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# Technical Report for Water Circulation Pumping System for Trihalomethanes (THMs)

W. Bellah

June 8, 2015

## **Disclaimer**

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This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

## TECHNICAL REPORT FOR WATER CIRCULATION PUMPING SYSTEM FOR TRIHALOMETHANES (THMs) CONTROL

**PURPOSE:** To install a treatment process for reducing the total trihalomethanes (TTHMs) in the existing distribution system in preparation for the use of surface water purchased from the Thomas Shaft Wholesale Water System (TSWWS) and to be proactive in meeting the Permit condition item No. 14 once the primary water source becomes the TSWWS.

### **BACKGROUND:**

The TSWWS was added as an active source of supply to the permit (No. 03-10-13P-003) in 2010, but has never been used due to the potential for formation of trihalomethanes (THMs) in the distribution system. THMs are formed as a by-product when chlorine is used to disinfect water for drinking. THMs are a group of chemicals generally referred to as disinfection by-products (DBPs). THMs result from the reaction of chlorine with organic matter that is present in the water. Some of the THMs are volatile and may easily vaporize into the air. This fact forms the basis of the design of the system discussed in this technical report. In addition, the design is based on the results of a study that has shown success using aeration as a means to reduce TTHMs to within allowable concentration levels with turn-over times as long as ten days. The Primary Drinking Water Standards of Regulated Contaminants Maximum Contaminant Level (MCL) for TTHMs is 80 parts per billion (ppb).

No other changes to the existing drinking water distribution system and chlorination operations are anticipated before switching to the TSWWS as the primary drinking water source. The two groundwater wells (Wells 20 and 18) which are currently the primary and backup water sources for the system would be maintained for use as backup supply. In the future, one of the wells may be removed from the system. A permit amendment would be filed at that time if this modification was deemed appropriate.

### **SYSTEM DESCRIPTION**

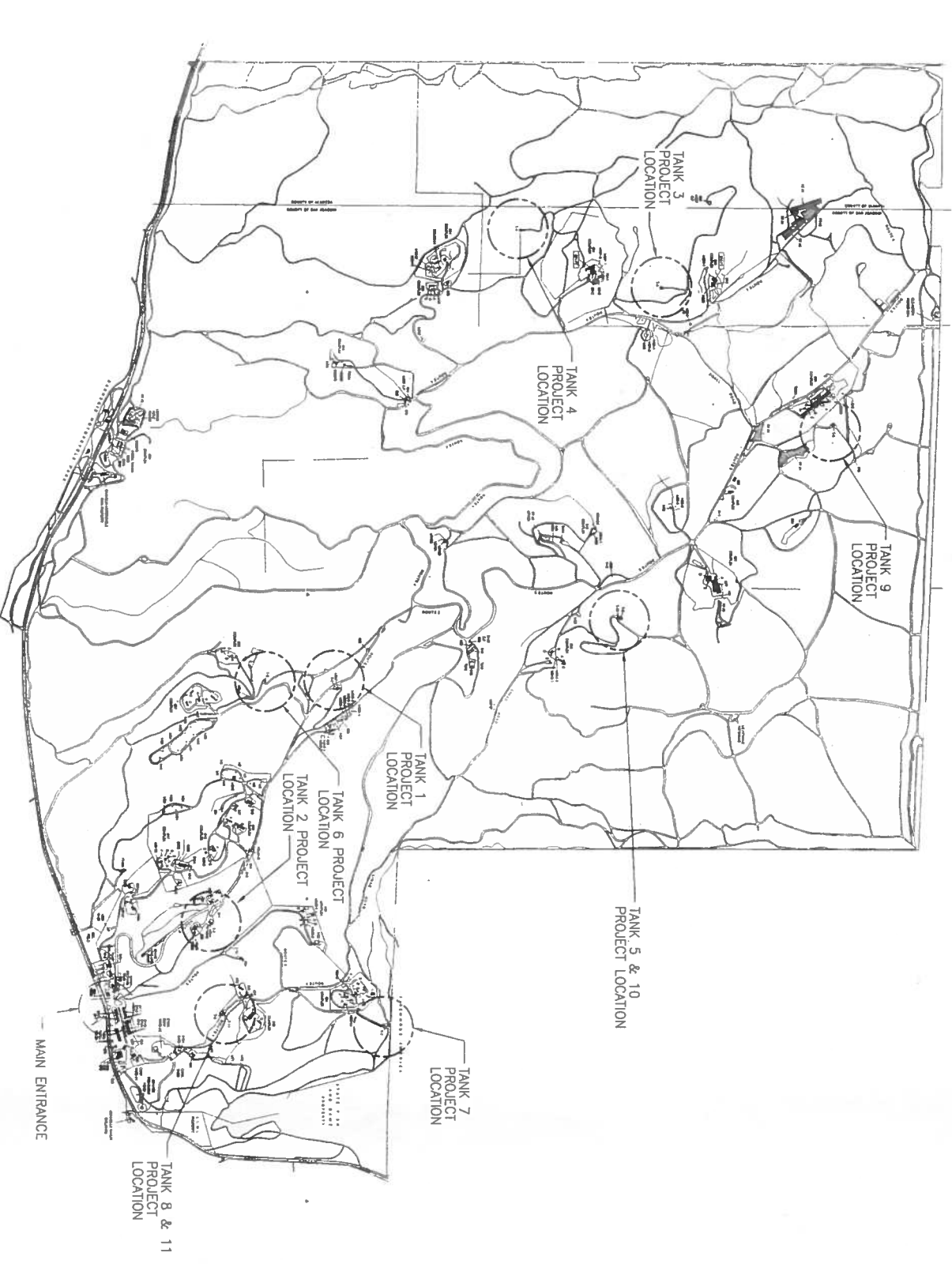
The reduction of THM concentration is accomplished by the continuous aeration and recirculation of the water contained in the storage tank. Aeration is accomplished by pumping the water to the spray nozzle under sufficient pressure to create a 90 degree full cone spray pattern at the air-space inside the tank and the spray is directed towards the center of the tank to traverse as much air volume available as possible. The dispersion of the water into tiny droplets allows the THMs to dissipate into the air that comes in contact with each water particle. The water is drawn from near the bottom of the tank in order to turn over the content of the tank in the least time possible with a given circulation rate.

To accomplish the aeration, a single electric motor driven water pump, local motor control, recirculation piping, suction and discharge pressure gages, and a spray nozzle with a solid cone spray pattern characteristic will be installed at each existing tank (11 locations total). A common pump size was selected for all eleven locations to provide a recirculation rate that would turn the contents of each tank in less than 7 days. The pump is a close-coupled PACO Pump Model 10-10707 LC, a NSF 61 compliant, 1-1/4" Inlet, 1" Outlet with a 1/2 horsepower, 1750 RPM TEFC electric motor drive. With the commonly sized pump, the turn over times range from approximately 1.5 days for the smaller tanks (Tanks 1, 3, 4, 5, 6, and 8) to 6.5 days for the largest size (Tank 11). It is anticipated that installation of all pumps and associated components will be complete by June 30, 2015. Details of the pump locations and mechanical specifications are provided in the attached plan set.

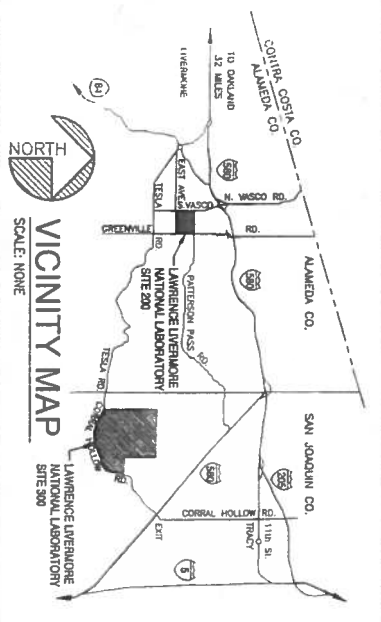
### OPERATION AND MAINTENANCE

The aeration system operation will be continuous 24 hours a day, 7 days a week, except at scheduled maintenance of the pump. Scheduled maintenance will be in accordance with the guidelines of LLNL's Preventative Maintenance Management System (PMMS). An uninstalled, spare pump and motor assembly is made available for immediate swap, as necessary. Normal operating pressures will be posted at the pressure gages for reference that may be unique for each tank location. Visual inspection of the pumps will occur concurrently with the visual inspection of the water storage tanks which occur at least three times per week.

# SITE 300 WATER TANKS - NEW CIRCULATING WATER PUMP INSTALLATION



**LAWRENCE LIVERMORE NATIONAL LABORATORY - SITE 300**  
SCALE: NONE



**VICINITY MAP**  
SCALE: NONE

APPLICABLE CODES	CODE, REGULATION OR FACILITY STANDARD	EDITION
	CALIFORNIA BUILDING CODE (2006 IBC)	2007
	NFPA 101 - LIFE SAFETY CODE	2009
	NFPA 1 - UNIFORM FIRE CODE	2009
	NATIONAL ELECTRIC CODE (NFPA 70)	2011
	CALIFORNIA PLUMBING CODE (2006 UPC)	2007
	CALIFORNIA MECHANICAL CODE (2006 UMC)	2007
	UNIFORM FEDERAL ACCESSIBILITY STANDARDS (NOT CALIFORNIA TITLE 24)	LATEST EDITION
	ASHRAE STANDARD 90.1-2007 FOR ENERGY COMPLIANCE	LATEST EDITION
	NATIONAL SANITATION FOUNDATION STD 61	2011

**PROJECT SCOPE**

- INSTALL WATER CIRCULATION PUMPING SYSTEM FOR TRIPHASED TANKS (TANKS) CONTROL AT SITE 300 DOMESTIC WATER TANKS 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, & 11, INCLUDING HEAT TRACING REQUIREMENTS.
- FOR ELECTRICAL WIRING AND ACCESSORIES TO EXTEND POWER TO THE PUMPS AND ASSOCIATED PIPING HEAT TRACING CIRCUITS PLEASE SEE DRAWINGS PSE2012-0300-0001D THROUGH 0028D.

**INDEX OF DRAWINGS**

DRAWING NUMBER:	SHEET NO.:	DRAWING TITLE:
GENERAL:		
PSM2012-0300-0001D	G-001	SITE MAP, VICINITY MAP, INDEX OF DRAWINGS, AND MISCELLANEOUS NOTES
MECHANICAL:		
PSM2012-0300-0002D	M-101	PIPING PLAN - TANK 1 CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM
PSM2012-0300-0003D	M-102	PIPING PLAN - TANK 2 CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM
PSM2012-0300-0004D	M-103	PIPING PLAN - TANK 3 CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM
PSM2012-0300-0005D	M-104	PIPING PLAN - TANK 4 CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM
PSM2012-0300-0006D	M-105	PIPING PLAN - TANK 5 CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM
PSM2012-0300-0007D	M-106	PIPING PLAN - TANK 6 CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM
PSM2012-0300-0008D	M-107	PIPING PLAN - TANK 7 CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM
PSM2012-0300-0009D	M-108	PIPING PLAN - TANK 8 CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM
PSM2012-0300-0010D	M-109	PIPING PLAN - TANK 9 CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM
PSM2012-0300-0011D	M-110	PIPING PLAN - TANK 10 CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM
PSM2012-0300-0012D	M-111	PIPING PLAN - TANK 11 CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM

EMEC Dept. Head:	Client:	Project Manager:	Design Manager:	Maint. & Site Util.:	ES&H:	Security:	Site Planning:	Fire Marshal:	Facility:
Richard Shanteau	Ray Chin	Ray Chin	Ruben Ocampo	Ellean Castro	Wynne Walters	Barbara D'Amico	Paul Chu	Barbara Walters	DAVE ARNDT
APPROVED BY	APPROVED BY	APPROVED BY	APPROVED BY	REVIEWED BY	REVIEWED BY	REVIEWED BY	REVIEWED BY	REVIEWED BY	REVIEWED BY
7-24-15	8/11/12	8/11/12	8-8-12	5-9-12	5-8-12	5/8/12	5/8/12	5-9-12	5-9-12

REV No	DATE	REV BY	WHY	CHK BY
0	4/26/12	ISSUED FOR CONSTRUCTION	RO	RC

Project Title: **SITE 300 WATER TANKS NEW CIRCULATING WATER PUMP INSTALLATION**  
Des: RUBEN OCAMPO  
Dwn: RUBEN OCAMPO  
Chk: RAY CHIN  
File Name: PSM2012-0300-0001D.dwg  
Scale: AS NOTED  
Sheet Title: **SITE MAP, VICINITY MAP, INDEX OF DRAWINGS AND MISCELLANEOUS NOTES**  
Dwg. No. **PSM2012-0300-0001D**  
Sht. No. **G-001** of 12  
Classification: UNCLASSIFIED/UNLIMITED RELEASE

**Lawrence Livermore National Laboratory**  
P.O. Box 808 Livermore, California 94551

**F&I** Facilities & Infrastructure  
Consultants

**NOTES**

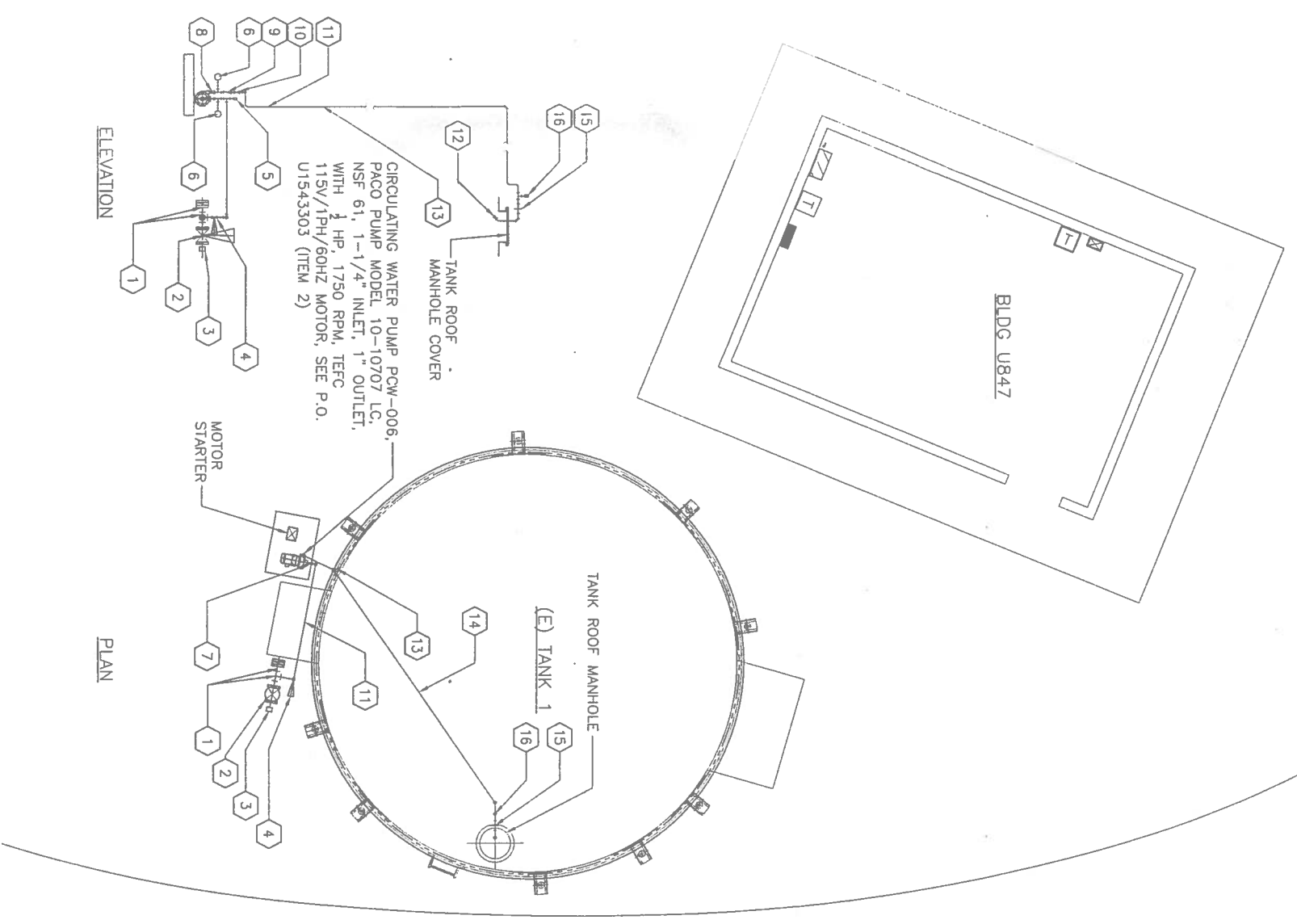
- 1 REPLACE EXISTING NIPPLE AND HOSE FITTING WITH NEW GALV. STEEL NIPPLE ASTM A120 AND 3"x3"x1-1/2" RED. TEE GALV. IRON ASME/ANSI B16.3 CLASS 150.
- 2 3"-125# FLANGED BRONZE GATE VALVE, O.S. & Y.
- 3 RE-INSTALL 3" MPT X HOSE FITTING WITH CAP, AFTER GATE VALVE.
- 4 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 5 1/2" 125# BALL VALVE, BRONZE BODY, STAINLESS STEEL BALL AND STEM, TEFLON SEATS AND SEALS. SCREWED ENDS.
- 6 4.5" PRESSURE GAUGE, 0-30 PSIG RANGE, PROVIDE BLOCK VALVE.
- 7 SWAGED NIPPLE 1-1/2"x1-1/4" COPPER, SCH 40.
- 8 SWAGED NIPPLE 1-1/2"x1" COPPER, SCH 40.
- 9 1-1/2" 125# SCREWED BRONZE CHECK VALVE, S.S. TRIM, SCREWED CAP.
- 10 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 11 1-1/2" COPPER PIPING PER ASTM B88 TYPE L AND COPPER SOLDER FITTINGS PER ASME/ANSI B16.22, EXCEPT SCREWED SCH 40 COPPER. NIPPLES AND SCREWED CAST BRONZE FITTINGS PER ASME/ANSI B16.15 CLASS 125.
- 12 FULL CONE SPRAY NOZZLE, BRASS, 1-1/4" FEMALE NPT, 20 GPM @ 7 PSIG CAPACITY, SPRAYING SYSTEMS PART # 1-1/4H-20 (SEE P.O. U1545882). INSTALL NOZZLE AS HIGH AS POSSIBLE DIRECTING THE DISCHARGE 45 DEGREE DOWNWARD TOWARDS THE CENTER OF THE TANK.
- 13 SUPPORT RISER PIPING WITH BRACKETS MOUNTED ON THE FLANGES OF THE TANK SHELL, USING TWO TANK FLANGE BOLTS SPACED AT LEAST 3-SUCCESSIVE BOLT SPACING APART.
- 14 ROUTE PIPING ON THE ROOF TO SUIT AVAILABLE MEANS TO SUPPORT PIPE. ALLOW 3' X 3' ACCESS CLEARANCE FROM LADDER SIDE OF THE MANHOLE.
- 15 PROVIDE BREAK UNION FOR REMOVAL OF MANHOLE COVER.
- 16 AIR RELEASE VALVE, 1/16" ORIFICE, 1/2" NPT INLET.
- 17 ALL NEW WATER PIPING, VALVES & PUMP SHALL BE HEAT TRACED AND INSULATED, IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:

HEAT TRACING SYSTEM SHALL BE CHROMALOX OR EQUAL, OF THE SELF REGULATING TYPE, 3-WATT/FT. 120V. COPPER OVERBRAID, COMPLETE WITH SUITABLE ACCESSORIES AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. CABLE LENGTH SHALL NOT EXCEED THAT FOR THE 15 AMP CIRCUIT BREAKER. SEE PROJECT ELECTRICAL DRAWINGS FOR POWER SUPPLY LOCATION. ENCLOSURES SHALL BE NEMA 4X. TEMPERATURE CONTROL SHALL BE PIPE WALL SENSING BULB AND CAPILLARY TYPE, STRAPPED TO PIPE CLOSEST TO POWER SUPPLY. PROVIDE ONE END SEAL WITH SIGNAL LIGHT PER CIRCUIT FOR INDICATION OF HEATING ACTIVATION, LOCATED AT SUCCTION PIPING WHERE IT SHOULD BE MADE VISIBLE FROM GRADE.

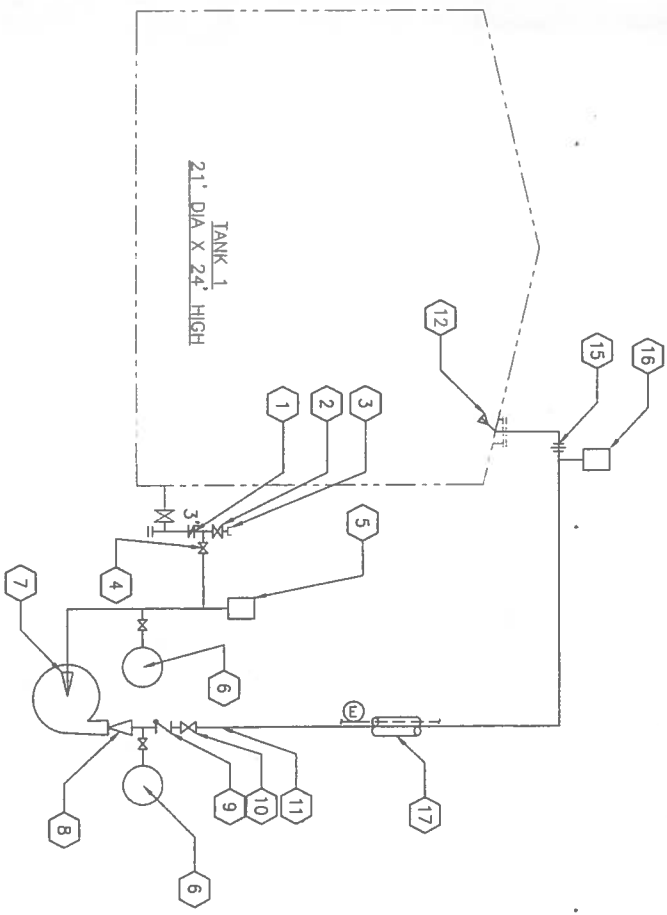
CABLE WRAPPING FACTOR SHALL BE 1.0 FOR 1.5" PIPE, AND 1.5 FOR 3" PIPE (3" PITCH). PROVIDE 5 FT CABLE ALLOWANCE FOR PUMP.

PIPE INSULATION SHALL BE 1" THICK FIBERGLASS INSULATION WITH ALL-WEATHER SERVICE JACKET. ACCEPTABLE SUBSTITUTE INSULATION IS PIPE INSULATION WITH K=0.23 BTU-IN/(HR-SQ FT-F) OR LESS @ 0°F (EQUIVALENT TO FIBERGLASS) AND IS NON-CORROSIVE TO THE PIPE.

PUMP SHALL BE INSULATED WITH REMOVABLE/REUSABLE INSULATION BLANKET, THERMAL ENERGY PRODUCTS (TEP) "ENERGY WRAP" OR EQUIVALENT.



**SITE PIPING PLAN & ELEVATION**  
**CIRCULATING PUMP PCW-006 INSTALLATION**  
 SCALE: 1/4"=1'-0"



**PIPING & INSTRUMENT DIAGRAM**  
**CIRCULATING PUMP PCW-006 INSTALLATION**  
 SCALE: NONE

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**National Laboratory**  
 P.O. Box 808 Livermore, California 94551

**F&I**  
 Facilities &  
 Infrastructure

Consultants

Dwg. No. **PSM2012-0300-0002D**

Scale: 1/4" = 1'-0"

PE Stamps

REGISTERED PROFESSIONAL ENGINEER  
 RUBEN OCAMPO  
 No. U17843  
 Exp. 09/30/13  
 MECHANICAL ENGINEER  
 STATE OF CALIFORNIA

REV	DATE	REV. S. N.	WH	BR	HK
0	4/28/12	ISSUED FOR CONSTRUCTION			

Project Title  
**SITE 300 WATER TANKS  
 NEW CIRCULATING WATER  
 PUMP INSTALLATION**

Des: RUBEN OCAMPO  
 Dwn: RUBEN OCAMPO  
 Chk: RAY CHIN  
 File Name: PSM2012-0300-0002D.dwg  
 PFINID: Scale AS NOTED Software AutoCAD 2010

Sheet Title  
**PIPING PLAN - TANK 1  
 CIRCULATING WATER PUMP  
 INSTALLATION AND  
 P & I DIAGRAM**

Dwg. No. **PSM2012-0300-0002D**

Sht No. **M-101**

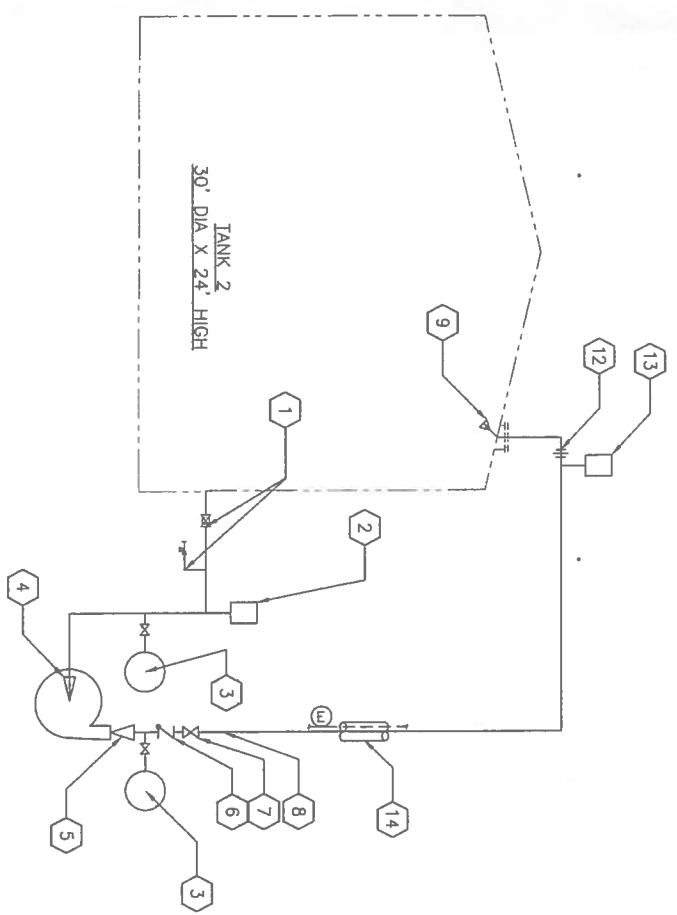
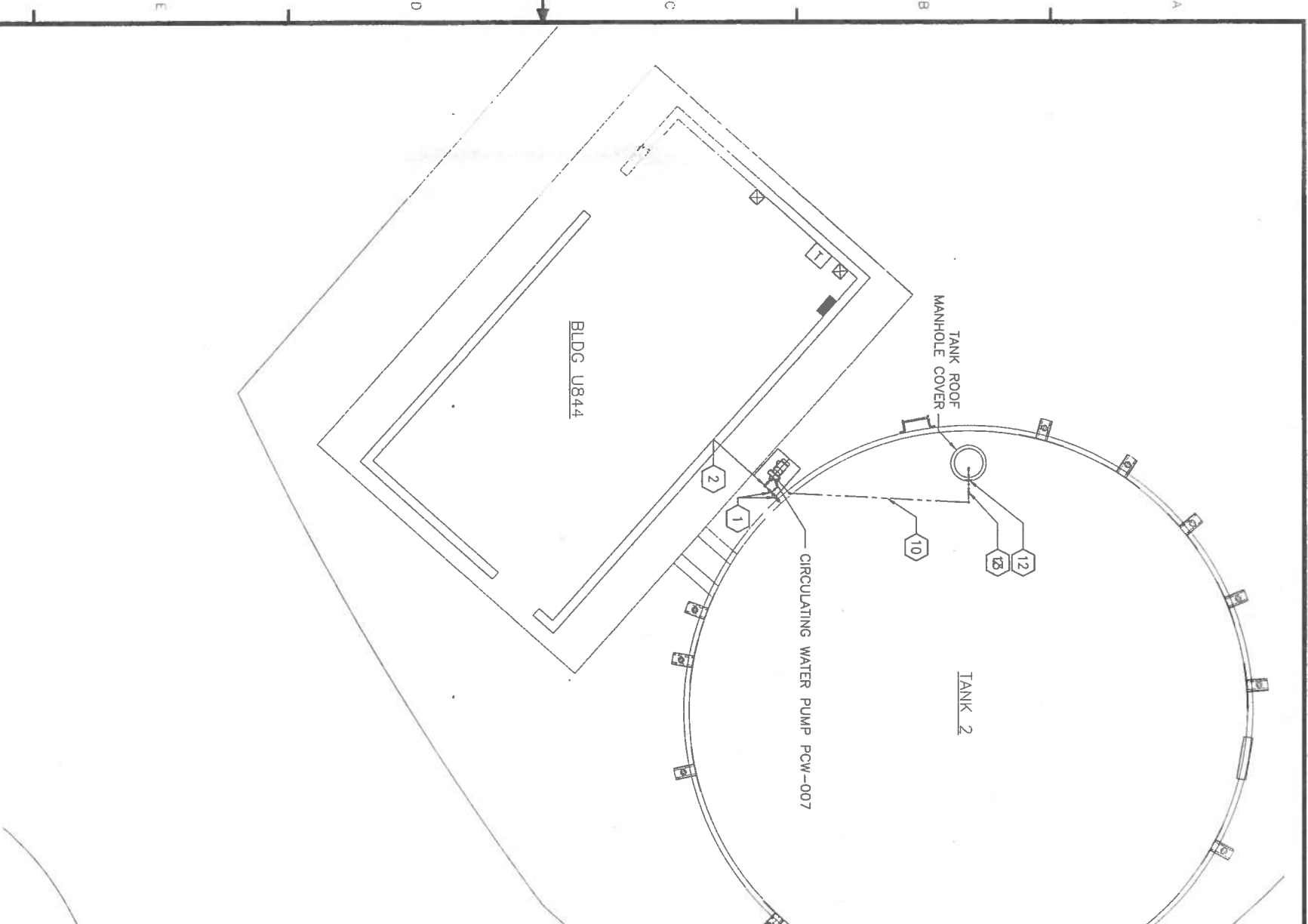
Classification  
 UNCLASSIFIED/UNLIMITED RELEASE

**NOTES**

- 1 REPLACE EXISTING NIPPLE AND FAUCET WITH A NEW NIPPLE, 1/2"x1/2"x2" REDUCING TEE, 1/2" FAUCET AND REQUIRED NEW 1/2" PIPING AS SHOWN ON P & I D.
- 2 1/2" 125# BALL VALVE, BRONZE BODY, STAINLESS STEEL BALL AND STEM, TEFLON SEATS AND SEALS. SCREWED ENDS.
- 3 4.5" PRESSURE GAUGE, 0-30 PSIG RANGE, PROVIDE BLOCK VALVE.
- 4 SWAGED NIPPLE 1-1/2"x1-1/4" COPPER, SCH 40.
- 5 SWAGED NIPPLE 1-1/2"x1" COPPER, SCH 40.
- 6 1-1/2" 125# SCREWED BRONZE CHECK VALVE, S.S. TRIM, SCREWED CAP.
- 7 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 8 1-1/2" COPPER PIPING PER ASTM B88 TYPE L AND COPPER SOLDER FITTINGS PER ASME/ANSI B16.15 CLASS 125.
- 9 FULL CONE SPRAY NOZZLE, BRASS, 1-1/4" FEMALE NPT, 20 GPM @ 7 PSIG CAPACITY, SPRAYING SYSTEMS PART # 1-1/4H-20 (SEE P.O. U1545882). INSTALL NOZZLE AS HIGH AS POSSIBLE DIRECTING THE DISCHARGE 45 DEGREE DOWNWARD TOWARDS THE CENTER OF THE TANK.
- 10 SUPPORT RISER PIPING WITH BRACKETS MOUNTED ON THE FLANGES OF THE TANK SHELL, USING TWO TANK FLANGE BOLTS SPACED AT LEAST 3-SUCCESSIVE BOLT SPACING APART.
- 11 ROUTE PIPING ON THE ROOF TO SUIT AVAILABLE MEANS TO SUPPORT PIPE. ALLOW 3' X 3' ACCESS CLEARANCE FROM LADDER SIDE OF THE MANHOLE.
- 12 PROVIDE BREAK UNION FOR REMOVAL OF MANHOLE COVER.
- 13 AIR RELEASE VALVE, 1/16" ORIFICE, 1/2" NPT INLET.
- 14 ALL NEW WATER PIPING, VALVES & PUMP SHALL BE HEAT TRACED AND INSULATED, IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:

HEAT TRACING SYSTEM SHALL BE CHROMALOX OR EQUAL, OF THE SELF REGULATING TYPE, 3-WATT/FT, 120V, COPPER OVERBRAID, COMPLETE WITH SUITABLE ACCESSORIES AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. CABLE LENGTH SHALL NOT EXCEED THAT FOR THE 15 AMP CIRCUIT BREAKER. SEE PROJECT ELECTRICAL DRAWINGS FOR POWER SUPPLY LOCATION. ENCLOSURES SHALL BE NEMA 4X, TEMPERATURE CONTROL SHALL BE PIPE WALL SENSING BULB AND CAPILLARY TYPE, STRAPPED TO PIPE CLOSEST TO POWER SUPPLY. PROVIDE ONE END SEAL WITH SIGNAL LIGHT PER CIRCUIT FOR INDICATION OF HEATING ACTIVATION, LOCATED AT SUCCTION PIPING WHERE IT SHOULD BE MADE VISIBLE FROM GRADE. CABLE WRAPPING FACTOR SHALL BE 1.0 FOR 1.5" PIPE, AND 1.5 FOR 3" PIPE (3" PITCH). PROVIDE 5 FT CABLE ALLOWANCE FOR PUMP.

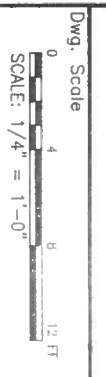
PIPE INSULATION SHALL BE 1" THICK FIBERGLASS INSULATION WITH ALL-WEATHER SERVICE JACKET. ACCEPTABLE SUBSTITUTE INSULATION IS PIPE INSULATION WITH K=0.23 BTU-IN/(HR-SQ FT-F) OR LESS @ 0" F (EQUIVALENT TO FIBERGLASS) AND IS NON-CORROSIVE TO THE PIPE. PUMP SHALL BE INSULATED WITH REMOVABLE/REUSABLE INSULATION BLANKET, THERMAL ENERGY PRODUCTS (TEP) "ENERGY WRAP" OR EQUIVALENT.



CIRCULATING WATER PUMP PCW-007,  
PACO PUMP MODEL 10-10707 LC, NSF  
61, 1-1/4" INLET, 1" OUTLET, WITH 1/2  
HP, 1750 RPM, TEFC 115V/1PH/60HZ  
MOTOR, SEE P.O. U1543303 (ITEM 2)

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P.O. Box 808 Livermore, California 94551

**F&I Facilities & Infrastructure**  
Consultants



REGISTERED PROFESSIONAL ENGINEER  
RUBEN OCAMPO  
No. A17842  
Exp. 09/30/13  
STATE OF CALIFORNIA  
Professional Seal of Ruben Ocampo

Project Title  
**SITE 300 WATER TANKS  
NEW CIRCULATING WATER  
PUMP INSTALLATION**

REV NO	DATE	REVISIONS	DWR	CHK
0	4/26/12	ISSUED FOR CONSTRUCTION	RO	FIG

Des: RUBEN OCAMPO	12/14/2011
Dwn: RUBEN OCAMPO	12/14/2011
Chk: RAY CHIN	4/25/2012
File Name: PSM2012-0300-0003D.dwg	
Scale: AS NOTED	AutocAD 2010

Sheet Title  
**PIPING PLAN - TANK 2  
CIRCULATING WATER PUMP  
INSTALLATION AND  
P & I DIAGRAM**

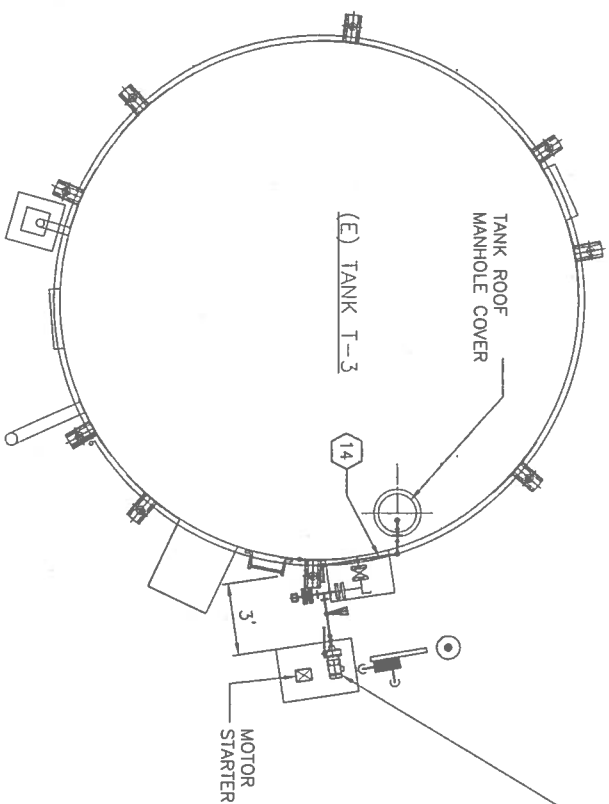
Dwg. No. **PSM2012-0300-0003D**  
Sht. No. **M-102** 3 of 12  
Classification **UNCLASSIFIED/UNLIMITED RELEASE**

**PIPING PLAN**  
**CIRCULATING PUMP PCW-007 INSTALLATION**  
SCALE: 1/4"=1'-0"



NOTES

- 1 REPLACE EXISTING NIPPLE AND HOSE FITTING WITH NEW GALV. STEEL NIPPLE ASTM A120 AND 3"x3"x1-1/2" RED. TEE GALV. IRON ASME/ANSI B16.3 CLASS 150.
- 2 3"-125# LUGGED RESILIENT SEATED BUTTERFLY VALVE, 316 S.S. DISC, FOOD GRADE EPDM SEAT, KEYSTONE AR2 OR EQUAL, WITH MATCHING CLASS 150FF ANSI B16.5 GALVANIZED STEEL SCREWED FLANGES.
- 3 RE-INSTALL 3" MPT X HOSE FITTING WITH CAP, AFTER BUTTERFLY VALVE.
- 4 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 5 1/2" 125# BALL VALVE, BRONZE BODY, STAINLESS STEEL BALL AND STEM, TEFLON SEATS AND SEALS, SCREWED ENDS.
- 6 4.5" PRESSURE GAUGE, 0-30 PSIG RANGE, PROVIDE BLOCK VALVE.
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- 8 SWAGED NIPPLE 1-1/2"x1" COPPER, SCH 40.
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- 10 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 11 1-1/2" COPPER PIPING PER ASTM B88 TYPE L AND COPPER SOLDER FITTINGS PER ASME/ANSI B31.22, EXCEPT SCREWED SCH 40 COPPER NIPPLES AND SCREWED CAST BRONZE FITTINGS PER ASME/ANSI B16.15 CLASS 125.
- 12 FULL CONE SPRAY NOZZLE, BRASS, 1-1/4" FEMALE NPT, 20 GPM @ 7 PSIG CAPACITY, SPRAYING SYSTEMS PART # 1-1/4H-20 (SEE P.O. U1545882). INSTALL NOZZLE AS HIGH AS POSSIBLE DIRECTING THE DISCHARGE 45 DEGREE DOWNWARD TOWARDS THE CENTER OF THE TANK. SUPPORT RISER PIPING WITH BRACKETS MOUNTED ON THE FLANGES OF THE TANK SHELL, USING TWO TANK FLANGE BOLTS SPACED AT LEAST 3-SUCCESSIVE BOLT SPACING APART.
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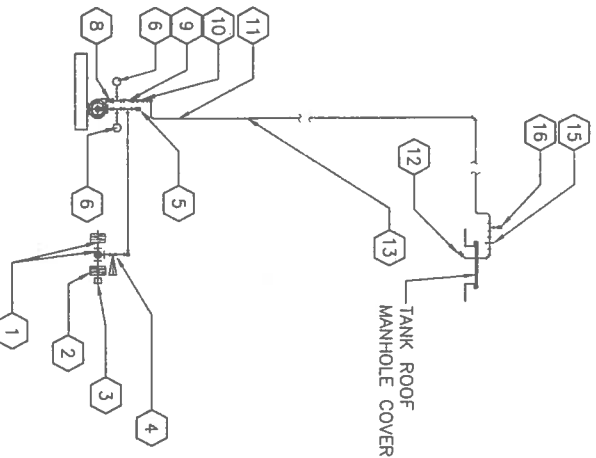
CIRCULATING WATER PUMP PCW-004.  
 PACO PUMP MODEL 10-10707 LC,  
 NSF 61, 1-1/4" INLET, 1" OUTLET,  
 WITH 1/2 HP, 1750 RPM, TEFC  
 115V/1PH/60HZ MOTOR, SEE P.O.  
 U1543303 (ITEM 2)

PIPING PLAN

CIRCULATING WATER PUMP PCW-004 INSTALLATION



SCALE: 1/4"=1'-0"

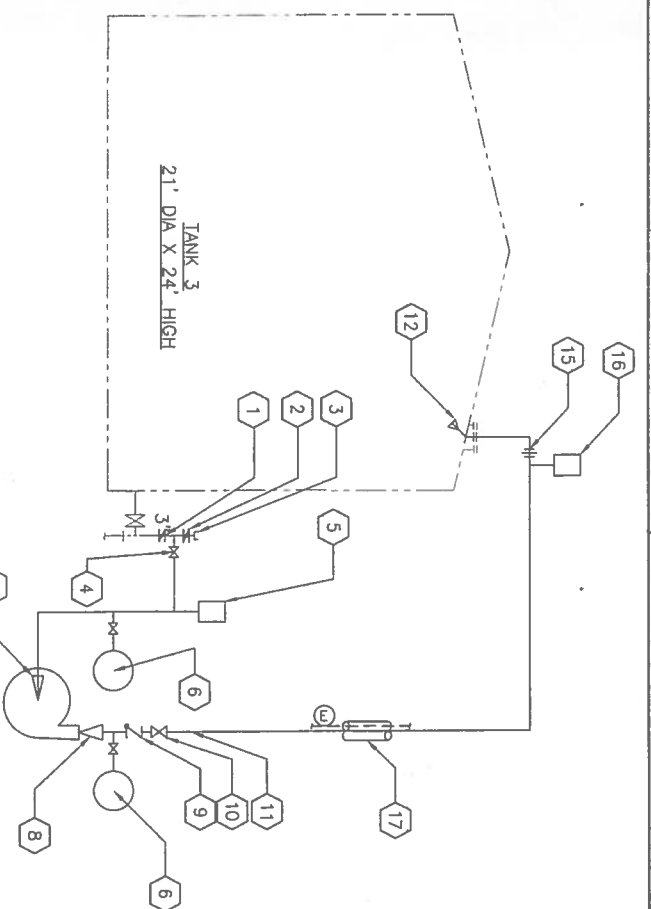


PIPING ELEVATION

CIRCULATING PUMP PCW-004 INSTALLATION

SCALE: NONE

PIPE INSULATION SHALL BE 1" THICK FIBERGLASS INSULATION WITH ALL-WEATHER SERVICE JACKET. ACCEPTABLE SUBSTITUTE INSULATION IS PIPE INSULATION WITH K=0.23 BTU-IN/(HR-SQ FT-F) OR LESS @ 0 F (EQUIVALENT TO FIBERGLASS) AND IS NON-CORROSIVE TO THE PIPE. PUMP SHALL BE INSULATED WITH REMOVABLE/REUSABLE INSULATION BLANKET, THERMAL ENERGY PRODUCTS (TEP) "ENERGY WRAP" OR EQUIVALENT



CIRCULATING WATER PUMP PCW-004.  
 PACO PUMP MODEL 10-10707 LC, NSF  
 61, 1-1/4" INLET, 1" OUTLET, WITH 1/2  
 HP, 1750 RPM, TEFC 115V/1PH/60HZ  
 MOTOR, SEE P.O. U1543303 (ITEM 2)

PIPING & INSTRUMENT DIAGRAM

CIRCULATING PUMP PCW-004 INSTALLATION

SCALE: NONE

**Lawrence Livermore National Laboratory**  
 P.O. Box 808 Livermore, California 94551

**F&I Facilities & Infrastructure**  
 Consultants



*Rubén Ocampo*  
 5/2/2012

Project Title  
**SITE 300 WATER TANKS  
 NEW CIRCULATING WATER  
 PUMP INSTALLATION**

REV NO	DATE	REV'S N	ISSUED FOR	CONSTRUCTION	NO	BY	CHK
0	4/26/12		ISSUED FOR CONSTRUCTION				

Des:	RUBEN OCAMPO	12/19/2011
Dwn:	RUBEN OCAMPO	12/19/2011
Chk:	RAY CHIN	4/25/2012
File Name:	PSM2012-0300-0004D.dwg	
Scale:	AS NOTED	Software: AutoCAD 2010

Sheet Title  
**PIPING PLAN - TANK 3  
 CIRCULATING WATER PUMP  
 INSTALLATION AND  
 P & ID**

Dwg. No. **PSM2012-0300-0004D**

Sht. No. **M-103**

Classification  
**UNCLASSIFIED/UNLIMITED RELEASE**



**NOTES**

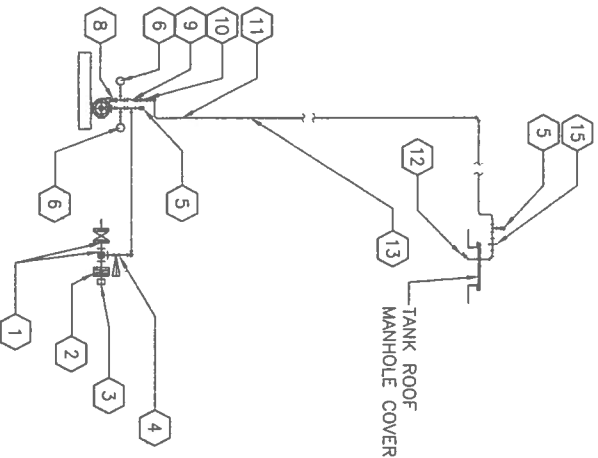
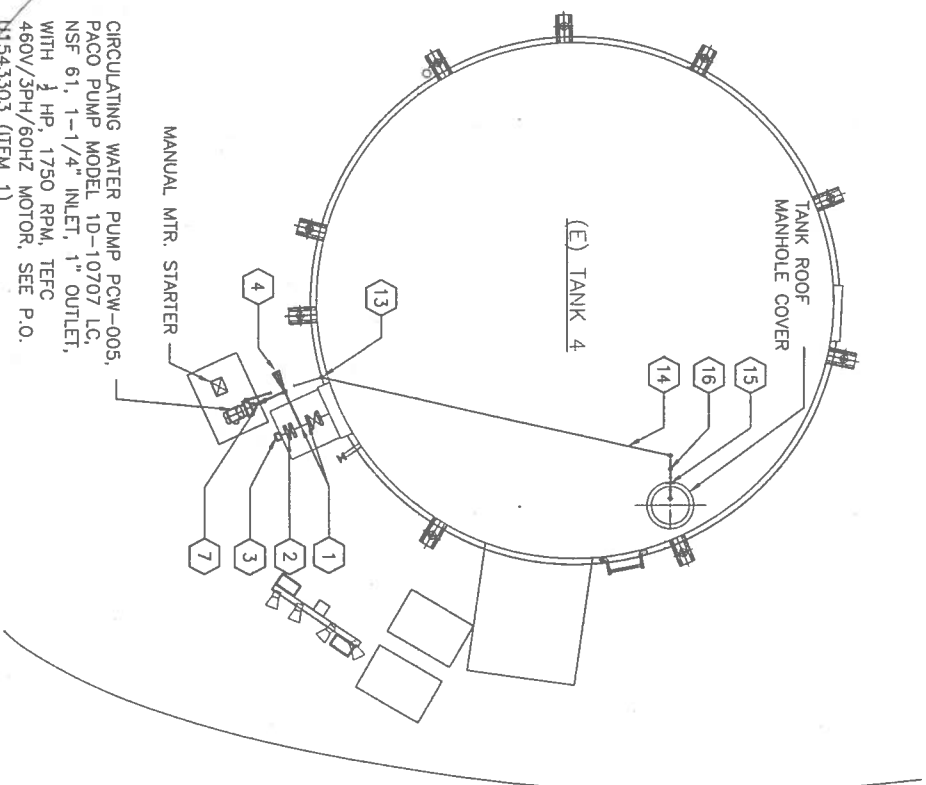
- 1 REPLACE EXISTING NIPPLE AND HOSE FITTING WITH NEW GALV. STEEL NIPPLE ASTM A120 AND 3"x3"x1-1/2" RED. TEE GALV. IRON ASME/ANSI B16.3 CLASS 150.
- 2 3"-125# LUGGED RESILIENT SEATED BUTTERFLY VALVE, 316 S.S. DISC, FOOD GRADE EPDM SEAT, KEYSTONE AR2 OR EQUAL, WITH MATCHING CLASS 150FT ANSI B16.5 GALVANIZED STEEL SCREWED FLANGES.
- 3 RE-INSTALL 3" MPT X HOSE FITTING WITH CAP, AFTER BUTTERFLY VALVE.
- 4 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 5 1/2" 125# BALL VALVE, BRONZE BODY, STAINLESS STEEL BALL AND STEM, TEFLON SEATS AND SEALS, SCREWED ENDS.
- 6 4.5" PRESSURE GAUGE, 0-30 PSIG RANGE, PROVIDE BLOCK VALVE.
- 7 SWAGED NIPPLE 1-1/2"x1-1/4" COPPER, SCH 40.
- 8 SWAGED NIPPLE 1-1/2"x1" COPPER, SCH 40.
- 9 1-1/2" 125# SCREWED BRONZE CHECK VALVE, S.S. TRIM, SCREWED CAP.
- 10 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 11 1-1/2" COPPER PIPING PER ASTM B88 TYPE L AND COPPER SOLDER FITTINGS PER ASME/ANSI B6.22, EXCEPT SCREWED SCH 40 COPPER NIPPLES AND SCREWED CAST BRONZE FITTINGS PER ASME/ANSI B16.15 CLASS 125.
- 12 FULL CONE SPRAY NOZZLE, BRASS, 1-1/4" FEMALE NPT, 20 GPM @ 7 PSIG CAPACITY, SPRAYING SYSTEMS PART # 1-1/4H-20 (SEE P.O. U1545882). INSTALL NOZZLE AS HIGH AS POSSIBLE DIRECTING THE DISCHARGE 45 DEGREE DOWNWARD TOWARDS THE CENTER OF THE TANK.
- 13 SUPPORT RISER PIPING WITH BRACKETS MOUNTED ON THE FLANGES OF THE TANK SHELL, USING TWO TANK FLANGE BOLTS SPACED AT LEAST 3-SUCCESSIVE BOLT SPACING APART.
- 14 ROUTE PIPING ON THE ROOF TO SUIT AVAILABLE MEANS TO SUPPORT PIPE. ALLOW 3' X 3' ACCESS CLEARANCE FROM LADDER SIDE OF THE MANHOLE.
- 15 PROVIDE BREAK UNION FOR REMOVAL OF MANHOLE COVER.
- 16 AIR RELEASE VALVE, 1/16" ORIFICE, 1/2" NPT INLET.
- 17 ALL NEW WATER PIPING, VALVES & PUMP SHALL BE HEAT TRACED AND INSULATED, IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:

CIRCULATING WATER PUMP PCW-005, PACO PUMP MODEL 1D-10707 LC, NSF 61, 1-1/4" INLET, 1" OUTLET, WITH 1/2 HP, 1750 RPM, TEFC 460V/3PH/60HZ MOTOR, SEE P.O. U1543303 (ITEM 1)

**PIPING PLAN**

**CIRCULATING WATER PUMP PCW-005 INSTALLATION**

SCALE: 1/4"=1'-0"



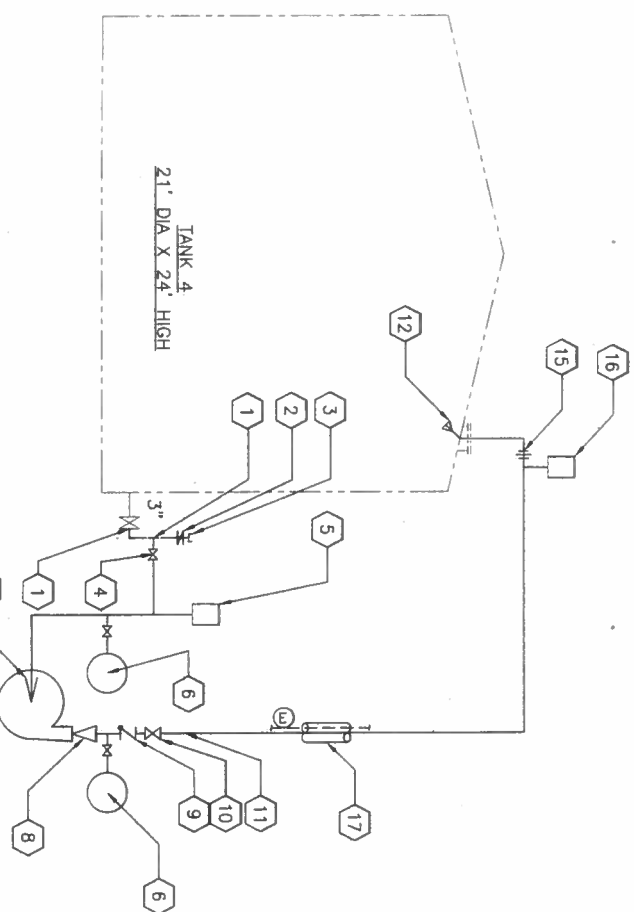
**PIPING ELEVATION**

**CIRCULATING PUMP PCW-005 INSTALLATION**

SCALE: NONE

HEAT TRACING SYSTEM SHALL BE CHROMALOX OR EQUAL, OF THE SELF REGULATING TYPE, 3-WATT/FT, 120V, COPPER OVERBRAID, COMPLETE WITH SUITABLE ACCESSORIES AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. CABLE LENGTH SHALL NOT EXCEED THAT FOR THE 15 AMP CIRCUIT BREAKER. SEE PROJECT ELECTRICAL DRAWINGS FOR POWER SUPPLY LOCATION. ENCLOSURES SHALL BE NEMA 4X. TEMPERATURE CONTROL SHALL BE PIPE WALL SENSING BULB AND CAPILLARY TYPE, STRAPPED TO PIPE CLOSEST TO POWER SUPPLY. PROVIDE ONE END SEAL WITH SIGNAL LIGHT PER CIRCUIT FOR INDICATION OF HEATING ACTIVATION, LOCATED AT SUCTION PIPING WHERE IT SHOULD BE MADE VISIBLE FROM GRADE. CABLE WRAPPING FACTOR SHALL BE 1.0 FOR 1.5" PIPE, AND 1.5 FOR 3" PIPE (3" PITCH). PROVIDE 5 FT CABLE ALLOWANCE FOR PUMP.

PIPE INSULATION SHALL BE 1" THICK FIBERGLASS INSULATION WITH ALL-WEATHER SERVICE JACKET. ACCEPTABLE SUBSTITUTE INSULATION IS PIPE INSULATION WITH K=0.23 BTU-IN/(HR-SQ FT-F) OR LESS @ 0°F (EQUIVALENT TO FIBERGLASS) AND IS NON-CORROSIVE TO THE PIPE. PUMP SHALL BE INSULATED WITH REMOVABLE/REUSABLE INSULATION BLANKET, THERMAL ENERGY PRODUCTS (TEP) "ENERGY WRAP" OR EQUIVALENT.



CIRCULATING WATER PUMP PCW-005, PACO PUMP MODEL 1D-10707 LC, NSF 61, 1-1/4" INLET, 1" OUTLET, WITH 1/2 HP, 1750 RPM, TEFC 460V/3PH/60HZ MOTOR, SEE P.O. U1543303 (ITEM 1)

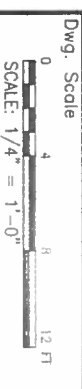
**PIPING & INSTRUMENT DIAGRAM**

**CIRCULATING PUMP PCW-005 INSTALLATION**

SCALE: NONE

**Lawrence Livermore National Laboratory**  
P.O. Box 808 Livermore, California 94551

**F&I Infrastructure**  
Consultants



REGISTERED PROFESSIONAL ENGINEER  
RUBEN OCAMPO  
No. 0117142  
Exp. 09/30/13  
CALIFORNIA  
Professional Seal

*Rubén Ocampo*  
5/2/2012

Project Title  
**SITE 300 WATER TANKS  
NEW CIRCULATING WATER  
PUMP INSTALLATION**  
P & ID

REV. No.	DATE	REVISION	ISSUED FOR	CONSTRUCTION	RO	RC
0	4/26/12		ISSUED FOR CONSTRUCTION			
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15						
16						
17						

Des: RUBEN OCAMPO  
Dwn: RUBEN OCAMPO  
Chk: RAY CHIN  
File Name: PSM2012-0300-0005D.dwg  
Date: 12/20/2011  
Date: 12/20/2011  
Date: 4/29/2012

Dwg. No. PSM2012-0300-0005D  
Sht. No. M-104  
Classification UNCLASSIFIED/UNLIMITED RELEASE

**NOTES**

- 1 REPLACE EXISTING NIPPLE AND HOSE FITTING WITH NEW GALV. STEEL NIPPLE ASTM A120 AND 3"x3"x1-1/2" RED. TEE GALV. IRON ASME/ANSI B16.3 CLASS 150.
- 2 3"-125# LUGGED RESILIENT SEATED BUTTERFLY VALVE, 316 S.S. DISC, FOOD GRADE EPDM SEAT, KEYSTONE AR2 OR EQUAL, WITH MATCHING CLASS 150# ANSI B16.5 GALVANIZED STEEL SCREWED FLANGES.
- 3 RE-INSTALL 3" MPT X HOSE FITTING WITH CAP, AFTER BUTTERFLY VALVE.
- 4 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 5 1/2" 125# BALL VALVE, BRONZE BODY, STAINLESS STEEL BALL AND STEM, TEFLON SEATS AND SEALS, SCREWED ENDS.
- 6 4.5" PRESSURE GAUGE, 0-30 PSIG RANGE, PROVIDE BLOCK VALVE.
- 7 SWAGED NIPPLE 1-1/2"x1-1/4" COPPER, SCH 40.
- 8 SWAGED NIPPLE 1-1/2"x1" COPPER, SCH 40.
- 9 1-1/2" 125# SCREWED BRONZE CHECK VALVE, S.S. TRIM, SCREWED CAP.
- 10 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 11 1-1/2" COPPER PIPING PER ASTM B88 TYPE L AND COPPER SOLDER FITTINGS PER ASME/ANSI B16.22, EXCEPT SCREWED SCH 40 COPPER NIPPLES AND SCREWED CAST BRONZE FITTINGS PER ASME/ANSI B16.15 CLASS 125.
- 12 FULL CONE SPRAY NOZZLE, BRASS, 1-1/4" FEMALE NPT, 20 GPM @ 7 PSIG CAPACITY, SPRAYING SYSTEMS PART # 1-1/4H-20 (SEE P.O. U1545882). INSTALL NOZZLE AS HIGH AS POSSIBLE DIRECTING THE DISCHARGE 45 DEGREE DOWNWARD TOWARDS THE CENTER OF THE TANK. SUPPORT RISER PIPING WITH BRACKETS MOUNTED ON THE FLANGES OF THE TANK SHELL, USING TWO TANK FLANGE BOLTS SPACED AT LEAST 3-SUCCESSIVE BOLT SPACING APART.
- 13 ROUTE PIPING ON THE ROOF TO SUIT AVAILABLE MEANS TO SUPPORT PIPE. ALLOW 3' X 3' ACCESS CLEARANCE FROM LADDER SIDE OF THE MANHOLE.
- 14 PROVIDE BREAK UNION FOR REMOVAL OF MANHOLE COVER.
- 15 AIR RELEASE VALVE, 1/16" ORIFICE, 1/2" NPT INLET.
- 16 ALL NEW WATER PIPING, VALVES & PUMP SHALL BE HEAT TRACED AND INSULATED, IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:
- 17 HEAT TRACING SYSTEM SHALL BE CHROMALOX OR EQUAL, OF THE SELF REGULATING TYPE, 3-WATT/FT, 120V, COPPER OVERBRAID, COMPLETE WITH SUITABLE ACCESSORIES AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. CABLE LENGTH SHALL NOT EXCEED THAT FOR THE 15 AMP CIRCUIT BREAKER. SEE PROJECT ELECTRICAL DRAWINGS FOR POWER SUPPLY LOCATION. ENCLOSURES SHALL BE NEMA 4X. TEMPERATURE CONTROL SHALL BE PIPE WALL SENSING BULB AND CAPILLARY TYPE, STRAPPED TO PIPE CLOSEST TO POWER SUPPLY. PROVIDE ONE END SEAL WITH SIGNAL LIGHT PER CIRCUIT FOR INDICATION OF HEATING ACTIVATION, LOCATED AT SUCTION PIPING WHERE IT SHOULD BE MADE VISIBLE FROM GRADE. CABLE WRAPPING FACTOR SHALL BE 1.0 FOR 1.5" PIPE, AND 1.5 FOR 3" PIPE (3" PITCH). PROVIDE 5 FT CABLE ALLOWANCE FOR PUMP.

PIPE INSULATION SHALL BE 1" THICK FIBERGLASS INSULATION WITH ALL-WEATHER SERVICE JACKET. ACCEPTABLE SUBSTITUTE INSULATION IS PIPE INSULATION WITH K=0.23 BTU-IN/(HR-SQ FT-F) OR LESS @ 0°F (EQUIVALENT TO FIBERGLASS) AND IS NON-CORROSIVE TO THE PIPE. PUMP SHALL BE INSULATED WITH REMOVABLE/REUSABLE INSULATION BLANKET, THERMAL ENERGY PRODUCTS (TEP) "ENERGY WRAP" OR EQUIVALENT.



PE Stamps



Project Title  
**SITE 300 WATER TANKS  
NEW CIRCULATING WATER  
PUMP INSTALLATION**

REV. No.	DATE	REVISIONS	DRAWN BY	CHECK BY
1	4/26/12	ISSUED FOR CONSTRUCTION	RO	RC

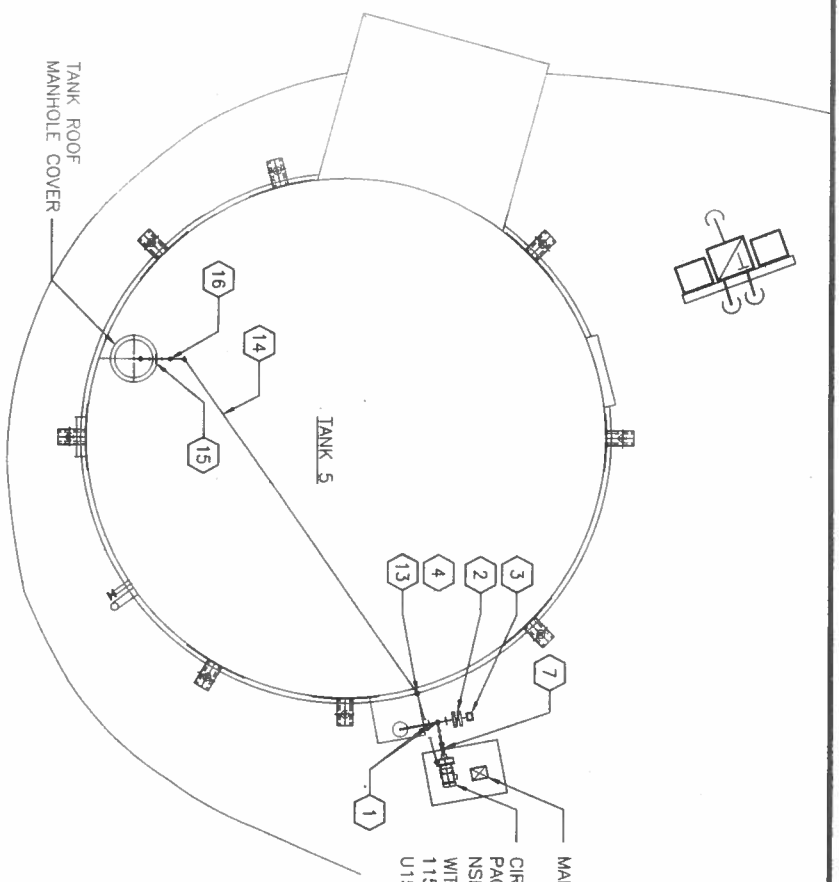
Des: RUBEN OCAMPO 12/22/2011  
Dwn: RUBEN OCAMPO 12/22/2011  
Chk: RAY CHIN 04/25/2012  
File Name: PSM2012-0300-0006D.dwg  
Scale: 1/4" = 1'-0"  
P/N: AS NOTED  
AutocAD 2010

Sheet Title  
**PIPING PLAN - TANK 5  
CIRCULATING WATER  
PUMP INSTALLATION AND  
P & I DIAGRAM**

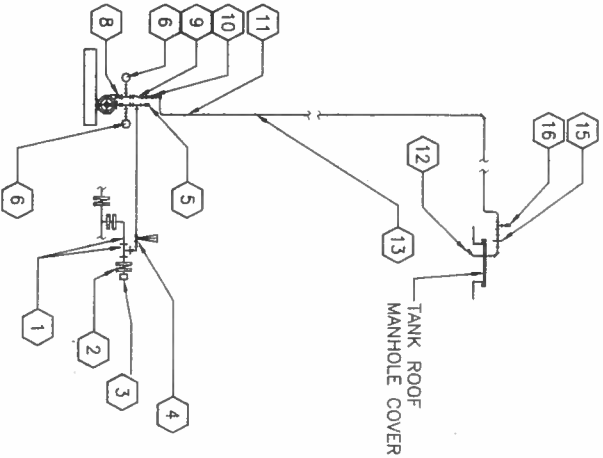
Dwg. No. **PSM2012-0300-0006D**

Sht. No. **M-105** 6 of 12

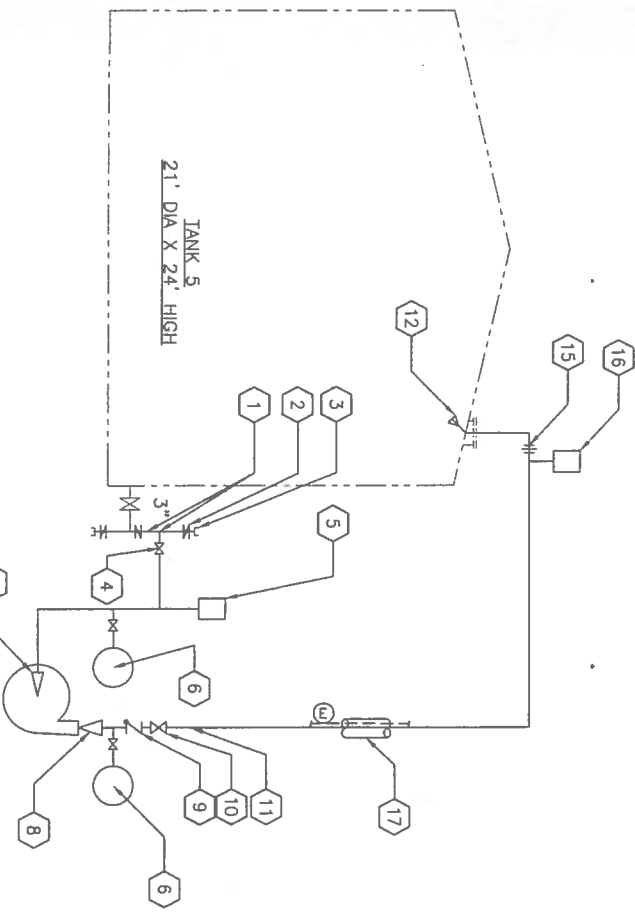
Classification  
UNCLASSIFIED/UNLIMITED RELEASE



**PIPING PLAN**  
**CIRCULATING WATER PUMP PCW-002 INSTALLATION**  
SCALE: 1/4"=1'-0"

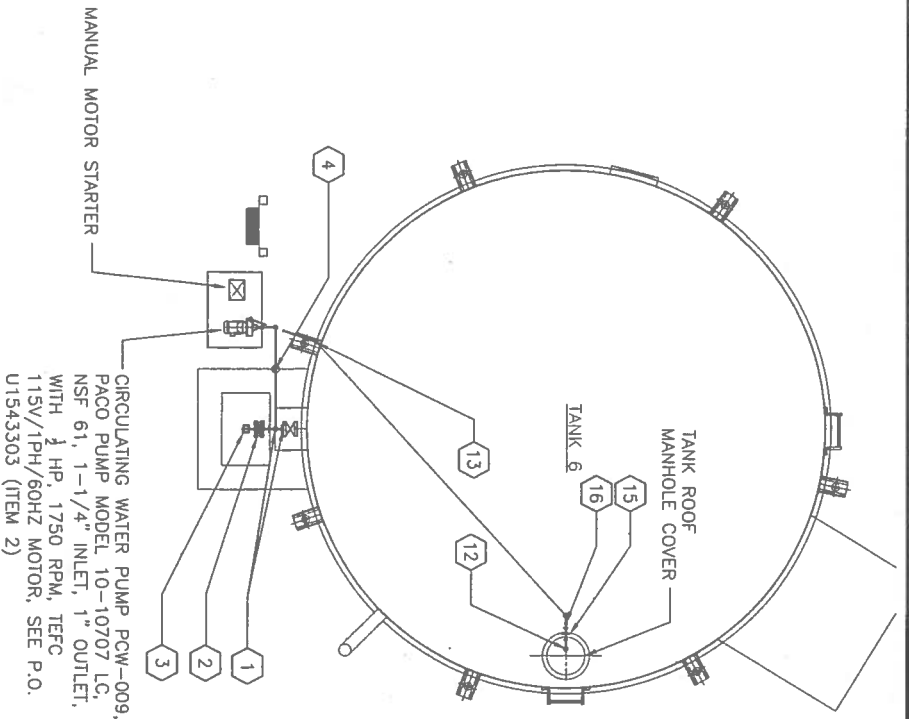


**PIPING ELEVATION**  
**CIRCULATING PUMP PCW-002 INSTALLATION**  
SCALE: NONE



**PIPING & INSTRUMENT DIAGRAM**  
**CIRCULATING PUMP PCW-002 INSTALLATION**  
SCALE: NONE

CIRCULATING WATER PUMP PCW-002,  
PACO PUMP MODEL 10-10707 LC, NSF  
61, 1-1/4" INLET, 1" OUTLET, WITH 1/2  
HP, 1750 RPM, TEFC 115V/1PH/60HZ  
MOTOR, SEE P.O. U1543303 (ITEM 2)



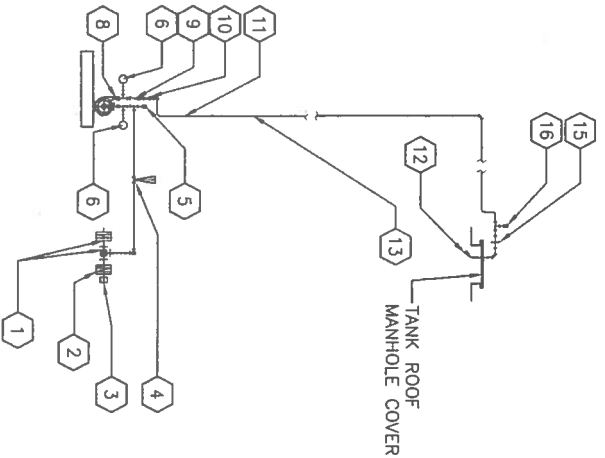
MANUAL MOTOR STARTER  
CIRCULATING WATER PUMP PCW-009,  
PACO PUMP MODEL 10-10707 LC,  
NSF 61, 1-1/4" INLET, 1" OUTLET,  
WITH 1/2 HP, 1750 RPM, TEFC  
115V/1PH/60HZ MOTOR, SEE P.O.  
U1543303 (ITEM 2)

**PIPING PLAN**

**CIRCULATING WATER PUMP PCW-009 INSTALLATION**



SCALE: 1/4"=1'-0"



**PIPING ELEVATION**

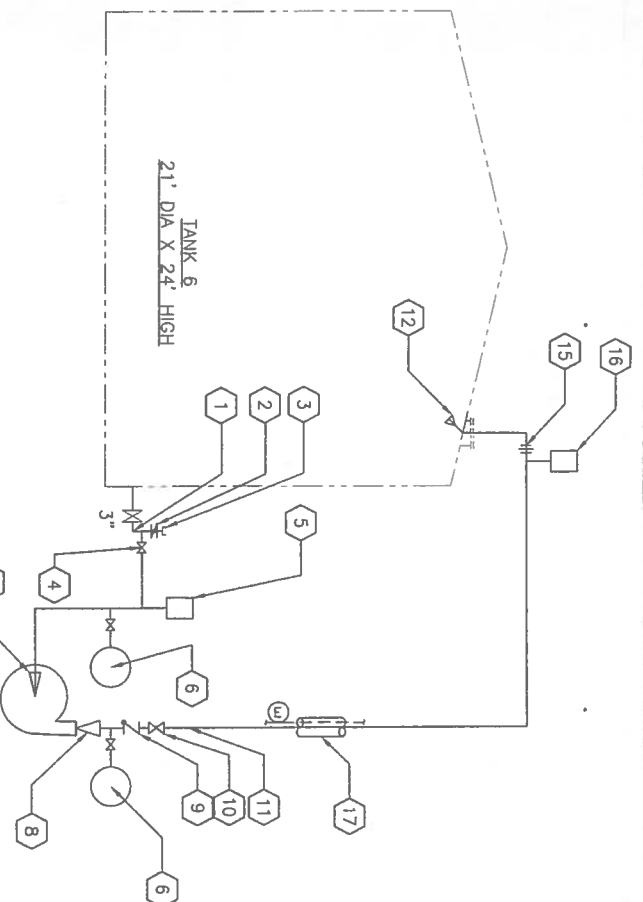
**CIRCULATING PUMP PCW-009 INSTALLATION**

SCALE: NONE

**NOTES**

- 1 REPLACE EXISTING NIPPLE AND HOSE FITTING WITH NEW GALV. STEEL NIPPLE ASTM A120 AND 3"x3"x1-1/2" RED. TEE GALV. IRON ASME/ANSI B16.3 CLASS 150.
- 2 3"-125# LUGGED RESILIENT SEATED BUTTERFLY VALVE, 316 S.S. DISC, FOOD GRADE EPDM SEAT, KEYSTONE AR2 OR EQUAL, WITH MATCHING CLASS 150FF ANSI B16.5 GALVANIZED STEEL SCREWED FLANGES.
- 3 RE-INSTALL 3" MPT X HOSE FITTING WITH CAP, AFTER BUTTERFLY VALVE.
- 4 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 5 1/2" 125# BALL VALVE, BRONZE BODY, STAINLESS STEEL BALL AND STEM, TEFLON SEATS AND SEALS, SCREWED ENDS.
- 6 4.5" PRESSURE GAUGE, 0-30 PSIG RANGE, PROVIDE BLOCK VALVE.
- 7 SWAGED NIPPLE 1-1/2"x1-1/4" COPPER, SCH 40.
- 8 SWAGED NIPPLE 1-1/2"x1" COPPER, SCH 40.
- 9 1-1/2" 125# SCREWED BRONZE CHECK VALVE, S.S. TRIM, SCREWED CAP.
- 10 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 11 1-1/2" COPPER PIPING PER ASTM B88 TYPE L AND COPPER SOLDER FITTINGS PER ASME/ANSI B16.15 CLASS 125.
- 12 FULL CONE SPRAY NOZZLE, BRASS, 1-1/4" FEMALE NPT, 20 GPM @ 7 PSIG CAPACITY, SPRAYING SYSTEMS PART # 1-1/4H-20 (SEE P.O. U1545882). INSTALL NOZZLE AS HIGH AS POSSIBLE DIRECTING THE DISCHARGE 45 DEGREE DOWNWARD TOWARDS THE CENTER OF THE TANK.
- 13 SUPPORT RISER PIPING WITH BRACKETS MOUNTED ON THE FLANGES OF THE TANK SHELL, USING TWO TANK FLANGE BOLTS SPACED AT LEAST 3-SUCCESSIVE BOLT SPACING APART.
- 14 ROUTE PIPING ON THE ROOF TO SUIT AVAILABLE MEANS TO SUPPORT PIPE. ALLOW 3' X 3' ACCESS CLEARANCE FROM LADDER SIDE OF THE MANHOLE.
- 15 PROVIDE BREAK UNION FOR REMOVAL OF MANHOLE COVER.
- 16 AIR RELEASE VALVE, 1/16" ORIFICE, 1/2" NPT INLET.
- 17 ALL NEW WATER PIPING, VALVES & PUMP SHALL BE HEAT TRACED AND INSULATED, IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:

HEAT TRACING SYSTEM SHALL BE CHROMALOX OR EQUAL, OF THE SELF REGULATING TYPE, 3-WATT/FT, 120V, COPPER OVERBRAID, COMPLETE WITH SUITABLE ACCESSORIES AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. CABLE LENGTH SHALL NOT EXCEED THAT FOR THE 15 AMP CIRCUIT BREAKER. SEE PROJECT ELECTRICAL DRAWINGS FOR POWER SUPPLY LOCATION. ENCLOSURES SHALL BE NEMA 4X. TEMPERATURE CONTROL SHALL BE PIPE WALL SENSING BULB AND CAPILLARY TYPE, STRAPPED TO PIPE CLOSEST TO POWER SUPPLY. PROVIDE ONE END SEAL WITH SIGNAL LIGHT PER CIRCUIT FOR INDICATION OF HEATING ACTIVATION, LOCATED AT SUCTION PIPING WHERE IT SHOULD BE MADE VISIBLE FROM GRADE. CABLE WRAPPING FACTOR SHALL BE 1.0 FOR 1.5" PIPE, AND 1.5 FOR 3" PIPE (3" PITCH). PROVIDE 5 FT CABLE ALLOWANCE FOR PUMP. PIPE INSULATION SHALL BE 1" THICK FIBERGLASS INSULATION WITH ALL-WEATHER SERVICE JACKET. ACCEPTABLE SUBSTITUTE INSULATION IS PIPE INSULATION WITH K=0.23 BTU-IN/(HR-SQ FT-F) OR LESS @ 0°F (EQUIVALENT TO FIBERGLASS) AND IS NON-CORROSIVE TO THE PIPE. PUMP SHALL BE INSULATED WITH REMOVABLE/REUSABLE INSULATION BLANKET, THERMAL ENERGY PRODUCTS (TEP) "ENERGY WRAP" OR EQUIVALENT.



CIRCULATING WATER PUMP PCW-009,  
PACO PUMP MODEL 10-10707 LC, NSF  
61, 1-1/4" INLET, 1" OUTLET, WITH  
1/2 HP, 1750 RPM, TEFC 115V/1PH/60HZ  
MOTOR, SEE P.O. U1543303 (ITEM 2)

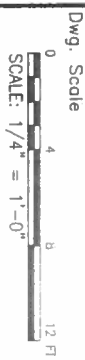
**PIPING & INSTRUMENT DIAGRAM**

**CIRCULATING PUMP PCW-009 INSTALLATION**

SCALE: NONE

**Lawrence Livermore National Laboratory**  
P.O. Box 808 Livermore, California 94551

**F&I Facilities & Infrastructure**  
Consultants



Project Title  
**SITE 300 WATER TANKS  
NEW CIRCULATING WATER  
PUMP INSTALLATION**

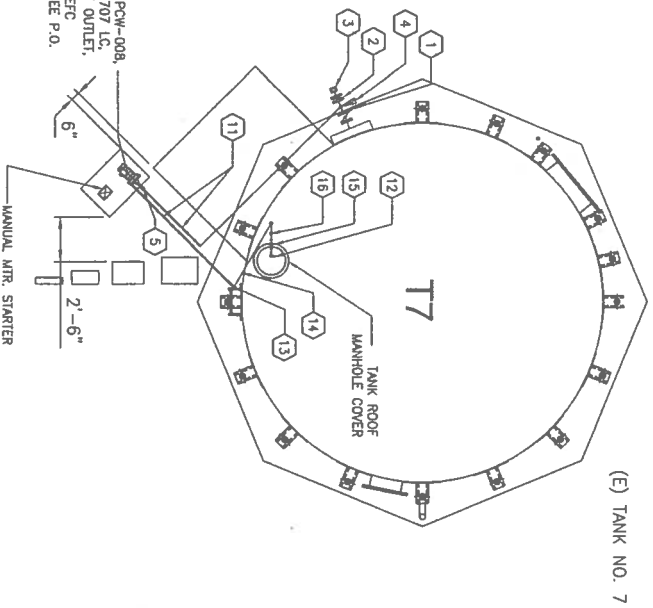
REV/NO	DATE	REVISIONS	APP'D	CHK'D
0	4/26/12	ISSUED FOR CONSTRUCTION	RO	RC

Des:	RUBEN OCAMPO	01/02/2012
Dwn:	RUBEN OCAMPO	01/02/2012
Chk:	RAY CHIN	4/25/2012
File Name:	PSM2012-0300-0007D.dwg	
PFNID:	Scale: AS NOTED	Software: AutoCAD 2010

Dwg. No.	PSM2012-0300-0007D
Sht. No.	M-106
Classification	UNCLASSIFIED/UNLIMITED RELEASE

**NOTES**

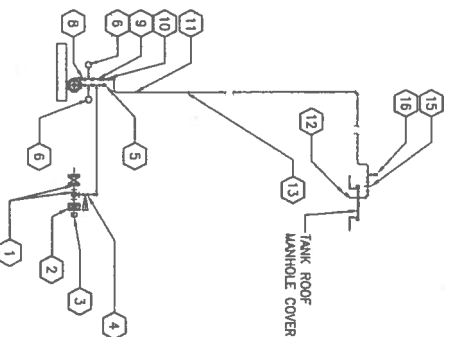
- 1 REPLACE EXISTING NIPPLE AND HOSE FITTING WITH NEW GALV. STEEL NIPPLE ASTM A120 AND 3"x3"x1-1/2" RED. TEE GALV. IRON ASME/ANSI B16.3 CLASS 150.
- 2 3"-125# LUGGED RESILIENT SEATED BUTTERFLY VALVE, 316 S.S. DISC, FOOD GRADE EPDM SEAT, KEYSTONE AR2 OR EQUAL, WITH MATCHING CLASS 150FF ANSI B16.5 GALVANIZED STEEL SCREWED FLANGES.
- 3 RE-INSTALL 3" MPT X HOSE FITTING WITH CAP, AFTER BUTTERFLY VALVE.
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- 6 4.5" PRESSURE GAUGE, 0-50 PSIG RANGE, PROVIDE BLOCK VALVE.
- 7 SWAGED NIPPLE 1-1/2"x1-1/4" COPPER, SCH 40.
- 8 SWAGED NIPPLE 1-1/2"x1" COPPER, SCH 40.
- 9 1-1/2" 125# SCREWED BRONZE CHECK VALVE, S.S. TRIM, SCREWED CAP.
- 10 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 11 1-1/2" COPPER PIPING PER ASTM B88 TYPE L AND COPPER SOLDER FITTINGS PER ASME/ANSI B16.15 CLASS 125.
- 12 FULL CONE SPRAY NOZZLE, BRASS, 1-1/4" FEMALE NPT, 20 GPM @ 7 PSIG CAPACITY, SPRAYING SYSTEMS PART # 1-1/4H-20 (SEE P.O. U1545882) INSTALL NOZZLE AS HIGH AS POSSIBLE DIRECTING THE DISCHARGE 45 DEGREE DOWNWARD TOWARDS THE CENTER OF THE TANK.
- 13 SUPPORT RISER PIPING WITH BRACKETS MOUNTED ON THE LADDER SUPPORT.
- 14 ROUTE PIPING ON THE ROOF TO SUIT AVAILABLE MEANS TO SUPPORT PIPE. ALLOW 3' X 3' ACCESS CLEARANCE FROM LADDER SIDE OF THE MANHOLE.
- 15 PROVIDE BREAK UNION FOR REMOVAL OF MANHOLE COVER.
- 16 AIR RELEASE VALVE, 1/16" ORIFICE, 1/2" NPT INLET.
- 17 ALL NEW WATER PIPING, VALVES & PUMP SHALL BE HEAT TRACED AND INSULATED, IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:  
HEAT TRACING SYSTEM SHALL BE CHROMALOX OR EQUAL, OF THE SELF REGULATING TYPE, 3-WATT/FT, 120V, COPPER OVERBRAID, COMPLETE WITH SUITABLE ACCESSORIES AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. CABLE LENGTH SHALL NOT EXCEED THAT FOR THE 15 AMP CIRCUIT BREAKER. SEE PROJECT ELECTRICAL DRAWINGS FOR POWER SUPPLY LOCATION. ENCLOSURES SHALL BE NEMA 4X. TEMPERATURE CONTROL SHALL BE PIPE WALL SENSING BULB AND CAPILLARY TYPE, STRAPPED TO PIPE CLOSEST TO POWER SUPPLY. PROVIDE ONE END SEAL WITH SIGNAL LIGHT PER CIRCUIT FOR INDICATION OF HEATING ACTIVATION. LOCATED AT SUCTION PIPING WHERE IT SHOULD BE MADE VISIBLE FROM GRADE.  
CABLE WRAPPING FACTOR SHALL BE 1.0 FOR 1.5" PIPE, AND 1.5 FOR 3" PIPE (3" PITCH). PROVIDE 5 FT CABLE ALLOWANCE FOR PUMP.  
PIPE INSULATION SHALL BE 1" THICK FIBERGLASS INSULATION WITH ALL-WEATHER SERVICE JACKET. ACCEPTABLE SUBSTITUTE INSULATION IS PIPE INSULATION WITH K=0.23 BTU-IN/(HR-SO FT--F) OR LESS @ 0" F (EQUIVALENT TO FIBERGLASS) AND IS NON-CORROSIVE TO THE PIPE.  
PUMP SHALL BE INSULATED WITH REMOVABLE/REUSABLE INSULATION BLANKET, THERMAL ENERGY PRODUCTS (TEP) "ENERGY WRAP" OR EQUIVALENT.



**PIPING PLAN**

**CIRCULATING WATER PUMP PCW-008 INSTALLATION**

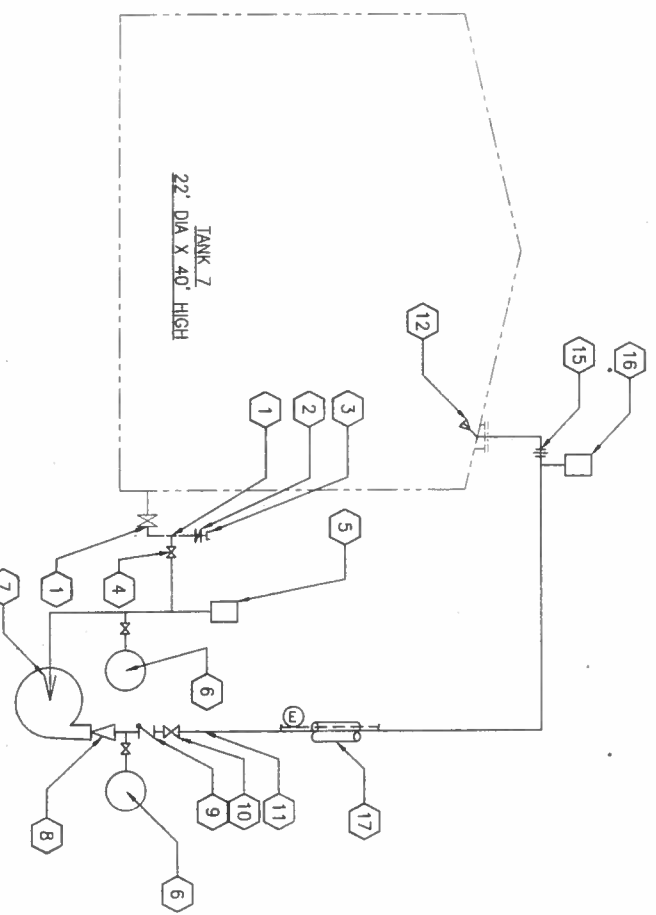
SCALE: 1/4" = 1'-0"



**PIPING ELEVATION**

**CIRCULATING PUMP PCW-008 INSTALLATION**

SCALE: NONE



**PIPING & INSTRUMENT DIAGRAM**

**CIRCULATING PUMP PCW-008 INSTALLATION**

SCALE: NONE

Lawrence Livermore  
National Laboratory  
P.O. Box 808 Livermore, California 94551

**F&I** Facilities & Infrastructure

Consultants

Dwg. Scale  
0 4 8 12 FT  
SCALE: 1/4" = 1'-0"

PE Stamps

REGISTERED PROFESSIONAL ENGINEER  
No. A17842  
Exp. 09/30/13  
STATE OF CALIFORNIA  
RUBEN OCAMPO  
5/2/2012

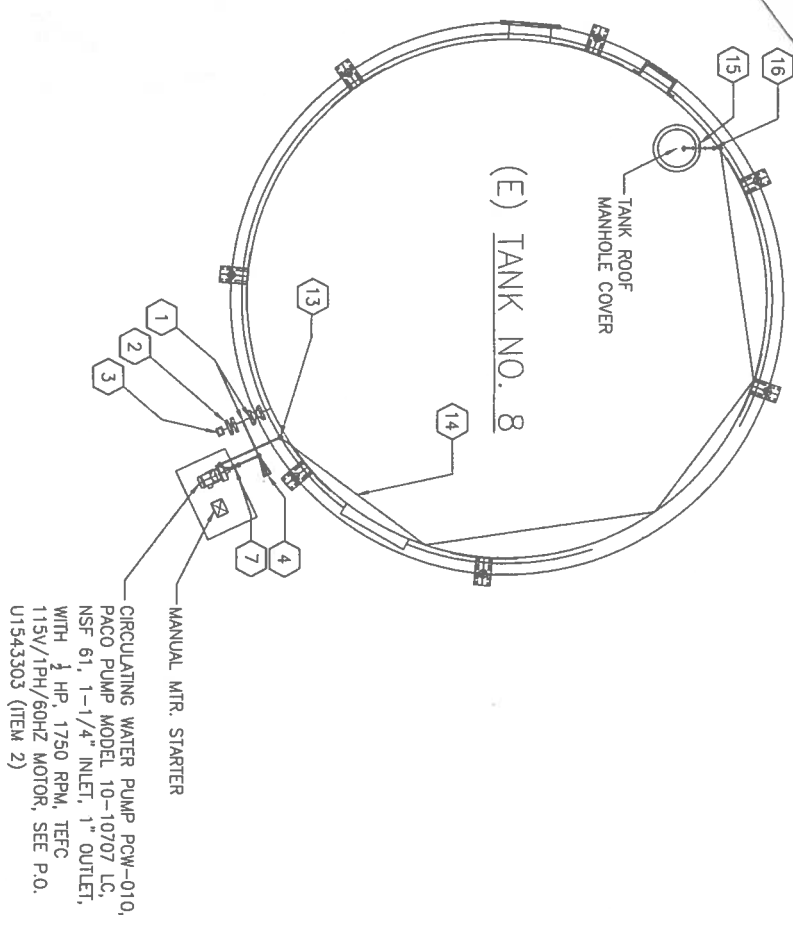
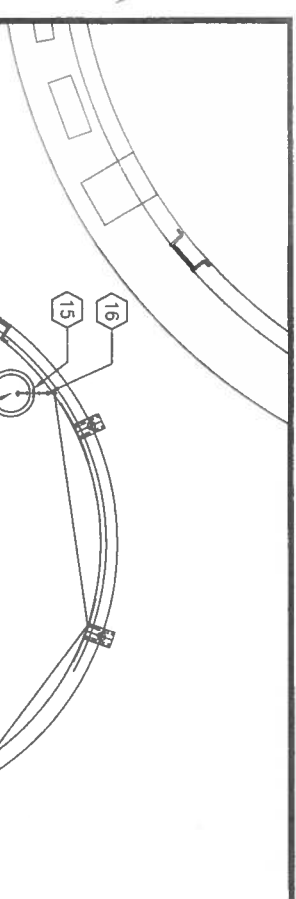
Project Title  
**SITE 300 WATER TANKS  
NEW CIRCULATING WATER  
PUMP INSTALLATION**

REV	DATE	REVISIONS	DWN	CHK
0	4/26/12	ISSUED FOR CONSTRUCTION		

Des: RUBEN OCAMPO 2/02/2012  
Dwn: RUBEN OCAMPO 2/02/2012  
Chk: RAY CHIN 4/25/2012  
File Name: PSM2012-0300-0008D.dwg  
PFNID: AS NOTED  
AutocAD 2010

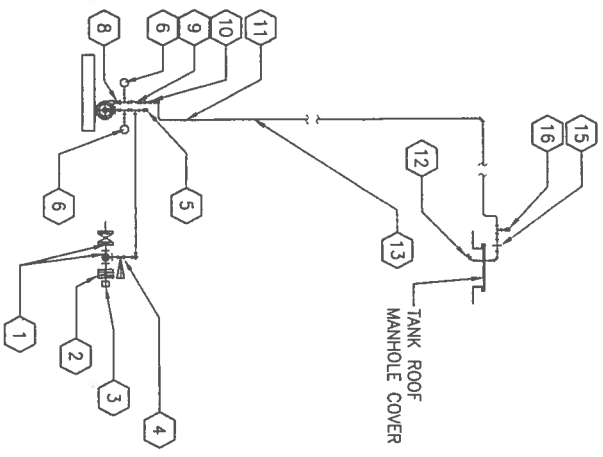
Sheet Title  
**PIPING PLAN - TANK 7  
CIRCULATING WATER  
PUMP INSTALLATION AND  
P&I DIAGRAM**

Dwg. No. PSM2012-0300-0008D  
Sht. No. M-107 8 of 12  
Classification UNCLASSIFIED/UNLIMITED RELEASE



**PIPING PLAN**

CIRCULATING WATER PUMP PCW-010 INSTALLATION  
SCALE: 1/4"=1'-0"



**PIPING ELEVATION**

CIRCULATING PUMP PCW-010 INSTALLATION  
SCALE: NONE

**NOTES**

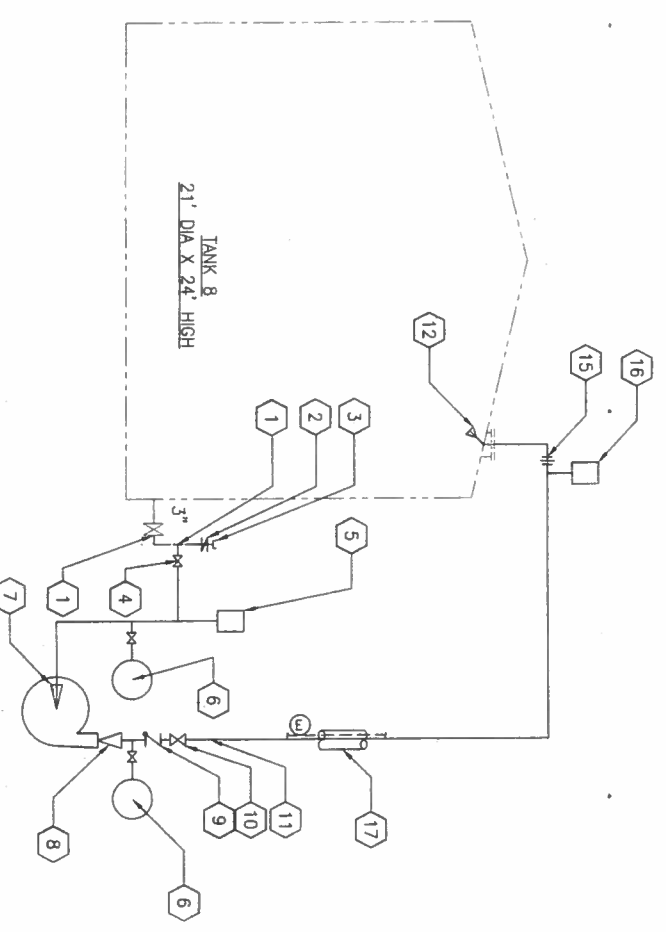
- 1 REPLACE EXISTING NIPPLE AND HOSE FITTING WITH NEW GALV. STEEL NIPPLE ASTM A120 AND 3"x3"x1-1/2" RED. TEE GALV. IRON ASME/ANSI B16.3 CLASS 150.
- 2 3"-125# LUGGED RESILIENT SEATED BUTTERFLY VALVE, 316 S.S. DISC, FOOD GRADE EPDM SEAT, KEYSTONE AR2 OR EQUAL, WITH MATCHING CLASS 150FF ANSI B16.5 GALVANIZED STEEL SCREWED FLANGES.
- 3 RE-INSTALL 3" MPT X HOSE FITTING WITH CAP, AFTER BUTTERFLY VALVE.
- 4 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 5 1/2" 125# BALL VALVE, BRONZE BODY, STAINLESS STEEL BALL AND STEM, TEFLON SEATS AND SEALS, SCREWED ENDS.
- 6 4.5" PRESSURE GAUGE, 0-30 PSIG RANGE, PROVIDE BLOCK VALVE.
- 7 SWAGED NIPPLE 1-1/2"x1-1/4" COPPER, SCH 40.
- 8 SWAGED NIPPLE 1-1/2"x1" COPPER, SCH 40.
- 9 1-1/2" 125# SCREWED BRONZE CHECK VALVE, S.S. TRIM, SCREWED CAP.
- 10 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 11 1-1/2" COPPER PIPING PER ASTM B88 TYPE L AND COPPER SOLDER FITTINGS PER ASME/ANSI B16.15 CLASS 125.
- 12 FULL CONE SPRAY NOZZLE, BRASS, 1-1/4" FEMALE NPT, 20 GPM @ 7 PSIG CAPACITY, SPRAYING SYSTEMS PART # 1-1/4H-20 (SEE P.O. U1545882). INSTALL NOZZLE AS HIGH AS POSSIBLE DIRECTING THE DISCHARGE 45 DEGREE DOWNWARD TOWARDS THE CENTER OF THE TANK.
- 13 SUPPORT RISER PIPING WITH BRACKETS MOUNTED ON THE FLANGES OF THE TANK SHELL, USING TWO TANK FLANGE BOLTS SPACED AT LEAST 3-SUCCESSIVE BOLT SPACING APART.
- 14 ROUTE PIPING ON THE ROOF TO SUIT AVAILABLE MEANS TO SUPPORT PIPE. ALLOW 3' X 3' ACCESS CLEARANCE FROM LADDER SIDE OF THE MANHOLE.
- 15 PROVIDE BREAK UNION FOR REMOVAL OF MANHOLE COVER.
- 16 AIR RELEASE VALVE, 1/16" ORIFICE, 1/2" NPT INLET.
- 17 ALL NEW WATER PIPING, VALVES & PUMP SHALL BE HEAT TRACED AND INSULATED, IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:

HEAT TRACING SYSTEM SHALL BE CHROMALOX OR EQUAL, OF THE SELF REGULATING TYPE, 3-WATT/FT, 120V, COPPER OVERBRAD, COMPLETE WITH SUITABLE ACCESSORIES AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. CABLE LENGTH SHALL NOT EXCEED THAT FOR THE 15 AMP CIRCUIT BREAKER. SEE PROJECT ELECTRICAL DRAWINGS FOR POWER SUPPLY LOCATION. ENCLOSURES SHALL BE NEMA 4X. TEMPERATURE CONTROL SHALL BE PIPE WALL SENSING BULB AND CAPILLARY TYPE, STRAPPED TO PIPE CLOSEST TO POWER SUPPLY. PROVIDE ONE END SEAL WITH SIGNAL LIGHT PER CIRCUIT FOR INDICATION OF HEATING ACTIVATION, LOCATED AT SUCCTION PIPING WHERE IT SHOULD BE MADE VISIBLE FROM GRADE.

CABLE WRAPPING FACTOR SHALL BE 1.0 FOR 1.5" PIPE, AND 1.5 FOR 3" PIPE (3" PITCH). PROVIDE 5 FT CABLE ALLOWANCE FOR PUMP.

PIPE INSULATION SHALL BE 1" THICK FIBERGLASS INSULATION WITH ALL-WEATHER SERVICE JACKET. ACCEPTABLE SUBSTITUTE INSULATION IS PIPE INSULATION WITH K=0.23 BTU-IN/(HR-SQ FT-F) OR LESS @ 0" F. (EQUIVALENT TO FIBERGLASS) AND IS NON-CORROSIVE TO THE PIPE.

PUMP SHALL BE INSULATED WITH REMOVABLE/REUSABLE INSULATION BLANKET, THERMAL ENERGY PRODUCTS (TEP) "ENERGY WRAP" OR EQUIVALENT.



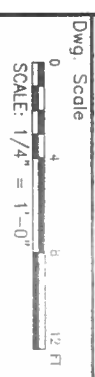
CIRCULATING WATER PUMP PCW-010, PACO PUMP MODEL 10-10707 LC, NSF 61, 1-1/4" INLET, 1" OUTLET, WITH 1/2 HP, 1750 RPM, TEFC 115V/1PH/60HZ MOTOR, SEE P.O. U1543303 (ITEM 2)

**PIPING & INSTRUMENT DIAGRAM**

CIRCULATING PUMP PCW-010 INSTALLATION  
SCALE: NONE

**Lawrence Livermore National Laboratory**  
P.O. Box 808 Livermore, California 94551

**F&I Facilities & Infrastructure**  
Consultants



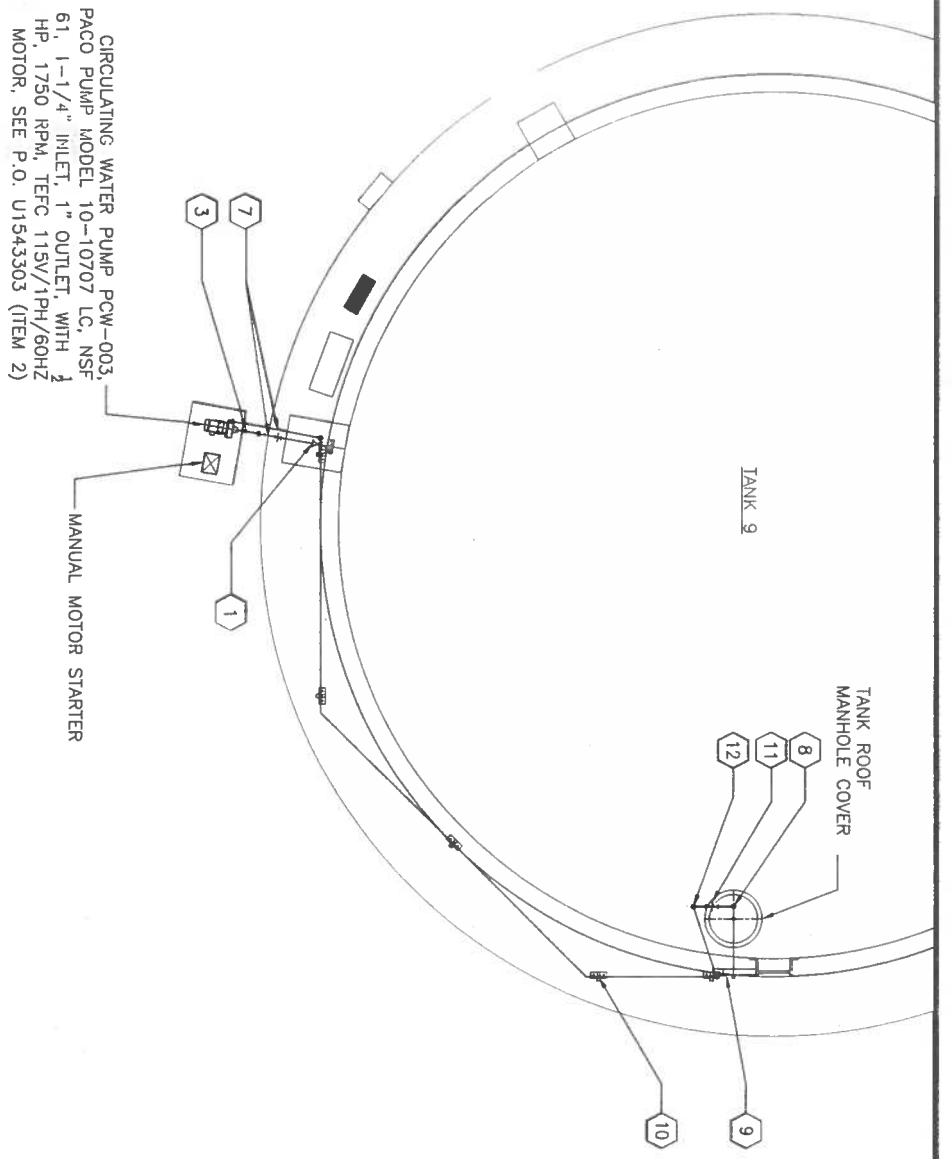
Project Title  
**SITE 300 WATER TANKS NEW CIRCULATING WATER PUMP INSTALLATION**

REV	DATE	REVISION	DRN	CHK
0	4/26/12	ISSUED FOR CONSTRUCTION	RO	RC

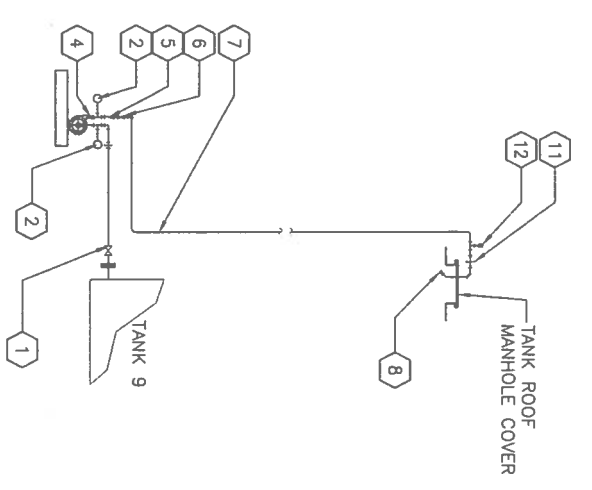
Des	RUBEN OCAMPO	2/02/2012
Dwn	RUBEN OCAMPO	2/02/2012
Chk	RAY CHIN	4/25/2012
File Name	PSM2012-0300-0009D.dwg	
PFNID	Scale AS NOTED	2 fl y or e
	AS NOTED	AutoCAD 2010

Sheet Title  
**PIPING PLAN - TANK 8 CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM**

Dwg. No. PSM2012-0300-0009D  
Sht. No. M-108  
Classification UNCLASSIFIED/UNLIMITED RELEASE



**SITE PIPING PLAN**  
**CIRCULATION PUMP PCW-003 INSTALLATION**  
 SCALE: 1/4"=1'-0"



**PIPING ELEVATION**  
**CIRCULATION PUMP PCW-003 INSTALLATION**  
 SCALE: NONE

**NOTES**

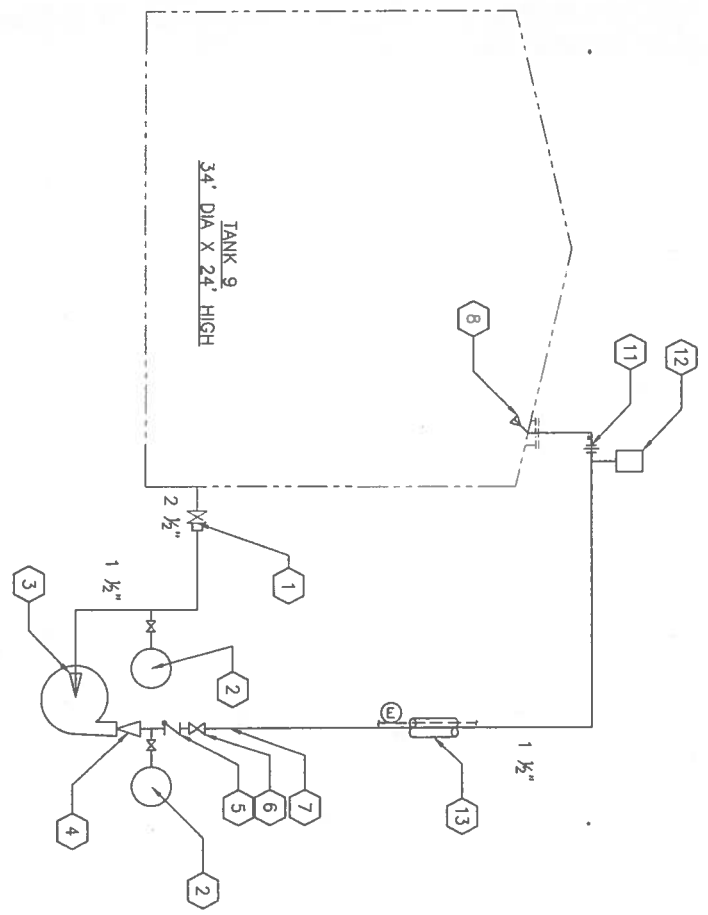
- 1 REMOVE EXISTING PLUG AND REPLACE WITH 2 1/2" X 1 1/2" REDUCING BUSHING.
- 2 4.5" PRESSURE GAUGE, 0-30 PSIG RANGE, PROVIDE BLOCK VALVE. LOCATE GAUGE DIAL FACES OF SUCTION AND DISCHARGE AT SAME ELEVATIONS AS MUCH AS POSSIBLE.
- 3 SWAGED NIPPLE 1-1/2"X1-1/4" COPPER, SCH 40.
- 4 SWAGED NIPPLE 1-1/2"X1" COPPER, SCH 40.
- 5 1-1/2" 125# SCREWED BRONZE CHECK VALVE, S.S. TRIM, SCREWED CAP.
- 6 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 7 1-1/2" COPPER PIPING PER ASTM B88 TYPE L AND COPPER SOLDER FITTINGS PER ASME/ANSI B31.22. EXCEPT SCREWED SCH 40 COPPER NIPPLES AND SCREWED CAST BRONZE FITTINGS PER ASME/ANSI B16.15 CLASS 125.
- 8 FULL CONE SPRAY NOZZLE, BRASS, 1-1/4" FEMALE NPT, 20 GPM @ 7 PSIG CAPACITY, SPRAYING SYSTEMS PART # 1-1/4H-20 (SEE P.O. U1545882). INSTALL NOZZLE AS HIGH AS POSSIBLE DIRECTING THE DISCHARGE 45 DEGREE DOWNWARD TOWARDS THE CENTER OF THE TANK.
- 9 SUPPORT RISER PIPING WITH COOPER B-LINE B-22 STRUT EXTENSIONS ALONG LADDER USING COOPER B-129 2-HOLE SPLICE PLATE, AND B-2011DCU CLAMP.
- 10 SUPPORT PIPING WITH COOPER B-LINE B-22 STRUT, B-2011DCU CLAMP AND 280FL POST BASE ANCHORED ON TANK FOUNDATION.
- 11 PROVIDE BREAK UNION FOR REMOVAL OF MANHOLE COVER.
- 12 AIR RELEASE VALVE, 1/16" ORIFICE, 1/2" NPT INLET.
- 13 ALL NEW WATER PIPING, VALVES & PUMP SHALL BE HEAT TRACED AND INSULATED, IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:

HEAT TRACING SYSTEM SHALL BE CHROMALOX OR EQUAL, OF THE SELF REGULATING TYPE, 3-WATT/FT, 120V, COPPER OVERBRAID, COMPLETE WITH SUITABLE ACCESSORIES AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. CABLE LENGTH SHALL NOT EXCEED THAT FOR THE 15 AMP CIRCUIT BREAKER. SEE PROJECT ELECTRICAL DRAWINGS FOR POWER SUPPLY LOCATION. ENCLOSURES SHALL BE NEMA 4X. TEMPERATURE CONTROL SHALL BE PIPE WALL SENSING BULB AND CAPILLARY TYPE, STRAPPED TO PIPE CLOSEST TO POWER SUPPLY. PROVIDE ONE END SEAL WITH SIGNAL LIGHT PER CIRCUIT FOR INDICATION OF HEATING ACTIVATION, LOCATED AT SUCTION PIPING WHERE IT SHOULD BE MADE VISIBLE FROM GRADE.

CABLE WRAPPING FACTOR SHALL BE 1.0 FOR 1.5" PIPE, AND 1.5 FOR 3" PIPE (3" PITCH). PROVIDE 5 FT CABLE ALLOWANCE FOR PUMP.

PIPE INSULATION SHALL BE 1" THICK FIBERGLASS INSULATION WITH ALL-WEATHER SERVICE JACKET. ACCEPTABLE SUBSTITUTE INSULATION IS PIPE INSULATION WITH K=0.23 BTU-IN/(HR-SQ FT-F) OR LESS @ 0°F (EQUIVALENT TO FIBERGLASS) AND IS NON-CORROSIVE TO THE PIPE.

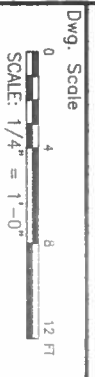
PUMP SHALL BE INSULATED WITH REMOVABLE/REUSABLE INSULATION BLANKET, THERMAL ENERGY PRODUCTS (TEP) "ENERGY WRAP" OR EQUIVALENT.



**PIPING & INSTRUMENT DIAGRAM**  
**CIRCULATION PUMP PCW-003 INSTALLATION**  
 SCALE: NONE

**Lawrence Livermore National Laboratory**  
 P.O. Box 808 Livermore, California 94551

**F&I Infrastructure**  
 Consultants



Project Title  
**SITE 300 WATER TANKS**  
**NEW CIRCULATING WATER**  
**PUMP INSTALLATION**

REGISTERED PROFESSIONAL ENGINEER  
 RUBEN OCAMPO  
 No. A17842  
 Exp. 09/30/13  
 STATE OF CALIFORNIA  
 MECHANICAL ENGINEER

*Rubén Ocampos*  
 5/2/2012

REV No	DATE	REVISIONS	D/WN	CHK
0	4/28/12	ISSUED FOR CONSTRUCTION	RO	RO

Des: RUBEN OCAMPO 01/10/2012  
 Dwn: RUBEN OCAMPO 01/10/2012  
 Chk: RAY CHIN 04/28/2012  
 File Name: PSM2012-0300-0010D.dwg  
 P/NID: Scale: AS NOTED Software: AutoCAD 2010

Sheet Title  
**PIPING PLAN - TANK 9**  
**CIRCULATING WATER PUMP**  
**INSTALLATION AND**  
**P & I DIAGRAM**

Dwg. No. **PSM2012-0300-0010D**

Sht. No. **M-109** 10 of 12

Classification  
**UNCLASSIFIED/UNLIMITED RELEASE**

**NOTES**

- 1 REPLACE EXISTING NIPPLE AND HOSE FITTING WITH NEW GALV. STEEL NIPPLE ASTM A120 AND 3"x3"x1-1/2" RED. TEE GALV. IRON ASME/ANSI B16.3 CLASS 150.
- 2 3"-125# LUGGED RESILIENT SEATED BUTTERFLY VALVE, 316 S.S. DISC, FOOD GRADE EPDM SEAT, KEYSTONE AR2 OR EQUAL, WITH MATCHING CLASS 150FF ANSI B16.5 GALVANIZED STEEL SCREWED FLANGES.
- 3 RE-INSTALL 3" MPT X HOSE FITTING WITH CAP, AFTER BUTTERFLY VALVE.
- 4 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 5 1/2" 125# BALL VALVE, BRONZE BODY, STAINLESS STEEL BALL AND STEM, TEFLON SEATS AND SEALS. SCREWED ENDS.
- 6 4.5" PRESSURE GAUGE, 0-30 PSIG RANGE, PROVIDE BLOCK VALVE.
- 7 SWAGED NIPPLE 1-1/2"x1-1/4" COPPER, SCH 40.
- 8 SWAGED NIPPLE 1-1/2"x1" COPPER, SCH 40.
- 9 1-1/2" 125# SCREWED BRONZE CHECK VALVE, S.S. TRIM, SCREWED CAP.
- 10 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 11 1-1/2" COPPER PIPING PER ASTM B88 TYPE L AND COPPER SOLDER FITTINGS PER ASME/ANSI B16.15 CLASS 125.
- 12 FULL CONE SPRAY NOZZLE, BRASS, 1-1/4" FEMALE NPT, 20 GPM @ 7 PSIG CAPACITY, SPRAYING SYSTEMS PART # 1-1/4H-20 (SEE P.O. U1545882). INSTALL NOZZLE AS HIGH AS POSSIBLE DIRECTING THE DISCHARGE 45 DEGREE DOWNWARD TOWARDS THE CENTER OF THE TANK.
- 13 SUPPORT RISER PIPING WITH BRACKETS MOUNTED ON THE FLANGES OF THE TANK SHELL, USING TWO TANK FLANGE BOLTS SPACED AT LEAST 3-SUCCESSIVE BOLT SPACING APART.
- 14 ROUTE PIPING ON THE ROOF TO SUIT AVAILABLE MEANS TO SUPPORT PIPE. ALLOW 3' X 3' ACCESS CLEARANCE FROM LADDER SIDE OF THE MANHOLE.
- 15 PROVIDE BREAK UNION FOR REMOVAL OF MANHOLE COVER.
- 16 AIR RELEASE VALVE, 1/16" ORIFICE, 1/2" NPT INLET.
- 17 ALL NEW WATER PIPING, VALVES & PUMP SHALL BE HEAT TRACED AND INSULATED, IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:  
 HEAT TRACING SYSTEM SHALL BE CHROMALOX OR EQUAL, OF THE SELF REGULATING TYPE, 3-WATT/FT, 120V, COPPER OVERBRAID, COMPLETE WITH SUITABLE ACCESSORIES AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. CABLE LENGTH SHALL NOT EXCEED THAT FOR THE 15 AMP CIRCUIT BREAKER. SEE PROJECT ELECTRICAL DRAWINGS FOR POWER SUPPLY LOCATION. ENCLOSURES SHALL BE NEMA 4X. TEMPERATURE CONTROL SHALL BE PIPE WALL SENSING BULB AND CAPILLARY TYPE, STRAPPED TO PIPE CLOSEST TO POWER SUPPLY. PROVIDE ONE END SEAL WITH SIGNAL LIGHT PER CIRCUIT FOR INDICATION OF HEATING ACTIVATION, LOCATED AT SUCTION PIPING WHERE IT SHOULD BE MADE VISIBLE FROM GRADE.  
 CABLE WRAPPING FACTOR SHALL BE 1.0 FOR 1.5" PIPE, AND 1.5 FOR 3" PIPE (3" PITCH). PROVIDE 5 FT CABLE ALLOWANCE FOR PUMP.  
 PIPE INSULATION SHALL BE 1" THICK FIBERGLASS INSULATION WITH ALL-WEATHER SERVICE JACKET. ACCEPTABLE SUBSTITUTE INSULATION IS P P INSULATION WITH K=0.23 BTU-IN/HR-SQ. FT.-F. OR LESS @ 0.1" (EQUIVALENT TO FIBERGLASS) AND IS NON-CORROSIVE TO THE PIPE. PUMP SHALL BE INSULATED WITH REMOVABLE/REUSABLE INSULATION BLANKET, THERMAL ENERGY PRODUCTS (TEP) "ENERGY WRAP" OR EQUIVALENT.

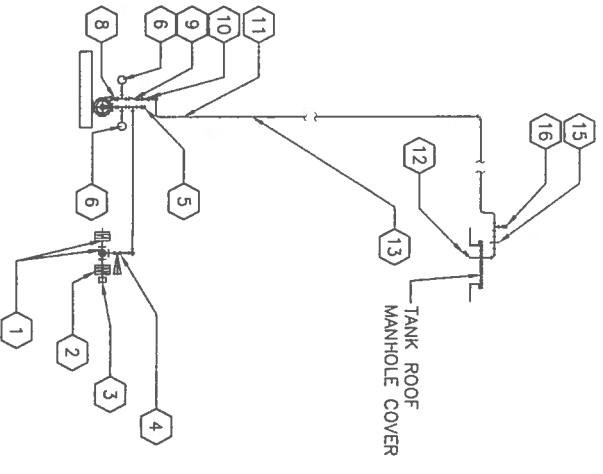
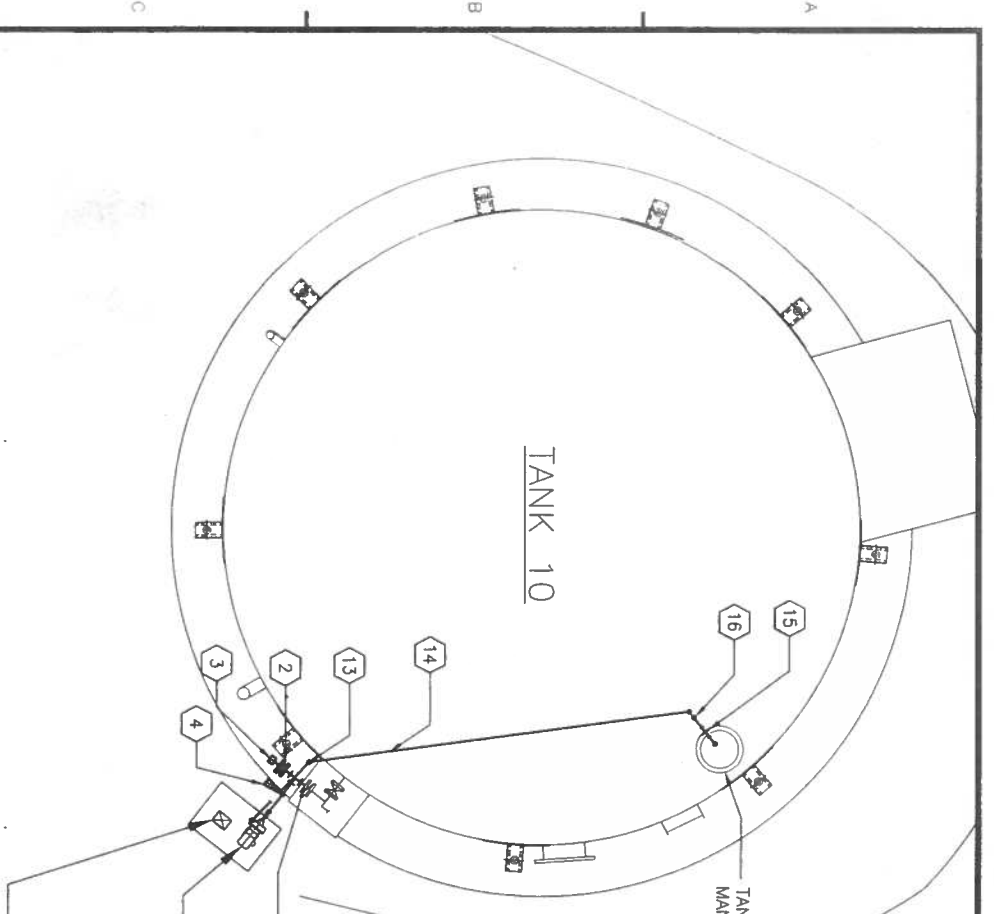
CIRCULATING WATER PUMP PCW-001, PACO PUMP MODEL 10-10707 LC, NSF 61, 1-1/4" INLET, 1" OUTLET, WITH 1/2 HP, 1750 RPM, TEFC, 115V/1PH/60HZ MOTOR, SEE P.O. U1543303 (ITEM 2)

MANUAL MTR. STARTER

**PIPING PLAN**

**CIRCULATING WATER PUMP PCW-001 INSTALLATION**

SCALE: 1/4"=1'-0"



**PIPING ELEVATION**

**CIRCULATING PUMP PCW-001 INSTALLATION**

SCALE: NONE

**Lawrence Livermore National Laboratory**  
 P.O. Box 808 Livermore, California 94551

**F&I Facilities & Infrastructure**  
 Consultants

Dwg. Scale  
 0 4 8 12 FT  
 SCALE: 1/4" = 1'-0"

PE Stamps



Project Title  
**SITE 300 WATER TANKS  
 NEW CIRCULATING WATER  
 PUMP INSTALLATION**

REV	DATE	ISSUED FOR	BY	CHKD	FIG
0	4/26/12	CONSTRUCTI	N		

wn: RUBEN OCAWPO	1 2 2011
hk: RAY CHIN	4 5/2012
file Name PSM2012 0300 0011	
FNID: Scale: AS NOTED	Aut. AD 2010

Sheet Title	PIPING PLAN - TANK 10
PIPING PLAN - TANK 10	
CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM	

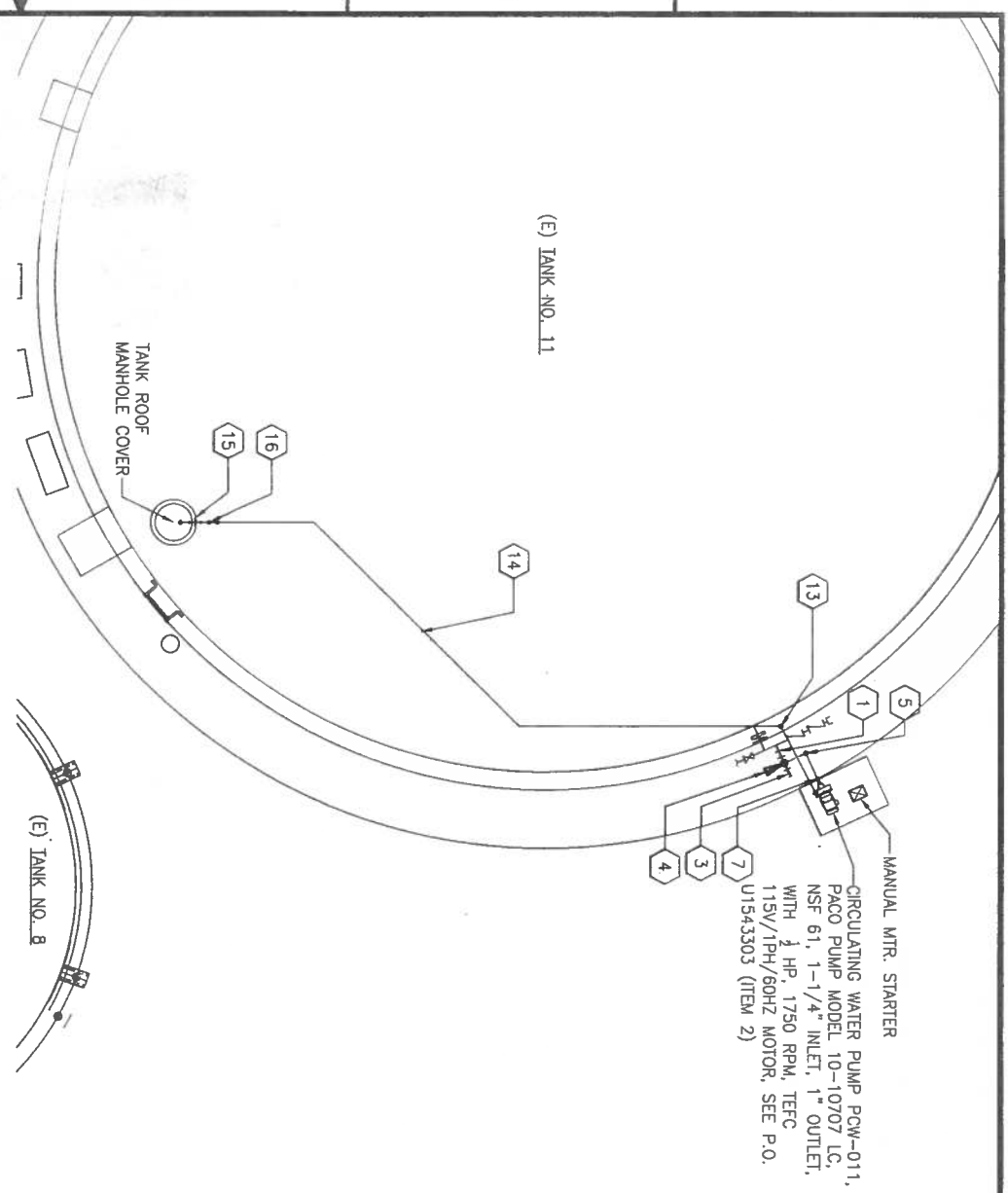
Dwg. No. PSM2012-0300-0011D	
Sht. No. M-110	11 of 12
Classification UNCLASSIFIED/UNLIMITED RELEASE	

**NOTES**

- 1 REPLACE EXISTING REDUCING BUSHING AND HOSE BIBB WITH NEW GALV. STEEL NIPPLE ASTM A120 AND 3"x3"x1-1/2" RED. TEE GALV. IRON ASME/ANSI B16.3 CLASS 150.
- 2 NOT USED
- 3 INSTALL REDUCING BUSHING AND A NEW HOSE BIBB AT THE NEW 3" TEE.
- 4 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 5 1/2" 125# BALL VALVE, BRONZE BODY, STAINLESS STEEL BALL AND STEM, TEFLON SEATS AND SEALS. SCREWED ENDS.
- 6 4.5" PRESSURE GAUGE, 0-30 PSIG RANGE, PROVIDE BLOCK VALVE.
- 7 SWAGED NIPPLE 1-1/2"x1-1/4" COPPER, SCH 40.
- 8 SWAGED NIPPLE 1-1/2"x1" COPPER, SCH 40.
- 9 1-1/2" 125# SCREWED BRONZE CHECK VALVE, S.S. TRIM, SCREWED CAP.
- 10 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 11 1-1/2" COPPER PIPING PER ASTM B88 TYPE L AND COPPER SOLDER FITTINGS PER ASME/ANSI B31.22, EXCEPT SCREWED SCH 40 COPPER NIPPLES AND SCREWED CAST BRONZE FITTINGS PER ASME/ANSI B16.15 CLASS 125.
- 12 FULL CONE SPRAY NOZZLE, BRASS, 1-1/4" FEMALE NPT, 20 GPM @ 7 PSIG CAPACITY, SPRAYING SYSTEMS PART # 1-1/4H-20 (SEE P.O. U1545882). INSTALL NOZZLE AS HIGH AS POSSIBLE DIRECTING THE DISCHARGE 45 DEGREE DOWNWARD TOWARDS THE CENTER OF THE TANK.
- 13 SUPPORT RISER PIPING WITH BRACKETS MOUNTED ON THE FLANGES OF THE TANK SHELL, USING TWO TANK FLANGE BOLTS SPACED AT LEAST 3-SUCCESSIVE BOLT SPACING APART.
- 14 ROUTE PIPING ON THE ROOF TO SUIT AVAILABLE MEANS TO SUPPORT PIPE. ALLOW 3' X 3' ACCESS CLEARANCE FROM LADDER SIDE OF THE MANHOLE.
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- 16 AIR RELEASE VALVE, 1/16" ORIFICE, 1/2" NPT INLET.
- 17 ALL NEW WATER PIPING, VALVES & PUMP SHALL BE HEAT TRACED AND INSULATED, IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:  
 HEAT TRACING SYSTEM SHALL BE CHROMALOX OR EQUIV., OF THE SELF REGULATING TYPE, 3-WATT/FT, 120V, COPPER OVERBRAID, COMPLETE WITH SUITABLE ACCESSORIES AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. CABLE LENGTH SHALL NOT EXCEED THAT FOR THE 15 AMP CIRCUIT BREAKER. SEE PROJECT ELECTRICAL DRAWINGS FOR POWER SUPPLY LOCATION. ENCLOSURES SHALL BE NEMA 4X. TEMPERATURE CONTROL SHALL BE PIPE WALL SENSING BULB AND CAPILLARY TYPE, STRAPPED TO PIPE CLOSEST TO POWER SUPPLY. PROVIDE ONE END SEAL WITH SIGNAL LIGHT PER CIRCUIT FOR INDICATION OF HEATING ACTIVATION, LOCATED AT SUCTION PIPING WHERE IT SHOULD BE MADE VISIBLE FROM GRADE.  
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 PUMP SHALL BE INSULATED WITH REMOVABLE/REUSABLE INSULATION BLANKET, THERMAL ENERGY PRODUCTS (TEP) "ENERGY WRAP" OR EQUIVALENT.



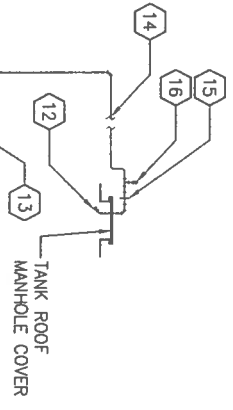
**CIRCULATING WATER PUMP PCW-011 INSTALLATION**  
 SCALE: 1/4"=1'-0"



**PIPING PLAN**

**CIRCULATING WATER PUMP PCW-011 INSTALLATION**  
 SCALE: 1/4"=1'-0"

MANUAL MTR. STARTER  
 CIRCULATING WATER PUMP PCW-011,  
 PACO PUMP MODEL 10-10707 LC,  
 NSF 61, 1-1/4" INLET, 1" OUTLET,  
 WITH 1/2 HP, 1750 RPM, TEFC  
 115V/1PH/60HZ MOTOR, SEE P.O.  
 U15453503 (ITEM 2)

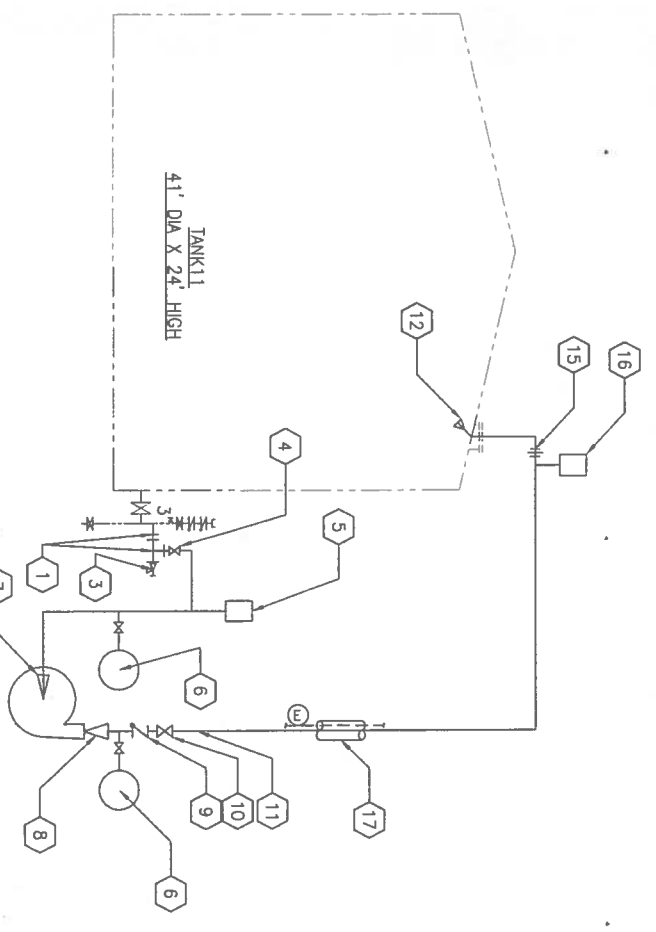


**PIPING ELEVATION**

**CIRCULATING PUMP PCW-011 INSTALLATION**  
 SCALE: NONE

SCALE: NONE

CIRCULATING WATER PUMP PCW-011,  
 PACO PUMP MODEL 10-10707 LC, NSF 61,  
 1-1/4" INLET, 1" OUTLET, WITH 1/2 HP, 1750  
 RPM, TEFC 115V/1PH/60HZ MOTOR, SEE  
 P.O. U15453503 (ITEM 2)



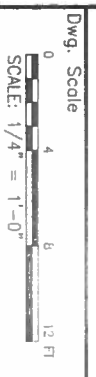
**PIPING & INSTRUMENT DIAGRAM**

**CIRCULATING PUMP PCW-011 INSTALLATION**  
 SCALE: NONE

SCALE: NONE

**Lawrence Livermore National Laboratory**  
 P.O. Box 808 Livermore, California 94551

**F&I Facilities & Infrastructure**  
 Consultants



Project Title  
**SITE 300 WATER TANKS  
 NEW CIRCULATING WATER  
 PUMP INSTALLATION**

REV. NO.	DATE	REVISION	WHY	CHK BY
0	4/26/12	ISSUED FOR CONSTRUCTION	RO	RC
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Des: RUBEN OCAMPPO 2/06/2012  
 Dwn: RUBEN OCAMPPO 2/06/2012  
 Chk: RAY CHIN 04/25/2012  
 File Name: PSM2012-0300-0012D.dwg  
 P/NID: Scale: AS NOTED  
 Software: AutoCAD 2010

Sheet Title  
**PIPING PLAN - TANK 11  
 CIRCULATING WATER PUMP  
 INSTALLATION AND  
 P & I DIAGRAM**

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Sht. No. M-111 12 of 12

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