LOS OSOS COMMUNITY SERVICES DISTRICT

CONSTRUCTION OF
LOS OSOS WASTEWATER PROJECT
AREA A, AREA B, AREA C, & AREA D AND WWTF

STATE REVOLVING FUND LOAN PROGRAM
PROJECT NO. C – 06 – 4014 - 110

ADDENDUM NO. 3
April 13, 2004

MWH
MONTGOMERY WATSON HARZA

Addendum No. 3
to the
Los Osos Wastewater Project

April 13, 2004

Los Osos Community Services District

2122 9th Street, Los Osos, CA 93402

To all prospective Bidders:

Attached herein are addendum items that shall be incorporated into the Contract Documents for the Los Osos Wastewater Project. These changes shall be considered as part of the Contract Documents, as if they were originally provided therein, and as such shall be used as Contract Documents. All other terms, conditions, requirements, and specifications of the Contract Documents shall remain unchanged.

Bidders must acknowledge receipt of this addendum on the Bid Forms. Failure to acknowledge receipt of this addendum may be considered non-responsive by the OWNER and may be cause for rejection of your Bid.

All communications relative to this addendum shall be directed to the ENGINEER prior to opening of the Bids.

For Area construction contact:

MWH Americas, Inc.
1340 Treat Blvd., Suite 300
Walnut Creek, CA 94597-7966
Telephone: (925) 274 - 2245
Attention: John Bergen

For WWTF construction contact:

MWH Americas, Inc.
1340 Treat Blvd., Suite 300
Walnut Creek, CA 94597-7966
Telephone: (925) 274 - 2201
Attention: Steve Hyland

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The Contract Documents for the Los Osos Wastewater Project shall be modified by this addendum in accordance with the following changes:

No.	Ref.	Description
	Vol. I	
	00300	**Delete** the amount "$1,730,000" in Bid Item 63c at the US Filter line in Bid Schedule 3 and Bid Schedule 5 and **replace** with the following: "$1,590,000".
	00850	**Delete** the words "... with the bid." In Paragraph 2 of Section 5: Reporting Requirements on Page 7 of 15 of the Compliance Documents for State Revolving Fund (SRF) Loan Program added by Addendum No. 1, Item 1.09, and **replace** with the following: "... within ten working days after the bid opening."
	01025	**Add** the following to Bid Item 19: 2" Force Main: "Include installation of 1.5" force mains in this bid item."
	01300	**Add** the following to Paragraph 1.6: "I. Online Training 1. Online training capability to supplement the technical manuals will be developed for the following unit processes: Section 11289 - Ultraviolet Disinfection System Section 11326, 11327, & 11328 – Grit System Section 11345 & 11349 – Screenings Handling Section 11560 – Centrifuge Dewatering System Section 11501 &13100 – Blowers and Membrane Bioreactor 2. The online training shall include course work, hosting services, quizzes, and testing. The technical content shall be developed with the cooperation of the manufacturers of the applicable equipment. 3. The online training will be able to evaluate and test the plant operators on the following: • Start-up and shut-down of equipment • Basic operation, maintenance, and safety issues • Trouble shooting techniques 4, The online training program will include the following functions: a. Intermittent quizzes and test questions. b. Wrong answer notification and feedback. c. 100% proficiency is required before a certificate of completion is

		generated. d. A real time clock on screen that verifies the time spent on the course material. e. The software program will automatically bookmark when the operator leaves a course (in case of power outage or an emergency in the facility). f. The online training program needs to be approved by the state-regulating agency for continuing education units. 5. The system will provide the plant manager with a record of progress attained by each operator. 6. The hosting of this service shall last a minimum of 5 years. A hard copy and an electronic version must be provided for the client to use for other non-online training programs. 7. Online training shall be provided by 360water, Inc. (925) 820-8060, IBM, or equal."
	01311	**Delete** the words "The CONTRACTOR shall attach a statement of computerized CPM capability to the Bid Forms and shall verify ..." in the first sentence of Paragraph 1.2.A and **replace** with the following: "The CONTRACTOR shall submit a statement of computerized CPM capability to the ENGINEER within ten days after the bid opening and shall verify ...".
	01535	**Delete** Paragraph 3.1.B and **replace** with the following: "B. The CONTRACTOR shall develop a settlement monitoring program for any permanent structure which is within a horizontal distance 1.5 times the depth of any excavation deeper than 5 feet. Permanent structures to be monitored include homes, businesses, and public buildings adjacent to the wastewater treatment facility, pump stations, pocket pump stations, standby power facilities, harvest wells, and effluent disposal sites."
	01535	**Delete** Paragraph 3.1.D.1 and **replace** with the following: "1. The CONTRACTOR shall set a minimum of two survey monuments on each permanent structure and a minimum of one survey target on sheet piling, sheeting, or shoring in the immediate vicinity of existing structures. The survey monuments and targets shall be spaced at least 50 feet apart on structures and 100 feet apart for all other conditions, when excavations parallel structures. Ground surface elevations on the centerline of the pipelines installed by microtunneling shall be monitored at 50-foot intervals (max) or at least three locations per tunnel drive, whichever gives more monitoring points."
	01535	**Add** the following after the words "... video monitoring program shall include ..." in Paragraph 3.2.A: "... be performed in accordance with Section 01532 – Site Conditions Survey and Construction Photographs and shall include ...".

	01535	**Delete** Paragraph 3.2.C in its entirety.
	01535	**Delete** Paragraph 3.3.A.1 and **replace** with the following: "1. The contingency plan shall outline steps to be taken to protect structures and to stop excessive movement or settlement identified by the settlement monitoring program."
	01535	**Delete** Paragraph 3.4.A and **replace** with the following (Paragraphs 3.4.A.1 and 3.4.A.2 are not changed): "A. The CONTRACTOR shall submit readings from the various instruments and survey points daily to the ENGINEER. Reading frequency shall be increased as required by the ENGINEER when excavation or tunnel construction is approaching or near critical structures (structures, bridge piers, etc., partially or entirely located within a distance equal to the depth of excavation or tunnel but at least within 50 feet). Initial readings of surface points shall be taken before any excavation or construction is started."
	01655	**Add** the following sentence to Paragraph 3.6.A.2 after the first sentence: "The foregoing shall include all sewer laterals except that the wye fitting and 1/8 bend fitting at the sewer main do not need to be mandrel tested."
	Vol. IIA	
	02200	**Delete** Paragraph 2.3.C.2.b and **replace** with the following: "b. For pipelines 12 inches and greater in diameter and for all pipelines below the existing groundwater table, the pipe zone material shall be Type E or Type G from below the pipe to the pipe springline."
	02200	**Delete** the first sentence of Paragraph 2.3.C.4 and **replace** with the following: "Final backfill for pipelines under paved areas, as defined under "Pipe and Utility Trench Backfill" shall be the same material as that used for trench backfill, except that Type G backfill material shall be used in the upper portion of the trench in accordance with the pavement restoration details provided in the Contract Drawings."
	02200	**Delete** the words "Trench Backfill Placed within 3 feet of Finished Grade in Pavement Areas" under the column heading "Recommended Minimum Location" in the table in Paragraph 3.12.H and **replace** with the following: "Trench Backfill Placed within 3 feet of Pavement Subgrade in Pavement Areas".
	02461	**Add** new Specification Section 02461 – LOVR Improvements attached to this Addendum.
	09255	**Delete** the words "... 1/2 inch regular, ..." in Paragraph 2.2B.1.

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	11148	**Add** the following table to Paragraph 2.3 K: " **Pump Station** **Hatch Rating** Lupine H-20 West Paso HS-20 Bay Wood H-20 East Ysabel H-20 Mountain View HS-20 Sunny Oaks H-20"
	11149	Add the following table to Paragraph 2.6.1: " **Pump Station** **Hatch Rating** 04A H-20 07A H-20 08A H-20 09A H-20 09B HS-20 10A H-20 11A H-20 12A H-20 13A H-20 13B H-20 15B H-20"
	11149	**Add** the following to Paragraph 2.9: "B. Myers MGPD100".
	15500	**Add** the following to Paragraph 2.4: "D. **Standby Power Building Ventilation Fans:** 1. Furnish and install panel mounted, belt-driven, propeller fans as shown on the Contract Drawings. 2. The propeller fans shall be belt-driven with aluminum blades, a spun steel venturi mounting panel, a steel wire guard, and motor mount with resilient anti-vibration pads at mounting points with panel. The propeller blade shall be statically and dynamically balanced. The fans shall be complete with gravity shutters, wall mount housing, bird screen, motor side guard, and externally mounted disconnect switch.

		a. Performance shall be 600 cfm, 0.5 in wg, ¼ HP at 120 VAC 3. The fan, panel mount, shutters, housing, blades, screen and guard shall be coated with a gray thermosetting polyester urethane (Technicoat 10-1). 4. Manufacturers, or equal: a. Cook b. Greenheck c. Penn"
	Vol. IIIA	
	02200	**Delete** Paragraph 2.3.C.2.b and **replace** with the following: "b. For pipelines 12 inches and greater in diameter and for all pipelines below the existing groundwater table, the pipe zone material shall be Type E or Type G from below the pipe to the pipe springline."
	02200	**Delete** the first sentence of Paragraph 2.3.C.4 and **replace** with the following: "Final backfill for pipelines under paved areas, as defined under "Pipe and Utility Trench Backfill" shall be the same material as that used for trench backfill, except that Type G backfill material shall be used in the upper portion of the trench in accordance with the pavement restoration details provided in the Contract Drawings."
	02200	**Delete** the words "Trench Backfill Placed within 3 feet of Finished Grade in Pavement Areas" under the column heading "Recommended Minimum Location" in the table in Paragraph 3.12.H and **replace** with the following: "Trench Backfill Placed within 3 feet of Pavement Subgrade in Pavement Areas".
	03300	**Add** the following to Paragraph 1.4: "H. **Sample Panels:** 1) The CONTRACTOR shall form, place, and finish two sample panels. One panel shall be 8'-0" high x 10'-0" long concrete wall and one panel shall be 8'-0" x 10'-0" slab of representative depth and reinforcement of the concrete work. The panels shall be used to demonstrate formwork, form liners, joints of all types, saw cuts, staining, finish, and other concrete accessories and placement procedures. The panels shall be used to verify compliance with the requirements listed in this and other Sections. 2) The panels shall remain on the Site for the duration of the Project and shall be used to determine final finishes such as staining, sealing, and caulking. 3) When accepted by the Engineer, the panels shall be the reference by which concrete work will be compared. All concrete work shall conform to and match the work product on the approved panels."

	07530	**Delete** Section 07530 –Single-Ply Membrane Roofing and **replace** with the new Section 07530 – Single-Ply Membrane Roofing attached to this addendum.
	Vol. IIIB	
	11501	Section 2.1.A, page 2, **delete** "...noise at 3 ft at design flow" and **replace** with "noise at 3 ft at future capacity" **Delete** Membrane Blower noise rating "85" and **replace** with "90"
	13100	**Delete** the words "... 17.3 hp ..." and "... 24.7 feet." in Paragraph 1.6.E.4 and **replace** with the following: "... 14.1 hp ..." and "... 20.2 feet.", respectively. **Delete** the words "... 146 hp." and "... 127 KW." in Paragraph 1.6.E.6 and **replace** with the following: "... 133 hp." and "... 116 KW.", respectively. **Delete** the amount "... $1,730,000." and in Paragraph 1.6.E.8 and **replace** with the following: "... $1,590,000."
	15030	**Add** the following to Paragraph 2.2A: "Stainless steel flanges shall be plate construction."
	15202	Section 2.1 **add:** "I. Stainless Steel Butterfly valves shall be suitable for mixed liquior, hypochlorite, and citric acid service. Hypochlorite concentration shall be no more than 8000 mg/l. Citric acid concentration be no more than 8000 mg/l."
	15202	Section 2.2 **add;** "M. Air Acuator: Refer to Section 15201 for requirements"
	16111	Section 3.2.A.2 , In the second sentence, **delete** the following "the top of the concrete envelope is a minimum of 30 inches below grade and a minimum of 36 inches below roadways" and **replace** with "the top of the concrete envelope is a minimum of 30 inches below roadways"
	16455	**Add** the following to Paragraph 2.8A: "4. General Electric Type AF300 Series"
	16456	**Add** the following to Paragraph 2.8A: "4. General Electric Type AF300 Clean Power Series."
	16620	**Delete** this section in its entirety and **replace** with a new specifications Section 16620, attached to this addendum.

	Vol. IV	
	B-PP-121	**Add** new sewer lateral on Pine Street at Station 10+14.5, Invert Elevation 41.00.
	B-PP-137	**Delete** sewer lateral on Ash Street at Station 5+35.
	B-PP-147	**Add** new sewer lateral on Henrietta Street. Install wye fitting at Station 9+59 and locate end of lateral (lateral will be installed diagonally in street) to serve south side of street at Station 9+95, Invert Elevation 21.2. (The lateral at Station 9+56 will remain.)
	C-PP-115	**Delete** the callout "STA 20+45" on the plan view and **replace** with the following callout: "STA 20+25".
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	A-PP-104	**Delete** the southernmost lateral of two laterals shown at Station 40+58.
	A-PP-105	**Delete** the sewer lateral at Station "33+90" and **replace** with a new sewer lateral at Station "33+60". **Delete** the associated Invert Elevation "74.58" and **replace** with Invert Elevation "74.63".
	A-PP-117	**Delete** the notation "6" in the plan view for the lateral callout at Station 57+97 "
	A-PP-123	**Add** the callout "Detail C-124" In the Plan view adjacent to PPS-8A-A01. **Add** following callout next to pipe stub from PPS: " Provide 3 ft long 1-1/2" diameter FM stub-out with cap."
	A-PP-127	**Add** following callout next to pipe stub from PPS: " Provide 3 ft long 1- 1/2" diameter FM stub-out with cap."
	A-PP-130	**Delete** sewer lateral at Station 73+78 and **replace** with sewer lateral at Station 74+07, Invert Elevation 38.72.
	A-PP-130	**Delete** callout "Detail C-122" at PPS-10A-A01 and **replace** with callout "Detail C-124". **Add** following callout next to pipe stubs from PPS: " Provide two 3 ft long 1- 1/2" diameter FM stub-outs with caps."
	A-PP-132,	**Delete** sewer lateral at Station 44+05 and **replace** with new sewer lateral at Station 43+72, Invert Elevation 81.55.
	Vol. VIA	
	42-A-01	**Add** workbench shown on the detail attached to this addendum. Locate workbench as directed by the ENGINEER beneath stairway to second floor on west wall of Workshop Area. Workbench shall be constructed in accordance with Section 06400 – Architectural Millwork.

	42-A-04	**Add** the following to Note C: "Sawcut lines are indicated by callout 03300.B."
	42-A-05	**Delete** Note C in its entirety and **replace** with the following: "C. Sawcut lines are indicated by callout 03300.B."
	42-A-05	**Delete** FF Elev from "75'-0"" and **replace** with "74'-0"" **Delete** Elev "91'-0"" and **replace** with "Second Floor Elev 90' -0"". **Delete** T.O. Metal Roof Deck Elev. "108'-0"" and **replace** with "107'-0"" **Delete** T.O.P. Elev. "111'-0"" and **replace** with "110'-0"".
	42-A-06	**Delete** Note C in its entirety and **replace** with the following: "C. Sawcut lines are indicated by callout 03300.B."
	43-A-05	**Add** the following to Note C: "Sawcut lines are indicated by callout 03300.B."
	43-A-06	**Delete** Note C in its entirety and **replace** with the following: "C. Sawcut lines are indicated by callout 03300.B."
	44-A-06	**Add** the following to the Notes: "J. Sawcut lines are indicated by callout 03300.B. K. All fabricated steel awnings and support structures indicated with callout 09900.A shall be painted in accordance with Section 09901 – Paints and Stains."
	44-A-07	**Add** the following to the Notes: "J. Sawcut lines are indicated by callout 03300.B. K. All fabricated steel awnings and support structures indicated with callout 09900.A shall be painted in accordance with Section 09901 – Paints and Stains."
	Vol. VIB	
	40-E-01	**Add** the following to the end of Note 1: "The CONTRACTOR shall restore LOS OSOS Valley Road after trenching."
	40-E-01	**Add** the following to the Notes: "8. Add feeder 45-1S (1"C, 2/C #16shld) from device 45-PIT-001 field located at the Bio Filter header (see Dwg 45-I-01) to Remote I/O #3 located in Electrical Room of Treatment Building (see Dwg 43-E-07A)."
	40-E-03	**Add** the following to the Notes: "6. Add feeder MSCP-9 (3/4"C, 2 #12 & 12 GND) from Switchgear Control Panel (MSCP) to feed Generator Control Panel (GCP). And mark circuit 9 is for Generator Control Panel (GCP)" in lieu of "spare " as shown (see Dwg 43-E-07A for locations of "GCP" and "MSCP.")"

	40-E-07	**Add** callout to left side of grounding grid: "Substation grounding grid (west side) extends 2'6" beyond gate swing. Provide grounding for fence gates and roots per Detail 14 shown on Dwg GE-03. Witts #2/0 BC bonded to the ground grid (total of 2 fence gates)."
	40-E-08	**Add** Note: "Add the following conduit/cable schedule: 1. Feeder MS-1C (2"C, 42 #14 & 18 #14SP) from Main SWGR "MS" to I/O #3 and wire complete for breaker status. (See Dwgs 40-E-03, 43-E-07A) 2. Feeder MS-1S (2"C, RS-485 signal cable) from Main SWGR "MS" to I/O #3 and wire complete for power monitoring 3. Feeder GCP-2C (1"C, 4 #14 & 6 #14SP) from Generator Control Panel "GCP" to I/O #3 and wire complete for Generator Status. 4. Feeder Gen-3C (2"C, 40 #14 & 20 #14SP) from Engine Local Control Panel "LCP" to Generator Control Panel "GCP" and wire complete for control wiring 5. Feeder Gen-2S (2"C, 8-2/C #16 Shld & 4-2/C #16 shld SP) from Engine Local Control Panel "LCP" to Generator Control Panel "GCP" and wire complete for signal wiring. 6. Revise Conduit layout accordingly on Dwg 43-E-07A"
	42-E-01	For Circuit Breaker 42 **delete** "150AF/125AT" and **replace** with "150AF/70AT"
	42-E-02	**Add** Note: "1. The maximum total dimension of "42-MCC-01" shall be "160"L x 42"D" in lieu of "160" x 21"D" as shown on contract drawings 43-E-02 & 43-E-03 2. The "42-MCC-01" consists of 26 vertical sections (20"L X 21"D each section) and shall have back to back arrangement with 8 vertical front sections and 8 vertical back sections. 3. Revise layout dimension of "42-MCC-01" on Dwg 43-E-03 accordingly."
	42-E-03	On "Cable and Conduit Notes:", Note 3, **delete** "See DWG 41-C-2 and 41-C-25" for location" and **replace** with "See DWG 41-C-38 and 41-C-39 for location"
	42-E-03	**Add** Note 6 to read : "6. Provide feeder 42-50C (1"C, 4# 14) from DEVICE LAH-301B at the septage receiving area to I/O #2 and wire complete for Septage High Alarm Status. Refer to Dwgs 42-M-01 and 42-I-03 for location of LAH-301B. And revise conduit/cable schedule shown on Dwg 42-E-12 accordingly."
	42-E-04	**Add** the following callouts: "1. Feeder 42-5C1 (1"C, 6 #14 & 2#14SP) from device 42-V-01-P1 located at Drum Screen NO. 1 "42-E-01-P1" to I/O #2 and wire complete.

		2. Feeder 42-6C1 (1"C, 6 #14 & 2#14SP) from device 42-V-02-P1 located at Drum Screen NO. 2 "42-E-02-P1" to I/O #2 and wire complete. 3. Feeder 42-7C1 (1"C, 6 #14 & 2#14SP) from device 42-V-01-SCR located at Wash Compactor NO. 1 "42-E-01-SCR" to I/O #2 and wire complete. 4. Feeder 42-8C1 (1"C, 6 #14 & 2#14SP) from device 42-V-02-SCR located at Wash Compactor no. 2 "42-E-02-SCR" to I/O #2 and wire complete. 5. "Refer to Dwg 42-I-01 for locations of 42-V-01-P1, 42-V-02-P1, 42-V-01-SCR and 42-V-02-SCR. Revise conduit/cable schedule shown on Dwg 42-E-12 accordingly."
	42-E-06	**Add** callout at "42-S-01-CA – On Rooftop" "One WP, GFCI, 120V duplex receptacle near Roof top unit 42-S-01-CA and wire complete to circuit 27 of Panel 42-LP-01 with feeder 42-LP1-27 (1"C, 2 #12 & 1 #12 GRD). Revise panel schedule shown on Dwg 42-E-11 accordingly."
	42-E-11	For Circuit no.27 of Panel "42-LP-01" **delete** "spare" and **replace** with "outdoor receptacle on roof"
	42-E-12	On conduit feeder "42-5C" **delete** "1"C, 6#14 & 2#14 SP" and **replace** with "1"C, 16#14 & 4#14SP" On conduit feeder "42-6C" **delete** "1"C, 6#14 & 2#14 SP" and **replace** with "1"C, 16#14 & 4#14SP" On conduit feeder "42-7C" **delete** "1"C, 6#14 & 2#14 SP" and **replace** with "1"C, 16#14 & 4#14SP"
	42-E-12	On conduit feeder 42MCC1-38 **delete** "3/4"C, 3 #12 & 1 #12 GND" and **replace** with "3/4"C, 3 #10 & 1 #10 GND, 2#14 & 2#14SP" On conduit feeder 42MCC1-39 **delete** "3/4"C, 3 #12 & 1 #12 GND" and **replace** with "3/4"C, 3 #10 & 1 #10 GND, 2#14 & 2#14SP"
	43-E-04	**Add** Note: "Note 1. The maximum total dimension of "43-MCC-01" shall be "240"L x 42"D" in Lieu of "220"L x 21"D" as shown on contract drawings 43-E-04 & 43-E-07A. 2. The "43-MCC-01" consists of 24 vertical sections (20"L x 21"D each section" and shall have back to back arrangement with 12 vertical front sections and 12 vertical back sections."
	43-E-05	For MCCs "43-MCC-02" and "43-MCC-03" **add** callout "The maximum total dimension of "43-MCC-02" and "43-MCC-03" shall be "100"L x 42"D" in lieu of "100"L x 21"D" as shown on contract drawings 43-E-05 & 43-E-07A." For MCC "43-MCC-02" **add** callout;

		"The "43-MCC-02" consists of 10 vertical sections (20"L x 21"D each section) and shall have back to back arrangement with 5 vertical front sections and 5 vertical back sections." Add Note: "Revise layout dimension of "43-MCC-02" and "43-MCC-03" on Dwg 43-E-07A accordingly."
	43-E-06A	**Add** the following feeders under "CABLE AND CONDUIT NOTES": "6. Feeder 43-20C (3/4"C, 8 #14 & 4 #14SP) from Engine Local Control Panel "LCP" to Day Tank LCP "43-GEN-02" 7. Feeder 43-21C (1"C, 8# 14 and 4 #14SP, 2 #12 & 1#12 GND) from Engine Local Control Panel "LCP" to Battery Charger 8. Feeder 43-2P1-31 (3/4" C, 2 #12 & 1#12 GND) from Engine Local Control Panel "LCP" to Panel 43-LP-01 and wire complete to ckt no. 31. See Dwg 43-E-07A for location of panel 43-LP-01. 9. Feeder 43-22C (3/4"C, 8# 14 & 4 #14SP) from Day Tank LCP "43-GEN-02" to Generator Control Panel "GCP" for control wiring. See Dwg 43-E-07A for location of Panel "GCP." 10. Feeder 43-23C (3/4"C, 8# 14 & 4 #14SP) from Battery Charger to I/O #3 for status indication wiring. See Dwg 43-E-07A for location of I/O #3. 11. Revise Conduit/Cable schedule shown Dwg 43-E-19 accordingly."
	43-E-06A	**Add** to "NOTES": "2. Locate engine local control panel "LCP" next to Generator Terminal Box "43-GEN-01" 3. Conduits and Cables are partially shown on this drawing. The CONTRACTOR shall provide complete wiring (conduits and cables) per single line diagrams, panelboard and conduit/cable schedules."
	44-E-05	For Panelboard "44-LP-02" **delete** Main Breaker "125A" and **replace** with "70A". For Panelboard "44-LP-02" **delete** bus rating "225A" and **replace** with "100A".
	43-I-18	**Add** two pressure switches (PSH-295A and PSHH-295B) with isolation valves on the backpulse header, upstream of "PIT-291".
	43-I-18	**Add** a discrete alarm input for each of the two pressure switches on the backpulse line; PAH-295A and PAHH-295B. Use existing spare inputs at MBR-PLC.

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SECTION 02461 – LOVR IMPROVEMENTS

PART 1 – GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide the Los Osos Valley Road (LOVR) improvements as specified herein and as shown on the Drawings.

B. The specifications and drawings for this work were prepared by the County of San Luis Obispo Department of Public Works. The drawings (Sheet No. 1 through Sheet No. 4) were issued in Addendum No. 2, Item 2.64.

C. The payment for the work specified herein shall be included in Bid Item No. 53: LOVR Improvements as a lump sum amount.

1.2 CONTRACTOR SUBMITTALS

A. Submittals shall be in accordance with Section 01300 - Contractor Submittals.

PART 2 – PRODUCTS

2.1 PRODUCTS

A. Refer to Section 9 and Section 10 herein for products to provide the LOVR Improvements. Refer to the Specifications for products not specified in this Section.

PART 3 – EXECUTION

3.1 EXECUTION

A. Refer to Section 9 and Section 10 herein for requirements to provide the LOVR Improvements. Refer to the Specifications for requirements not specified in this Section.

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The Special Provisions contained hereafter have been prepared by or under the direction of the following registered engineer(s):

PREPARED BY:

Paul F. Donnelly — 3/1/04
PROJECT ENGINEER — DATE

RECOMMENDED FOR APPROVAL BY:

3/22/04
COUNTY DESIGN ENGINEER — DATE

SECTION 9. DESCRIPTION OF WORK

9-1.01 Excavation and grading shall be performed, storm drains and concrete inlets shall be installed, concrete curb and gutter shall be installed, aggregate base shall be placed, an asphalt concrete pavement shall be placed and other such items or detail work not mentioned herein that is required by the Standard Plans and/or Project Plans, the Standard Specifications and/or these Special Provisions shall be performed, constructed, furnished and/or installed.

9-1.02 Specifications and Plans: The work embraced as described in Section 9-1.01 of these Special Provisions shall be done in accordance with the Standard Specifications for the Construction of Local Streets and Roads (California Department of Transportation), dated July 2002, and the Standard Plans for the Construction of Local Streets and Roads, dated July 2002, insofar as they may apply and in accordance with these Special Provisions. Wherever State Agencies, Departments or Officers are referred to in the above mentioned Standard Specifications and Standard Plans, the comparable Los Osos Community Services District Department or Officer having jurisdiction shall be meant thereby for the purpose of these Special Provisions.

In case of conflict between the Standard Specifications and the Special Provisions herein, the Special Provisions shall take precedence over such conflicting portions.

SECTION 10. CONSTRUCTION DETAILS

10-1.01 Trench Safety: Attention is directed to Section 7-1.01E, "Trench Safety" of the Standard Specifications and these Special Provisions.

Contractor shall submit a detailed plan in advance of any trench excavation work as part of this contract showing the design of shoring, bracing, sloping or other provisions for worker protection from the potential hazard of caving ground resulting from excavation of any trench or trenches over five (5) feet in depth. The detailed plan must be prepared by a registered civil engineer or structural engineer if the design varies from the shoring system standards required by the Construction Safety Orders.

Payment for compliance with the requirements of "Trench Safety" shall be considered as included in the contract items of work involved and no separate payment will be made therefor.

10-1.02 Maintaining Traffic: Attention is directed to the provisions of Section 7-1.08, "Public Convenience," Section 7-1.09, "Public Safety," and Section 12, Construction Area Traffic Control Devices," of the Standard Specifications and these Special Provisions.

Public two-way traffic shall be permitted to pass through the construction zone at all times. During the times when men or equipment are actually working, a minimum of one 12-foot wide lane with flagging shall be provided for public traffic. At all other times, a minimum of two 10-foot wide lanes which are reasonably smooth and satisfactory for public two-way traffic shall be provided and maintained by the Contractor irrespective of the state of construction. Adequate sight distance for vehicles exiting driveways shall be maintained. In addition, the Contractor shall backfill and compact the excavated shoulder to match the edge of remaining pavement on a 4:1 slope to provide a temporary shoulder.

No lane closures shall be permitted on Los Osos Valley Road prior to 9:00 AM or after 2:30 PM on any day.

The Contractor shall conduct operations in such a manner that access of abutting residences and businesses along the road is not obstructed. Care shall be taken by the Contractor so that materials or equipment placed or parked within the County road right of way will not block access to any residence or business.

10-1.03 Obstructions: Attention is directed to Section 8-1.10, "Utility and Non-Highway Facilities," and Section 15, "Existing Highway Facilities," of the Standard Specifications and these Special Provisions.

The Contractor shall coordinate work activities with the related utility work necessary during construction of the project which must occur during the progress of the Contractor's work. The contract time includes an allowance of twenty (20) working days for the utility companies to perform their respective work. During this time, the Contractor may only work on those portions of the project that do not interfere with the utility companies' work.

Compensation for delay to permit rearrangement of utilities shall be considered as included in the contract items of work involved and the Contractor will not be entitled to any compensation for such delay, nor entitled to an extension of time for such delay, without due cause.

The Contractor shall notify the Engineer in writing at least five (5) working days prior to the date upon which the utility companies may begin their rearrangement work. In the event that the work area is not satisfactorily prepared, as determined by the Engineer, the Contractor shall supply the Engineer with another five (5) working days notice, in writing, upon which the utility companies may begin their rearrangement work.

The Contractor is responsible for maintaining the roadway for traffic at all times. During utility rearrangement work, the Contractor shall avoid activities that could conflict with the utility work and shall coordinate activities that could facilitate utility work.

The following utility companies have existing facilities and/or services within the project limits:

Company Name	Contact	Phone Number
SBC (telephone)	Jim Pierce	(805)546-7444
Gas Co,	Brian Reilly	(805)781-2452
PG&E	Richard Vierra	(805)546-5254
LOCSD	Bruce Buel	(805)528-9370
Williams Communications	Joel Wright	(805)541-6845
Sprint/MCI Worldcom	Don Beckerman	(408)533-4177

Underground Service Alert ("USA") shall be contacted a minimum of 48 hours prior to the start of construction; ph. (800) 227-2600. Contractor shall provide to the Engineer, the USA ticket for verification.

10-1.04 Construction Area Signs: Attention is directed to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these Special Provisions.

The Contractor shall furnish all sign panels, posts and hardware. The Contractor shall also erect and maintain all construction area signs shown on the plans as provided in these Special Provisions. The Contractor is responsible for having any underground utilities marked where sign posts will be placed. Construction area signs shall not be used until they are needed and when no longer needed, they shall be removed from the site of the work by the Contractor.

The base material of construction area signs shall not be plywood. Used sign panels, in good repair as determined by the Engineer, may be furnished. If determined by the Engineer, signs damaged by any cause shall be repaired or replaced by the Contractor at the Contractor's own expense.

"CONSTRUCTION AREA SIGNS" will be paid for on a lump sum basis in the manner specified in Section 12-4.01 of the Standard Specifications.

10-1.05 Traffic Control System for Lane Closures: A traffic control system shall consist of closing traffic lanes in accordance with the details shown in the Standard Plans and the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications.

The provisions in this section will not relieve the Contractor from the responsibility to provide such additional devices or take such measures as may be necessary to comply with the provisions in Section 7-1.09, "Public Safety," of the Standard Specifications.

One-way traffic shall be controlled through the project in accordance with the Standard Plan titled, "Traffic Control System for Lane Closure of Two Lane Conventional Highway," and these Special Provisions. If the Contractor utilizes a pilot car, radio contact with the personnel in the work area shall be provided by the Contractor and the maximum allowable speed of the pilot car through the traffic control zone shall be no more than 25 miles per hour.

If any component in the traffic control system is damaged, displaced or ceases to operate or function as specified, from any cause during the progress of the work, the Contractor shall immediately repair said component to its original condition, or replace said component, and shall restore the component to its original location.

When lane closures are made for work periods only, all components of the traffic control system, except portable delineators placed along open trenches or excavations adjacent to the traveled way, shall be removed from the traveled way, shoulder and auxiliary lanes at the end of each work period. If the Contractor so elects, the components of the traffic control system may be stored at selected central locations, approved by the Engineer, within the limits of the highway right of way.

Upon completion of the work requiring lane closure, all components of the traffic control system shall be removed from the site of the work by the Contractor.

The contract lump sum price paid for, "TRAFFIC CONTROL SYSTEM" shall include full compensation for furnishing all labor, including all flagging costs for the lane closures on two-lane highways, materials (including signs), tools, equipment and incidentals, and for doing all the work involved in placing, removing, storing, maintaining, moving to new locations, replacing, and disposing of the components of the traffic control system as shown on the plans or as specified in the Standard Specifications and these Special Provisions and no additional compensation will be allowed therefor. All flagging costs for lane closures on two-lane highways shall be considered as included in the contract lump sum price paid for, "TRAFFIC CONTROL SYSTEM" and no additional compensation will be allowed therefor.

Full compensation for furnishing and operating a pilot car (including driver, radio communications and any other equipment and labor required) shall be considered as included in the contract lump sum price paid for, "TRAFFIC CONTROL SYSTEM" and no additional compensation will be allowed therefor.

The adjustment provisions in Section 4-1.03, "Changes," of the Standard Specifications shall not apply to the item of, "TRAFFIC CONTROL SYSTEM". Adjustments in compensation for, "TRAFFIC CONTROL SYSTEM" will be made only for increased or decreased traffic control system components required by changes ordered by the Engineer and will be made on the basis of the cost of the increased or decreased component necessary. Such adjustment will be made on a force account basis as provided in Section 9-1.03, "Force Account Payment," of the Standard Specifications for increased work, and estimated on the same basis in the case of decreased work.

Any traffic control system that is required by work which is classed as extra work, as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications, will be paid for as part of said extra work.

10-1.06 Existing Highway Facilities: The work performed in connection with various existing highway facilities shall conform to the provisions in Section 15, "Existing Highway Facilities," of the Standard Specifications and these Special Provisions.

10-1.06A Abandon Culvert: The existing culvert at approximately Station 485+79 shall be abandoned in place or, at the option of the Contractor, the culvert shall be removed and disposed of.

The existing culvert to be abandoned, shall be backfilled with sand by any method, acceptable to the Engineer, which completely fills the pipe. Sand backfill material shall be clean, free draining, and free from roots and other deleterious substances.

The ends of the culvert shall be securely closed by a 0.5-foot thick tight fitting plug or wall of commercial quality concrete.

Full compensation for plugs, sand backfill and/or pipe removal and disposal shall be considered as include in the contract lump sum price paid for, "ABANDON CULVERT" and no additional compensation will be allowed therefor.

10-1.06B Remove Inlet: The existing concrete inlet structure at the culvert to be abandoned is to be completely removed and disposed of in accordance with Section 15 of the Standard Specifications.

Full compensation for removing and disposing of the concrete inlet structure shall be considered as included in the contract lump sum price paid for, "REMOVE INLET," and no additional compensation will be allowed therefor.

10-1.06C Remove Asphalt Concrete Surfacing: The existing asphalt concrete surfacing to be removed shall be saw cut along the line as shown on the plans, broken up and removed. The saw cut shall be a neat vertical cut no less than 0.2-feet in depth. Care is to be taken for the surfacing that is to remain in place.
The asphalt concrete material removed shall be considered as excess material and disposed of in accordance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

The boundary of the area of the removed surfacing shall be marked by portable delineators. Payment for placing, relocating, maintaining and removing the portable delineators shall be considered as included in the contract item paid for, "TRAFFIC CONTROL SYSTEM," and no separate payment will be made therefore.

Full compensation for saw cutting, removing and disposing of the asphalt concrete surfacing shall be considered as included in the contract unit price paid by the square yard for, "REMOVE ASPHALT CONCRETE SURFACING," and no additional compensation will be allowed therefor.

10-1.06D Relocate Roadside Sign: The existing stop sign at the northwest corner of Los Osos Valley Road and Palisades Avenue, shall be relocated by the Contractor and temporarily mounted on a type III barricade while the curb ramp is being constructed. The mounted sign shall be temporarily placed

along the roadway during construction near its original location and as approved by the Engineer.

Contractor shall be responsible for the daily maintenance of the temporarily mounted sign and barricade during construction. If the sign is damaged or unusable, as determined by the Engineer, it shall be replaced by the Contractor at Contractor's own expense during its use as a temporary roadside sign.

The sign shall be salvaged for reuse and set on a new metal post at the final locations shown on the plans. If it is determined by the Engineer that the salvaged sign cannot be reused, a new sign will be provided by the County and the replaced sign will be salvaged. This determination shall be made just prior to final relocation to the permanent sign location shown on the plans.

Payment for removing and maintaining the roadside sign, furnishing the type III barricade, maintaining the temporary mount, furnishing new sign post and setting the sign in a permanent location shall be included in the lump sum price for, "RELOCATE ROADSIDE SIGN" and no additional payment will be allowed therefor.

10-1.07 Earthwork: Earthwork shall conform to the provisions in Section 19, "Earthwork," of the Standard Specifications and these Special Provisions.

"ROADWAY EXCAVATION" will be measured and paid for by the cubic yard in the manner specified in Section 19-2 of the Standard Specifications.

10-1.08 Aggregate Base: Aggregate base shall be Class 2 and shall conform to the provisions in Section 26, "Aggregate Bases," of the Standard Specifications.

"CLASS 2 AGGREGATE BASE" will be measured and paid for by the cubic yard in place in the manner specified in Section 26, "Aggregate Bases," of the Standard Specifications.

10-1.09 Asphalt Concrete: Asphalt concrete shall be Type "B" and conform to the provisions in Section 39, "Asphalt Concrete," of the Standard Specifications and these Special Provisions.

The viscosity grade of the paving asphalt shall be Grade AR-8000, for all asphalt concrete unless otherwise specified. The amount of asphalt binder to be mixed with the mineral aggregate shall be between 6.2 and 6.3 percent by weight of the dry mineral aggregate or as determined by California Test No. 367.

Aggregate grading requirements shall be ½" Maximum, Medium. Lime shall not be added to the asphalt concrete mix or mineral aggregate unless permitted by the Engineer.

"ASPHALT CONCRETE (TYPE B)" will be measured and paid for by the ton in place in the manner specified in Section 39, "Asphalt Concrete," of the Standard Specifications.

10-1.10 Concrete Structures: Portland cement concrete structures shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these Special Provisions.

Concrete for minor structures shall be Class A and conform to the provisions in Section 90, "Portland Cement Concrete," of the July 1992 Standard Specifications.

Steps within the drainage inlets, regardless of depth, are not required in this contract.

The estimated quantity for, "MINOR CONCRETE (MINOR STRUCTURE)," shall be a final pay quantity, measured and paid for by the cubic yard in the manner specified in Section 51, "Concrete Structures," of the Standard Specifications.

Concrete gutter depressions and concrete curbs, associated with the drainage inlets as shown on the plans, shall be considered as included in the contract unit price paid per cubic yard for, "MINOR CONCRETE (MINOR STRUCTURE)," and no separate payment will be made therefor.

10-1.11 Roadside Signs: Roadside signs shall conform to the provisions in Section 56, "Signs," of the Standard Specifications and these Special Provisions.

Posts for the roadside signs in this contract shall be metal. The sign post shall be installed per the detail contained herein.

The contract unit price paid for "ROADSIDE SIGN - ONE POST" shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in furnishing and installing roadside signs, complete in place, including the signs and necessary hardware as shown on the plans, as specified in the Standard Specifications and these Special Provisions, and no additional compensation will be allowed therefor.

10-1.12 Plastic Pipe: Plastic pipe shall conform to the provisions in Section 64, "Plastic Pipe," of the Standard Specifications and these Special Provisions.

Plastic pipe for this contract shall be smooth interior wall type and shall not be polyvinyl chloride (PVC) type pipe.

Payment for each type of plastic pipe specified, including temporary caps, will be measured and paid for in the manner specified in Section 64, "Plastic Pipe," of the Standard Specifications.

10-1.13 Miscellaneous Concrete Construction: Concrete curbs, gutters, sidewalks, wheelchair ramps (curb ramps), etc. shall conform to the provisions in Section 73, "Concrete Curbs and Sidewalks," of the Standard Specifications and these Special Provisions.

"MINOR CONCRETE (CURB AND GUTTER)" will be measured and paid for by the linear foot in the manner specified in Section 73, "Concrete Curbs and Sidewalks," of the Standard Specifications.

"MINOR CONCRETE (CROSS GUTTER AND SPANDREL)" will be measured and paid for by the cubic yard in the manner specified in Section 73, "Concrete Curbs and Sidewalks," of the Standard Specifications.

Spandrel gutters at cross gutters and their associated curb through the returns shall be considered as included in, "MINOR CONCRETE (CROSS GUTTER AND SPANDREL)" and no separate payment will be made therefor.

"MINOR CONCRETE (CURB RAMP)" will be measured and paid for by the cubic yard in the manner specified in Section 73, "Concrete Curbs and Sidewalks," of the Standard Specifications.

Sidewalk area associated with curb ramps are considered as included in, "MINOR CONCRETE (CURB RAMPS)". Curbs and/or curbs and gutters at curb ramps are not considered as included in, "MINOR CONCRETE (CURB RAMPS)".

10-1.14 Miscellaneous Metal: the metal frame and cover for the drainage inlets shall conform to the provisions in Section 75, "Miscellaneous Metal," of the Standard Specifications and these Special Provisions.

"FRAME AND COVER" will be measured and paid for each in the manner specified in Section 75, "Miscellaneous Metal," of the Standard Specifications.

10-1.15 Survey Monument Well: Survey monument wells shall conform to the provisions herein.

Survey monument wells shall consist of furnishing the monument wells and

covers (Brooks traffic rated type or approved equal), excavating the finish pavement and ground beneath, setting the well to finish grade, providing the concrete collar and the 6-inch diameter concrete base for the survey marker per the detail included herein. The monument well cover shall be marked with the word, "MONUMENT". The Portland cement concrete shall be Class "A" concrete per Section 90, "Portland Cement Concrete" of the 1992 Standard Specifications.

Setting of monument wells shall be performed after the final paving has been completed. Traffic control shall be maintained around each monument well as provided elsewhere in these Special Provisions until the concrete has obtained sufficient strength as determined by the Engineer.

The contract unit price paid per each for, "SURVEY MONUMENT WELL" shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all of the work involved, complete in place, including the monument well cover and concrete collar as shown on the detail herein, as specified in the Standard Specifications and these Special Provisions, and no additional compensation will be allowed therefor.

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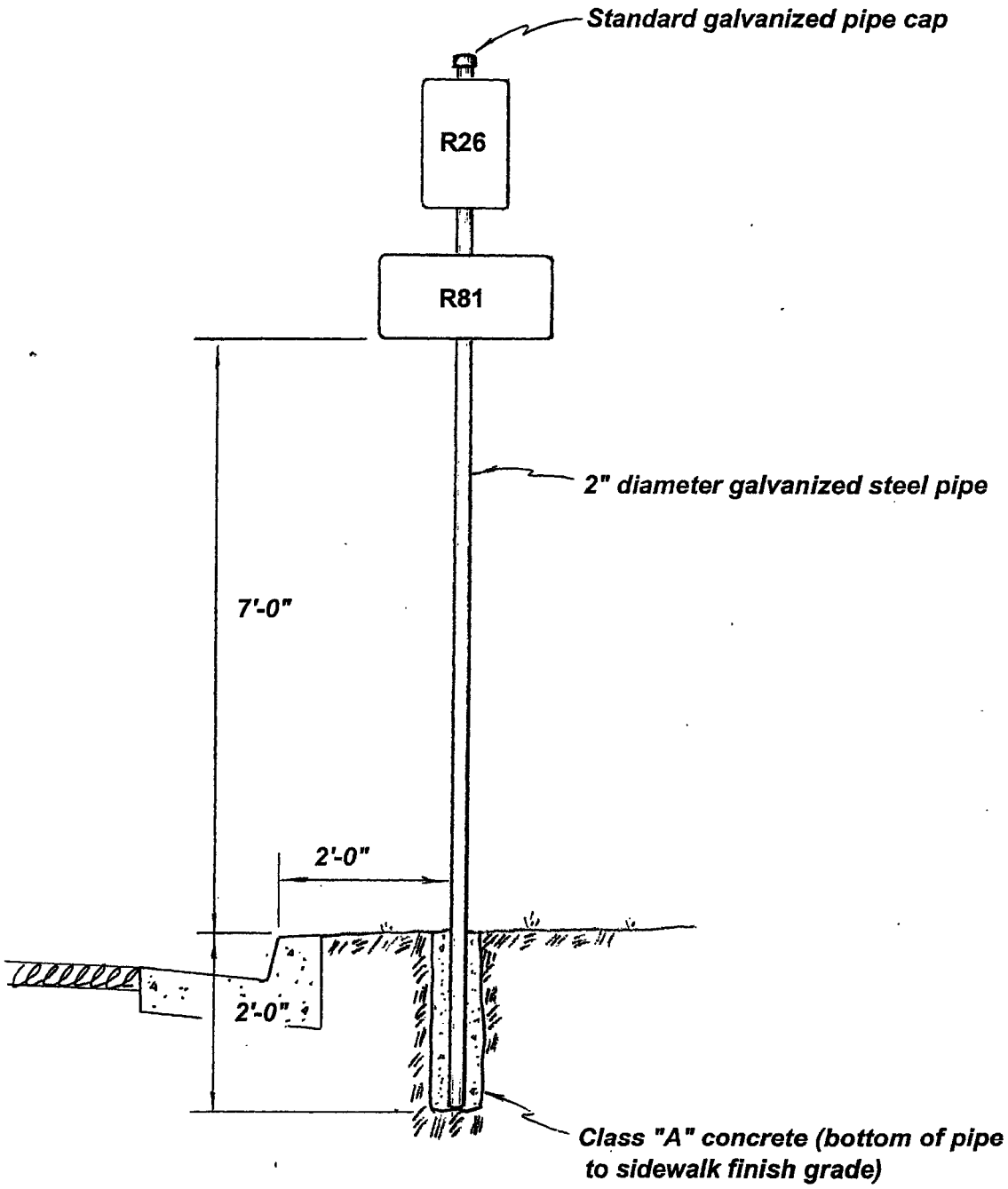

Drawn by: 1/04	COUNTY OF SAN LUIS OBISPO DEPARTMENT OF PUBLIC WORKS **SIGN POST INSTALLATION**	Scale: NONE Design Drawing No. **SP-1**

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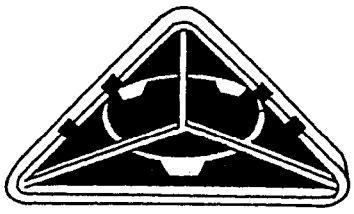
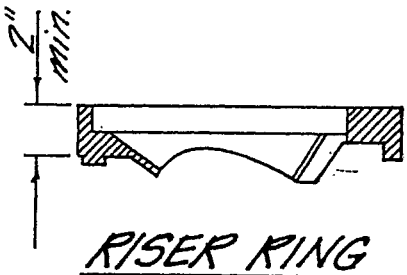


COVER (BOTTOM)



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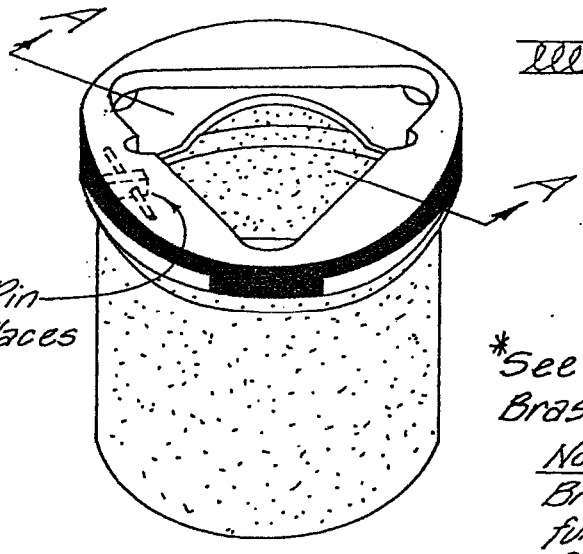

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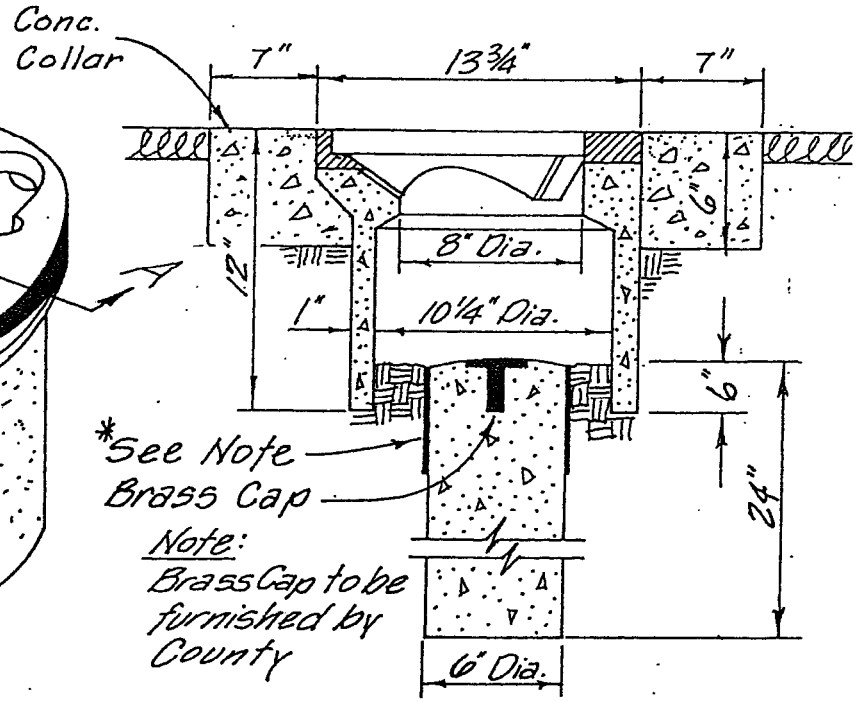

SECTION A-A

*NOTE:

3 Lb. Coffee Can, or equivalent, w/ both top & bottom cut out, to form a sleeve that will project beyond the bottom of the concrete well.

	COUNTY OF SAN LUIS OBISPO DEPARTMENT OF PUBLIC WORKS	Scale: NONE
	SURVEY MONUMENT WELL	Design Drawing No. MW-1
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SECTION 07530 - SINGLE-PLY MEMBRANE ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes single-ply membrane roofing systems.

B. Pre-finished metal parapet cap at Residual and Treatment building

C. Types of roofing systems specified in this Section using single-ply roofing membranes include the following:

1. Fully Adhered Systems. (Residual & Treatment Buildings)
2. Mechanically Attached Systems (Operations Building)

D. Single-ply roofing membranes include the following:

1. Ethylene Propylene (EP).

E. Roof insulation and cricketing related to single-ply membrane roofing.

F. Roof expansion joints and covers.

G. Fully adhered protective walk-way.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data, installation instructions, and general recommendations from manufacturer of single-ply membrane system for types of roofing required. Include data substantiating that materials comply with requirements.

C. Samples of finished roofing sheets, including side/end-lap seam. Also include the following:

1. Insulation board.

D. Shop drawings showing roof configuration, sheet layout, seam locations, colors (as applicable), details at perimeter, and special conditions.

1. Indicate layout of tapered insulation materials.

E. Test data for pullout resistance of fastening systems.

F. Certification that materials comply with local VOC limitations.

G. Submit certification that installer is a Manufacturer Approved Applicator.

H. Submit ICBO approval reference for membrane.

I. Submit Manufacturers certification of ISO 9002 compliance.

1.4 QUALITY ASSURANCE

A. Manufacturer: Obtain primary single-ply membrane roofing from a single manufacturer.

B. Installer: Engage an experienced Installer that has specialized in installing roofing systems similar to those required for this Project. Installer must be certified or licensed by manufacturer of primary roofing material.

1. Work associated with single-ply membrane roofing systems, insulation, flashing, and membrane sheet joint sealers and accessories shall be performed by tradesmen trained and certified in accordance with manufactures written installation methods.

C. Pre-Roofing Conference: Before installing roofing systems and associated Work, a pre-roofing meeting will be held at the project site with Installer, roofing manufacturer, installers of related work, and other entities concerned with roofing performance, including governing authorities, Architect, and Owner. Record discussions and agreements and furnish copy to each participant. Provide at least 72 hours advance notice to participants prior to convening pre-roofing conference.

D. UL Listing: Provide labeled materials that have been tested and listed by UL in "Building Materials Directory" or by other nationally recognized testing laboratory for Class A rated materials/system.

E. Inspection: Upon completion of the installation, a certified technical representative, having authority to direct and warrant the work and whom shall be unrelated to the sales department or the manufacturer of the product shall inspect the roofing system and associated accessories, materials and workmanship to determine that it has been performed according to the Manufacturer's published specifications, details and practices. Upon approval of the project by the Inspector and the Manufacturer, a warranty shall be issued to the Owner.

1.5 PROJECT CONDITIONS

A. Weather: Proceed with roofing work when existing and forecasted weather conditions permit work to be performed in accordance with manufacturers' recommendations and warranty requirements.

B. Substrate Conditions: Do not begin roofing installation until substrates have been inspected and are determined to be in satisfactory condition.

1.6 WARRANTY

A. Manufacturer's Warranty: Submit executed copy of single-ply membrane manufacturer's agreement including flashing endorsement, signed by an authorized representative of the manufacturer.

B. Warranty Period: 15 years PLUS 5: from date of Substantial Completion.

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. Compatibility: Provide products warranted by manufacturer to be fully compatible with substrates and products specified for the project. Provide separation materials as required to eliminate contact between incompatible materials.

2.2 Ethylene Propylene (E.P.)

A. General: Thermopoly Olefin roofing membrane formed into uniform flexible sheets, complying with the following:

1. Tensile Strength (ASTM D 412): 1000 psi (7 MPa).
2. Ultimate Elongation (ASTM D 412): 350 percent.
3. Brittleness Temperature (ASTM D 746): -40 deg F (-40 deg C).
4. Resistance to Heat Aging (ASTM D 573): Retains 100 percent of tensile strength after 14 days at 212 deg F (100 deg C).
5. Thickness: 60 mils (1.1 mm), nominal.
6. Reinforcing Scrim: Polyester or nylon.
7. Exposed Face Color: Desert brown at residual and treatment building: white at operations building.

Physical property	Test method	Specification
Weight, minimum (Mass)	ASTM D-751	024 lbs./ft' (1.41 Kg/M2)
Thickness tolerance	ASTM D-751	.060" ± 10%
Breaking strength, minimum	ASTM D-751, Grab Method	350 lbs.
Tear Strength, minimum	ASTM D-751, Tongue Tear	100lbs.
Shore A hardness	ASTM D-2240	82 ±5
Volatility, maximum volatile loss	ASTM D- 1203 Method A	0.5%
Hydrostatic resistance, minimum	ASTM D-751 Method A	425 psi
Ozone resistance*	ASTM D- 1149, 3ppm @ 30% strain @ 104°F (40°C): 72 hrs and 2500 hrs.	no effect
Emmaqua® concentrated natural sunlight, 4 million langleys	ASTM E-838; no visible surface cracking or stiffening	

Dimensional stability	ASTM D-1204 24 hrs @ 0.1% 129°F (54°C)	+_.3%
Puncture resistance, minimum	FTM 101 B, Method 2031	400 lbs.

2.3 INSTALLATION MATERIALS

A. Sheet Seaming System: Manufacturer's standard materials for sealing lapped joints, including edge sealer to cover exposed spliced edges as recommended by membrane manufacturer.

B. Tapered Edge Strips, and Flashing Accessories: Types recommended by membrane manufacturer, including adhesive tapes, flashing cements, and sealants.

C. Flashing Material: Manufacturer's standard system compatible with single-ply membrane.

D. Slip Sheet: Type recommended by membrane manufacturer for protecting membrane from incompatible substrates.

E. Mechanical Fasteners: Metal or plastic plates, caps, battens, accessory components, and fastening devices to suit substrate and as recommended by membrane manufacturer.

F.. Adhesives, Sealants, Primers and Caulks:
Manufacturers proprietary system to provide warranty indicated. Install as per manufacturers written installation instructions. All insulation must be approved in writing by the roofing membrane manufacturer for fully adhered installation.

G. Roof walkways: Where walkway is indicated, furnish and install Stevens EP Walkway Roll over the membrane. Walkway shall be heat welded to the roofing membrane per the manufacturers published installation methods.

H. Prefabricated Corners and Jacks: Provide manufacturer pre-formed .055 inch unsupported flashing for use at outside and inside corners. Provide manufacturers standard pre-formed .055 inch pipe and vent jacks in sizes and shapes as required to accommodate roof penetrations.

2.4 INSULATING MATERIALS

A. General: Provide insulating materials to comply with requirements indicated for materials and with referenced standards in sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths, and lengths. Install two layers (2 inches each) over the entire area.

B. Polyisocyanurate Board Roof Insulation: Rigid, cellular, thermal insulation with polyisocyanurate closed-cell foam core and manufacturer's standard facing laminated to both sides; complying with FS HH-I-1972/2, Class 1.

C. Expanded -Polystyrene Board Insulation (Cricketing material): Rigid, cellular, thermal insulation with closed cells and integral high-density skin, complying with ASTM C 578 for Type indicated; with 5-year aged r-values of 5.4 and 5.0 (rSI-values of 0.95 and 0.88 for 25.4 mm) at 40 and 75 deg F (4 and 24 deg C), respectively, and as follows:

1. Type IV, 1.6-pcf (25-kg/cu.m) minimum density, unless otherwise indicated.
   a. Surface Burning Characteristics: Maximum flame-spread and smoke-developed values of 5 and 165, respectively.
   b. Provide tapered boards where indicated for sloping to drain. Fabricate with taper of 1/2 inch per foot (min.), unless otherwise indicated, in addition to layers indicated.

2.5 AUXILIARY INSULATION MATERIALS

A. Adhesive for Bonding Insulation: Type recommended by roofing and insulation manufacturer and complying with fire-resistance requirements.

B. Mechanical Anchors: Corrosion-resistant type as recommended by insulation manufacturer for deck type and complying with fire and insurance wind-uplift rating requirements.

1. Provide system tested and approved for I-90 wind-uplift rating.

2.6 PARAPET CAP SYSTEM

A. Stevens Coping: Metal coping cap with galvanized steel anchor/support cleats for capping any parapet wall. The system shall be watertight, maintenance free, and does not require exposed fasteners. Joints shall be a butt type with concealed splice plates. Standard model is (PTCS) for all sizes.

B. Performance Characteristics:

1. Sections shall expand and contract freely while locked in place on anchor cleats.
2. Sections shall lock to anchor cleats by mechanical pressure from hardened stainless steel springs factory attached to anchor cleats.
3. All splice plates include factory applied dual non-curing sealant strips capable of providing a watertight seal.

C. Metal: .050" aluminum with Kynar coatings;

1. Parapet cap length of 12'-0" (3.65 m), widths to 24" manufactured to job requirements.
2. Vertical face and back leg: 2-1/4" to 6" manufactured to job requirements.
3. Concealed splice plates: 8" wide. Finish to match finish of coping cap with factory applied dual non-curing sealant strips.
4. Anchor/Support Cleat: 20 ga. prepunched galvanized cleat with stainless steel spring mechanically locked to cleat normally 12" (304.8 mm) wide @ 6'-0" (1.82 mm) on center. Mechanically fastened as indicated and detailed.
5. Fasteners: #12 x 1-5/8" corrosion resistant fasteners provided with drivers. No exposed fasteners shall be permitted.
6. Finishes: Shall be standard post-coated Kynar 500 from industry standard two-coat colors;

2.7 PARAPET CAP ACCESSORIES:

A. Corners, end caps, pier caps, etc. shall be fabricated by the coping manufacturer.

B. Welded or quicklock assembly shall be used to maintain watertight integrity.

PART 3 - EXECUTION

3.1 PREPARING SUBSTRATE

A. General: Comply with manufacturers' instructions to prepare substrate to receive single-ply membrane system.

1. Verify that penetrations, expansion joints, and blocking are in place and secured and that roof drain pans and piping accessories are properly installed.

B. Clean substrate of dust, debris, and other substances detrimental to single-ply system installation. Remove any sharp objects or projections.

C. Install flashings, and accessory items as shown and as recommended by manufacturer.

3.2 INSTALLING INSULATION

A. General: Extend insulation full thickness in two layers,(2 inches each) over entire surface to be insulated, cutting and fitting tightly around obstructions. Form crickets, saddles, and tapered areas with additional material as shown and as required for proper drainage of membrane.

1. Stagger joints in one direction for each course. For multiple layers, stagger joints in both directions between courses with no gaps, to form a complete thermal envelope.
2. Provide tapered units to suit drainage pattern indicated, in addition to layers indicated.

B. Do not install more insulation in a day than can be covered with membrane before end of day or before start of inclement weather.

3.3 INSTALLING MEMBRANE

A. General: Start installation only in presence of manufacturer's technical representative.

1. Cut out and repair membrane defects at the end of each day's work.

B. Mechanically Fastened Membrane (Operations Building):

1. Install membrane by unrolling over prepared substrate, fastening at laps, perimeter and at penetrations. Maximum fastening rows shall not exceed 76". Lap adjoining sheets and heat seal as recommended by the manufacturer. Seal all non-encapsulated edges with seam caulk. Attach membrane with Manufacturer provided fasteners and plates to decks. Do not exceed 76 inches between fastener rows
2. Flashing: Flash perimeter, curb, vents, expansion joints, drains, and other details in compliance with manufacturer's standard published details.
3. Check and repair seams at the completion of work each day.
4. Temporarily seal loose edge of membrane with approved overnight seal at the end of each day to comply with manufacturer's instructions.
5. Walkway Protection: Install specified walkway material at areas indicated on the construction documents and around roof mounted equipment.
6. Inspect roofing systems and repair defects in bonding, raised or exposed fasteners, loose flashings and all other deficiencies.

7. Notify Architect and Owner to arrange for final inspection and acceptance of the work performed.

C. Fully Adhered Membrane (Treatment and Residuals Buildings):

1. Accommodate contours of roof deck to drain across shingled laps of sheets. Do not stretch membrane prior to attachment.
2. Install membrane by unrolling over prepared substrate, Apply bonding adhesive per manufacturers requirements for warranty and FM I-90. Lap adjoining sheets and heat seal as recommended by the manufacturer. Seal all non-encapsulated edges with seam caulk.
3. Flashing: Flash perimeter, curb, vents, expansion joints, drains, and other details in compliance with manufacturer's standard published details.
4. Check and repair seams at the completion of work each day.
5. Temporarily seal loose edge of membrane with approved overnight seal at the end of each day to comply with manufacturer's instructions, and to maintain a watertight building.
6. Walkway Protection: Walkway Protection: Install specified walkway material at areas indicated on the construction documents and around roof mounted equipment.
7. Inspect roofing systems and repair defects in bonding, raised or exposed fasteners, loose flashings and all other deficiencies.
8. Attach new pre-finished metal work at all parapets and walls as required by membrane manufacturer for warranty. All parapet metal work shall have a continuous cleat attachment on the outside face of the parapet wall.
9. Notify Architect and Owner to arrange for final inspection and acceptance of the work performed.

3.4 PARAPET CAP INSTALLATION:

A. Submit product design drawings for review and approval to Architect before fabrication.

B. Installing contractor shall check as-built conditions and verify the coping details for accuracy to fit the wall assembly prior to fabrication. The installer shall comply with manufacturer's installation guide when setting copings.

C. Installer shall use provided fasteners consistent with Steven's instructions suitable for the substrate to which it is being installed.

3.4 PROTECTING ROOFING

A. After completing roofing and associated work, institute appropriate procedures for surveillance and protection of roofing during remainder of construction period. At the end of the construction period, or at a time when remaining construction will in no way affect or endanger roofing, make a final inspection of roofing and prepare a written report to Owner, describing nature and extent of any deterioration or damage that may be encountered and the appropriate repair or replacement procedures.

B. Repair or replace as directed by Inspector and Architect. Deteriorated or defective work found at the time of final inspection shall be returned to a condition free of damage and deterioration according to the requirements of the manufactures warranty prior to issuing the warranty. Warranty period shall commence on the date of substantial completion.

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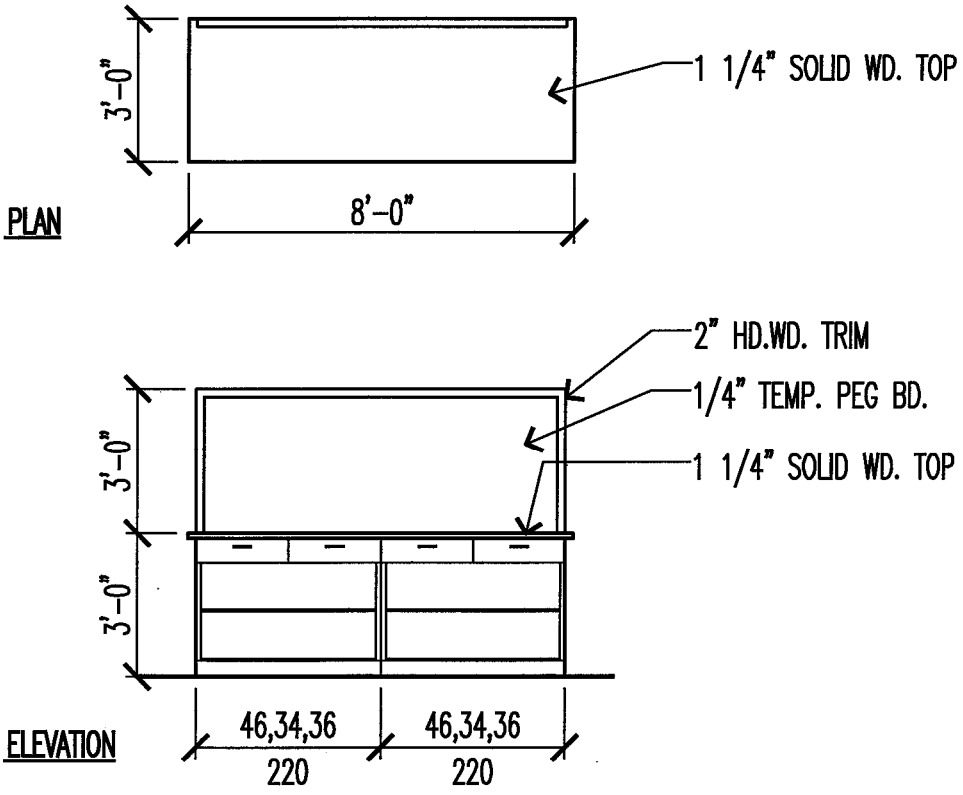

WORK BENCH	1/4"	

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Date	4/9/04
Job No.	1002008
Scale	1/4"=1'-0"

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SECTION 16620 – STANDBY GENERATOR SYSTEM

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. **General:** The CONTRACTOR shall provide an engine-driven standby electrical generating system, complete and operable, in accordance with the Contract Documents and as shown on Drawings 40-E-03, 40-E-04, 43-M-03, and 43-M-13. The CONTRACTOR shall furnish and install one complete diesel engine generator unit, skid-mounted on a structural steel base, anchored to a concrete foundation block with vibration isolators. The Concrete foundation block shall be a concrete equipment base with separating joint for vibration isolation. Th engine generator unit shall be complete with a local unit-mounted engine control panel "LCP", remote engine control panel "GCP", automatic electric starting and control equipment, exhaust silencer and piping, intake air cleaning and piping, oil pumps, and unit-mounted battery with cables and charger, lubricating oil and engine jacket water heater, and all other parts, instruments, and auxiliary equipment necessary to make the unit completely automatic in starting, operating, and stopping in response to power requirements. The Generator shall be oversized in relation to the engine, as specified herein, to minimize motor starting voltage dip and voltage wave from distortion from non-linear currents.

B. The CONTRACTOR shall also furnish all equipment appurtenant to the engine-generator units including fuel oil day tank with transfer pumps, fuel oil storage tank, fuel handling equipment and related piping, fuel distribution system, auxiliary controls, sensors, instruments, enclosures, and engine generator controls including the voltage regulator and engine speed control. The generator voltage regulator and engine speed controls shall be capable of operation as a single isolated engine generator unit and maintain a set terminal voltage and frequency which is field adjustable. The same control equipment shall be capable of parallel operation with future engine generator sets having paralleling switchgear and synchronizing controls. The control interface point shall be the remote engine control panel (Generator Control Panel, "GCP"). Provide adequate space and terminal points in the remote engine speed control and the generator voltage control having adjustable voltage and speed droops, limits of operation, and other controls items necessary for future parallel mode of operation with future engine-generator sets. The engine generator units and all appurtenant equipment specified or referenced in this section shall be provided by a single supplier to ensure coordination and compatibility of equipment. The CONTRACTOR shall be responsible for providing complete and operable systems and shall establish the exact limits of work between the CONTRACTOR and the engine-generator equipment supplier. The CONTRACTOR shall coordinate the work so that each vendor's interface with another vendor's equipment/work matches and a minimum of conflict occurs. Specified interface coordination is required with the VFD equipment, automatic transfer control system, heating, ventilating and air conditioning controls, and equipment, short circuit study, protective device and coordination study, harmonics study, voltage distortion estimate, and engine generator controls and equipment. The CONTRACTOR shall provide all submittals, labor, materials, communications,

scheduling, and coordination to cause the equipment to mesh together and work together safely as a fully operational system with fully documented setpoints and safety parameters as recommended by the various studies and manufacturers/suppliers.

C. The diesel engine/generator unit shall be manufactured by a concern that has been in the business of engine/generator manufacturing for at least 15 years. The unit shall also be assembled and packaged for this project by a concern that has been in the business of packaging and servicing diesel engine generation for at least 15 years. In addition, the unit assembler shall be located within 200 miles of the job site and shall stock material required for factory recommended maintenance over the life of the machine. The assembler shall have on its permanent staff, technicians that have been factory trained to perform the maintenance.

D. The engine generator unit shall be the product of a single manufacturer regularly engaged in the production of the type and size of equipment required to be furnished as specified. All materials and parts in this unit shall be new and unused, of current manufacture, and of the highest grade, and free from all defects affecting performance. The engine-generator units and all appurtenant equipment specified herein shall be provided by **Onan-Cummins, Kohler, Caterpillar, Detroit Diesel or approved equal**, establishing one source of responsibility for the equipment performance and assuring high standards of quality, coordination, reliability, and service. The named suppliers shall also be the functioning authorized distributors and service facility for the proposed power plant and generator. The engine and generator shall be capable of producing the required output at sea level.

E. The engine generator and all auxiliary equipment shall be provided to meet or exceed all requirements and recommendations of the NFPA codes. Provide all devices and equipment to exceed or meet all requirements and recommendations of NFPA 37 and NFPA 110. Where these contract documents require additional equipment or higher degree of quality, engineering, workmanship, or material the contract documents shall take precedence. The engine-generator shall be classified as Type 10, Class 48, Category B, Level 1 units.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Materials shall conform with applicable requirements of National Electrical Code (NEC), and any other State or Municipal codes which apply. Generator system shall meet applicable standards and codes, including IEEE, NEMA, ANSI, OSHA, and UL.

1. NEPA 70 (National Electric Code)

2. NFPA 30

3. NFPA 37

4. NFPA 110

5. UL 142

6. API 620

1.3 CONTRACTOR SUBMITTALS

A. The CONTRACTOR shall submit the following shop drawings and literature for review in accordance with the requirements of Section 01300 entitled, "CONTRACTOR Submittals." Submittals shall comply with Section 16050, 1.6 "CONTRACTOR SUBMITTALS."

B. The CONTRACTOR shall furnish information showing manufacturer's model numbers, dimensions, and weights for engine, generator, and major auxiliary equipment.

C. The CONTRACTOR shall submit copies of pertinent drawings and schematic diagrams and shall include the following:

1. Engine generator set including plans and elevations or riser views clearly indicating entrance points for each of the interconnections required. Dimensions shall be provided showing location and space available for conduit and wire termination.

2. Engine control cubicles.

   a. Local unit mounted engine control panel "LCP"

   b. Remote engine control panel "GCP"

3. Fuel consumption rate curves at various loads and fuel pumping rates.

4. Ventilation and combustion CFM requirements including allowable cooling fan pressure loss.

5. Exhaust system and vibration isolators

6. Battery charger, battery, battery cables, and battery rack.

7. Starting kW and kVA capability.

8. Provide voltage regulation curve for the integrated system package per MG1-16.48 up to the maximum motor starting kVA.

9. Actual electrical diagrams including schematic diagrams and interconnection writing diagrams for all equipment to be provided.

10. Legends for all devices on all diagrams.

11. A certified performance rating from the engine manufacturer that the engine when equipped with all auxiliary equipment as needed or specified shall have a minimum rating of 1500 kW available at the generator terminals when installed at the specified altitude.

12. Complete test specification detailing the testing procedure to be used to verify the performance of the equipment provided.

13. Submittals shall include information relative to the staff and facilities of the assembler; submittal shall include date, address, telephone number and contact name for at least five projects of similar scope and size.

14. Generator winding temperature indication system.

15. Generator capability curve.

D. Submit the following engineering calculations.

1. Battery capacity which shall incorporate engine torque and cranking requirements, battery cable size and length, engine temperature, battery temperature, starter motor minimum voltage for obtaining required speed at torque, and the number of starting attempts as well as amount of time required.

2. The bolted three phase fault current at the generator terminals.

3. The single line to ground to fault current at the generator terminals.

4. The double line to ground fault current at the generator terminals.

5. The line to line fault current at the generator terminals.

6. Engine Generator torsional analysis to identify and then prevent any mechanical resonance from occurring, which potentially might result in equipment failure or destruction.

7. Design certification and anchorage sketches as required in Section 16050, "Electrical Work, General," paragraph 3.4 "Equipment Anchoring" to show adequate seismic safety.

E. Submit the recommended settings of all engine primary and secondary protective device adjustments. This shall include overspeed, overtemperature, overpressure, underpressure, low level, low flow, or other protective sensing devices.

F. Submit the recommended settings of all generator primary and secondary protective device adjustments. This shall include maximum current and time for different types of faults for main breaker and protective relay adjustments for voltage, frequency or other types of protective sensing devices. The generator manufacturer shall provide recommendations to protect the engine-generator. The coordination study of Section 16431 shall finalize the settings based on the balance of selectivity and equipment protection along with equipment manufacturer recommendations.

G. Standard generator data including the following items:

1. kVA rating
2. kW rating
3. Temperature rise at rated load
4. Insulation system
5. Short circuit capability
6. No load wave from distortion (THD)
7. Telephone influence factor
8. Heat dissipation in watts
9. Inertia
10. Maximum overspeed
11. Stator winding configuration
12. Weights of stator, rotor, and unit
13. Efficiencies
14. Reactances including
    a. Subtransient
    b. Transient
    c. Synchronous
    d. Positive sequence
    e. Negative sequences
    f. Zero sequences
15. Time constants associated with reactances including
    a. Subtransient
    b. Transient
    c. Armature
    d. Field
16. Stator winding resistance

17. Rotor winding resistance

1.4 MANUFACTURER REPRESENTATIVE

A. The CONTRACTOR shall provide the services of qualified supervisory personnel of the supplier of the engine-generator set to check during installation and testing, and to instruct the operating personnel in the proper care and operation of the unit. The CONTRACTOR shall also furnish five copies of operation and instruction books and complete catalogs covering all parts auxiliary equipment of the engine and generator set and associated controls.

B. The manufacturer shall furnish all engine inspection and test data. Provide the following data as part of the technical manual submittal:

1. Crankshaft deflection

2. Bedplate alignment

3. Engine-generator alignment

4. Other checks and measurements for proper operation and maintenance of the system

1.5 COORDINATION

A. Engine Generator Supplier shall provide the electrical connection and auxiliary requirements to the Automatic Transfer Control System (ATS)/Main Switchgear "MS" supplier as requested by the ENGINEER or CONTRACTOR.

B. CONTRACTOR shall coordinate the electrical connections, wiring, conduits and auxiliary requirements between Engine Generator Supplier, 480V Main Switchgear MS/ATS manufacturer.

C. The Engine Generator Supplier shall provide all technical information, setpoints, and recommendations necessary to other firms/companies/persons performing work under the contract documents for the purpose of proper interfacing and sizing equipment, proper planning and scheduling of work, completion of studies reflecting as built conditions, and proper selection and adjustments of protective devices.

A significant effort shall be required to provide information for several areas of work including:

1. Heating ventilation and air conditioning controls and equipment

2. Instrumentation programmable logic controllers

3. Automatic transfer control system and equipment

4. Short circuit study

5. Protective device and coordination study

6. Harmonics study

7. Auxiliary equipment

8. Auxiliary instruments

9. Auxiliary controls

10. Installation and connection

D. The CONTRACTOR shall coordinate, schedule, and control the information and work to provide systems which fit together and work together safely as a fully operational system with fully documented setpoints and safety parameters as recommended by the various studies and manufacturers/suppliers.

PART 2 -- PRODUCTS

2.1 ENGINE

A. **General:** A diesel engine shall be used to drive the generator. The engine shall be suitable for operation on No. 2 diesel fuel oil and it shall have a continuous power rating at 1,800 rpm and with all necessary equipment connected to drive the generator at a continuous standby load, of not less than 1500kW after deduction of fan loss, and correction of altitude. The engine shall be 4 cycle, water-cooled, turbocharger, and aftercooled model.

1. The engine shall minimize discharge of gaseous pollutants and shall comply with the discharge limitations of the San Luis Obispo Air Quality Management District. The CONTRACTOR shall furnish a certification from the manufacturer that the proposed generator set will comply with the limitations.

B. The engine shall be as manufactured by **Cummins, Caterpillar, Detroit Diesel, or equal.**

C. **Equipment:** The engine shall be equipped with the following:

1. 0.25 percent frequency regulation with isochronus governor (solid-state regulator) having capability to be utilized for parallel operation with future engine generator sets and future paralleling switchgear controls for proportional load sharing. Governor shall be located in the remote engine control panel (Generator Control Panel GCP"), and shall be manufactured by Woodward.

2. Engine water cooling system

3. Water-cooled lubricating oil cooler

4. Exhaust system

5. Dry-type intake air filter-silencer

6. 24-volt dc, 2-wire remote starting.

7. Safety shutdown

8. Local unit-mounted engine control panel "LCP" which has been vibration isolated with flexible connections and vibration isolating mounts.

9. Remote engine control panel. (Generator Control Panel "GCP").

D. **Battery:** The CONTRACTOR shall also furnish and install the necessary 24-volt lead-acid, batteries for instrumentation and starting the engine along with a trickle charge as described herein and battery cables and termination lugs. Batteries shall be unit mounted sized to satisfy engine requirement for start up and continuous operation. Batteries shall provide a minimum 90 second cranking time at a minimum ambient temperature of 20° F, a greater than minimum recommended engine cranking speed, and shall maintain a voltage sufficient for proper operation of instruments, relays, and controls. Batteries shall be vibration and shock isolated in their support rack with vibration snubbers and spring supports from the engine frame. Batteries shall be built for engine vibration and shock.

E. **Cooling System:** The cooling water system shall be of the radiator type, with high velocity forced circulation, complete with cooling fan and water circulating pump. The system shall have ample capacity to permit up to 100 percent of full load operation at an ambient temperature of 120° F at sustained operation. The fan shall be of the pusher type, designed to pull the air across the engine. The radiator shall be provided with protecting grille and radiator duct flange. The heated air shall be discharged to the atmosphere through a galvanized steel or aluminum metal duct, designed to permit full load operation. The duct shall be connected to the engine radiator with a flexible connection and it shall extend through the wall to the atmosphere. The wall opening shall be protected by bird screen and frame. A 50 percent ethylene glycol coolant shall be provided. The exhaust duct, flex connection, and bird screen shall be supplied.

F. **Exhaust System:** The engine shall be equipped with a dry, insulated, exhaust manifold or water-cooled exhaust manifold.

1. Silencer – The silencer shall be critical grade stainless steel exhaust silencer, **GT Exhaust Systems, Maxim, or equal** designed for minimum backpressure. Silencer supports shall be prefabricated, stainless steel units of standard design. Exhaust piping shall be pitched upward from the engine and be provided with sufficient drains to eliminate condensation and rain water. Exhaust piping shall be welded steel pipe. Elbows shall be welding type, standard wall. Flanges shall be welding slip-on type, 125-pound, either forged or plate steel. Exhaust piping shall be supported independently of the silencer. The silencer and exhaust piping shall be insulated with a minimum of 2-1/2 inches of calcium silicate with a stainless steel jacket and shall be supported as required. The weight of the exhaust and silencer shall not be supported by the engine.

2. Roof/Wall Thimbles – Supplied as shown and detailed in the Contract Drawings.

3. Exhaust Piping Supports – Contractor shall be responsible for installing exhaust piping supports and sway supports for the entire exhaust piping layout. The piping supports and support details shall be shown on the shop drawings and shall be stamped and signed by a licensed structural engineer.

G. **Engine Jacket Water Heater:** Two electric heaters shall be installed on the engine, complete with thermostat control in the engine cooling water system to maintain at all times, while the engine is not in operation, a jacket water temperature of 100° F to 140° F. The heater shall be 460 volt, single phase, 3.0 kW each. The heater shall be an electric immersion or thermal circulation type heater, as manufactured by **Kim Hotstart Manufacturing Co., Spokane, Washington; Emerson Electric Co. (Chromalox); or equal.**

H. **Lubricating Systems:** The engine shall have a positive gear-type lubricating oil pump and a full flow lubricating oil filter system which will filter all oil before it enters the main bearing galleries and other areas to be lubricated. The crankcase shall have inspection cover plates to permit easy inspection and access to the oil pump and oil pump screen. The oil filter system shall be engine-mounted, spin-on, cartridge type oil filter; oil filter shall not block access to engine inspection ports and essential piping.

I. **Governor:** The governor shall be capable of maintaining frequency of the generator within ±0.25 percent of rated frequency under steady state load conditions and capable of parallel operation with load sharing controls and shall be isochronous electronic type.

J. **Engine Base:** The engine shall be furnished with a rigid structural steel skid type base to maintain engine alignment. The base shall be drilled as required by the engine manufacturer. Vibration isolators shall be provided for anchoring the steel frame skid to the concrete equipment base with separating joint for vibration isolation.

K. **Engine-Mounted Switches:** Provide engine mounted pilot switches that will actuate controls to shut down the engine as outlined in NFPA 110 including high engine temperature, low lube oil pressure, and engine overspeed.

L. **Fuel System:** Injection System to include, but not be limited to, fuel transfer pump, primer pump, fuel lines, fuel oil filters, and injectors.

M. **Battery Float Charger:** There shall be furnished a 120 volt, single phase, with automatic 2-step trickle charger (float and equalize), having a charge rate from 2 to 20 amperes. A DC voltmeter and an ammeter shall be integrally mounted on the trickle charger. Charger shall locally indicate loss of AC power, low battery voltage, high DC charge and provide a common output alarm to the engine-generator control panel and a separate contact closure for low battery voltage.

N. **Pipe Connections:** All pipe connections to the engine shall be made with flexible connectors of not less than 12 inches in length, with flanges or screwed ends, suitable for minimum 150 psig working pressure and 250° F temperature.

2.2 FUEL OIL STORAGE TANK

A. **General:** The CONTRACTOR shall provide a double wall diesel fuel-oil storage tank complete with leak detection system, fuel level system, fuel distribution system, and all appurtenances in conformance with Section 13201 "Diesel Storage Tank and Equipment". The Contractor shall be responsible for the integration and operation of all fuel supply components into the standby generator facility.

2.3 FUEL OIL DAY TANK

A. **General:** The CONTRACTOR shall provide one 200 gallon day tank for each engine-generator unit that is prewired, preplumbed packaged system complete with motor-operated transfer pump and all specified controls. The packaged day tank shall be a heavy duty factory assembled system designed to comply with all local, state and federal codes for the State of California. The day tank shall be U.L. listed and labeled both mechanically and electronically.

B. **Tank:** The day tank features shall include heavy gauge steel, removable 6 inch square gasketed inspection plates, fuel level gauge, heavy duty float switch(es), tank drain, transfer pump, removable top cover, four 1-1/4 inch NPT threaded pipe connections, where shown plus the pumped fuel inlet, one 3 inch vent opening with screened waterproof vent cap, engine-generator fuel supply check valve, fuel line isolation valve, drain valve, 24 volt DC energized open fuel supply isolation solenoid valve, fuel strainer and U.L. listed enclosed control panel.

C. **Fuel Pump and Electric Motor:** Tank-mounted fuel oil transfer pump shall be a 7 gpm, bronze gear pump with stainless steel shafts. Motor shall be a 120 VAC, 1-phase heavy duty type that conforms to Section 16040 "Electric Motors."

D. **Local Control Panel:** The tank-mounted, enclosed, industrial control panel shall be UL listed. The control system shall start the fuel transfer pump at low level and stop the fuel transfer pump at high level. A low level alarm shall be locally indicated and transmitted to the engine generator local control panel for local alarm indication and PLC for remote alarm indication. A high-level overflow alarm transmitted to PLC for remote alarm indication and internal emergency shutdown of fuel transfer pump. Provide local control panel including all controls and indication, control power transformer, fully gasketed enclosure, motor controller disconnect switch, motor starter, motor overloads, relays, terminal blocks and other items and devices to provide a fully operational safe system. A 120 volt 1 phase power supply shall be utilized.

1. Local Control Panel Shall Include the Following Features

   a. Manual-Off Automatic Selector Switch

   b. Power Status Indicator Light

c. Low Fuel Level Indicator Light

d. High Fuel Level Indicator light

2. Output Signals

a. Low Level Alarm to PLC

b. Low Level Alarm/Emergency Shutoff to Engine Generator

c. H-O-A Position Indicator to PLC

d. High Level Alarm to PLC

E. **Spare Parts:** The CONTRACTOR shall supply the following spare parts with each day tank:

- Fuel-oil transfer pump with motor (1 ea.)
- Indicator light bulbs (6 ea.)
- Indicator light lenses 91 ea. Color)
- Fuel Strainer filter and gasket (3 ea.)
- Flexible fuel line connector for pump supply/return (2 ea.)
- Pump pressure relief valve (1 ea.)

F. **Manufacturer Or Equal:**

The day tank shall be **Pryco Inc., Simplex Inc., or equal**

2.4 AC GENERATOR

A. The AC generator shall be rated 1500 kW/1875 kVA continuous minimum standby rating, 0.8 PF lagging, 3-phase, 4-wire, 277/480 volt, 60-Hertz, 1800 rpm, class H insulation with class B temperature rise (80 degrees celsius by resistance) in accordance with MG1 and field windings braced for solid grounding. Generator shall be suitable for operation at ambient temperature of 40° C at sea level. The generator excitation system shall be separately excited and shall consist of a three-phase alternating current exciter, the output of which is directly connected to the main generator field through silicone diodes, and shall have no commutator, slip-rings, or brushes incorporated in the generator design. The generator shall be a close coupled two bearing machine conforming to applicable NEMA standards and shall have a rigid drip-proof frame with covers to provide easy access to the interior. Provide generator space heater with disconnect and controls for 120 volt operation. Provide bird and rodent screens over all generator ventilation openings.

B. The generator shall be equipped with a solid-state type voltage regulator which will hold machine voltage to the set value with not over 2 percent variation from no load to full load when delivering power to driven loads. Voltage regulator shall be three phase sensing, solid-state temperature compensated design and shall function by controlling the exciter magnetic field between stator and rotor. The voltage regulation system shall be insensitive to severe, load induced waveshape distortion from SCR or thyristor circuits such as those used in battery charging (ups) and motor speed control equipment loads. Voltage regulator shall be mounted in the Engine Remote Control panel (GCP). Voltage regulation system shall also be provided with loss of field monitor and protection suited for use in environment where a leading power factor under some conditions can occur. The generator shall be fitted with two RTDs per phase wired out to a temperature selector switch and a temperature indicator calibrated in degrees centigrade. Provide a voltage regulator for single engine-generator operation at a set constant voltage which is field adjustable. This same voltage regulator shall be equipped and capable of parallel operation with future engine generator sets having paralleling switchgear and synchronizing controls. Provide a voltage regulator, when in the parallel mode of operation, having adjustable voltage droop, limits of operation, and other control items necessary to properly share reactive loading when operating in parallel with future engine-generator sets.

C. The alternator, exciter, and voltage regulator shall be provided by the generator manufacturer so that the characteristics shall be matched and coordinated.

D. Generator set shall be capable of safe stable operation with non linear loads of up to 70 percent of the units KVA rating without exceeding the temperature rise limits of the generator insulation system.

E. The generator shall be sized in accordance with the requirements listed below:

1. The starting KVA of each generator shall not be less than 925 KVA at 10% voltage dip and 2080 SKVA at 20% voltage dip.

2. The maximum transient voltage dip and voltage recovery time shall not exceed 15% and 4.5 seconds respectively.

3. Non-linear loads up to 70% of the unit's KVA rating shall not cause overheating due to harmonics.

F. The generator shall be **Caterpillar, Onan, Kohler, Marathon, Century, Kato, or equal.**

G. Provide protective circuits and/or surge arrestors for components sensitive to voltage surges including field rectifier diodes, relays, voltage regulator, and other controls.

2.5 ENGINE CONTROL PANEL

A. **General:**

1. The unit-mounted engine generator local control panel "LCP" shall be vibration isolated and located at eye level with respect to finished grade. The face of the panel shall be battery illuminated and the enclosure shall be NEMA 1, gasketed type. The control panel shall conform to Section 16485 "Local Control Panels." Provide hinged front door with 3-point latch and padlockable handle.

2. The remote engine local control panel (Generator Control Panel "GCP") shall be located in a separate room and house the bulk of the electrical controls and relays. The remote panel face shall be battery illuminated and the enclosure shall be fully gasketed NEMA 1. The remote panel shall conform to Section 16485, "Local Control Panels." Provide hinged front door with 3-point latch and padlockable handle.

B. **Engine Local Control Panel ("LCP"):** The engine local control panel shall have the following gages, meters, controls, and indication:

1. Jacket water temperature gage

2. Lubricating oil pressure gage

3. Lubricating oil temperature gage

4. Tachometer—digital display with 1 RPM precision

5. Pyrometer (cylinder temperature gage) with an N-position selector switch. N is the number of cylinders in the engine plus one for the off position and two more for turbocharger inlet and outlet temperature.

6. Engine lock-out switch

7. Engine "lock-out" indicator

8. Indicating Lights including

   a. ATS in "Utility" position

   b. ATS in "Generator" position

   c. Common Shutdown

9. Emergency stop pushbutton

10. Momentary indicating lamp test switch

11. Fuel Pressure gage

12. Junction/Terminal Box for termination of field wires and conduit. Provide identified terminal strips

13. Emergency fuel shut-off switch

14. Controls and instruments shall be powered by the engine battery

15. Engine Hours

C. **Engine Remote Control Panel (Generator Control Panel "GCP"):** The engine remote control panel shall have the following meters, relays, controls, indication, devices, and items:

1. Run-stop auto (remote) switch

2. Remote Starting

3. Field circuit breaker

4. Battery DC voltmeter

5. Elapse time meter

6. Indicating lamp test pushbutton

7. Fault reset test pushbutton

8. The following indicating lights

   a. ATS in "Utility" position

   b. ATS in "Generator" position

   c. Run

   d. Pre-warning for low oil pressure

   e. Pre-warning for high coolant temperature

   f. Low oil pressure shutdown

   g. High coolant temperature shutdown

   h. Overclank shutdown

   i. Overspeed shutdown

   j. Low coolant temperature alarm

   k. Low fuel alarm for main tank and day tank

   l. Low DC voltage alarm

m. Manual safety shutdown

n. Automatic safety shutdown

o. Pre-warning low coolant level

p. Generator main breaker tripped

q. Differential current trip

r. Undervoltage trip

s. Overcurrent trip

t. Reverse power trip

u. Negative sequence current trip

v. Underfrequency trip

w. Ground fault current trip

x. Loss of generator field

y. Engine running

z. Control switch nit in auto alarm

aa. Cool down period

bb. Normal power failure

cc. Controller malfunction

9. The following utility grade relays:

a. 3-phase differential current (device 87)

b. undervoltage/overvoltage (device 27/59)

c. 3-phase negative sequence current (device 46)

d. 3-phase reverse power (device 32)

e. 3-phase overcurrent with voltage restraint (device 51 V)

f. underfrequency (device 81U)

g. overfrequency (device 81O)

h. ground fault overcurrent (device 51G)

i. Loss of field (device 40)

It shall be the responsibility of the engine generator unit supplier to complete the detail design of the protective relaying system in accordance with the functional requirements shown in the one-line diagram and to properly apply relay selection and types from the listings shown. Utility grade, multifunction, programmable microprocessor based relays are preferred and also shall be manufactured by Basler Electric #BE1-GPS100, General Electric #UR G60, SEL #SEL-300G.

10. Control for automatic/safety shutdown of the engine-generator including:

    a. Remote safety manual shutdowns from the local and remote panel emergency safety stop switches.

    b. Remote safety manuel fuel shut-off from the local and remote panel fuel shut-off switches.

    c. Low oil pressure

    d. High coolant temperature

    e. Excessive engine speed

    f. Under engine speed

    g. Overcrank

    h. Internal short circuit

    i. Undervoltage

    j. Over-current at undervoltage

    k. Reverse power

    l. Negative sequence current

    m. Ground fault current

11. Watt-hour meter

12. Switchboard 1 percent accuracy meters, 4-1/2 inches square with 250 degree scales including:

    a. 5 amp AC taut-band ammeter with scale marks to match the connected current transformers

    b. 0-150 volt AC taut-band voltmeter with scale marks to provide a 600 volt full scale reading with 120 volt potential transformers.

13. 4-position Ac-ammeter phase selector switch: A, B, C, and off.

14. 4-position Ac-voltmeter phase selector switch: AB, BC, CA, and off.

15. Frequency meter-dial type 58-62 Hertz range

16. Voltage adjust rheostat

17. Speed adjust rheostat

18. Potential Transformers (minimum of 2)

19. Emergency safety manual shutdown switch with lockable access cover.

20. Emergency Fuel shut-off switch with lockable ass cover.

21. Alarm Horn

22. Alarm silence pushbutton

23. Normally open common failure contacts to interface with the PLC and provide one spare.

24. Engine generator running contacts to interface with the PLC and provide one spare.

25. Cycle cranking control which shall consist of three attempts to start. Each start cycle shall be of 15 seconds duration with 10 second rest periods. After a set of three attempts, the engine shall lockout on overcrank.

26. Control to provide automatic starting the engine upon closure of a remote contact. This shall include activating electric fuel solenoid valves and energizing motorized ventilation inlet louvers.

27. Momentary indicating lamp test pushbutton.

28. Nameplates for all indicating lights, switches, relays, meters, and controls.

29. Provide identified terminal strips, all factory wired and labeled for termination of field wire.

30. Controls and instruments shall be powered by the engine starting battery.

31. Control for time delay start including a three-tenths second to three minute adjustable on-delay relay.

32. Control for time delay stop including a one minute to ten minute adjustable off-delay relay.

33. Control shall provide all wiring, instruments, meters, gages, and other items needed to provide a fully operational system giving a high level of safety to plant and operators.

34. Battery powered emergency lights inside control enclosures to allow nighttime trouble shooting of controls if engine fails during a power outage.

D. **Automatic Starting Control:** Automatic engine control shall be an integral part of the engine remote control panel (Generator Control Panel GCP). The control shall provide for automatically starting the engine upon closure of a remote contact and shall activate electric fuel solenoid valve. The controls shall include the necessary relays to provide for cycle cranking, and shall be equipped with hand-off automatic switch, indicating lights, and audible alarm with reset. A time-delay relay after energization to start engine shall be furnished. Individual signal lights mounted on the front of the panel shall indicate failures. Normally one common failure and running contacts shall be provided for remote transmission. The cycle starting shall consist of three attempts to start, each of which shall be approximately 15 seconds duration with 10-second rest periods. If the engine fails to start, it shall be locked out. Control shall provide contacts for engine running and engine malfunction. Nameplates shall be furnished for the indicating lights and selector switch. All wiring shall be terminated on open face terminal blocks and the terminal blocks shall have a marker strip to identify all wiring connections.

E. **Generator Terminal Housing:** The generator terminal housing shall enclose and be provided with the following:

1. Bussing and volume large enough to terminate the conduit and wire shown or indicated in the contract drawings or described in the contract specifications.

2. Current transformers as shown or indicated in the contract drawings or described in the contract specifications with indicated generator power connections/terminations.

2.6 CORROSION INHIBITORS

A. All enclosures shall be provided with corrosion inhibitors to protect equipment in storage, in-transit, and an idle state on site from corrosion while waiting for startup and commissioning or any testing.

B. Provide corrosion inhibitors sized to last approximately one year in an idle non-operational stored piece of equipment.

C. Provide **Hoffman Industrial Corrosion Inhibitors, Cortec VCI Emitters or Equal.**

D. Corrosion Inhibitors shall be removed from any equipment before it is energized which might be damaged if present while running or energized.

2.7 Finish

A. Cleanliness of the equipment finish shall be such that it is smooth and free of all foreign matter including scale, sand, blisters, weld spatters, metal chips, metal shavings, oil, grease, organic matter, and rust.

B. All metal enclosures and exterior surfaces shall be finished as described below:

1. All surfaces shall be finished as specified in Section 09800 "Protective Coating". The color of exterior surfaces shall be No. 61 (light grey) in accordance with ANSI Z55.1. The color of interior surfaces shall be white.

2. The CONTRACTOR shall supply paint, matching each color used, for filed "touch-up" after installation of the equipment. One quart of each color shall be supplied for each assembly.

PART 3 -- EXECUTION

3.1 INSTALLATION

A. The engine generator and auxiliaries shall be installed in accordance with the procedure submitted with the shop drawings and per manufacturer's recommendation.

B. Installation shall be supervised by the manufacturer's authorized representative.

3.2 Factory Testing

A. Prior to delivery at the job site, the engine generator set shall be tested at the manufacturer's authorized dealer, witnessed by the OWNER and ENGINEER. The test shall verify that the unit is free of any defects, verify guaranteed performance, and simulate automatic starting of the generator in conjunction with controller as specified herein.

B. Testing of the unit, complete with all auxiliaries shall be for a minimum period of 4-hour load test prior to shipment, including repeated automatic starts. Provide at least 2 hours at full load. Testing shall also include block loading and unloading at 25 percent, 50 percent, 75 percent and 100 percent of rated KW. Engine shall run in each step until all temperatures have stabilized. Voltage and frequency variations at each step shall be measured. Certified test reports shall be furnished to the ENGINEER prior to shipment of the unit to the job site. Test report shall include temperature of each engine cylinder pyrometer taken at 5 minute intervals during load run.

1. In addition to the tests described above all tests and documentation required or recommended by NFPA 110 – under Paragraph 5-13 "Installation Acceptance" shall be performed and submitted. This shall include cycle crank testing.

2. Provide and submit certified strip chart recordings of engine generator speed and voltage regulation performance. The strip chart recordings shall record the voltage and frequency rises and dips for each block loading and unloading above. The strip chart shall be clearly marked for units of time on the horizontal axis, units of voltage (volts) for the line to line voltage channel and units of frequency (Hertz) for the frequency channel.

C. Final acceptance tests shall be conducted by the manufacturer's representative after installation to assure compliance with all operating requirements and specifications. Tests shall include, but not be limited to a repeat of factory tests described above. A written report of the tests shall be submitted to the ENGINEER.

D. All costs for transportation, lodging and subsistence for the OWNER and ENGINEER during the witness testing shall be borne by the CONTRACTOR at no additional cost to the OWNER. The manufacturer shall give the engineer a minimum of two weeks notice prior to the tests.

E. The manufacturer of the generator shall provide testing of the generator at their testing facility. The testing shall include standard tests and full load heat run tests. The standard tests include:

1. Winding resistance
2. Insulation resistance on all windings
3. High potential test on all windings
4. Air gap measurement
5. Regulator operations
6. Exciter field current
7. Voltage balance

The tests shall be conducted with the CONTRACTOR's preposed voltage regulator. Provide and submit a test report of all above conducted tests including temperature of each RTD at 5 minute intervals during full load heat run until temperatures have stabilized.

3.3 START UP AND OPERATIONS TESTING AND TRAINING

A. Upon completion of the installation, start up shall be supervised by the engine manufacturer's representative. Start up shall include complete testing of the engine generator, interface to other systems/equipment and auxiliaries. Testing shall include verification of all shut down devices and related indicators. Testing shall demonstrate automatic and manual startup and shutdown of generators. Additional testing is specified in Section 16950. A written report of the test shall be submitted to the ENGINEER.

B. The CONTRACTOR shall utilize plant equipment to provide the required engine generator loading if it is operationally available. If plant operational requirements will not allow use of plant equipment for load testing the engine generator, the CONTRACTOR shall provide temporary load cells and connections to provide full load acceptance testing of the engine.

C. Start-Up Assistance

1. The engine-generator manufacturer shall provide on site a minimum of 24 hours assistance to the CONTRACTOR. Approximately 8 hours shall be provided for receipt inspection and initial installation. The remainder shall be provided to troubleshoot, start up, and test the completed installation.

2. The engine-generator controls supplier shall provide on site a minimum of 24 hours of assistance to CONTRACTOR. Approximately 8 hours shall be provided for receipt inspection and initial installation. The remainder shall be provided to troubleshoot, start up, and test the completed installation.

D. Training

1. The engine-generator manufacturer representative shall conduct on site

   a. Operator training for a minimum of 8 hours.

   b. Maintenance training for a minimum of 8 hours.

2. The engine-generator controls representative shall conduct on site

   a. Operator training for a minimum of 8 hours.

   b. Maintenance training for a minimum of 8 hours.

3. Training shall be provided in two separate intervals separated by about two weeks of equipment operation to allow personnel to gather operational questions and digest the first session. CONTRACTOR shall provide two separate site trips for each type of training above.

4. Training shall be provided by individuals knowledgeable on the supplied equipment. Training shall be prepared and delivered as described in NFPA 70B, Appendix D, "How To Instruct."

E. Operation and maintenance manuals shall be furnished by the engine manufacturer, generator manufacturer, and controls supplier. These shall be included as part of the overall plant O&M manual. A minimum of five complete sets shall be provided.

3.4 WARRANTY

A. The engine generator set shall be guaranteed against defective parts and workmanship for a period of two (2) years minimum from the date of final acceptance of the plant.

3.5 SPARE PARTS

A. Provide spare parts. Spare parts shall include:

1. Engine

   1 complete set of injectors

2 complete sets of fuel, oil, and air filters

1 set of crankcase gaskets

1 set of fuses, indicator lights, control transformers, relays, and contacts

2. Generator

1 voltage regulator

3 field rectifier diodes (forward)

3 field rectifier diodes (reverse)

1 surge suppressor

1 rectifier assembly

1 set of fuses, indicator lights, control transformers, relays, contacts

3. Remote Control Panel

1 control relay of each type used

3 control fuses of each type used

1 control transformer of each type used

3 pushbuttons of each type used

4 contacts of each type used

12 indicator lights of each type used

3 lenses for indicator lights of each color used

1 coil of each type used for various contractors

2 lamps for emergency light

3.6 COORDINATION

A. CONTRACTOR shall provide coordination between all vendor and suppliers of different systems which have a common interface. The CONTRACTOR shall provide all labor and material to provide quality safe operational systems and equipment and resolve and interface problems.

- END OF SECTION -