete shall not be placed when the atmospheric temperature is below 60°*F*, or during unsuitable weather.

   2. Repairs: Deficient paving and/or low areas with inadequate drainage and damaged paving due to subgrade failure, inadequate trench compaction, etc., shall be repaired by the Contractor at no additional cost to the Owner.

3.03 ASSOCIATED PAVING RELATED WORK

A. Manhole Covers: Adjust sewer and storm drain manhole covers three (3) inches below the finish design pavement surface prior to the installation of A.C. pavement. Raise the manhole covers to finish pavement grade after paving operations are completed. Place a one (1) foot wide, one (1) foot deep 4,000 PSI concrete ring concentric around the manhole level with the finish pavement surface.

B. Valve Covers: Adjust water valve risers and covers three (3) inches below the finish design pavement surface prior to the installation of A.C. pavement. Raise the valve risers and covers to finish pavement grade after paving operations are completed. Place an eight (8) inch wide, eight (8) inch deep 4,000 PSI concrete ring concentric around the water valve riser and cover level with the finish pavement surface.

C. Striping: Replace the traffic striping and pavement markers over the areas receiving the overlay.

D. Traffic Signs: Replace traffic signs temporarily removed during the construction work.

E. Payment: Payment for all associated paving related work as described herein shall be included in the appropriate bid item(s) indicated on the Proposal forms and no additional compensation shall be made therefore.

3.04 FOG SEAL

A. Application: Apply fog seal at a rate of 0.06 to 0.10 gallons per square yard of surface area.

B. Fog Seal Schedule: Apply fog seal not less than fourteen (14) days following placement of asphalt concrete surfacing.

3.05 PAVING SCHEDULE

Unless otherwise approved by the Engineer, all permanent paving shall commence only after construction of all other contract work is completed.

3.06 APPLICATION OF SEAL COAT

A. Prepare the surfaces, mix the seal coat material, and apply in accordance with Standard Specification, Section 302-4.

B. Apply one coat of the specified sealer.

C. Achieve a finished surface seal which, when dry and thoroughly set, is smooth, tough, resilient, of uniform black color, and free from coarse textured areas, lap marks, ridges and other surface irregularities.

*****END OF SECTION*****

SECTION 32 13 13

SITE CONCRETE WORK

PART 1 -- GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract requirements and Division 1, General Conditions apply to this section.

1.02 SCOPE OF WORK

Complete site concrete work as shown on drawings and specified herein.

1. Final Subgrade Preparation
2. Forms for this Work
3. Placing Concrete
4. Concrete Finishing
5. Concrete Curing
6. Reinforcement

1.03 QUALITY ASSURANCE

A. Reference Standards:

1. CBC: All work shall conform to the requirements of the current edition.
2. County of Riverside.
3. City of Indio.

B. Tests and Inspection:

1. Tests shall be performed as required by the Inspector.
2. Contractor shall notify testing laboratory a minimum of forty-eight (48) hours before pouring of concrete.
3. A minimum of three (3) test cylinders will be taken by molded cylinder method for each fifty (50) yards of each grade of structural concrete. A minimum of one set of cylinders shall be taken for each day placement of each grade.

1.04 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00.

1.05 SUBMITTALS

A. Provide in accordance with Section 01 33 00.

B. Contractor shall submit all necessary Product Data and a complete list of material sources for all products to be incorporated into the project for review and approval of the Architect. The Performance of all Mix Designs shall be established either by stamped by an individual licensed to specify concrete mix designs engaged by Concrete Supplier or by break test data from at least 30 different projects for each mix design.

1.06 CLOSEOUT

Upon completion of work of this Section, the Contractor shall remove all equipment, excess material, and waste products from the site.

PART 2 -- PRODUCTS

2.01 MANUFACTURER

Materials used in concrete work shall be all new from domestic sources approved by the Architect.

2.02 MATERIALS

A. Cement: Shall be a standard brand of domestic Portland cement conforming to "Standard Specifications for Portland Cement", ASTM Des. C-150 Type I or II.

B. Concrete Aggregates: Shall conform to ASTM Des. C-33 and UBC Standard No. 26-2 for stone weight concrete and in addition shall comply with the following:

1. Aggregates shall be from approved local pits and shall not contain opaline, feldspar, siliceous magnesium limestone, or other deleterious substances. No pumice aggregate will be allowed. If aggregate is from pits having a high alkali content, cement shall be "low alkali" with a maximum of 0.6% free alkali as determined by standard tests in ASTM C-114.

2. Concrete aggregates for stone concrete shall conform to UBC Standards, except as modified by this section. Any suitable individual grading of coarse aggregates may be used, provided the "grading of combined aggregates" shown below are obtained. Both the coarse and fine aggregate shall be tested by the use of a solution of sodium or magnesium sulfate, or both, whenever in the judgment of the Architect or Structural Engineer or the Building Department, such tests are necessary to determine the quality of the materials. Such tests shall be performed in accordance with the standard method of tests for "Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate", ASTM C88. The loss shall not exceed six percent for either fine or coarse aggregate. Aggregate failing to comply with this requirement may be used in the work provided it contains less than 2 percent of shale and other deleterious particles and shows a loss in the soundness test of not more than ten (10) percent when tested in the sodium sulphate solution.

3. Grading of Combined Aggregate:

SAME NUMBER ASONE & ONE HALF		ONE INCH	THREE-FOURTHS
SIZE IN INCHES	INCH MAXIMUM	MAXIMUM	INCH MAXIMUM
Passing a 2 inch	--	--	--
Passing a 1-1/2"	95 - 100	--	--
Passing a 1"		75 - 90	90 - 100 --
Passing a 3/4"	55 - 77	70 - 90	90 - 100
Passing a 3/8"	40 - 35	45 - 65	60 - 80
Passing a No. 4	30 - 40	31 - 47	40 - 60
Passing a No. 8	22 - 35	23 - 40	30 - 45
Passing a No. 16	16 - 30	17 - 35	20 - 35
Passing a No. 30	10 - 20	10 - 23	13 - 23
Passing a No. 50	2 - 8	2 - 10	5 - 15
Passing a No. 100	0 - 3	0 - 3	0 - 5

4. Coarse Aggregate: Shall be clean, hard, fine-grained, sound washed gravel, or crushed stone, containing not more than 2% by weight of flat, thin elongated, friable, or laminated pieces. Maximum sizes of gradations for concrete work shall be 3/4"

and 1-1/2" for locations as hereinafter designated. The nominal maximum size of the aggregate shall not be larger than one-fifth of the narrowest dimensions between sides of forms, one-third of the depth slabs, nor three-fourths of the minimum clear spacing between individual reinforcing bars.

C. Water: For all concrete and cement work shall be clean, free from strong acids, alkali, oil, or organic materials and shall be supplied by Contractor from domestic source.

D. Form Coatings: Standard product resin type sealer, free of oil, grease, wax or any other substance deleterious to materials applied to concrete, delivered in unopened labeled containers. Do not use form oil or any oil-bearing material.

E. Forms: Conform to shape, lines and dimensions of the members as shown on the plans. Properly brace or tie together to maintain position and shape. Make forms sufficiently tight to prevent leakage of mortar. Lumber shall be Construction grade Douglas Fir conforming to WCLA Grading Rules 16, as revised.

F. Other Admixtures:

1. For workability, an admixture may be added in accordance with manufacturer's recommendations. Obtain approval of material prior to use. Approval will be based on the following requirements:

   a. Reduction of mixing water by at least ten (10) percent.

   b. Reduction of segregation and bleeding.

   c. Increasing of placability and viscosity of concrete.

   d. No reduction in strength for any proportion of water/cement ration.

2. Add air-entrainment material to concrete mix at the rate of 4-6% per cubic yard of concrete.

2.03 CONCRETE

A. Transmit-mixed concrete shall be mixed and delivered in accordance with the requirements set forth in ASTM C94 and, in addition, shall in no case be mixed for a period of less than ten (10) minutes at a peripheral drum speed of approximately 200 feet per minute, and mixing shall be continued until discharge is completed. At least 3 minutes of the mixing period shall be at the job site. Concrete shall be rejected if not placed in final position within one (1) to one and a half (1-1/2) hours after water is first added to the batch. The concrete at the time of placing shall be in such condition that it can be properly placed.

B. Site-mixed Concrete: Conform to "Arbitrary Mix" in California Building Code.

C. All concrete shall be six (6) sack mix concrete having a twenty-eight (28) day strength of not less than two thousand (3000) PSI or as noted on the plans and details.

D. Curing Materials:

1. Liquid curing compound: Thompson's approved standard product fugitive resin type, or equal conforming to ASTM C309, free of wax or oil, compatible with subsequently applied finishes or coverings, not deleterious to bond of cementitious materials to concrete. Deliver in unopened, labeled containers.

2. Concrete Curing Paper: Sisalkraft, non-staining reinforced type, or equal conforming to ASTM C171.

E. Expansion Joint Material: "Fleximastic" or other approved hot-pour rubber type conforming to ASTM D1190.

F. Concrete Finish: Medium Salt Finish and/or broom finish as called out on the Drawings.

G. Patching Mortar: One part Portland cement or equal (part white and part gray adjusted to match color of paving being patched) and two and one-half (2-1/2) parts sand with the least

water required to produce a workable mass. Rework this mortar until it is the stiffest consistency that will permit placing.

H. Reinforcing fibers: Shall be polypropylene, collated, fibrillated fibers from Fibermesh Company (615) 892-7243, or approved equal. Follow NER 284 and manufacturers requirements for installation. Only fibers designed and manufactured specifically for use in concrete and so certified shall be acceptable.

PART 3 -- EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Correct conditions detrimental to timely and proper completion of the Work.

C. Do not proceed until unsatisfactory conditions are corrected.

D. Beginning of installation means acceptance of conditions.

3.02 SUBGRADE PREPARATION

A. Construct the subgrade true to grade and detail as shown on the plans.

B. Contractor shall verify the acceptability of the work of other sections to be concealed by concrete work prior to commencing concrete placement.

C. Preparation Before Placing: Water shall be removed from excavation before concrete is deposited. Any flow of water shall be diverted without washing over freshly deposited concrete. Hardened concrete, debris and foreign materials shall be removed from interior of forms and from inner surfaces of mixing and conveying equipment. Reinforcement shall be secured in position, inspected and approved before pouring of concrete. Wheeled concrete-handling equipment shall not be wheeled over reinforcement nor shall runways be supported on reinforcement. Sub-grade for paving over native earth or fill shall be finished to exact location and section of bottom of slab and shall be maintained in a smooth, compacted condition, until concrete is placed. Sub-grade shall be thoroughly moistened but not muddy at time concrete is deposited.

D. Subgrade to 95% maximum density at optimum moisture content.

E. Prior to pouring concrete, call Contractor's Soil Engineer for approval of subgrade compaction and moisture content. Give Soil Engineer minimum 24 hours notice prior to inspection time. Soil Engineer's fee will be paid by Contractor.

3.03 FORMING

A. Set forms with upper edges true to line and grade. Remove side forms not sooner than twelve (12) hours after finishing has been completed.

B. Form curves so that there are no abrupt offsets or jogs at points of tangency. Secure approval of form alignment both horizontally and vertically prior to pouring and make necessary adjustments to conform to plans and details as directed.

C. Where forms adjoin existing concrete, the transition shall be smooth and even in both alignment and in horizontal plane.

D. Forming shall not be secured to surface which will remain exposed, with powder shot studs or any other manner which will damage finish.

E. Rigidly construct and shore to prevent mortar leakage, sagging, displacement, or bulging between supports. Use clean, sound approved form material, coated with specified materials only, not oil. Provide backing on all plywood joints.

1. Form Ties: Bolts or rods with internal ties and spreaders; designed so that no permanent metal is within one (1) inch of exterior surface or one-half (1/2) inch of interior surface.
2. Wood: Leave no wood in forms except as indicated nailing blocks and inserts.
3. Shores: Of substantial construction to prevent deflection under imposed loads, double-wedged with large bearing blocks, kept tight during concrete placing, or with approved jacks.

F. Embedded Items: Install work built into concrete such as sleeves, anchor bolts, wood nailers, reglets, frames and sleeves for piping, conduit and fittings. Provide facilities and supervision required for installation of inserts specified under other sections and perform cutting and reinforcing of forms required to accommodate them. Do not place any concrete until all inserted items are installed in their proper locations, secured against displacement, cleaned, inspected and approved. Set such items according to approved shop drawings and setting plans. Furnish ties and supports necessary to keep embedded items in place when concrete is placed.

3.04 CONCRETE INSTALLATION

A. Construct concrete work to conform to plans and details.

B. Weather: Do not place concrete during rain unless approved measures are taken to prevent damage to concrete. Cure concrete placed during periods of dry winds, low humidity, high temperatures and other conditions causing rapid drying, initially with a fine fog maintained until final curing operations are begun.

C. Slump: Conform to ASTM C143. Not over five (5) inches for slabs on grade and not over four (4) inches for walls and footings.

D. Mix for footings shall be Class B concrete.

E. Transit Mix:

1. Transit mixed concrete shall conform to ASTM C-94 and UBC Standards. Transit mixers shall be equipped with automatic devices for recording number of revolutions of drum.
2. Admixture: Shall comply with UBC Standards and shall be installed in accordance with manufacturer's recommendations.
3. Transit mix concrete shall comply with UBC Standards and not be delivered to work with total specified amount of water incorporated therein. Withhold two and a half (2-1/2) gallons of water per cubic yard which may be incorporated in mix before concrete is discharged from mixer truck. Adding of any water shall be under direct inspection of Architect. Each mixer truck shall arrive at job site with its water container full.

3.05 PLACING FORMED CONCRETE

A. Notify Architect not less than 48 hours before starting any concrete placing. No concrete shall be poured until reinforcing steel and forms have been approved by the Structural Engineer or Architect or by jurisdictional Inspector.

B. Cleaning of Forms: Before placing of any concrete, thoroughly clean all forms, wash out with water, and make tight.

C. Concrete: Deliver to point of placing so as not to fall vertically more than six (6) feet, and deposit so that surface is kept horizontal and level, a minimum amount being allowed to flow from one portion to another. Deposit concrete in forms as nearly as possible in its final location. Under no circumstances deposit concrete which has partially hardened.

D. Vibration and Tamping: As concrete is placed in forms, work concrete around reinforcing steel, built-in items and into corners and angles. Provide mechanical vibrators operated by

experienced men for agitating concrete in forms and vibrate thoroughly within five (5) minutes after layer is placed. Vibration shall be carried well into previous layer. Supplement vibration by suitable methods to eliminate voids along forms for full depth of layer as directed. Do not use vibrators to work concrete along the forms. Keep at least one spare vibrator on the job at all times while concrete is being placed. Comply with ACI 309 (609.60), Consolidating of Concrete.

E. Stoppage: Upon completion of pour and after concrete has partially hardened, wash scum or laitance off surface with stiff brush and stream of water. When work is resumed, brush clean with wire brushes or as specified, then place fresh concrete. A chemical retarding agent may be used on joint surfaces to expose the aggregate. Remove retarded mortar within 24 hours after placing and wash surface to produce a rough, exposed aggregate bonding surface.

3.06 FLATWORK

A. Set forms as shown on plans.

B. Deposit concrete evenly, consolidate with mechanical vibrators, particularly at side forms and strike off to indicated elevations and contours. Depress slabs for applied finishes as required. Maintain full indicated thickness of slab over all parts of cambered supports.

C. Screed concrete to elevations and contour indicated or required for the work. Compact concrete with grid tamper to eliminate voids and pockets and to produce a uniformly dense slab.

D. Where rough slabs are left to receive deferred finishes, provide protection against contamination from time of placing mechanically, leaving a clean surface.

E. Expansion Joints:

1. Building/Paving: Three-fourths (3/4) inch expansion joints with one-half (1/2) inch deep poly-sealant caulk water seal. Install typically where concrete paving meets the building shell and columns.

2. Sidewalks: Expansion joints shall be provided in all sidewalks at twenty (20) feet o.c. Joints shall be filled with one-half (1/2) inch asphalt impregnated felt.

3. All exterior flat work shall be marked off as indicated on the Drawings. Make markings with an approved "V" shaped tool, straight, even, properly spaced and uniformly deep matching contraction joints.

F. Contraction Joints: Locate where indicated on plans, to full depth and slightly below finish surface. Make joints as detailed extending entirely through slab, using material conforming to ASTM D1751. Contraction joints for walks and paving unless otherwise indicated shall be tooled one-fifth (1/5) the depth of the slab and one-eighth (1/8) inch wide. Joints shall be five (5) feet on center unless otherwise indicated on the plans.

G. Test surface as work progresses and eliminate high or low spots. Smooth gradient transitions are required.

H. Tolerances: Cement finish shall be true in line, plane and elevations as shown. Finished concrete slab surfaces shall not deviate from a flat plane more than one-eighth (1/8) inch when tested with a ten (10) foot straight edge held in any direction. Furnish and maintain in good condition a ten (10) foot straight edge for use by the Architect.

I. Defective Finish: Any slab showing a greater variation than the specified one-eighth (1/8) inch, showing voids or separation of the aggregates, or showing a texture in variance to the plans shall be deemed defective and the entire slab shall be removed and replaced with acceptable concrete at the Subcontractor's expense.

3.07 SURFACE FINISHES

A. Finish all surfaces to present a uniform appearance throughout the area involved, and throughout adjacent areas with the same treatment. Locations of required finish shall be as

indicated on plans. Provide two (2) samples of each finish. The approved samples shall act as examples for all concrete work.

B. Formed surfaces shall be free of flaws, cracks, rock pockets, voids or spalls and be true to line and detail.

C. Ensure exposed to view finish surfaces of concrete are uniform in color and texture.

D. Where finishing occurs adjacent to finished metal or other finished surfaces, particularly where serrated or indented, remove all traces of cement film before it hardens. This applies particularly to stair nosings and similar items.

E. Broomed: After floating, draw broom across the surface at right angle to flow of traffic producing a uniform non-skid surface. For light broom finish, use a fiber broom, leaving depressions approximately one-sixteenth (1/16) inch deep. Use liquid curing membrane.

F. Medium Salt Finish: After floating, finish with steel trowel. Add salt in density approved in sample. Wash clean after concrete set. Protect landscape areas from salt.

G. Steel Trowel with "Sack" Finish: Shiner band at joints and paving edges shall be steel troweled. Do not burnish smooth. Sack finish to provide a smooth but skid-proof surface. Use liquid curing membrane.

3.08 CURING

A. Commence curing as soon as feasible after finishing without marring surfaces, and in any case on same day.

B. Paper Curing: Except as otherwise specified, use concrete curing paper only, joints sealed with pressure-sensitive tape; immediately repair any tears during curing period. Verify that surfaces remain damp for full curing period; if necessary, lift paper and wet surfaces with clean water, and replace paper.

C. Liquid Curing Compound: Do not apply on any surface to receive retardant, mortar, or any other material adhered by bond, except as otherwise specified. Carefully mask and protect adjoining surfaces where compound is used.

D. Fugitive Dye Type: Subject to approval, may be used where no other finish or material is to be applied, ASTM C309, clear, Type 1.

E. Curing Period and Protection: Maintain curing mediums in proper sealed condition for minimum of ten days after application. Keep traffic on curing surfaces to minimum possible, and completely off liquid compound cured surfaces. Immediately restore any damaged or defective curing media.

F. Curing Formed Concrete: Keep forms containing concrete thoroughly wet, including tops and exposed portions of concrete, for not less than fourteen (14) days from time of placing concrete. Continuously wet concrete between hours of 8:00 a.m. and sunset each day, including Saturdays, Sundays and holidays, for first ten (10) days, and not less than three (3) times daily for remaining four (4) days. Polyethylene film or equal may be used as approved.

3.09 DEFECTIVE CONCRETE

A. If any concrete work is not formed as indicated, or is not true to intended alignment, or is not plumb or level; or has voids, honeycombs, or has been cut or resurfaced; or has voids or honeycombs that have been filled, unless under the direction of Architect or has any sawdust, shavings, wood or debris embedded in it; or does not fully conform to provisions of contract; then such concrete work shall be deemed to be defective materials and/or faulty workmanship and Contractor shall remove same from site in accordance with contract.

B. Defective concrete will be cut out by Contractor. Patch and fill surfaces which are to remain exposed and indicated to be smooth so as to match adjoining areas.

C. Fill rock pockets, "honeycombs" and holes resulting from the removal of nails, ties and spreaders and like items with mortar formed of cement and fine aggregate in the proportion used in concrete mix, and non-shrink grout material in quantity as recommended by the manufacturer, using a pressure gun. Chip away defective areas to solid concrete, forming perpendicular or slightly undercut edges. Drench area of patch and surrounding area with water. Brush a thin coat of cement grout onto base and edges of patch area. Pack full with mortar. Match surrounding concrete surfaces in color and texture using part white Portland cement where necessary. Remove fins and irregularities in exposed concrete; patching must match adjoining surface and approved sample.

*****END OF SECTION*****

SECTION 32 17 00

PAINTED TRAFFIC LINES AND MARKINGS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Requirements apply to this Section.

1.02 SUMMARY

Section includes Painted traffic striping and symbols on pavements and curbs.

1.03 REGULATORY REQUIREMENTS

Provide pavement markings meeting the accessibility requirements of the 2010 California Building Code (CBC).

1.04 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00.

1.05 SUBMITTALS

Provide in accordance with Section 01 33 00.

1.06 PRODUCT HANDLING

A. Comply with the requirements of Section 01 66 00.

B. Deliver paints and paint materials in original sealed containers that plainly show the designated name, batch number, color, date of manufacture, manufacturer's directions, and name of manufacturer. Provide storage facilities at the project site for maintaining materials at temperatures recommended by the manufacturer.

1.07 ENVIRONMENTAL CONDITIONS

Do not apply paint when either air or pavement temperature is below 50 degrees F or above 95 degrees F; or when rain, fog, condensation, or temperatures below 50 degrees F are anticipated during the drying period.

1.08 CLOSE-OUT

A. Extended Warranty: Comply with the requirements of the General Condition Article 3.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Pavement Marking Paint: Vinyl acrylic type for use on asphaltic concrete and portland cement concrete, colors as indicated, specified herein, or required by CBC Title 24 Part 2.

B. Acceptable products or equal: Frazee Paint Company; 502 Vinyl Traffic Paint Dunn-Edwards Corp.; Traffic Paint W-801

PART 3 – EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Verify that specified items may be installed in accordance with the approved design.

C. Correct conditions detrimental to timely and proper completion of the Work.

D. Do not proceed until unsatisfactory conditions are corrected.

E. Beginning of installation means acceptance of conditions.

3.02 PREPARATION

A. Immediately before applying the paint, thoroughly clean the pavement surface of dust, dirt, sand, scale, water, oil, grease or other objectionable matter. Do not use solvent material that will damage pavements as cleaning agents. Immediately before painting, give pavement surfaces a final cleaning by means of a power broom and a power blower using compressed air following the brooming.

B. Provide warning devices required to protect the painting operations and the finished work.

3.03 APPLICATION

A. Do not apply pavement markings until after sealer has been applied as specified in Section 02743. Apply the paint only when the pavement is dry and clean. Under inclement weather conditions, or when temperature is below 50 degrees F, painting will not be permitted.

B. Equipment: Apply the traffic and parking striping [and game markings] with a traffic stripe painting machine with a compressor capacity of at least 105 cubic feet and capable of operating at an air pressure of 125 psi. Mechanically agitate paint while the machine is in operation. Equip the striping machine with a pointer so designed that the machine will hold exactly to the alignment. Equip the propelling vehicle with a speedometer or tachometer, and with a suitable device for determining the quantity of paint in the container. Thoroughly clean the paint container and spray nozzles on the machine before starting each day's work.

1. Equipment used for applying reflectorized striping shall be equipped with a bead dispenser capable of applying the beads at the specified rate.

2. Where the configuration or location of a traffic stripe is such that a striping machine is not suitable, use hand spraying equipment and stencils or templates.

3. Apply paint for word markings, letters, numerals, and symbols using hand spraying equipment and stencils or templates.

C. Application: Immediately following the preparation of the pavement surface, apply the striping at the rate of 100 to 110 square feet per gallon of paint. Apply lines 4 inches wide unless otherwise indicated. Apply the stripe of the indicated or specified width, with clean true edges and without sharp breaks. Repaint, to the applicable specifications, portions of the stripe damaged by any type of traffic within 24 hours after the stripe has been applied.

1. Provide International Symbol of Accessibility for each parking stall for the disabled at location indicated. Symbol shall be 36 inches square, white on standard blue background and shall conform to CBC Title 24 Part 2, Chapter 11; and ADA Accessibility Guidelines for Buildings and Facilities.

2. Tactile warning lines shall be in conformance with CBC Section 1133B.8.3 and 1133B.8.4.

D. Tolerances: Apply striping within a tolerance of 1/2 inch in 50 feet. Apply markings and stripings to the widths indicated within a tolerance of 1/4 inch on straight sections and 1/2 inch on curved sections.

E. At completion touch up stripes and markings which are not clear and distinct or which are not uniform in color.

*****END OF SECTION*****

SECTION 32 17 26

DETECTABLE WARNING SURFACE

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Requirements apply to this Section.

1.02 SUMMARY

A. Perform all work required to complete, as indicated by the Contract Documents and furnish all supplementary items necessary for the proper installation of Precast Concrete Pavers.

B. System shall consist of precast concrete pavers installed on Latex thinset mortar setting bed.

C. The paver installation shall be absolutely rigid and even large slabs when subjected to vehicular traffic, shall not be displaced.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. ASTM C 33: Specification for Concrete Aggregates
2. ASTM C 150: Specification for Portland Cement
3. ASTM C 67: Method of Sampling and Testing Brick and Structural Clay Tile
4. ASTM C 140: Specification for concrete

B. T.C.A. Tile Council of America

1. Installation Method Cement Mortar Bonded F102 - 95.

C. A.N.S.I. American National Standards Institute

1. A-118.4 Latex Portland Cement Mortar
2. A-118.6 Grout – Latex

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. All products covered under this Section shall be produced by a single manufacturer unless otherwise specified.
2. Manufacturer shall submit evidence of having not less than ten (10) years successful production of this product.
3. The paver manufacturer shall demonstrate, either by proven field performance of the laboratory freeze-thaw test that the paving units have adequate durability if they are to be subjected to a freeze-thaw environment.

a. Satisfactory field performance is indicated when units similar in composition and made with the same manufacturing process as those to be supplied to the purchaser, do not exhibit objectionable deterioration after at least 3 years.

b. The units used as the basis for proven field performance shall have been exposed to the same general type of environment, temperature range and traffic volume as is contemplated for the units supplied to the purchaser.

B. Subcontractor Qualifications:

Subcontractor shall submit evidence of skill and not less than five (5) years specialized experience with this product.

1.05 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00.

1.06 SUBMITTALS

A. Provide in accordance with Section 01 33 00.

B. Manufacturer's Literature: Materials descriptive literature, installation instructions and paver color selection chart.

1. Test Reports: Three (3) copies, showing compliance with specified ASTM requirements

2. Quality Assurance Qualifications – see Item 1.04.

3. Shop drawings:

a. Layout drawings of each paved area showing the pattern of pavers, indicate pavers requiring cutting, indicate setting bed methods in each area, drainage patterns and drains. Include details of setting beds, noting all materials and their thickness, show details at curbs and vertical surfaces.

b. Details of custom (nonstandard) curbs and stair tread/risers, include methods of installation

4. Samples: Three (3) sample pavers of each manufacturer, type, size and color selected or specified.

1.07 PROJECT/SITE CONDITION

A. Environmental Requirements: Do no work during freezing weather or on wet or frozen sub-base.

B. Mock-up Installation

1. Prior to the start of precast concrete paver work construct mock-ups of each type of paver size and pattern area including precast curb for the Owner and Architect to review. The mock-ups will be at the project site at a location mutually agreed to by the Owner and Contractor.

2. Construct the two (2) mock-up installations a minimum 8 foot x 8 foot area of typical precast concrete units and slabs with all setting beds, joints, edge and curb details as shown on the drawings.

3. After review of the mock-ups, they should be retained and used as a standard of quality for the precast concrete paver work. At completion of the work remove the mock-up installations and related materials from the project site. If the mock-ups are incorporated in the actual construction, record their actual locations and sizes on the actual built record drawings for the project.

1.08 SEQUENCING AND SCHEDULING

Coordinate sequencing and scheduling of work with other supporting, adjacent, contiguous or otherwise related material trades.

1.09 PRODUCT HANDLING

Adhere to requirements of Section 01620.

1.10 CLOSE-OUT

A. Reports: None required.

B. As-Builts: None required.

C. Operation and Maintenance Data: None required.

D. Extra Materials: None required.

E. Extended Warranty: Comply with the requirements of the General Condition Article 3.5 and Section 01740.

PART 2 – PRODUCTS

2.01 MATERIALS

A. System Source: Wausau Tile, Wausau WI, 1-800-388-8728

B. System Name: Thinset Mortar Method - Pedestrian Installation

C. Precast Concrete Pavers

1. Name: Detectable Warning Pavers
2. Size: As shown on the drawings
3. Texture: ADA-2 Truncated Dome
4. Finish and Color: To be picked from Standard color and finish.
5. Reference Standard:
   a. Cementitious Materials: Materials shall conform to the following applicable ASTM Specifications
      1) Portland Cement: ASTM C 150 for Portland Cement
   b. Aggregates shall conform to these ASTM specifications, except that grading requirements shall not necessarily apply:
      1) Normal Weight: ASTM C 33 for Concrete Aggregates
   c. Other constituents: Coloring pigments, integral water repellents, etc., shall be previously established as suitable for use in concrete and either shall conform to ASTM Standards where applicable, or shall be shown by test or experience not to be detrimental to the durability of the concrete.
6. Performance Requirements:
   a. Compressive Strength: At the time of delivery to the work site, the average compressive strength shall not be less than 7,000 psi with no individual unit less than 6,500 psi per ASTM C 140.
   b. Absorption: The average shall not be greater than 5% per ASTM C140.
   c. Flexural Strength: Not less than 600 psi per ASTM 293.
   d. Load carrying capacity: Paver units shall have a tested center load capacity of 1,750 lbs.
   e. Latex Mortar Mix: A.N.S.I A-118.4
   f. Water: Clean and free of deleterious acids, alkalies or organic materials
   g. Grout: A.N.S.I. A-118.6, Grout – Latex
   h. Sealant: As specified in Section 07920 -0 Sealants and Caulking
   i. Back-up: As specified in Section 07920 - Sealants and Caulking
   j. Bond Breaker: As specified in Section 07920 - Sealants and Caulking

2.02 MIXING

A. Latex Portland Cement Mortar setting bed: As recommended by the manufacturer.

B. Grouting Mix: Latex as recommended by manufacturer. Color as selected.

C. Rework mixes from time to time to maintain proper consistency, as recommended by manufacturer but do not add ingredients. Discard mortar that has reached its initial set.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Verify that specified items may be installed in accordance with the approved design.

C. Correct conditions detrimental to timely and proper completion of the Work.

D. Do not proceed until unsatisfactory conditions are corrected.

E. Beginning of installation means acceptance of conditions.

3.02 INSPECTION

A. Examine all surfaces to receive the parts of the work specified herein. Concrete slab shall not exceed 1/8" in 10'-0" from required plane. Notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected. Installation of precast concrete pavers and associated construction constitutes acceptance of the adjacent and underlying construction.

B. Installation of Mortar bed as per TCA F102 - 95. All materials used follows instructions of manufacturer for use in mortar method.

C. Install precast concrete pavers

D. Grouting of pavers in strict accordance with grout manufacturer's directions and instructions. Latex or acrylic additives of the same manufacturer as the grout.

E. All control and expansion joints to be installed as per TCA EJ 171-94. All joint materials said to follow manufacturer's directions and instructions.

F. Field cut precast pavers in accordance with manufacturer's recommendations for methods, equipment and precautions.

3.03 CLEANING AND PROTECTION

A. Remove and replace pavers that are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment to eliminate evidence of replacement.

B. Cleaning: Remove mortar stains and all other types of soiling from exposed paver surfaces, wash and scrub clean.

C. Provide final protection and maintain conditions in a manner acceptable to installer, which ensures paver work being without damage or deterioration at time of substantial completion.

***** END OF SECTION *****

SECTION 32 31 16

WROUGHT IRON FENCES AND GATES

PART 1 -- GENERAL

1.01 SUMMARY

Division 0, Contract requirements and Division 1, General Conditions apply to this section.

1.02 DESCRIPTION

Work Included: Provide wrought iron fence system where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

1.03 QUALITY ASSURANCE

Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.04 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00.

1.05 SUBMITTALS

A. Provide in accordance with Section 01 33 00.

Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section;
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
3. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades;
4. Manufacturer's recommended installation procedures which, when accepted by the Architect, will become the basis for accepting or rejecting actual installation procedures for the Work.

PART 2 -- PRODUCTS

2.01 MATERIALS

A. Pickets shall be 5/8" square regular style. Pickets shall be spaced at 4" clear unless otherwise shown on the Drawings.

B. Rails shall be 1" square - regular style. This shall also be the size of all members of gate frames up to 25 sq. ft.

C. Posts:

1. Sizes:

a. 1-1/2" square regular weight - for end, corner and line posts for fences up to 5'-0" in height.

b. 2" square regular weight- end, corner and line posts for 6'-0" high fence and gateposts for regular iron gates up to 15 sq. ft.

c. 2" square heavy weight for end, corner and line posts up to 6'-0" high and gates between 15 and 25 s. f.

d. 2-1/2" square - for gateposts for iron gates between 25 and 40 sq. ft.

2. Provide pressed steel caps with all posts.

3. Add 1'-6" to the gross height of the fence for posts going into concrete footings. If posts are designed to be flange mounted, no additional length is required.

D. Finishes:

1. All ornamental steel fencing shall be cleaned in hot caustic solution and coated with an oakite to prevent flash rust and give paint adhesion. After fabrication, panels and posts are to be dipped in black primer coating inside and out of all metal surfaces and then electrostatically sprayed with a finish coat of low sheen, alkalide resin, and zinc chromate rust inhibiting paint.

2.02 HARDWARE

A. Swing Gate Hardware:

1. Hinges: Provide clamp-on hardware for flat wall or post installation as shown on the Drawings.

a. Operation shall be one- way self-closing butt hinges unless shown otherwise on the Drawings.

b. Hinges, which are shown on the drawings to be dual acting, will also be self-closing butt hinges.

2. Latches:

a. If no other latch / lock is specified, gate manufacturer shall provide padlock hasp at post and gate for securing the gate. Latch shall be a forked or plunger bar to permit operation from either side of the gate.

3. Gate pairs shall be provided with drop rod, which shall be accessible only from the interior of the gate and protected by a welded steel box.

B. Rolling Gate Hardware: Provide following for each gate:

1. Latches:

a. Provide forked type or plunger-bar type to permit operation from either side of the gate.

b. Provide padlock eye as integral part of latch.

2. Universal Track Bracket:

a. Provide 10 gage galvanized steel brackets with 3/8" diameter galvanized J-Bolts and nuts.

3. Rear Wheels:

a. Provide 5" outside diameter, 4" diameter V-Groove, galvanized steel roller bearing wheel.

b. Anchor rear wheels to gate frame with 5/8" diameter.

4. Double Wheel Carriage:

a. Provide 1" x 2" x 14 ga. galvanizing steel tube axle with 3/8" diameter galvanized J-Bolts and 6" diameter rubber tire with galvanized steel roller bearing hub.

PART 3 -- EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Correct conditions detrimental to timely and proper completion of the Work.

C. Do not proceed until unsatisfactory conditions are corrected.

D. Beginning of installation means acceptance of conditions.

3.02 INSTALLATION

A. General:

1. Install posts at a maximum spacing of 8 feet on centers.

2. Install corner of slope posts where changes in line or grade exceed a 30° deflection.

3. The distance between end or corner posts shall be divided equally into panels not over 8'-0" long.

4. Install panels at a bias when there is more than a 4" drop for the distance that the panels in this section cover and more than 2" drop within the length of a given panel. A post shall be installed at the top and bottom of each bias.

B. Excavating:

1. Drill holes for post footings in firm, undisturbed or compacted soil, strictly adhering to the dimensions and spacing shown.

2. Post hole dimensions:

a. Provide 24" deep by 6" diameter foundations for line posts.

b. Provide 24" deep by 9" diameter foundations for all other posts. (i.e.: corner and gateposts).

3. Spread soil from excavations uniformly adjacent to the fence line, or on adjacent areas of the site if so directed.

4. When solid rock is encountered near the surface, drill into rock at least 12" for line posts and at least 18" for end, pull, gate, and corner posts. Drill hole at least 1" greater diameter than the largest dimension of the post to be placed.

5. If solid rock is below soil overburden, drill to full depth required, except penetration into rock need not exceed minimum depths as specified above.

C. Setting posts:

1. Remove loose and foreign materials from sides and bottoms of holes, and moisten soil prior to placing concrete.

2. Center and align posts in hole.

3. Place concrete around posts in a continuous pour, and vibrate or tamp for consolidation.

4. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.

5. Trowel tops of footings, and slope or dome to direct water away from posts.

6. Extend footings for gateposts to the underside of bottom hinge.

7. Set keeps, stops, sleeves, and other accessories into concrete as required.

8. Keep exposed concrete surfaces moist for at least seven days after placement, or cure with membrane curing material or other curing method accepted by the Architect.

9. Grout-in those posts, which are set into, sleeved holes, concrete constructions, or rock excavations, using non-shrink Portland cement grout or other grouting material accepted by the Architect.

D. Concrete strength:

1. Allow concrete to attain at least 75% of its minimum 28-day strength before rails are installed.

2. Do not, in any case, install such items in less than seven days after placement of concrete.

3. Do not hang gates until concrete has attained its full design strength.

E. Rails: Install with panel mounting angle clips with screws into post top and bottom. Ensure each panel is level and plumb. Rails shall be mounted to maintain an even 4" above ground.

F. Installing gates:

1. Install gates plumb, level, and secure for full opening without interference.

2. Install ground-set items in concrete for anchorage in accordance with the fence manufacturer's recommendations as accepted by the Architect.

3. Lubricate and adjust the hardware for smooth operation.

G. Miscellaneous:

1. Repair coatings damaged in the shop or field erection, using a hot-applied repair compound applied in accordance with its manufacturer's recommendations as accepted by the Architect.

***** END OF SECTION *****

SECTION 32 92 19

HYDROSEEDING

PART 1 -- GENERAL

1.01 SUMMARY

Division 0, Contract requirements and Division 1, General Conditions apply to this section.

1.02 MATERIALS

A. Equipment shall have a built in agitation system and operating capacity sufficient to agitate, suspend and homogeneously mix a slurry containing not less than 20 kilos (44 lbs.) of organic mulching amendment plus fertilizer, chemical additives and solids for each 100 gallons of water.

B. Cellulose Fiber Mulch. Apply at a rate of 1500 lbs./acre.

C. Best 6-20-20 or Best 15-15-15 or approved equal applied at rate appropriate for product.

D. Hydroseed seed mix shall be as follows:

1. Common bermuda seed, Apply at 8 lbs./1000 sq.ft.

E. Organic tackifier shall be applied at rate of 70 lbs./acre

1.03 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00.

1.04 SUBMITTALS

Provide in accordance with Section 01 33 00.

PART 2 -- EXECUTION

2.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Correct conditions detrimental to timely and proper completion of the Work.

C. Do not proceed until unsatisfactory conditions are corrected.

D. Beginning of installation means acceptance of conditions.

2.02 INSTALLATION

A. Inspection of conditions: Examine related work including irrigation and grading of surface before proceeding with any work and inform the Architect in writing on conditions which may prevent the proper execution of this work. Failure to report unsuitable conditions will require the contractor to rectify unacceptable work at no additional cost to the County.

B. Water all plant areas thoroughly to saturate upper layers of soil prior to the hydroseeding operation.

C. Allow the planting area soil surface to dry out for one day only prior to the hydroseeding application. Exercise care not to allow the soil surface to be overly saturated with water prior to the hydroseeding installation. At the same time the soil surface should not become too dry during this period. There should be some residual moisture within the first 1/4" of the soil surface.

D. Begin the hydroseeding operation on all areas specified.

E. Hydroseeding application.

1. Apply the hydroseeding in the form of a slurry consisting of organic soil amendments, commercial fertilizer, and any other chemicals that are called out. When hydraulically sprayed onto the soil, the mulch shall form a blotter-like material. Direct the spray operation so that this procedure will drill and mix the slurry components into the soil, the slurry spray will also penetrate the soil surface, thus ensuring maximum impregnation and

coverage. The impregnation and mixing of the components will help in retaining moisture while stabilizing soil surface from superficial erosion.

2. Do not let the hydroseeding slurry components in the hydroseeding machine for more than two (2) hours because of possible seed destruction. If slurry components are left for more than two hours in the machine, add 50% more of the originally specified seed mix to any slurry mixture which has not been applied within the two hours after mixing. Add 75% more of the original seed mix to any slurry mixture which has not been applied eight (8) hours after mixing. All mixtures more than eight (8) hours old, must be disposed, off-site, at the contractor's expense.

3. Spray the area with a uniform visible coat, using the dark color of the cellulose fiber or organic amendments as a visual guide. The slurry shall be applied in a downward drilling motion via a fan stream nozzle. Ensure that all of the slurry components enter and mix with the soil. Ensure the uniformity of the hydroseed application. The hydraulic contractor shall be approved by the Architect.

4. Exercise special care to prevent any of the slurry from being sprayed onto any hardscape areas including concrete walks, fences, walls, buildings, etc. Remove all slurry sprayed onto these walls at the contractor's expense.

5. Contractor to save all tags and turn into the Architect for acceptance.

6. The Architect shall be present during the hydroseeding operation.

2.03 MAINTENANCE PERIOD

A. Upon completion of hydroseeding operations, maintain all hydroseeding areas for a period of 180 days as follows:

1. Germination stage irrigation: Approximately 25 hours after hydroseeding the planting areas, initiate the watering sequence. Leave the water on long enough to moisten the soil thoroughly to the depth of the slurry mulch taking care not to super saturate or wash away the slurry and seed. Perform frequent, light irrigation until the seed has germinated. Repair all seed washings and erosion.

2. Establishment stage irrigation: After germination, reduce each watering. The specific watering program shall be approved by the Architect.

B. Fertilization: Fertilize all hydroseed areas with an approved commercial fertilizer, 30 days from the start of the maintenance period and continuing once every 30 days until the completion of the 180-day maintenance period.

C. Weeding: All concentrated developments of weed growth appearing in the seed mix planting areas during the maintenance period shall be removed at 2-week intervals. The contractor may elect to remove such concentrations of weeds manually or by an approved herbicide program.

2.04 COVERAGE AND ACCEPTANCE

A. Minimum coverage: Final acceptance may be given at the end of the 180-day maintenance period if 80% germination of turf and plant establishment has been obtained, as determined by the Architect.

B. Final approval and acceptance will be given in writing by the Engineer following a final acceptance inspection. The Architect reserves the option to extend the maintenance period to achieve a minimum of 80% germination of all turf areas.

C. Beginning of installation means acceptance of conditions.

*****END OF SECTION*****

SECTION 33 05 50

PVC PIPE

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

Division 0, Contract Requirements and Division 1, General Requirements apply to this Section.

1.02 SECTION INCLUDES

The Contractor shall furnish and install all PVC and polyethylene plastic pipe, fittings, transitions, connections and appurtenant work, complete and in accordance with the requirements of the Contract Documents.

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

Commercial Standards:

ASTM D 1784 and ASTM D 1785	Specifications for Polyvinyl Chloride (PVC) Plastic Pressure Pipe
ASTM D 3034	Specifications for Polyvinyl Chloride (PVC) Plastic Gravity Sewer Pipe
AWWA C 900 and AWWA C 905	Specifications for Polyvinyl Chloride (PVC) Plastic Water Pressure Pipe
ASTM D 2321	Standard Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe

1.01 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00.

1.04 CONTRACTOR SUBMITTALS

A. Provide in accordance with Section 01 33 00.

B. Contractor shall submit copies of the manufacturer's product specifications according to the Submittal requirements for this project.

1.05 WARRANTY

Comply with the requirements of General Condition Article 5 and Section 01740.

PART 2 – PRODUCTS

2.01 PVC (POLYVINYL CHLORIDE) PRESSURE PIPE, 4 INCHES AND SMALLER SOLVENT-WELDED

All PVC pressure pipe 4 inches and smaller shall be made from all new rigid unplasticized polyvinyl chloride and shall be Normal Impact Class 12454-B, Schedule 80, to conform to ASTM D 1785, unless otherwise shown. Elbows and tees shall be of the same material and schedule as the pipe. Unless otherwise shown, joint design shall be for solvent-welded construction.

2.02 AWWA C 900 AND AWWA C 905 WATER PIPELINE WITH BELL AND SPIGOT JOINTS

This Specification designates general requirements for unplasticized polyvinyl chloride (PVC) plastic class water pipe with integral bell and spigot joints for the conveyance of water. Pipe shall meet the requirements of AWWA C 900 or AWWA C 905 "Polyvinyl Chloride (PVC) Water Distribution".

All pipe shall be suitable for use as pressure conduit, provisions must be made for expansion and contraction at each joint with an elastomeric ring. The bell shall consist of an integral wall section with a factory installed, solid cross-section elastomeric ring which meets the requirements of ASTM F 477. The bell section shall be designed to be at least as hydrostatically strong as the pipe wall and meet the requirements of AWWA C 900. Sizes and dimensions shall be as shown in this Specification. Joint design shall meet qualification requirements of ASTM F 3139. Each pipe shall be tested to four times the pressure class of the pipe for a maximum of 5 seconds. The integral bell shall be tested with the pipe. Standard laying lengths shall be 20 feet (±1") for all sizes.

The pipe stiffness using F/ΔY for PVC class water pipe is contained in the table below:

CLASS	DR	FΔy (PSI)
100	25	129
150	18	364
200	14	815

Pipe shall withstand, without failure at 73°F, an impact of a falling missile, TUP C, at the following levels (per ASTM D 2444):

Pipe Size (IN.)	Impact (FT./LBS.)
4	100
6	100
8	100
10	120
12	120

There shall be no visible evidence of shattering or splitting when the energy is imposed.

Randomly selected samples tested in accordance with ASTM D 1599 shall withstand, without failure, pressures listed below when applied in 60-70 seconds.

Class	Minimum Burst Pressure At 73°F (PSI)
100	535
150	755
200	985

Pipe for this Project shall conform with the specifications for AWWA C 900, Class 150 PVC pipe material for diameter sizes 4-inches through 12 inches and AWWA C 905, DR 25 PVC pipe material for diameter sizes 14 inches through 36-inches unless otherwise indicated on the Plans.

2.03 PVC (POLYVINYL CHLORIDE) GRAVITY PIPE

A. Pipe shall conform to the requirements of ASTM D 3034 for SDR 35 gravity pipe.

B. All pipe joints shall be of the bell and spigot type with electrometric seals and conform to the requirements of ASTM D 3212. Gaskets shall be factory installed and chemically bonded to the bell end of the pipe. Gasket material shall conform to the requirements of ASTM F 477.

C. All fittings shall be fabricated from pipe meeting the requirements of these standards. Fabricated miter joints shall be reinforced by fusion heat welding. All fittings shall be approved for use by the pipe manufacturer and shall be capable of accepting bell and spigot connections.

1. There shall be no sign of flaking or disintegration when immersed in anhydrous acetone for 20 minutes as described in ASTM D 2152.

D. All pipe shall be from quality PVC resin, compounded to provide physical and mechanical properties that equal or exceed cell class 12454 as defined in ASTM 1784.

E. Minimum pipe stiffness at 5 percent deflection shall be 46 PSI for all sizes when tested in accordance with ASTM D 2412, External Loading Properties of Plastic Pipe by Parallel-Plate Loading".

F. Each pipe shall be identified with the name of manufacturer, nominal size, cell classification, ASTM designation F 1803, the pipe stiffness designation "PS-46" and manufacturer's date code.

PART 3 – EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Verify that specified items may be installed in accordance with the approved design.

C. Correct conditions detrimental to timely and proper completion of the Work.

D. Do not proceed until unsatisfactory conditions are corrected.

E. Beginning of installation means acceptance of conditions.

3.02 INSTALLATION OF PIPE

A. All pipe, fittings, etc., shall be carefully handling and protected against damage, impact shocks and free fall. All pipe handling equipment shall be acceptable to the Engineer. Pipe shall not be placed directly on rough ground, but shall be supported in a manner which will protect the pipe against injury whenever stored at the work site. All pipe damaged prior to Substantial Completion shall be repaired or replaced by the Contractor.

B. The Contractor shall inspect each pipe and fitting prior to installation to ensure that there are no damaged portions of the pipe. Damaged pipe shall be replaced with new undamaged sections of pipe.

C. Before placement of the pipe in the trench, each pipe or fitting shall be thoroughly cleaned of any foreign substance which may have collected thereon and shall be kept clean at all times thereafter. For this purpose, the openings of all pipes and fittings in the trench shall be closed during any interruption to the Work. As pipe laying progresses, the Contractor shall keep the pipe interior free of all debris. The Contractor shall completely clean the interior of

the pipe of all sand, dirt, rocks and any other debris following completion of pipe laying prior to testing, disinfecting and placing the completed pipeline in service.

D. Pipe shall be laid directly on the imported bedding material. No blocking will be permitted and the bedding shall be such that it forms a continuous, solid bearing for the full length of the pipe. Bell holes shall be formed at the ends of the pipe to prevent joint loading at the bells or couplings.

E. Where necessary to raise or lower the pipe grade due to unforeseen obstructions or other causes, the Engineer may change the alignment and/or the grades. Such change shall be made by the deflection of joints or by the use of additional fittings. However, in no case shall the deflection in the joint exceed the maximum deflection recommended by the pipe manufacturer.

F. No pipe shall be installed upon a foundation into which frost has penetrated or any time that there is a danger of the formation of ice or penetration of frost at the bottom of the excavation. No pipe shall be laid unless it can be established that the trench will be backfilled before the formation of ice and frost occurs.

G. Immediately before jointing bell and spigot pipe, both the bell and spigot end of the pipe shall be thoroughly cleaned and lubricated with an approved vegetable-based lubricant. The spigot end of the pipe section shall then be inserted into the bell of the previously laid joint and telescoped into its proper alignment. Tilting of the pipe to insert the spigot into the bell will not be permitted.

H. Solvent-welded and heat-fused joints shall be carefully and thoroughly cleaned immediately before jointing the pipe. Particular care shall be taken in making solvent-welded joints to ensure a uniform, homogeneous and complete bond.

I. Pipe installation shall conform with Technical Specification Section 31 23 00. If this installation of pipe section and Section 31 23 00 conflict, the most stringent specification shall apply.

*****END OF SECTION*****

SECTION 33 10 00

WATER SYSTEM

PART I -- GENERAL

1.01 SUMMARY

Division 0, Contract requirements and Division 1, General Conditions apply to this section.

1.02 DESCRIPTION

Work in This Section: Work includes, but is not limited to:

1. Contractor shall furnish and install all piping, valves, fillings, etc. as shown on the plans, as specified herein, and as required to make the on-site water system completely operational.
2. Water system - From the Utility Company main or point of connection to within 5 feet of the Building or other Building point of connection as indicated on the drawing.
3. Related Work: Documents affecting work of this Section include, but are not necessarily limited to, Special Conditions, and Sections in Division 1 of these Specifications

1.03 QUALITY ASSURANCE

A. Perform all work in accordance with applicable provisions of "Uniform Plumbing Code", current Edition, International Association of Plumbing and Mechanical Officials, Los Angeles, California (UPC).

B. Underground Conduit Construction shall be in accordance with Section 306 of "Standard Specifications for Public Works Construction", current Edition, published by Building News, Inc., Los Angeles, California (PWC Specifications).

C. Disinfection of on-site water system shall be in accordance with American Water Works Associates (AWWA) Standard C601.

D. Installation of water service line, meter and backflow preventer shall be in accordance with Local Governing Agency requirements.

1.04 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00.

1.05 SUBMITTALS

A. Provide in accordance with Section 01 33 00.

B. Submittal: List of material proposed, accompanied by manufacturers latest printed literature with technical data.

C. Certificates: Manufacturers certification that materials meet specified requirements.

D. Certification: Certificate of compliance from testing firm that on-site potable water system is disinfected in accordance with AWWA Standard C601.

1.06 RECORD DRAWINGS

Comply with pertinent provisions of the General Conditions.

1.07 SEQUENCING OF CONSTRUCTION

A. Protect existing water service facilities and other existing utilities in place.

B. Install site water system as soon as conditions permit other facilities and improvements to follow.

C. Note that work includes the abandonment of existing water system serving the current building, which will remain in service. Sequence construction such that new water service is installed and operational prior to demolishing existing service. Connect existing building to new service, providing a temporary connection where required. Coordinate with and provide assistance to local Utility as required to abandon existing service.

D. Install tops of manholes, junction chambers, vaults, boxes, valve boxes, etc., unless otherwise specifically indicated on the drawings, to an elevation 3" below rough grade and raise to final elevation after paving.

1.08 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility location. Verify that water system piping may be installed in accordance with original designs and proposed standards.

1. Locate existing water mains and verify any new work to be performed in conjunction therewith. If any pre-existing damage to any portion of the existing water system is discovered, report it in writing to the Owners Representative prior to start of any work connected with or in the area of the damaged portion. Repair or replace any damaged existing water system or portion thereof, which is not reported as described herein, at no additional cost to Owner.

2. Where new water mains connect to existing system, excavate carefully expose and verify horizontal and vertical locations of all points of connection; notify Architect of any discrepancies. Perform all such required exploratory work far enough in advance of storm water main construction to allow for Architect to redesign any systems as required to meet existing condition. No time delays will be allowed due to failure of Contractor to perform this work early enough in his construction period. Any water system that must be reconstructed due to failure of Contractor to verify grades must be completed at no additional cost to the Owner.

B. Verify and coordinate installation locations to assure clearance from all other utilities and from footings and foundations. Pay particular attention to structural details pertaining to piping installations with respect to foundations. Where utilities fall within the zone of influence of footings or foundations as shown on these details, deepen footings, relocate piping, or, if approved by the Soils Engineer, modify trench backfill connections, materials or methods, all at no additional cost.

PART 2 -- PRODUCTS

2.01 WATER SYSTEMS

A. Pipe: Poly Vinyl Chloride (PVC)

1. 4" and larger - Polyvinyl Chloride (PVC 1120) pressure pipe shall conform to AVMA C-900, DR 18, with elastomeric type gaskets per ASTM F477 in bell-and-spigot joints. Pipe shall be UL listed.

2. 2" and smaller - PVC shall conform to ASTM D1785, schedule 40. Joints shall conform to ASTM D2564.

B. Gate Valves (less than 4 inches):

1. Iron body, bronze mounted, parallel seat, double disc, non-rising stem, bottom or side wedging, and comply with AWVVA C-500 specifications.

2. Suitable for a working pressure of 150 psi. The working pressure and the name of the manufacturer cast in plain letters on the body of the valve.

3. Open by turning counterclockwise.
4. Entire wedging mechanism of solid bronze, designed to allow the gates to function property when water pressure is exerted from either or both directions.
5. Valve stems shall be solid bronze.
6. Stem nuts shall be solid bronze.
7. All cast or rolled bronze used in the manufacture of gate valves, which will be in contact with water, shall contain a maximum zinc content of 5 percent and a maximum aluminum content of 2 percent.

C. Gate Valves (4 inches and larger):

1. Valves shall be line size, 150 psi working pressure, UL listed, non-rising stem, resilient seat gate valves per AWWA C-509 and shall be opened counter clockwise.
2. Valves shall have the manufacturers name, catalog number and marking pressure molded or stamped in places where the name and number may be easily seen when the valves are installed. Valves shall be painted as specified in Section 27, AVWA Specifications C-500. Valves shall be furnished complete with accessories. Valve joints shall be in accordance with all applicable requirements specified for joints and shall be for buried service.

D. Check valves: Swing type spring loaded for 150 psi working pressure, set readily and tightly with the face of the closure elements made of a corrosion resistant material such as bronze composition conforming to ASTM B-62.

E. Backflow Devices: Per Local Governing Agency Standard Specifications.

F. Meters: Meter shall be furnished by Local Governing Agency and installed by Contractor. Contractor shall schedule and coordinate this work with the Local Governing Agency.

G. Air / Vacuum Valves and Blowoffs shall be per Local Governing Agency Standards.

H. Valve Boxes: Unless otherwise specified, the following options may be provided. All valve box covers shall have "WATER" cast in the top using sharp faced letters of 1" minimum height:

1. Cast iron, slip adjustment type of appropriate size for valve. Alhambra No. A-3009 or approved equal.
2. Pre-cast concrete with cast iron cover. For valves larger than 2", Brooks 3-RT series or approved equal. For valves 2" and smaller, Brooks 1-R series (1-RT in traffic areas) or approved equal.

I. Marker Tape: Manufacturers standard permanent bright blue continuous-printed detectable plastic tape intended for direct burial; not less than 6" wide x 4-mil thickness. Black print shall read, "CAUTION - WATER LINE BURIED BELOW".

J. Thrust Blocks: per Local Governing Agency Standards.

PART 3 -- EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Correct conditions detrimental to timely and proper completion of the Work.

C. Do not proceed until unsatisfactory conditions are corrected.

D. Beginning of installation means acceptance of conditions.

3.02 FIELD CONDITION

A. Verify drawing dimensions with actual field conditions. Inspect related work and adjacent surfaces. Correct improper conditions.

B. Coordinate all work of this section with related trades.

C. All water used on this project must be delivered through a Water District furnished construction meter or approved alternative. The Contractor shall be responsible for the cost of all construction water: including that used for loading of new lines, testing, flushing, and disinfecting.

D. Verify and coordinate installation locations to assure clearance from all other utilities and from footings and foundations. Pay particular attention to structural details pertaining to piping installations with respect to foundations. Where utilities fall within the zone of influence of footings or foundations as shown on these details, deepen footings, relocate piping, or, if approved by the Soils Engineer, modify trench/backfill conditions, materials or methods, all at no additional cost.

3.03 TRENCH EXCAVATION, BEDDING, AND BACKFILL

A. Perform all trench excavation and all additional excavation required for vaults or other structures forming a part of the pipeline. Trench excavation and backfill shall conform to the requirements of Section 02200 of these specifications and Section 306-1.2 of the PWC Specifications and shall require the approval of the Soils Engineer.

B. For 4" diameter pipe and larger, bedding material shall normally extend from 3" below the pipe invert to a point 1 foot above the top of pipe. Bedding material shall be a mixture of sand, gravel, crushed aggregate or approved native material. Bedding material shall have a sand equivalent of 30 or more, and have a coefficient of permeability greater than 0.001 centimeters per second. Bedding material shall be sized within the following range:

Sieve Size:	Percent Passing:
3/4"	100
No. 4	35 - 65
No. 200	0-10

C. For piping less than 4" in diameter, bedding shall be a granular material free from rocks as approved by the Soils Engineer.

D. Bedding shall be compacted to 90 percent of the Maximum Relative Density, unless otherwise specified.

E. In backfilling the trench, take all necessary precautions to protect the pipe from damage due to shifting.

F. Bury marker tape 6" to 12" below finished grade, directly above pipe.

3.04 PIPE LAYING, JOINTING AND TESTING

A. Survey line and grade: Provide grade controls and survey lines in accordance, with Section C) 1050.

B. Pipe installation: the Inspector will inspect Pipe in the field before and after laying. Any corrective work shall be done by the Contractor and approved by the Inspector at no cost to the Owner. Installation of pipe shall conform to the requirements of Section 306.1.2 of the PWC Specifications.

C. Install concrete thrust blocks against undisturbed soil at all 4" diameter or larger bends, tees, crosses, valves, pipe ends and where changes in pipe diameters occur at reducers or in fittings. Thrust blocks shall be Class 420-C-2500 Portland Cement.

D. Testing of pipelines: Perform all tests required by governing agencies. Testing shall be performed in accordance with Section 306-1.4 of PWC Specifications. Furnish all water,

materials, and labor for making the required tests. All tests shall be made in the presence of the Inspector. Notify the Inspector at least 48 hours before performance of the required tests.

E. Disinfection: before acceptance of the onsite potable water system, an approved testing firm hired by the Contractor as prescribed in AWWA Standard C601 shall disinfect each unit of completed water line. The disinfection and testing procedures shall continue at the contractors expense until tests indicate that satisfactory bacteriological results have been obtained. The testing firm shall provide a certificate of compliance to the Owner that the unit tested met the AWWA requirements.

3.05 LOCAL GOVERNMENTAL AGENCY

A. Contractor shall purchase and maintain on the project site copies of the Governing Agencies' Standard Specifications and Standard Drawings for Water and Sanitary Sewer Facilities, Current Edition. Agency standards shall take precedence over these Specifications.

B. Prior to final acceptance of the work obtain approval of all connections to the public main and all backflow assembly installations from the Local Governing Water District and submit copies of the Certificates of Completion to the Inspector for forwarding to the Owner.

3.06 DEFECTIVE WORK

Repair or replace defective work as at no additional cost to the Owner.

3.07 CLEAN-UP

Upon completion of work, leave the site clean and clear of debris and construction materials.

***** END OF SECTION *****

SECTION 33 11 19

SITE FIRE WATER SYSTEMS

PART I -- GENERAL

1.01 SUMMARY

Division 0, Contract requirements and Division 1, General Conditions apply to this section.

1.02 DESCRIPTION

Work in This Section: Work includes, but is not limited to:

1. Fire water system with all appurtenances, complete, tested, and ready for service. Contractor shall make "Hot Tap" in accordance with the requirements of "Local Governing Agency" for domestic water systems.
2. Contractor shall furnish and install all piping, valves, fittings, etc. as shown on the plans, as specified herein, and as required to make the on-site fire water system completely operational.
3. Related Work: Documents affecting work of this Section include, but are not necessarily limited to, Special Conditions, and Sections in Division 1 of these Specifications.

1.03 QUALITY ASSURANCE

A. Perform all work in accordance with applicable provisions of "Uniform Plumbing Code", current Edition, International Association of Plumbing and Mechanical Officials, Los Angeles, California (UPC), and "standard for the Installation of Private Fire Service Mains and their appurtenances", NFPA 24.

B. Underground Conduit Construction shall be in accordance with Section 306 of "Standard Specifications for Public Works Construction", current Edition, published by Building News, Inc., Los Angeles, California (PWC Specifications).

C. Disinfection of on-site water system shall be in accordance with American Water Works Associates (AWWA) Standard C601.

1.04 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00.

1.05 SUBMITTALS

A. Provide in accordance with Section 01 33 00.

B. Submittal: List of proposed materials, accompanied by manufacturers latest printed literature with technical data.

C. Certificates: Manufacturers certification that materials meet specified requirements.

1.06 SEQUENCING OF CONSTRUCTION

A. Protect existing water service facilities and other existing utilities in place.

B. Install fire water system as soon as conditions permit other facilities and improvements to follow.

C. Comply with City Fire Marshall's requirements prior to bringing combustible materials onto construction site.

D. Install tops of manholes, junction chambers, vaults, boxes, valve boxes, etc., unless otherwise specifically indicated on the drawings, to an elevation 3" below rough grade and raise to final elevation after paving.

1.07 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility location. Verify that water system piping may be installed in accordance with original designs and proposed standards.

1. Locate water system piping and verify new work to be performed in conjunction therewith. If any pre-existing damage to any portion of the existing water system is discovered, report it in writing to the Owner's Representative prior to start of any work connected with or in the area of the damaged portion. Repair or replace any damaged existing water system or portion thereof, which is not reported as described herein, at no additional cost to Owner.

2. Where new water mains connect to existing system, excavate, carefully expose and verify horizontal and vertical locations of all points of connection. Notify Architect of any discrepancies. Perform all such required exploratory work far enough in advance of water system construction to allow for Architect to redesign piping required to meet existing conditions. No time delays will be allowed due to failure of Contractor to perform this work early enough in his construction period. Any water system, which must be reconstructed due to failure of Contractor to verify grades, must be completed at no additional cost to Owner.

3. Verify conditions required for connection to exist Rancho California Water District main. If night shutdown of existing main or other special arrangements is required, perform the work at no additional cost to owner.

B. Verify and coordinate installation locations to assure clearance from all other utilities and from footings and foundations. Pay particular attention to structural details pertaining to piping installations with respect to foundations. Where utilities fall within the zone of influence of footings or foundations as shown on these details, deepen footings, relocate piping, or, if approved by the Soils Engineer, modify trench/backfill conditions, materials, or methods, all at no additional cost.

PART 2 -- PRODUCTS

2.01 WATER SYSTEMS

A. Pipe:

1. Polyvinyl Chloride (PVC 1120) pressure pipe shall conform to AWWA C-900; Class 150 (DR 18) with elastomeric-type sealing rings in bell-and-spigot joints. Pipe shall be UL and NSF-61 listed.

2. Ductile Iron pipe, AWVVA C-151, with cement mortar lining complying with AV\ANA C-104, Class 51, unless otherwise indicated.

3. Concrete cylinder pipe, AWWA C-301.

4. Steel pipe, AVVWA C-200, with cement mortar lining and coating, AV\IWA C-205, Type V.

B. Fittings:

1. PVC and Ductile Iron Pipe Fittings: AV\IWA C-1 10 or C-153, cement lined with rubber gaskets per AWWA C-111.

2. Reinforced Concrete Pipe Fittings: As manufactured for concrete cylinder pipe.

3. Steel Water Pipe Fittings: AVMA C-208; welded joints per AVMA C-206.

C. Valves:

1. Line-size gate valves, UL-listed, 175 psi working pressure, resilient wedge gate valve with non-rising stem, unless otherwise specified, with inside screw and shall open to the left or counter clockwise. Valves shall be equipped with double O-ring stem seals with both rings located above the collars or with Johns-Manville "Duro" packing, Style No. S-171, or approved equal, cut to fit in separate rings with staggered joints. Valves shall have the manufacturers name, catalog number and marking pressure molded or stamped thereon in places where the name and number may be easily seen when the valves are installed. Valves shall be painted as specified in Section 27, AWWA Specifications C-500. Valves shall be furnished complete with accessories. Valve joints shall be in accordance with all applicable requirements specified for joints and shall be for buried service.

2. Valve boxes: Unless otherwise specified, the following options may be provided. All valve box covers shall have 'WATER" cast in the top using sharp faced letters of 1" minimum height:

a. Cast iron, slip adjustment type of appropriate size for valve. Alhambra or approved equal.

b. Pre-cast concrete with cast iron cover. Brooks 3-RT series or approved equal.

D. Fire Hydrants: James Jones Model J-3765 with (1) 4" and (2) 2-1/2" outlets per Water District requirements.

E. Air release valves: Per Water District requirements.

F. Double Check Detector Check Assembly: Per Water District requirements.

G. Accessories: Provide anchorages for tees, crosses, plugs, and caps, bend valves and hydrants. After installation, apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of ferrous anchorages. Clamps, straps and washers, steel, ASTM A-506; steel rods per ASTM A-575. Rod couplings shall be malleable iron: ASTM A-1 97. Steel bolts per ASTM A-30-1.

H. Thrust blocks: Per Water District requirements.

I. Marker Tape: Manufacturers standard permanent bright blue continuous-printed plastic tape intended for direct burial; not less than 6" wide x 4-mil thickness. Black print shall read, "CAUTION - WATER LINE BURIED BELOW'.

PART 3 -- EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed.

B. Correct conditions detrimental to timely and proper completion of the Work.

C. Do not proceed until unsatisfactory conditions are corrected.

D. Beginning of installation means acceptance of conditions.

3.02 FIELD CONDITIONS

A. Verify drawing dimensions with actual field conditions. Inspect related work and adjacent surfaces. Correct improper conditions.

B. Coordinate all work of this section with related trades.

C. All water used on this project must be delivered through a Water District construction meter obtained and paid for by the Contractor, who will be responsible for the cost of all construction water, including that used for loading of new lines, testing, flushing and disinfecting.

3.03 TRENCH EXCAVATION, BEDDING, AND BACKFILL

A. Perform all trench excavation and all additional excavation required for vaults or other structures forming a part of the pipeline. Trench excavation and backfill shall conform to the requirements of Section 02220 of these specifications and Section 306-1.2 of the PWC Specifications and shall require the approval of the Soils Engineer.

B. Bedding material shall normally extend from 3" below the pipe invert to a point 1 foot above the top of pipe. Bedding material shall be a mixture of sand, gravel, crushed aggregate or approved native material. Bedding material shall have a sand equivalent of not less than 30 or have a coefficient of permeability greater than 0.001 centimeters per second. Bedding material shall be sized within the following range:

Sieve Size:	Percent Passing:
3/4"	100
No. 4	35 - 65
No. 200	0-10

C. Bedding shall be compacted to 90 percent of the Maximum Relative Density.

D. In backfilling the trench, take all necessary precautions to protect the pipe from damage due to shifting.

E. Bury marker tape directly above pipe, 6" to 12" below finished surface of trench backfill.

3.04 CONNECTIONS TO EXISTING MAINS

Connection to existing public main will be per Water District Standard. Contractor shall coordinate this work with the Water District and shall install the service lateral and double check detector check per the water district standards and as shown on contract drawings. All work in public right-of-way shall be in accordance with City Standards. Obtain and pay for encroachment permits from City for all work in City right-of-way.

3.05 PIPE LAYING, JOINTING AND TESTING

A. Survey line and grade: Provide grade controls and survey lines in accordance with Section 01055.

B. Pipe installation: the Inspector will inspect Pipe in the field before and after laying. Any corrective work shall be approved by the Inspector at no cost to the Owner. Installation of pipe shall conform to the requirements of Section 306.1.2 of the PWC Specifications.

C. Install concrete thrust blocks against undisturbed soil, or other restraining devices is detailed, at bends, tees, crosses, valves, pipe ends and where changes in pipe diameters occur at reducers or in fittings.

D. Flush system in accordance with NFPA 24.

E. Testing of pipelines: Perform all test required by governing agencies. Testing shall be performed in accordance with Section 306-1.4 of PWC Specifications. Furnish all water, materials, and labor for making the required tests. All tests shall be made in the presence of the Inspector. Notify the Inspector at least 48 hours before performance of the required tests.

F. Disinfection: Before acceptance of the onsite fire water system, each unit of completed voter line shall be disinfected by an approved testing fin-n hired by the Contractor as prescribed in AWWA Standard C601. The disinfection and testing procedures shall continue at the contractors expense until tests indicate that satisfactory bacteriological results have been

obtained. The testing firm shall provide a certificate of compliance to the Architect that the unit tested met the AWWA requirements.

3.06 DEFECTIVE WORK

Repair or replace defective work no additional cost to the Owner.

3.07 ACCEPTANCE BY LOCAL GOVERNING AGENCY

Prior to final acceptance of the work obtain approval of the double check detector check installation from the governing Water District and submit copies of the Certificates of Completion to the Inspector for forwarding to the Owner.

3.08 CLEAN-UP

Upon completion of work, leave the site clean and dear of debris and construction materials.

***** END OF SECTION *****

SECTION 33 30 00

SANITARY SEWERS

PART 1 -- GENERAL

1.01 SUMMARY

Division 0, Contract requirements and Division 1, General Conditions apply to this section.

1.02 DESCRIPTION

A. Work in This Section: Contractor shall furnish and install all piping, manholes, cleanouts, etc. as shown on the plans, as specified herein, and as required to make the on-site sanitary sewer system completely operational. Work includes, but is not limited to:

1. Sanitary Sewer System to points of connection 5 feet outside of buildings, unless otherwise shown on the plans.
2. Connection to existing systems.
3. Manholes and Cleanouts
4. Related Work: Documents affecting work of this Section include, but are not necessarily limited to, Special Conditions, and Sections in Division 1 of these Specifications

B. Related Work Not In This Section:

1. Section 01 05 50: Field Engineering
2. Section 31 23 00: Excavating, Backfilling and Compacting
3. Section 32 12 16: Asphalt Concrete Paving
4. All other site utilities, such as Drainage, Water, Gas, Electric, Irrigation, etc.

1.03 QUALITY ASSURANCE

A. Perform all work in accordance with applicable provisions of "Uniform Plumbing Code", current Edition, International Association of Plumbing and Mechanical Officials, Los Angeles, California. (UPC), and current standards of the local Water District.

B. Underground Conduit Construction shall be in accordance with Section 306 of "Standard Specifications for Public Works Construction", current Edition, published by Building News, Inc., Los Angeles, California (PWC Specifications).

1.04 SUBSTITUTIONS

Substitutions will be considered per Section 01 25 00.

1.05 SUBMITTALS

A. Provide in accordance with Section 01 33 00.

B. Material List: Submit a list of material proposed for use for approval.

C. Provide written certification that the entire system is clean and free of obstructions.

D. Record Drawings: Submit record drawings of installed sanitary sewer system in accordance with Section 01 78 39.

PART 2 -- PRODUCTS

2.01 PIPE MATERIALS: Unless a specific pipe option is indicated on the plans, the following options may be used:

A. Extra strength vitrified day pipe: Conform to ASTM C700. Compression joints shall conform to ASTM C425.

B. ABS plastic solid wall pipe: Per ASTM D2751 and PWC Specifications, Section 207-15 as modified therein. Joint solvent cement shall be an ABS cement conforming to ASTM D2235. Gaskets shall conform to PWC Specifications, Section 208-4.

C. Polyvinyl Chloride (PVC) Plastic Sever Pipe: Conform to ASTM D3034, SDR 35. PVC sewer pipe shall have gasketed joints conforming to the requirements of PWC Specifications, Section 208-4.

2.02 CONCRETE MANHOLES

A. Concrete manholes, unless otherwise specified, shall conform to the specifications referenced on the plans.

B. Manhole covers shall be marked "SEWER".

2.03 CLEANOUTS

Cleanouts to grade shall be constructed of the same material and same size as associated line; terminate at surface in a concrete or cast iron body with tight-fitting cast iron or brass top. In paved area, top to be traffic-rated; in walks, lawns or planters surface to be smooth, non-tripping. "SEWER" shall be cast into cover in sharp 1" high letters.

2.04 MARKER TAPE

Manufacturers standard permanent bright green, continuous-printed plastic tape intended for direct burial; not less than 6" wide x 4-mil thickness. Black print shall read "CAUTION-SEVVER LINE BURIED BELOW'.

PART 3 -- EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed

B. Correct conditions detrimental to timely and proper completion of the Work.

C. Do not proceed until unsatisfactory conditions are corrected.

D. Beginning of installation means acceptance of conditions.

3.02 FIELD CONDITIONS

A. Verify drawing dimensions and elevations with actual field conditions. Inspect related work and adjacent surfaces. Correct all improper conditions.

B. Coordinate all work of this section with related trades. Immediately notify Architect should conflicts with other utilities be encountered.

C. Perform all work within the Road right-of-way in accordance with traffic and detour plan approved by the City. Provide all required traffic control devices and personnel. Perform night work if required at no additional cost to Owner.

D. Verify elevation(s) of point of connection to existing main prior to construction. Where new sanitary sewers connect to existing sewers, excavate carefully, expose and verify horizontal and vertical location of all points of connections. Notify Architect of any discrepancies. Perform all such required exploratory work far enough in advance of sewer construction to allow Architect to redesign sewers as required to meet out-fall conditions. No time delays will

be allowed due to failure of Contractor to perform this work early enough in the construction period. Any sanitary sewer, which must be reconstructed due to failure of Contractor to verify grades, must be completed at no additional cost to Owner.

E. Verify and coordinate installation locations to assure clearance from all other utilities and from footings and foundations. Pay particular attention to structural details pertaining to piping installations with respect to foundations. Where utilities fall within the zone of influence of footings or foundations as shown on these details, deepen footings, relocate piping, or, if approved by the Soils Engineer, modify trench/backfill conditions, materials or methods, all at no additional cost to the Owner.

3.03 TRENCH EXCAVATION, BEDDING, AND BACKFILL

A. Perform all excavation for the construction of trenches and all additional excavation required for manholes or other structures forming a part of the pipeline. Trench excavation and backfill shall conform to the requirements of Section 02220 of these specifications and Section 306-1.2 of the PWC Specifications and shall require the approval of the Soils Engineer.

B. Bedding material shall normally extend from 3" below the pipe invert to a point 1 foot above the top of the pipe. Bedding material shall be a mixture of sand, gravel, crushed aggregate or approved native material. Bedding material shall have a sand equivalent of not less than 30 or have a coefficient of permeability greater than 0.001 centimeters per second. Bedding material shall be sized within the following range:

Sieve Size:	Percent Passing:
3/4"	100
No. 4	35 - 65
No. 200	0-10

C. Bedding shall be compacted to 90 percent of the Maximum Relative Density.

D. In backfilling the trench, take all necessary precautions to protect the pipe from damage due to shifting.

3.04 PIPE LAYING, JOINTING AND TESTING

A. Survey, line and grade: Provide grade controls and survey lines in accordance with Section 01055.

B. Pipe installation: the Inspector will inspect Pipe in the field before and after laying. Any corrective work shall be done by the Contractor and approved by the Inspector at no cost to the District. Installation of pipe shall conform to the requirements of Sections 306-1.2 of the PWC Specifications.

C. Unless otherwise specified, match soffits at all sewer connections, laterals, manholes, etc.

D. Bury marker tape 6" to 12" below finished grade, directly above pipe.

E. Testing of pipelines: Perform all tests required by governing agencies. Testing shall be performed in accordance with Section 306-1.4 of PWC Specifications. Furnish all water, materials and labor for making the required tests. All tests shall be made in the presence of the Inspector. Notify the Inspector at least 48 hours before performing the required tests.

3.05 CONNECTIONS TO EXISTING MAINS

Connect on site sewer system to existing system. Comply with all requirements of governing Water District and the City for work within the public right-of-way.

3.06 CLEAN-UP

A. Upon completion of work, all sanitary sewer systems shall be left free from silt, debris, and obstructions.

B. Clear dirt and other superfluous material from interior of pipe as work progresses. Maintain swab or drag in line and pull past each joint as it is completed.

C. Place plugs in ends of uncompleted conduit at end of day or whenever work stops.

D. Flushing of lines: Prior to acceptance of work, flush each line to ensure that the entire system is clean and free of all obstructions.

***** END OF SECTION *****