SYNERGY ENVIRONMENTAL, LLC

OPERATION & MAINTENANCE PLAN

RID WELLHEAD TREATMENT SYSTEMS

FEBRUARY 2015
Revision 5

WEST VAN BUREN AREA WQARF SITE
PHOENIX, ARIZONA

Prepared for: **Arizona Department of Environmental Quality**

Prepared by: **Synergy Environmental, LLC**

On Behalf of: **Roosevelt Irrigation District**

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O&M PLAN REVISION SUMMARY

#	Description
0	Original draft.
1	Refined draft incorporating updates to operational details based on initial pilot system performance.
2	Original final version; includes full record drawing sets and all available technical information.
3	Incorporates revisions following completion of pilot system performance assessment/evaluation.
4	Incorporates revisions based on comments from ADEQ, PRPs and the public, received September 5, 2014.
5	Incorporates revisions based on comments from ADEQ dated December 15, 2014.

February 2015, Revision 5

OPERATION AND MAINTENANCE PLAN – RID WELLHEAD TREATMENT SYSTEMS

WEST VAN BUREN AREA
WATER QUALITY ASSURANCE REVOLVING FUND SITE

1.0 INTRODUCTION

Groundwater in the West Van Buren Area Water Quality Assurance Revolving Fund Site (WVBA Site) contains hazardous substances, principally volatile organic compounds (VOCs) that have impacted Roosevelt Irrigation District (RID) production wells. Arizona Department of Environmental Quality (ADEQ) acknowledged that the RID wells that extract and discharge VOC-contaminated groundwater to surface water are the major outflow of contamination from the Site (Terranext, 2012). It was further noted that the RID canals provide a potential route of surface water contaminant migration within and downstream of the WVBA Site.

RID relies on the wells within the WVBA Site to meet critical water supply needs and, consequently, submitted a Work Plan for conducting an Early Response Action (ERA) to restore a portion of these impacted wells for current and reasonably foreseeable beneficial uses, including future use as a drinking water source (Montgomery & Associates, 2010), as provided in the Arizona Water Quality Assurance Revolving Fund Program:

- Arizona Revised Status (ARS) §49-282.06.B.4.b; and,
- Arizona Administrative Code (A.A.C.) R18-16-405.

Although the ERA was designed to capture and treat hazardous substances primarily as a well protection and water supply initiative, the action was also proposed to mitigate public exposure associated with the uncontrolled release of VOCs in groundwater pumped by RID from the WVBA Site. Air and water sampling was conducted in accordance with the *Public Health Exposure Assessment and Mitigation Work Plan*. The resulting data enabled review of the potential insight into the fate and transport of these contaminants (Synergy Environmental (Synergy), 2011a). The assessment compared the sampling results to health-based guidelines to make a screening-level determination as to whether these substances pose a significant risk to public health and provide data to assist in developing detailed designs for engineering controls to limit uncontrolled VOC emissions.

Consistent with the Task 4-Engineering Design Study required by the ADEQ in the ERA conditional approval letter of June 24, 2010 (ADEQ, 2010), RID submitted a proposal to construct and operate a pilot wellhead treatment system at RID-95 and additional wellhead treatment at select sites (Synergy Environmental, 2011b). In a letter dated September 2, 2011, ADEQ authorized implementation of RID's proposed Pilot System initiative (ADEQ, 2011).

Before initiating treatment at the additional well sites (i.e., RID-89, RID-92 and RID-114), RID agreed to prepare and submit a near-term assessment, following one month of system operation, to consider the technology, system design and site-specific engineering and operation controls to determine the effectiveness of liquid-phase granular activated carbon (LGAC) and the reliability of the system as designed/operated to provide safeguards to protect public health in the event of system failures (in accordance with A.A.C. R18-16-411). The *1-Month Technology/Design Demonstration Report: RID-95 Pilot System*, describes the successful completion of the assessment period, which demonstrated the reliable operation of the treatment system without identification of any design or operational issue that could reasonably endanger public health (Synergy, 2012a).

On July 17, 2012, a Modified ERA Proposal was submitted to ADEQ as an addendum to the original ERA Work Plan, dated February 3, 2010 and conditionally approved by ADEQ on June 24, 2010 (Synergy, 2012b). The addendum was proposed in order to provide a more cost effective approach to accomplish the goals of the ERA remedial action. The Modified ERA Proposal provided an optimized design approach to address the highest contaminated RID wells located in the WVBA Site and incorporated information and insights gained from the investigations prescribed by ADEQ in the original ERA Work Plan letter (Tasks 1 through 4) and from the Pilot System initiative. Based on the detailed consideration and analysis of this new information, RID proposed substantive modifications to the original ERA Work Plan, which included utilizing a combination of treatment and blending to effectively reduce the concentration of VOCs from several additional, lower concentration wells resulting in lower volume of water being directly treated while providing a higher total volume of groundwater that is remediated to meet applicable federal maximum contaminant levels (MCLs). On October 19, 2012, Synergy submitted the Modified ERA Work Plan to ADEQ, which incorporated applicable content from the original ERA Work Plan and from the Modified ERA Proposal (Synergy, 2012c). ADEQ conditionally approved the Modified ERA Work Plan on February 1, 2013 (ADEQ, 2013).

Consistent with the ADEQ letter dated September 2, 2011, that agreed with implementation of the Pilot System initiative, the *Long-Term Operational Assessment Report, RID-95 Wellhead Pilot Treatment Systems* documented the long-term performance of the wellhead treatment systems in order "*…to determine whether well head treatment can be an effective treatment technology*…(that results in)…*reducing the cost of the final remedy…and/or mitigating*

contaminant exposure" (Synergy, 2012d). The Assessment Report indicated that the RID Pilot System initiative conclusively demonstrated the cost effectiveness of the technology, and therefore the reasonableness of the selected remedy for the Modified ERA (which could be incorporated into the final remedy following the Feasibility Study process) in order to effectively treat the contaminated groundwater impacting RID's wells and the successful mitigation of public health exposures to these contaminants.

As part of the scope of work described in its proposed Pilot System initiative, RID was to prepare and submit an Operation and Maintenance (O&M) Plan to ADEQ. This O&M Plan, Revision 4, provides equipment and construction details, the sampling and analysis program, and specific O&M and reporting procedures for the RID wellhead treatment systems, and shall replace all previous editions. Updates and/or revisions will continue to be made to this O&M Plan, as necessary. At a minimum, this O&M Plan will be reviewed on an annual basis to confirm accuracy and completeness.

2.0 BACKGROUND

A summary of the physical setting, hydrogeologic and groundwater conditions, sources of contamination and impacts on RID wells and operations was provided in the Remedial Investigation (RI) Report (Terranext, 2012). The RI Report was published by ADEQ in August 2012, and included a discussion of the nature and extent of contamination in the WVBA Site. Brief descriptions of the Site location and physical characteristics, the contaminants of concern (COCs) present at the Site and the impact of the contamination on the RID water systems are provided in the following sections.

2.1 SITE LOCATION AND PHYSICAL CHARACTERISTICS

Land use within the WVBA is predominantly zoned industrial with smaller tracts of residential (with elementary schools and churches) and commercial. The WVBA Site is located within the City of Phoenix Central City and Estrella urban villages (**Figure 1**). With the significant acreage of agricultural land available to be developed in the future, the Estrella Village (41 square miles) is identified as a Phoenix targeted growth area, and is expected to experience significant increases in both employment and residential growth (Synergy, 2011b).

Figure 2 depicts the approximate boundaries of the groundwater contamination, as well as relevant features within the WVBA Site. The extent of groundwater contamination associated with the WVBA Site is generally bounded on the north by McDowell Road, on the east by 7th Avenue, on the south by Lower Buckeye Road, and on the west beyond 79th Avenue.

2.2 CONTAMINANTS OF CONCERN

The COCs in the WVBA Site have been identified based on historical and present data obtained from samples collected by ADEQ and RID from the impacted RID groundwater supply wells over the past 20 years. These COCs comprise the commingled WVBA Site plume and are listed as follows (including the chemical name and the Chemical Abstract Service (CAS) number:

- 1,1-Dichloroethene (1,1-DCE) CAS number 75-53-4
- Tetrachloroethene (PCE) CAS number 127-18-4
- Trichloroethene (TCE) CAS number 79-01-6
- 1,1,1-Trichloroethane (TCA) CAS number 71-55-6
- cis 1,2-Dichloroethene (cis 1,2-DCE) CAS number 156-59-2
- 1,1-Dichloroethane (1,1-DCA) CAS number 75-34-3

Chromium is also a COC that occurs locally within the WVBA Site boundaries. The chromium concentrations in the impacted RID wells are well below the federal MCL for drinking water and have only been detected in two (2) wells: RID-102 and RID-104; neither of which was selected for wellhead treatment. Consequently, chromium is not included in the sampling and analysis program as part of this O&M Plan.

Only three (3) of the listed COCs (i.e., TCE, PCE and 1,1-DCE) are present in the impacted groundwater within the WVBA Site at concentrations that exceed the MCLs. Consequently, these COCs are referred to as the "target COCs" in this O&M Plan. The target COCs will be used to determine when GAC replacement is necessary.

2.3 WATER QUALITY – TREATMENT SYSTEM WELLS

A summary of recent historical analytical data that presents target COC concentrations for samples collected by ADEQ from RID treatment system wells is included below. All results that are equal to or exceed MCLs are indicated in red text.

Table 1. Summary of Recent Water Quality – Treatment System Wells

TCE, presented as micrograms per liter (µg/L)

Sample Date	Well			
	89	92	95	114
Apr-13	34.1	73.5	54.4	48.6
Sep-13	37.5	86.4	59.6	39.0
Mar-14	35.5	76.2	44.0	45.6

PCE, presented as µg/L:

Sample Date	Well			
	89	92	95	114
Apr-13	11.0	14.7	3.44	2.20
Sep-13	11.7	14.5	3.71	2.63
Mar-14	10.3	13.5	2.99	2.86

1,1-DCE, presented as µg/L:

Sample Date	Well			
	89	92	95	114
Apr-13	2.39	5.17	9.23	3.33
Sep-13	3.14	6.22	7.52	2.50
Mar-14	2.84	4.84	6.18	3.01

2.4 TREATMENT GOALS

The minimum standard for treated water quality at the wellhead treatment systems is the MCL for each of the target COCs, which is consistent with the final Remedial Objectives set forth in the Final RI Report, Appendix AA (Terranext, 2012).

Target COC	MCL (μg/L)
Trichloroethene (TCE)	5.0
Tetrachloroethene (PCE)	5.0
1,1-Dichloroethene (1,1-DCE)	7.0

The point of compliance (POC) sample ports (installed in the 14-inch discharge piping, located downstream of the treatment skids and immediately upstream of the receiver box for each treatment system, see **Figures 3-6**) is the location for demonstrating that each treatment system achieves these Treatment Goals.

3.0 SYSTEM DESCRIPTION

RID selected a pre-engineered LGAC system, manufactured by Siemens Water Technologies, to treat the discharge from the highest impacted RID production wells. The selected LGAC systems, described in more detail in Section 4.3, are modular and consist of two (2) GAC pressure vessels, a treatment "skid", with a capacity of 1,000 gallons per minute (gpm, nominal) with Siemens stated maximum of 1,100 gpm. The treatment skids are installed on and anchored to concrete containment pads with 6-inch curbing and sumps. Each discharge structure is enclosed and sealed for volatilization control. Wellhead treatment will be conducted in a manner consistent with RID historical pumping. Design/record drawings for the wellhead treatment systems are included as **Appendix A** (RID-89), **Appendix B** (RID-92), **Appendix C** (RID-95), and **Appendix D** (RID-114).

1. RID-89: Located on the east side of 51st Avenue, approximately ¼-mile north of Buckeye Road; the site area is approximately 4,500 square feet (ft^2). Based on nominal flow rate of 3,400 gpm, RID installed three skids.

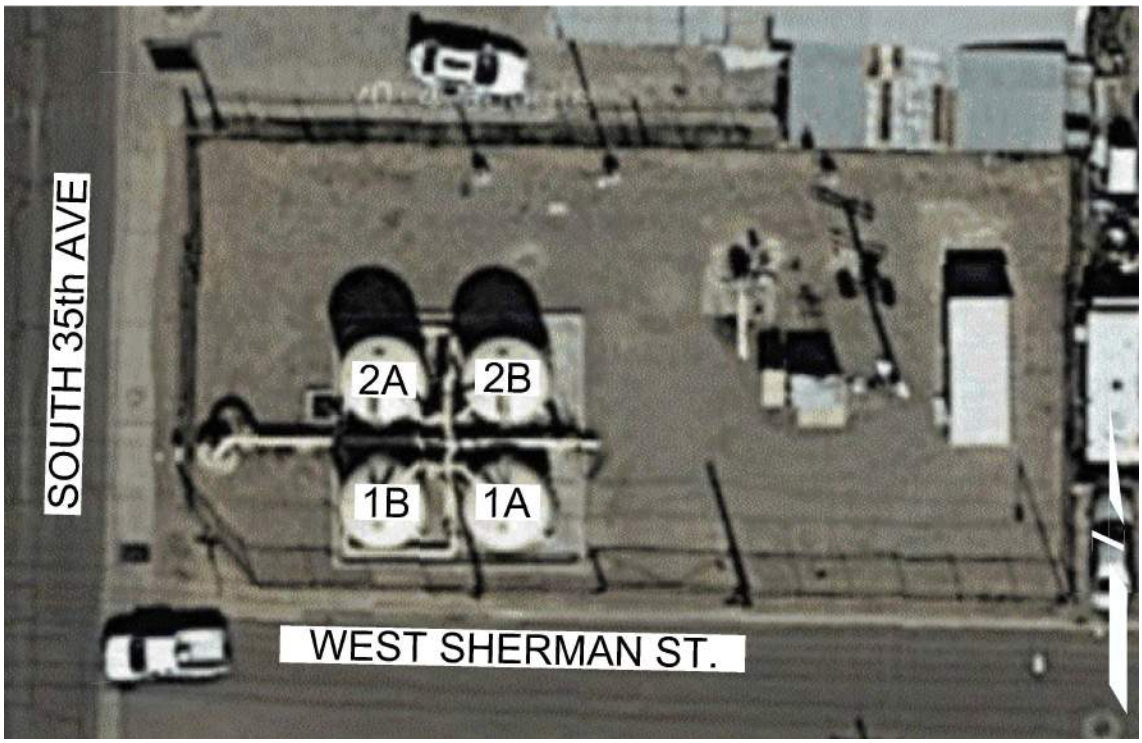
   From north to south, skids are numbered 1, 2, and 3; with vessels labeled: 89-1A and 89-1B (skid 1); 89-2A and 89-2B (skid 2); 89-3A and 89-3B (skid 3).

2. RID-92: Located on the east side of 43rde Avenue, approximately ¼-mile north of Buckeye Road; the site area is approximately 2,400 ft^2. Based on nominal flow rate of 1,400 gpm and limited available foot print, RID installed a single skid.

   Vessels are labeled 92-1A (west vessel) and 92-1B.

3. RID-95: Located on the northeast corner of Sherman Street and 35th Avenue, approximately ¼-mile north of Buckeye Road; the site area is approximately 6,900 ft^2. Based on nominal flow rate of 1,850 gpm, RID installed two skids.

   From south to north, skids are numbered 1 and 2; with vessels labeled: 95-1A (east vessel) and 95-1B for skid 1; and 95-2A (west vessel) and 95-2B for skid 2.



4. RID-114: Located at the southwest corner of 23rd Avenue and Van Buren Street; the site area is approximately 7,000 ft^2. Based on nominal flow rate of 2,500 gpm, RID installed three skids.

   From north to south, skids are numbered 1, 2, and 3; with vessels labeled: 114-1B and 114-1A (skid 1); 114-2B and 114-2A (skid 2); 114-3B and 114-3A (skid 3).

4.0 OPERATION AND MAINTENANCE

The following sections describe the specific details for operating and maintaining the wellhead treatment systems, including a notifications procedure during system operation upset events; and details for RID's well pumps, the selected LGAC treatment skids, wellhead treatment system operations, instrumentation and controls, and the sampling and analysis program.

4.1 SYSTEM OPERATION UPSET EVENT NOTFICATIONS

The Operator (Spinnaker Holdings, LLC) receives automated notifications (on his mobile phone) to alert in the event of certain control conditions described in detail in Section 4.5.9, and is required to respond, as appropriate, to each notification within 2 hours. The Operator will notify RID and Synergy in the event of significant process control change(s), problem(s) or failure(s). As soon as the issue(s) of the event are reviewed and fully understood, Synergy will notify ADEQ by telephone within 24 hours of operational changes made to the wellhead treatment systems, if the quality of the treated water could be affected, or if releases to the environment have occurred.

Contact information for the individuals to be notified by Spinnaker Holdings/Synergy is included below:

Roosevelt Irrigation District –

Donovan Neese, PE
Superintendent
Email: dneese@rooseveltirrigation.org
Phone: (623) 670-4760

Ken Craig
Water Operations Manager
Email: kcraig@rooseveltirrigation.org
Phone: (623) 695-5855

Agency Oversight –

Danielle Taber
Arizona Department of Environmental Quality
Email: taber.danielle@azdeq.gov
Phone: (602) 771-4414

In accordance with A.A.C. R18-16-411(E)(4), this O&M Plan shall include "a process for the treatment system Operator to promptly notify potentially affected water providers of a failure of a key treatment system component that could affect the quality of a discharge of treated water."

Treated water from the wellhead treatment systems currently is exclusively discharged to RID canals and laterals for agricultural use. Consequently, there are no other potentially affected water providers within the WVBA Site that would be affected by a discharge of treated water in the event of significant process control issues or failures at any of the wellhead treatment systems. However, at such time in the future when RID plans to serve treated water to persons or parties for municipal and industrial end use, this O&M Plan will be revised to identify the affected water provider(s) and the process by which RID will promptly notify those water providers of any failure of a key treatment system component that could affect the quality of the discharge of treated water. The revised O&M Plan will be submitted for ADEQ approval at least 90 days prior to initiation of water delivery to the affected water provider(s).

4.2 WELL PUMP DETAILS

Table 2 provides details for well construction (i.e., hole depth, screen intervals, units screened, casing total depth and casing diameters), historical depth to water and pumping water levels, and pumps/motors currently installed and operating at each wellhead treatment system site. The control strategy for each well pump is provided in Section 4.5.1. Following is a summary of normal operating values for each of the wellhead treatment systems.

RID-89

Parameter	Normal Operating Value
Wellhead Pressure (Bypass)	0.5 psi
Wellhead Pressure (Treatment)	16.5 psi
Flow Rate (Bypass)	3,400 gpm
Flow Rate (Treatment)	2,600-3,000 gpm
Skid 1 Post-Lead Vessel Pressure	12 psi
Skid 1 Effluent Pressure	2.0 psi
Skid 2 Post-Lead Vessel Pressure	12 psi
Skid 2 Effluent Pressure	2.0 psi
Skid 3 Post-Lead Vessel Pressure	11 psi
Skid 3 Effluent Pressure	1.5 psi

Notes:
psi = pounds per square inch
gpm = gallons per minute

RID-92

Parameter	Normal Operating Value
Wellhead Pressure (Bypass)	0.5 psi
Wellhead Pressure (Treatment)	21 psi
Flow Rate (Bypass)	1,400 gpm
Flow Rate (Treatment)	1,100-1,300 gpm
Skid 1 Post-Lead Vessel Pressure	2.0 psi
Skid 1 Effluent Pressure	1.0 psi

RID-95

Parameter	Normal Operating Value
Wellhead Pressure (Bypass)	1.0 psi
Wellhead Pressure (Treatment)	12.5 psi
Flow Rate (Bypass)	1,850 gpm
Flow Rate (Treatment)	1,500-1,750 gpm
Skid 1 Post-Lead Vessel Pressure	5.0 psi
Skid 1 Effluent Pressure	2.0 psi
Skid 2 Post-Lead Vessel Pressure	7.0 psi
Skid 2 Effluent Pressure	2.0 psi

RID-114

Parameter	Normal Operating Value
Wellhead Pressure (Bypass)	0.5 psi
Wellhead Pressure (Treatment)	11.5 psi
Flow Rate (Bypass)	2,500 gpm
Flow Rate (Treatment)	2,250-2,450 gpm
Skid 1 Post-Lead Vessel Pressure	7.0 psi
Skid 1 Effluent Pressure	2.0 psi
Skid 2 Post-Lead Vessel Pressure	7.0 psi
Skid 2 Effluent Pressure	3.0 psi
Skid 3 Post-Lead Vessel Pressure	6.0 psi
Skid 3 Effluent Pressure	2.5 psi

4.3 LGAC TREATMENT SKIDS

The wellhead treatment systems consist of Siemens HP-1220 LGAC treatment skids, each capable of treating a nominal flow of 1,100 gpm of water in series (lead-lag) configuration. The numbers of skids at each well site include: RID-89 (3), RID-92 (1), RID-95 (2) and RID-114 (3), for a total of 9 skids.

The LGAC treatment skids include the following standard design features:

- Down-flow configuration to facilitate backwash;
- Integrated piping (8-inch schedule 40 carbon steel) with cast iron gear/wheel butterfly valves with EPDM seats, configured to allow series, parallel or vessel-isolation flow;
- Systems operate utilizing existing well equipment to pump the impacted groundwater through the LGAC vessels for treatment and periodic backwash;
- Equipped with sample ports at the skid influent, 25%, 50% and 75% of GAC bed depth, and vessel effluent to enable monitoring of mass transfer zone and breakthrough;
- 20,000 pound carbon capacity in each carbon steel vessel (7,520 gallon volume);
- Operating flow rate of 1,100/2,200 gpm (series/parallel) per skid and 1,000 gpm backwash flow rate (higher flow rates can be achieved but empty bed contact time would decrease proportionally);
- Integrated GAC transfer piping (4-inch Schedule 10 304L stainless steel); and,
- Vessels and piping are rated to 125 psi and burst discs are integral to the piping to safely release and divert water in the event of over-pressure.

During 2013 and 2014, critical maintenance work was needed at all four (4) wellhead treatment systems (i.e., all 18 vessels) to replace corroded piping (4-inch, Schedule 10 304L stainless steel GAC fill and removal lines), which were covered under warranty. Similar defects have been observed on the Siemens GAC equipment installed at the North Indian Bend Wash federal Superfund Site. Each pipe was removed and replaced by Siemens' (now Evoqua Water Technologies) contractor Smyth Industries, of Tucson, Arizona with the GAC fill lines primarily replaced in 2013 and the GAC removal lines replaced on 10 of 18 vessels during carbon change-out activities from June through October 2014. The remaining GAC removal lines will be replaced when carbon change-out activities are needed on the 8 remaining vessels.

4.4 SYSTEM OPERATION

General system operation for each LGAC skid includes operation in treatment mode, bypass mode, and a modified treatment mode to facilitate LGAC change-outs and/or backwash. Each skid is configured for series (or lead-lag) operation for normal treatment mode, but are capable of parallel or single vessel operation, as necessary, to facilitate maintenance activities.

Operational performance data will be continuously monitored and collected on a monthly basis using the instrumentation and supervisory control and data acquisition (SCADA) system described in Section 4.5.6.

An Operation & Maintenance Manual (prepared by Siemens) for the pre-engineered LGAC skids is included as **Appendix E**, and provides equipment details/specifications including: standard procedures to operate the treatment skids (i.e., start-up, carbon changes, backwashing), troubleshooting, system monitoring, shutdown and emergency procedures, maintenance, lists of scheduled materials (with part numbers) on the drawings in Section 8.0, and specifications for the vessels (i.e., drain system, valves, burst disks, spray nozzles, pressure gauges, and interior/exterior coatings). Although the Operation & Maintenance Manual specifically identifies "Well Site 95", the same Manual was used for the other three (3) wellhead treatment systems (RID-89, RID-92 and RID-114). Therefore, only one Manual is included as part of this O&M Plan.

A flow diagram and valve sequence chart are also included in the Siemens Operation & Maintenance Manual and on **Figures 3-6**. Each valve associated with the HP-1220 systems has been clearly labeled in the field to help the Operator when making changes to the operation of the treatment systems.

4.4.1 Treatment Mode

Each LGAC skid is operated in conjunction with RID's pumping schedule with cessation of treatment during well maintenance activities, treatment system maintenance activities (requiring system shut-down) or unanticipated failures (including but not limited to: power outages, critical alarms, or equipment malfunctions).

4.4.2 Bypass Mode

Should it become necessary to shut off any of the treatment trains, and RID requires the flow from that well, the untreated flow may be temporarily bypassed (in part or in whole) around the treatment system and discharged directly into the existing receiver box until treatment can resume (utilizing the 3-way valve, see Section 4.5.4).

The notification procedure in Section 4.1 shall be followed if a treatment system is changed from treatment mode to bypass mode (full bypass) due to a system upset event. Other operational changes that require partial bypass, including carbon change-out activities or changes in RID's water demand that require full bypass, for example, will be documented in the Monthly Progress Reports (Section 6.2).

There is a routine occurrence when operation in partial bypass mode is necessary at the RID-92 wellhead treatment system. Since there is only one treatment skid at RID-92, partial bypass is necessary during carbon change out activities to fluidize the GAC for removal and refilling activities, and backwashing. Partial bypass is necessary in this case to prevent excessively high flow rate during backwash, which could result in possible loss of GAC. Since all other treatment systems utilize two or three treatment skids, this mode of routine partial bypass is only necessary at the RID-92 wellhead treatment system.

During full or partial bypass operation, the SCADA system is still functioning and the change in flow path is shown on the control screens and captured by data acquisition. When this occurs, the wellhead pressure will decrease and flows will increase (due to reduced pressure head). During full bypass mode operation, pressure differential across the lead and lag vessels goes to zero, and therefore, no alarms are triggered.

4.4.3 LGAC Change-Outs and Backwash

LGAC bed life will be assessed/monitored in each treatment train by sampling and analysis for target COCs as described in Section 4.6. A carbon change-out with reactivated GAC will be scheduled when any of the target COCs reach ½ of the Treatment Goals (see Section 2.4) in the POC samples. When this condition is observed, the lead vessel of the skid with the highest target COC concentration in the Mid-Skid sample will be scheduled for the change-out[1].

During each carbon change-out, the lag vessel will be reconfigured as lead and the spent GAC removed from the exhausted vessel and replaced with fresh reactivated GAC. During removal and replacement of the spent GAC from the exhausted vessel, the remaining vessel will continue to treat the flow on a stand-alone basis (i.e., single pass). In some instances, it may be necessary to isolate an entire skid and/or switch to partial or full bypass to facilitate maintenance activities.

Following recharging of the exhausted vessel, the recharged vessel will be backwashed to remove fines, left to soak for approximately 24 hours to remove entrained air, and put back into service as the lag vessel and remain in that configuration until the lead vessel requires a carbon change-out. Backwash will be conducted at a flow of approximately 1,000 gpm (using treated water conveyed from the new lead vessel while operating in stand-alone basis) and backwash water will be diverted from the backwashed vessel directly to the discharge receiver box.

[1] Currently, the RID-92 wellhead treatment system only has a single skid.

Based on carbon change-out frequencies for each of the wellhead treatment systems[2] to date, the estimated change-out schedule per vessel at each site is included below:

- RID-89: 4-5 months of operation
- RID-92: 2-3 months of operation
- RID-95: 2-3 months of operation
- RID-114: 5-6 months of operation

4.5 INSTRUMENTATION AND CONTROLS

The wellhead treatment systems are equipped with instrumentation and controls (I&C), designed and integrated by Vertech, that provide real-time monitoring of key performance parameters of system operation. The I&C also enables remote operation and monitoring of system operations and provides alarm notification for key process and control parameters. Control System record drawings for the wellhead treatment systems are included in **Appendix A** (RID-89), **Appendix B** (RID-92), **Appendix C** (RID-95), and **Appendix D** (RID-114).

Instrumentation is included to monitor:

- Well pump run status;
- Well discharge and bypass flow rates (instantaneous and totalized);
- Flow to each treatment skid (instantaneous and totalized);
- Wellhead pressure; and,
- Differential pressure across each treatment skid.

Controls/alarms are included for:

- Pump start/stop;
- Bypass flow;
- Low flow at each treatment skid; and,
- Water level in sumps.

These I&C nodes are integrated into a SCADA system that allows for remote control of the systems as well as continuous monitoring capabilities and data storage to document key aspects of treatment system operations and demonstrate the level of reliability required to ensure the successful remediation of the groundwater supply (i.e., to achieve Treatment Goals) and the protection of public health. The following sections describe the various I&C components, including O&M requirements for each. Equipment manuals for each component are included in **Appendix F**.

[2] These systems currently only operate 7-8 months per year based on RID's historical operations.

4.5.1 Well Pumps

The well pumps for the wellhead treatment systems convey groundwater through the treatment skids (treatment mode) or directly to the discharge structure (bypass mode). The pumps can be controlled manually from the local Operator Interface Terminal (OIT), mounted to the front of the Remote Terminal Unit (RTU) control panel, or operated remotely from the OIT in the control room at RID-95 (or via remote connection to the OIT in the control room). The OIT in the control room can control operations for all four (4) wellhead treatment systems.

System Start-Up and Shut Down Procedures

Prior to start-up of each wellhead treatment system, the Operator shall inspect the system components for potential problems (including water accumulation in the containment area sump[s]), inspect piping for signs of leaks, verify all control and isolation valves are positioned properly, and acknowledge/clear any alarms on the OITs. The Operator will check to see if the pump switch at each site is in "Auto" mode inside the motor control center (MCC) cabinet.

- Well pumps are started manually by pressing the "Main Pump Start" push button on the local OIT or the OIT located in the control room (or via remote connection to the OIT in the control room).
- Following start-up, the Operator will monitor the treatment systems for a minimum of 15 minutes to verify proper operation.
  Each well pump will run continuously until manually stopped by pressing the "Main Pump Stop" push button on the local OIT or at the OIT located in the control room (or via remote connection to the OIT in the control room).

Shut Down Conditions

- Each well pump will stop automatically in the event of a motor overload condition. The pump will need to be restarted manually at the MCC cabinet after the overload relay for the pump motor starter is reset.
- In the event of a power failure/outage while the pump is running (see Section 4.5.9), the pump will attempt to restart one time. If the attempt fails, the pump will need to be restarted manually at the local OIT or remotely at the control room after the SCADA computer is restarted.
- In the event of an overload condition with the pump motor starter, an alarm will be displayed on the OIT at the local control panel and at the OIT in the control room, and the Operator will be notified.

- In the event of a low flow rate critical alarm at a treatment skid, the Operator will be notified and the well pump will automatically shut off at that site. For this critical alarm, the Operator will follow the system upset notifications procedure described in Section 4.1.
- When water (e.g., rain water or process water) accumulate in a sump, a high-level switch alarm will result when water reaches the first float alarm point. The Operator will be notified and the sump pump(s) will start automatically to discharge the water until the water level drops to below the first float alarm point. If the accumulation of water reaches the second float alarm point, a high-high critical alarm will result in another notification to the Operator, and the well pump will automatically shut off. For this critical alarm, the Operator will follow the system upset notifications procedure described in Section 4.1.

4.5.2 Flow Meters

Manufacturer/Model	Size	Sensor/Transmitter Type
Siemens, Sitrans F M Magflo®	8”& 14”	MAG 5100W/MAG 5000

- 8-inch flow meters installed one per treatment skid to measure instantaneous and totalized flow of raw groundwater (i.e., influent).
- 14-inch flow meters installed one per well site on the bypass piping. At RID-89, RID-92 and RID-114, the flow meter measures well discharge flow in both treatment and bypass modes (instantaneous and totalized values). At RID-95, the 14-inch flow meter only measures bypass flow (instantaneous and totalized) due to operational/mechanical constraints within the treatment system concrete pad. Treatment flow at RID-95 is measured by the two 8-inch flow meters, which are combined to derive the total well discharge flow rate.
- If a treatment skid flow rate at a site falls below the low flow rate critical alarm value, (summarized in Section 4.5.6), the Operator will be notified and the well pump at that site will automatically shut off.

4.5.3 Pressure Transmitters

Manufacturer/Model	Range	Order No.
Siemens, Sitrans P200	0-200 psig	7MF1565-4CB

- At each site, one pressure transmitter is located upstream of the 3-way valve to monitor wellhead pressure (see **Figures 3-6**).

- At each site, one pressure transmitter is located on the effluent piping of each treatment skid to monitor effluent water pressure and differential pressure across the vessels (see **Figures 3-6**). If the differential pressure (calculated from the values measured at the transmitter located immediately downstream of the wellhead and the transmitter at the effluent piping of each treatment skid) increases to the high differential pressure value of 25 psi (which could indicate solid deposits accumulating in the carbon bed, for example), an alarm will be displayed on the OIT and the Operator will be notified. This is not a critical alarm, and therefore, will not automatically shut off the well pump.

4.5.4 3-Way Valves

Manufacturer/Model	# of Positions	Power
VSI, Series 1000 Electric Actuator [1200]	2 (on/off)	AC 120V/240V AC24

- Each wellhead treatment system includes one (1) 3-way valve that can be controlled manually at the valve (using an Allen handle at the manual override location), or using the electric actuator through the local OIT mounted to the front of the RTU control panel at each site, or remotely from the OIT in the central control room (or via remote connection to the OIT in the control room). In normal operation, the valve will be closed on the bypass piping and open on the influent piping to each treatment skid.
- To prevent water hammer, power-assisted closing/opening of valve is paced to occur over a 120-second period (i.e., over 2X safety factor based on the manufacturer's specifications) when changing from normal operation to bypass mode, or from bypass mode to normal operation.
- For temporary changes in flow between treatment and bypass, the Operator may manually open/close the bypass valve until the desired flow rates are obtained (using an Allen handle at the manual override location). The manual opening/closing of the bypass valve is conducted at a controlled rate to prevent water hammer.

4.5.5 Sumps and Level Switches

Manufacturer/Model	# of Floats	Order No. / Switch Type
Dwyer, Mercoid Series FSW2 Free-Floating Level Switch	2 (high/high-high)	FSW2-ONPN-20 / SPST NO FSW2-CNPN-20 / SPST NC

- The concrete pads at each site are constructed with approximate 6-inch berms along the pad perimeter to contain and prevent release of water and the pads slope slightly

towards the collection sump(s) to facilitate collection and detection of any incidental rainfall or system leakage.

- The wellhead treatment systems at RID-92 and RID-95 each have one sump equipped with two (2) level sensors/switches.
- The RID-89 and RID-114 wellhead treatment systems each have two sumps, both equipped with two (2) level sensors/switches that operate independently.
- Each sump is covered by a grate conforming to Maricopa Association of Governments (MAG) detail 539.
- The Operator will inspect each sump on a weekly basis for the accumulation of water and if present, will determine the source.
- When water (e.g., rain water or process water) accumulate in a sump, a high-level switch alarm will result when water reaches the first float alarm point. The Operator will be notified and the sump pump(s) will start automatically to discharge the water until the water level drops to below the first float alarm point. If the accumulation of water reaches the second float alarm point, a high-high critical alarm will result in another notification to the Operator, and the well pump will automatically shut off. For this critical alarm, the Operator will follow the system upset notifications procedure described in Section 4.1.
- The water contained in the sump will be discharged via 1 ½" to 2" galvanized steel piping by a ¾ horsepower pump (rated for 50 gpm) to the discharge structure/receiver box at the well site.

4.5.6 SCADA System

Each wellhead treatment system site is equipped with a wireless transceiver that allows communication with the control room at RID-95, which serves as the central hub for the SCADA system. Screen shots of the SCADA system are included in **Appendix G**. A summary of the SCADA system alarm conditions is included below. The critical alarm value for each skid is calculated as 90% of the low treatment flow rate for the "normal operating value" included in Section 4.2, divided by the number of treatment skids for that site. The Operator will be notified for each alarm condition.

Condition	Alarm Value
RID-89 Low Flow Rate - Treatment Skid #1 (Critical)	780 gpm
RID-89 Low Flow Rate - Treatment Skid #2 (Critical)	780 gpm
RID-89 Low Flow Rate - Treatment Skid #3 (Critical)	780 gpm
RID-92 Low Flow Rate - Treatment Skid #1 (Critical)	990 gpm
RID-95 Low Flow Rate - Treatment Skid #2 (Critical)	675 gpm
RID-95 Low Flow Rate - Treatment Skid #3 (Critical)	675 gpm
RID-114 Low Flow Rate - Treatment Skid #1 (Critical)	675 gpm
RID-114 Low Flow Rate - Treatment Skid #2 (Critical)	675 gpm
RID-114 Low Flow Rate - Treatment Skid #3 (Critical)	675 gpm
Treatment Skid Differential Pressure (Non-Critical)	25 psi
High Level in Sump (Non-Critical)	First float
High-High Level in Sump (Critical)	Second float
High Temperature (Non-Critical)	120°F

4.5.7 Temperature Sensors

Manufacturer/Model	Product No.
Siemens, 4-20 mA Room Temperature Sensor	536-753 (20 to 120°F)

- Temperature sensors are installed at all the wellhead treatment systems.
- The sensors monitor the cabinet temperature containing the control hardware and the temperature inside of the RID-95 control room. If the alarm value 120 degrees Farenheit (°F) is exceeded, the Operator will be notified, but no change in the operational status of the system will occur.

4.5.8 Site Security

Site security at each wellhead treatment system site includes:

- New lighting fixtures that comply with local night sky ordinance.
- New wrought-iron fencing and access gates set-up with electronic sensing alarms (except at RID-92).
- Keys for the locks at each well site access gate will be provided to approved/authorized personnel only (Note: locks are daisy-chained to allow access by Salt River Project personnel to read the electrical meters).
- Secure access to electrical equipment.

- Cameras for 24-hour site surveillance. Cameras can be remotely operated (including pan/zoom capability) on the SCADA computer to assist the Operator in rapid assessment of system conditions.

4.5.9 System Operation Upset Events

An unscheduled shutdown of the wellhead treatment systems may occur due to various reasons, which include (but are not limited to) the following:

- Power Outage – power supply outages may occur as a result of lightning storms, downed power lines, down transformer, etc. If any of the treatment systems have a loss of power, the system will automatically restart the well pump one time, in bypass mode. In the event of a power outage, a back-up power supply will allow for the SCADA system to remain operational, and the Operator will be notified of the alarm. The Operator will need to physically visit the treatment system to inspect the cause of the alarm, coordinate restoration of power supply at the site, and restart the treatment system.

- Heavy Rain – as indicated in Section 4.5.5, each sump is equipped with a two-level sensor/switch. In the event that a heavy rainstorm causes accumulation of rain water in a sump to reach the second float (triggering a high-high critical alarm), the Operator will be notified and the well pump will automatically shut off.

- Critical Alarms – there are a number of alarm conditions (summarized in Section 4.5.6), that when triggered, will result in an automatic notification to the Operator. However, two types of critical alarms (i.e., low flow rate for each treatment skid and a high-high level in a sump), will automatically shut off the well pump.

Please refer to Section 4.1 for proper notification procedures for wellhead treatment system upset events.

4.6 SAMPLING AND ANALYSIS

This section provides the methods and procedures to collect and analyze wellhead treatment system samples.

4.6.1 Purpose of Sampling and Analysis Program

The goal of the sampling and analysis program is to collect data to:

- Determine compliance with the water quality Treatment Goals for the target COCs;
- Determine when LGAC bed breakthrough/exhaustion occurs and LGAC change-out is needed; and,
- Determine the approximate mass of target COCs being removed at each wellhead treatment system.

4.6.2 Frequency and Locations of Sampling

The proposed data collection/sampling programs are presented in the matrix below. The location and frequency of each sample will be conducted for each of the individual LGAC treatment skids. Sampling frequency and locations refer only to the "lead" vessel except where noted.

Wellhead Treatment System Sampling Program Matrix

LOCATION	**FREQUENCY**
Influent Sample Port @ Wellhead	Weekly
	Monthly*
Mid-Skid Sample Port	Weekly
	Monthly*
Point of Compliance (POC)	Weekly

The asterisk next to each "Monthly" indicates that a change to this frequency will be based on an evaluation of "Weekly" data and may be changed after the treatment system reaches steady-state (if agreed to in advance by ADEQ). Sampling will revert to "Weekly" should significant variation or unanticipated results be observed.

The POC sample ports (installed at the 14-inch discharge piping, located downstream of the treatment skids and immediately upstream of each receiver box, see **Figures 3-6**) will be the location for demonstrating that the treatment system achieves the Treatment Goals for the

target COCs described in Section 2.4. Field quality control (QC) samples will be collected as described in Section 4.6.4.

4.6.3 Sampling Methods

The following section provides details regarding the methods that will be used for the wellhead treatment system sampling program. Sampling will be conducted consistent with the provisions of the Health and Safety Plan, included as **Appendix H**.

Sampling Equipment & Procedure

Prior to sample collection, each sampling port will be purged for approximately 15-30 seconds to remove any stagnant water (i.e., non-representative water). Purge water from the influent and effluent sample ports will be collected in a two (2) gallon bucket, and will be disposed within the treatment system concrete containment structure.

Each water quality sample will be collected in a set of two (2) 40-milliliter volatile organic analysis (VOA) vials preserved with 1:1 hydrochloric acid (HCl). Samples will be collected with zero headspace. Each VOA vial will be tilted to approximately 45 degrees of vertical, and filled using a low flow rate (i.e., approximately 250 milliliters per minute of sample). The vial will be filled to the brim and then, using the cap, a small amount of water shall be added until a convex meniscus is formed. The vial will then be capped, turned upside down, and tapped to verify no headspace. Samples will be stored in a cooler with wet ice at 4° Celsius (C), ± 2°C, and hand delivered to the analytical laboratory.

4.6.4 Analytical Methods and Procedures

Samples will be analyzed following protocols that include quality control (QC) provisions and sample documentation and management practices as described in the following sections.

Sample Analyses

Water samples will be analyzed for VOCs following EPA Method 8260B and submitted to Airtech Environmental Laboratories (AEL) of Phoenix, Arizona. AEL is an environmental testing laboratory certified by ADHS under license number AZ0740. AEL will analyze for the six (6) WVBA Site COCs. The reporting limit for each COC will be 0.5 micrograms per liter.

Data quality control practices will be in accordance with the AEL standard operating procedure (SOP) for analysis of VOCs by EPA Method 8260B (**Appendix I**). Standard quality control requires analysis of a Laboratory Control Sample (LCS), LCS duplicate, internal standard, and

surrogate analytes with each sample set. The 8260B method requires analytical accuracy to fall within a series of ranges of percent recoveries for internal standards and surrogates (see **Appendix I**). Laboratory duplicates must be less than or equal to 20 relative percent difference (RPD). Data quality control outside of these limits will be re-run if possible, or appropriately flagged with the reported results.

Quality Control

Quality control measures will be employed to evaluate both the field sampling procedures and techniques as well as the laboratory procedures and performance of instrumentation.

Field QC samples (including trip blanks and field duplicates) will be collected to help evaluate conditions resulting from field conditions and activities. Field QC samples may be used to evaluate variability in environmental sampling and analysis of organic contaminants.

Field duplicate samples will be collected and treated independently of its counterpart in order to assess field sampling procedures and laboratory precision and accuracy, through comparison of the results, and collected at a frequency of one (1) per sampling event. Duplicate samples will be preserved, packaged, and sealed in the same manner as the primary samples. A separate sample number and identification will be assigned to the duplicate, and it will be submitted blind to the laboratory. Identity of the duplicate sample will be recorded on the Weekly Operation and Maintenance Inspection Form (**Appendix J**).

Trip blank samples are used to determine if VOC water samples have been contaminated during transport from the field to the lab. The trip blanks are prepared by the laboratory by filling a VOA vial head-space free with organic free water, preserved with 1:1 HCl, labeled as "Trip Blank" or "TB" with the preparation date included on the custody seal. Trip blanks will be included in each cooler used to transport water samples to the laboratory. The results of the trip blanks are a key aspect of the overall QC system for the sampling program, and will be included in the analytical results report.

Laboratory quality control samples are certified standards analyzed by the laboratory (including matrix spike samples and duplicates) to demonstrate accuracy on a daily basis. Since samples to be used as matrix spikes are randomly selected by the laboratory analyst after receipt of samples, it is understood that such analyses may or may not include samples from any given sampling event or location.

Laboratory procedures will be evaluated using field duplicate samples, matrix spikes and other internal procedures defined by the analytical method and analytical laboratory.

Sample Documentation and Management

Chain-of-custody records are completed for each sampling event. The chain-of-custody record will be completed as samples are collected. An example chain-of-custody record for AEL is provided as **Appendix K** and will accompany the samples to the laboratory. Information to be entered on each chain-of-custody record includes:

- Project name
- Project manager/contact person
- Printed name of sampler and signature
- Date and time of collection
- Sample matrix identification
- Number of containers collected for each sample
- Sample identification
- Analyses requested
- Turn-around-time requested
- Dates of possession
- Name and signature of person relinquishing samples
- Date of sample receipt
- Time of sample receipt
- Name and signature of person receiving the samples
- Remarks pertinent to sample collection, preparation, preservation, and analyses

Samples will be submitted as soon as possible (i.e., on the date of sampling) to AEL with requested turnaround time of five (5) days and VOC analyses following EPA Method 8260B, which has a hold time of 14 days.

All documentation will be made in indelible ink. Corrections will be made by drawing a line through the error and entering the correct information. Both the error and the correct information must be legible. The person making the correction will initial the document where changes are made.

5.0 SPENT GAC MANAGEMENT

For each wellhead treatment system site, spent GAC must currently be profiled every two years by the carbon vendor. Synergy will coordinate the profiling process, contacting the carbon vendor a minimum of six weeks prior to an anticipated carbon change-out so that a grab sample of spent GAC can be collected and analyzed. The grab sample shall be collected by the carbon vendor using a 16-ounce glass jar (or similar) by accessing the 14-inch by 18-inch elliptical man-way located at the top of each vessel (see Section 8.0 of the Siemens O&M Manual in **Appendix E**). Following satisfactory completion of the profiling process, spent GAC can be removed and transported off-site to a reactivation facility provided the profile indicates the GAC as non-hazardous. All historical profiles have indicated spent GAC from the wellhead treatment systems were non-hazardous. All profile records will be maintained in the Field Office at RID-95.

6.0 DOCUMENTATION AND REPORTING

This section includes the ongoing, periodic documentation and reporting necessary for effective monitoring of the wellhead treatment systems.

6.1 WEEKLY INSPECTION FORMS

Inspections will be conducted once per week to monitor the operational and physical conditions at each wellhead treatment system. A blank inspection form is included as **Appendix J**, and provides for collecting data related to water flow rates; operating pressures at the wellhead and across the treatment vessels, alarms, and equipment inspections and maintenance/repairs. The Operator will complete the form during each inspection. All inspection data and information will then be uploaded to the operations database for the wellhead treatment systems. The inspection form will be reviewed annually (at a minimum) and updated as appropriate.

6.2 MONTHLY PROGRESS REPORTING

For each month that the wellhead treatment systems are in operation, a Monthly Progress Report will be prepared to document remedy progress. RID will provide ADEQ's Remedial Projects Unit with one (1) hardcopy and one (1) electronic copy of each Report by the 15th of the month that follows the reporting period. An example of a typical Monthly Progress Report (excluding copies of the final laboratory reports) is provided as **Appendix L**. Each Monthly Progress Report will include the following, at a minimum:

- Approximate mass of target COCs removed and groundwater volume treated during the reporting period, and cumulative total of target COCs removed and groundwater volume treated since system start-up for each treatment system and total for all sites;
- Tabular summary of wellhead treatment system samples collected and analytical results for the reporting period;
- Copies of final laboratory reports for the reporting period;
- Operational hours/percentage for each wellhead treatment system during the reporting period;
- Dates of carbon change-outs conducted during the reporting period;
- Summary of any malfunctions which caused the wellhead treatment systems to be offline during the reporting period;

- Summary of the maintenance activities performed to correct those malfunctions during the reporting period;
- Summary of system operation upset events (see Section 4.1) reported to ADEQ during the reporting period; and,
- Copies of the weekly inspection forms during the reporting period.

The most recent Monthly Progress Reports (without voluminous analytical laboratory results) are available on the West Valley Groundwater Cleanup Coalition website (http://www.wvgroundwater.org), under the "Project Documents" tab.

7.0 KEY CONTACTS LIST

Key contacts for the wellhead treatment systems include:

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Compliance Coordinator –

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Synergy Environmental, LLC
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Phone: (602) 430-2785

8.0 REFERENCES CITED

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TABLES

TABLE 2.
SUMMARY OF WELL CONSTRUCTION INFORMATION
ROOSEVELT IRRIGATION DISTRICT WELLHEAD TREATMENT SITES
West Van Buren Area WQARF Site

Well Name	ADWR Number	Hole Depth (feet, bls)	Screened Interval(s) (feet, bls)	Unit(s) Screened[a]	Year Constructed	Casing Total Depth (feet, bls)	Casing Diameter (inches)	Reported Depth to Water[b] (feet, bls)	Pumping Water Level, 2012 (feet, bls)	Pump Details	VFD Motor	Pump Setting Depth (feet, bls)
RID-89	55-607221	1,800	180-805 860-1,434 1,465-1,770	UAU, MAU, LAU	4/29/65; redrill	1785	20 16 12	120	139	Louis Allis 16HH, 1185 RPM, 200 hp, 6 stages, 251 amps / 268 FLA , 440 V	No	200
RID-92	55-607218	500	180-488	UAU, MAU	2/9/59; redrill	488	20	112	208	AOA Smith 14HXB, 1760 RPM, 150 hp, 4 stages, 174 amps / 180 FLA, 440 V	No	270
RID-95	55-607215	1,800	180-815 836-1,470 1,497-1,775	UAU, MAU, LAU	12/29/64; redrill	1775	24 20 16	103	190	American Turbine, 15-M, 1760 RPM, 200 hp, 2 stages, 157 amps / 227 FLA, 440 V	No	220
RID-114	55-607197	395	205-380	UAU	2/11/53	395	20	109	no data	Keller 14MC, 1760 RPM, 200 hp, 3 stages, 194 amps / 240 FLA, 440 V	No	220

Explanation:

[a]Based on well driller's log

[b]RID reported 2013 (January) non-pumping water levels.

Abbreviations:

bls = below land surface
gpm = gallons per minute
UAU = Upper Alluvial Unit
MAU = Middle Alluvial Unit
LAU = Lower Alluvial Unit
hp = horsepower
FLA = full load amps
V = volts

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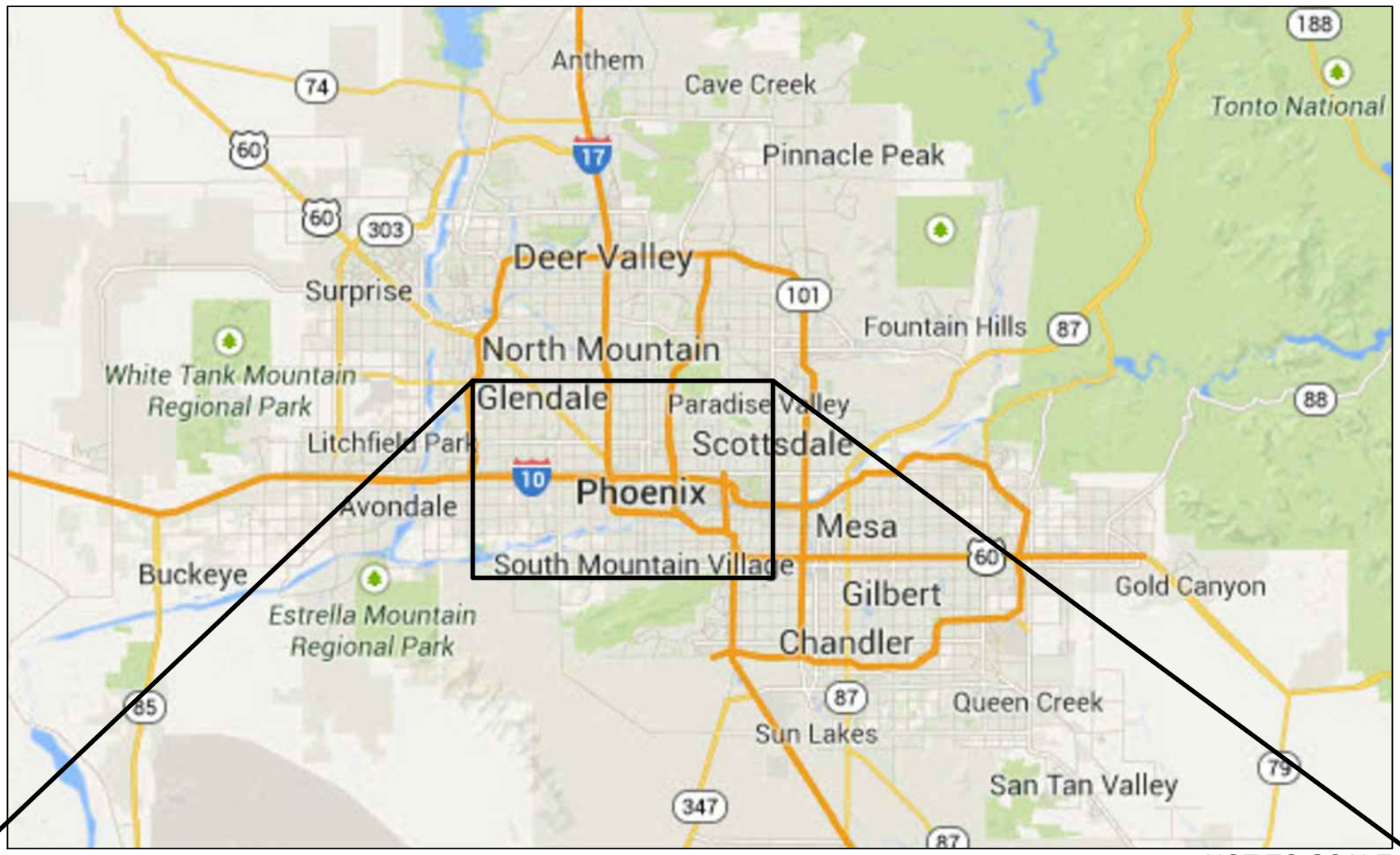
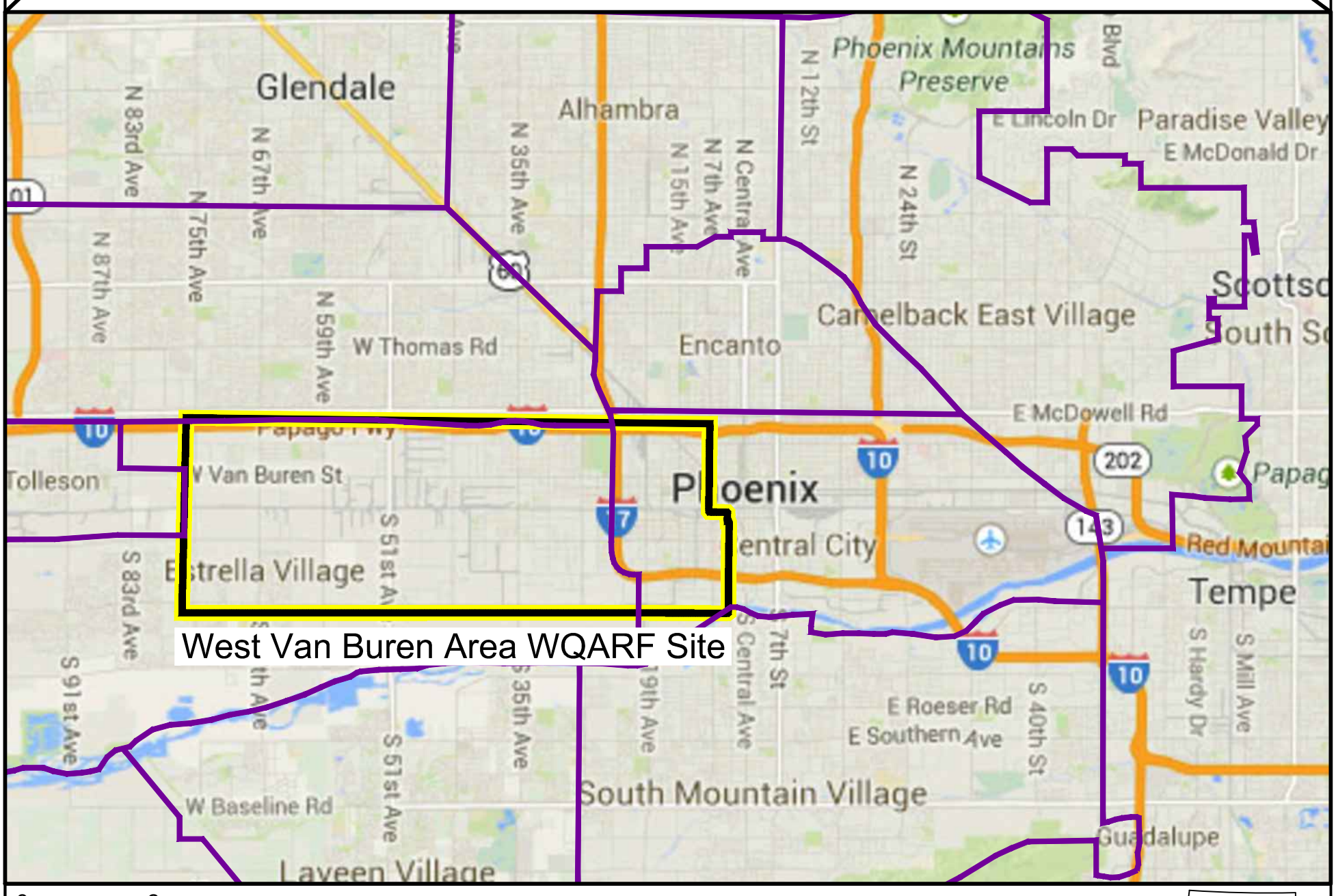
FIGURES

Drawing Path: N:\Synergy\Roosevelt Irr\O&M Plan\, Drawing Name: Site Location Map Fig 01 Exhibit.dwg



NOT TO SCALE



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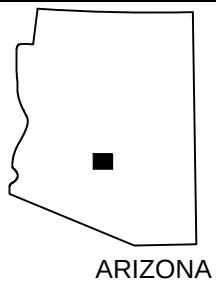
EXPLANATION

Site Boundary

Approximate Urban Village Boundary

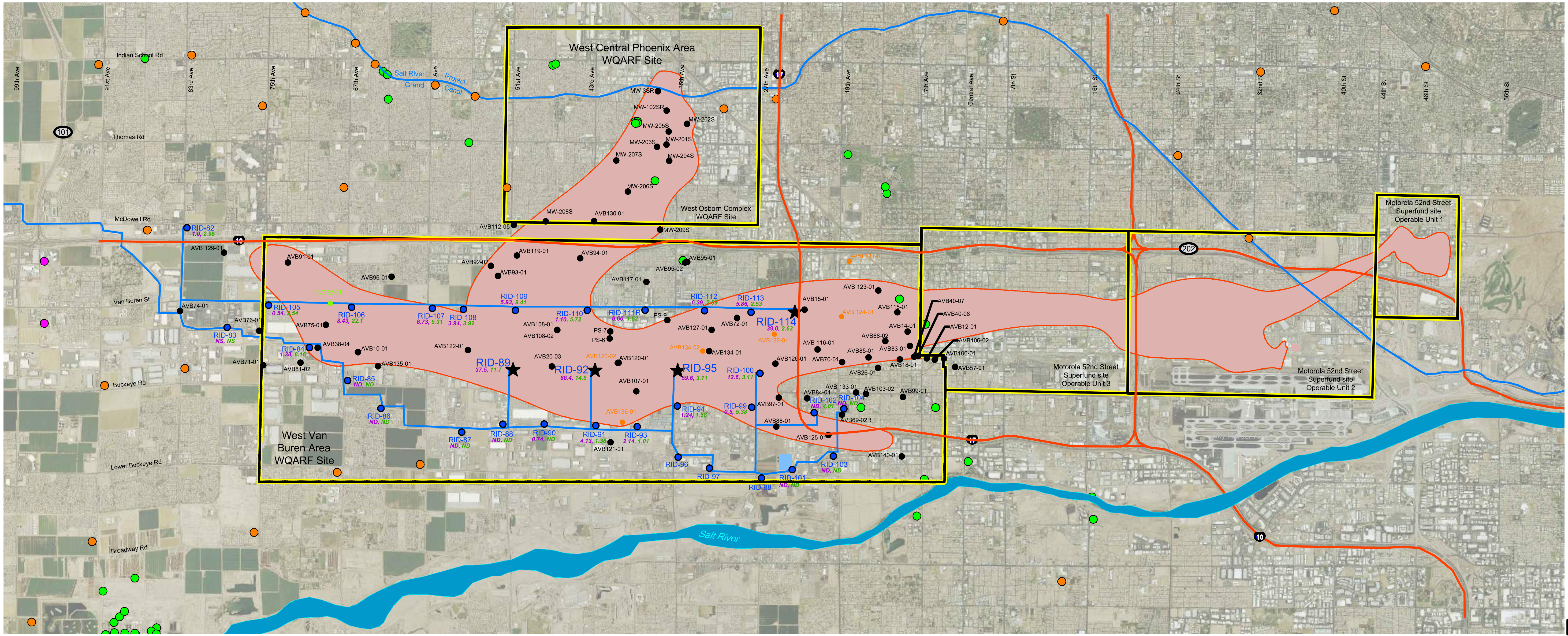


N

SITE LOCATION MAP

Roosevelt Irrigation District
West Van Buren Area
WQARF Site

By: LD	Date: 09/17/14	Project No. 804.90
Synergy Environmental, LLC 10645 N. Tatum Blvd. Suite 200-437 Phoenix, AZ 85028 602-430-2785		Figure 1



0 6,600 13,200

APPROXIMATE SCALE IN FEET

EXPLANATION

Symbol	Description
● (blue)	Roosevelt Irrigation District Well Identifier
RID-90 NS, NS	Concentration of PCE, in µg/L Concentration of TCE, in µg/L
★ RID-89	Location of Wellhead Treatment System
● AVB10-01	Monitor Well and Identifier (Black=UAU1; Orange=UAU2; Green=MAU)
● (green)	City of Phoenix Well
● (magenta)	City of Tolleson Well
● (orange)	Salt River Project Well
Yellow box	Site Boundary
Red shaded area	Estimated Extent of PCE and/or TCE Contamination greater than 5µg/L in Central Phoenix Groundwater Contaminant Plume
Blue line	Existing Canal or Pipeline
Red line	Interstates
Grey line	Local Streets

NOTE: Water quality data noted for RID wells are from September 2013.

Abbreviations

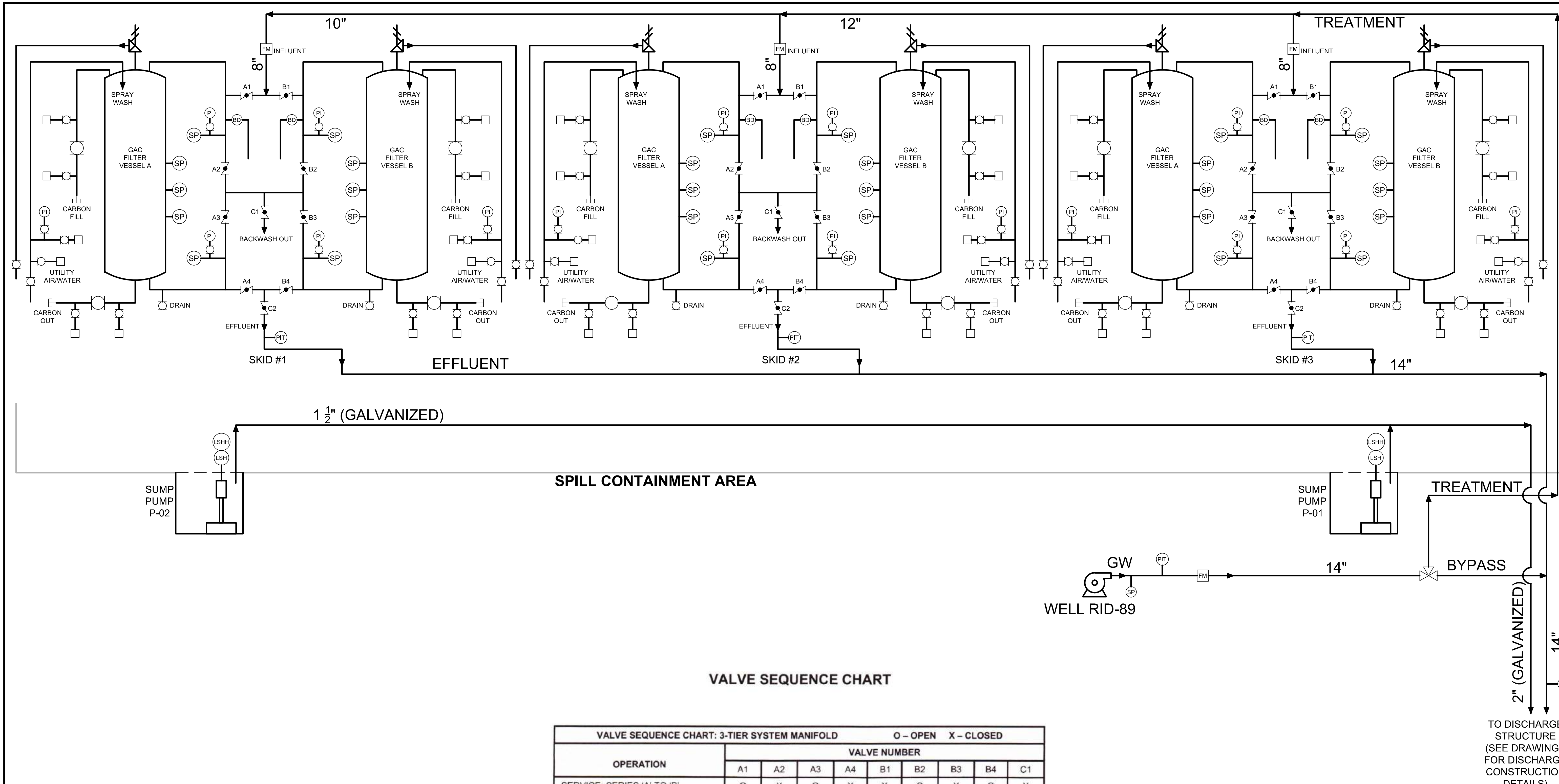
WQARF - Water Quality Assurance Revolving Fund
WWTP - Waste Water Treatment Plant
RID - Roosevelt Irrigation District
LAU - Lower Aquifer Unit
MAU - Middle Aquifer Unit
UAU - Upper Aquifer Unit
ND - Not Detected
NS - Not Sampled
ADEQ - Arizona Department of Environmental Quality
PCE - Tetrachloroethene
TCE - Trichloroethene
µg/L - Micrograms per Liter

Groundwater contamination depicted on this map represents the author's interpretation of currently available data to estimate the geographical extent of PCE and TCE contamination in commingled contaminant plumes throughout the central and west central Phoenix area. There are numerous sources of contaminants of concern in groundwater throughout this region and interpolation of data and its representation in a consolidated regional plume is subjective; the actual extent of contamination may be different. Sources of data include depth specific UAU and MAU monitor wells and large capacity RID wells that produce groundwater largely from the UAU. The representation of the extent of groundwater contamination within the Motorola 52nd Street Superfund site is generated from the most recent plume map published by ADEQ and posted on their web site.

SITE MAP AND VICINITY

Roosevelt Irrigation District
West Van Buren Area
WQARF Site

By: ld	Date: 09/17/14	Project No. 802.40
Synergy Environmental, LLC	Montgomery & Associates	Figure 2



VALVE SEQUENCE CHART

VALVE SEQUENCE CHART: 3-TIER SYSTEM MANIFOLD O – OPEN X – CLOSED									
OPERATION	VALVE NUMBER								
	A1	A2	A3	A4	B1	B2	B3	B4	C1
SERVICE: SERIES 'A' TO 'B'	O	X	O	X	X	O	X	O	X
SERVICE: SERIES 'B' TO 'A'	X	O	X	O	O	X	O	X	X
SERVICE: 'A' ONLY	O	X	X	O	X	X	X	X	X
SERVICE: 'B' ONLY	X	X	X	X	O	X	X	O	X
SERVICE: PARALLEL 'A' AND 'B'	O	X	X	O	O	X	X	O	X
BACKWASH: 'A' ONLY	X	O	X	O	X	X	X	X	O
BACKWASH: 'B' ONLY	X	X	X	X	X	O	X	O	O
BACKWASH 'A' FROM SERVICE 'B' [1]	X	O	X	O	O	X	X	O	O
BACKWASH 'B' FROM SERVICE 'A' [1]	O	X	X	O	X	O	X	O	O
BACKWASH: PARALLEL 'A' AND 'B'	X	O	X	O	X	O	X	O	O

[1] REQUIRES VALVE ON EFFLUENT WATER PIPE TO BE CLOSED.

EXPLANATION

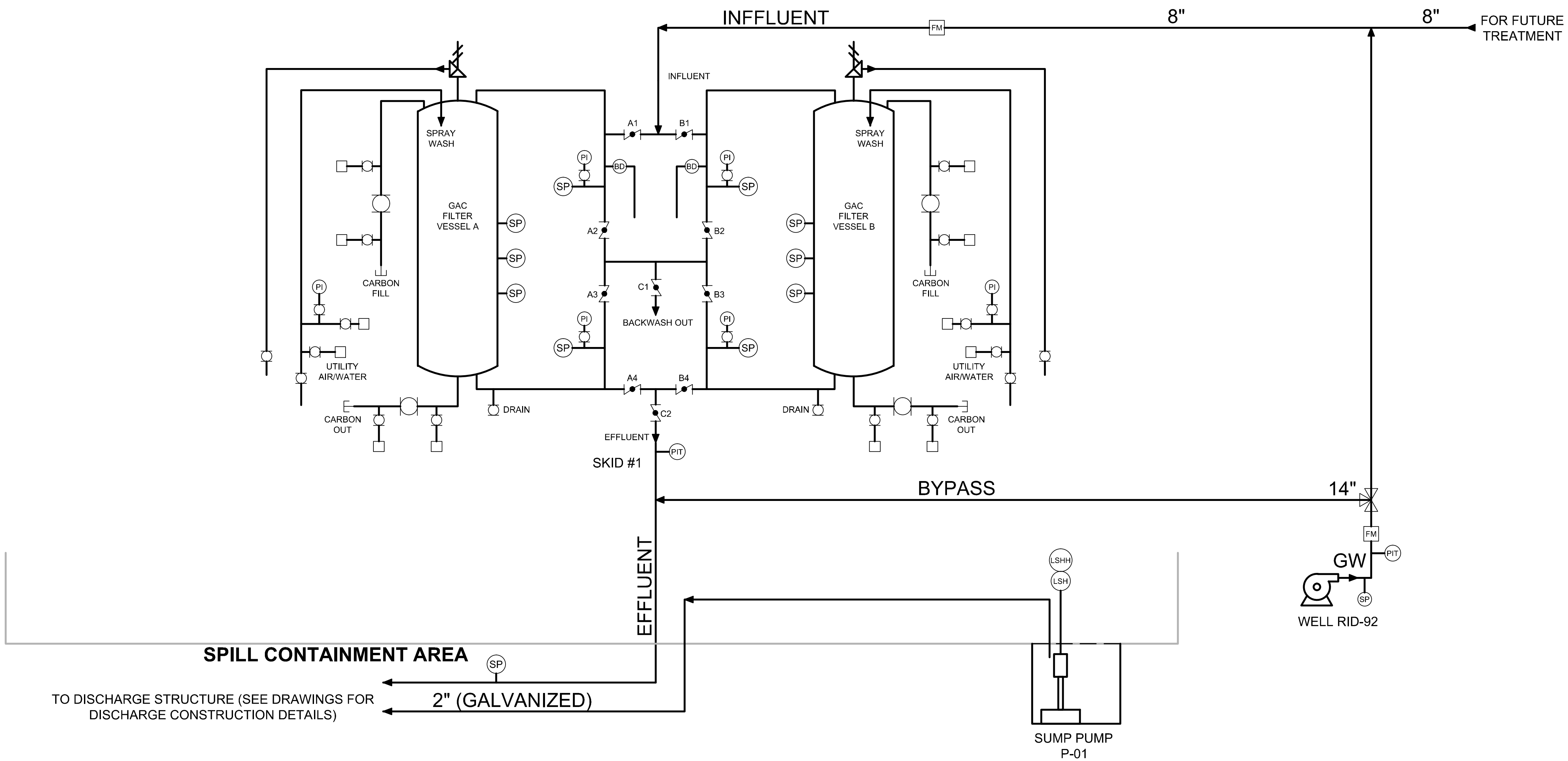
- CHICAGO FITTING
- BALL VALVE
- 3-WAY VALVE
- BUTTERFLY VALVE
- VACUUM/AIR RELIEF
- CAM LOCK (MALE)
- WELL PUMP
- PI — PRESSURE INDICATOR
- BD — BURST DISK
- SP — SAMPLE PORT
- FM — FLOW METER
- PIT — PRESSURE TRANSMITTER
- LSH — HIGH LEVEL SWITCH
- LSHH — HIGH-HIGH LEVEL SWITCH

0 5 10
APPROXIMATE SCALE IN FEET

PIPING AND INSTRUMENTATION DIAGRAM
RID-89 WELLHEAD TREATMENT SYSTEM

Roosevelt Irrigation District
West Van Buren Area

By: LD	Date: 10/07/14	Project No. 802.40
SYNERGY ENVIRONMENTAL, LLC	10645 N. Tatum Blvd. Suite 200-437 Phoenix, AZ 85028 602-430-2785	Figure 3

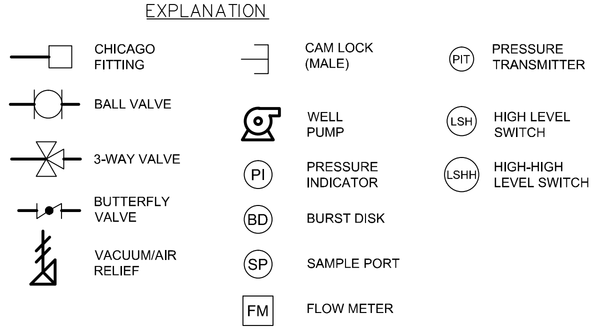


VALVE SEQUENCE CHART

VALVE SEQUENCE CHART: 3-TIER SYSTEM MANIFOLD O – OPEN X – CLOSED									
OPERATION	VALVE NUMBER								
	A1	A2	A3	A4	B1	B2	B3	B4	C1
SERVICE: SERIES 'A' TO 'B'	O	X	O	X	X	O	X	O	X
SERVICE: SERIES 'B' TO 'A'	X	O	X	O	O	X	O	X	X
SERVICE: 'A' ONLY	O	X	X	O	X	X	X	X	X
SERVICE: 'B' ONLY	X	X	X	X	O	X	X	O	X
SERVICE: PARALLEL 'A' AND 'B'	O	X	X	O	O	X	X	O	X
BACKWASH: 'A' ONLY	X	O	X	O	X	X	X	X	O
BACKWASH: 'B' ONLY	X	X	X	X	X	O	X	O	O
BACKWASH 'A' FROM SERVICE 'B' [1]	X	O	X	O	O	X	X	O	O
BACKWASH 'B' FROM SERVICE 'A' [1]	O	X	X	O	X	O	X	O	O
BACKWASH: PARALLEL 'A' AND 'B'	X	O	X	O	X	O	X	O	O

[1] REQUIRES VALVE ON EFFLUENT WATER PIPE TO BE CLOSED.

EXPLANATION



0 5 10
APPROXIMATE SCALE IN FEET

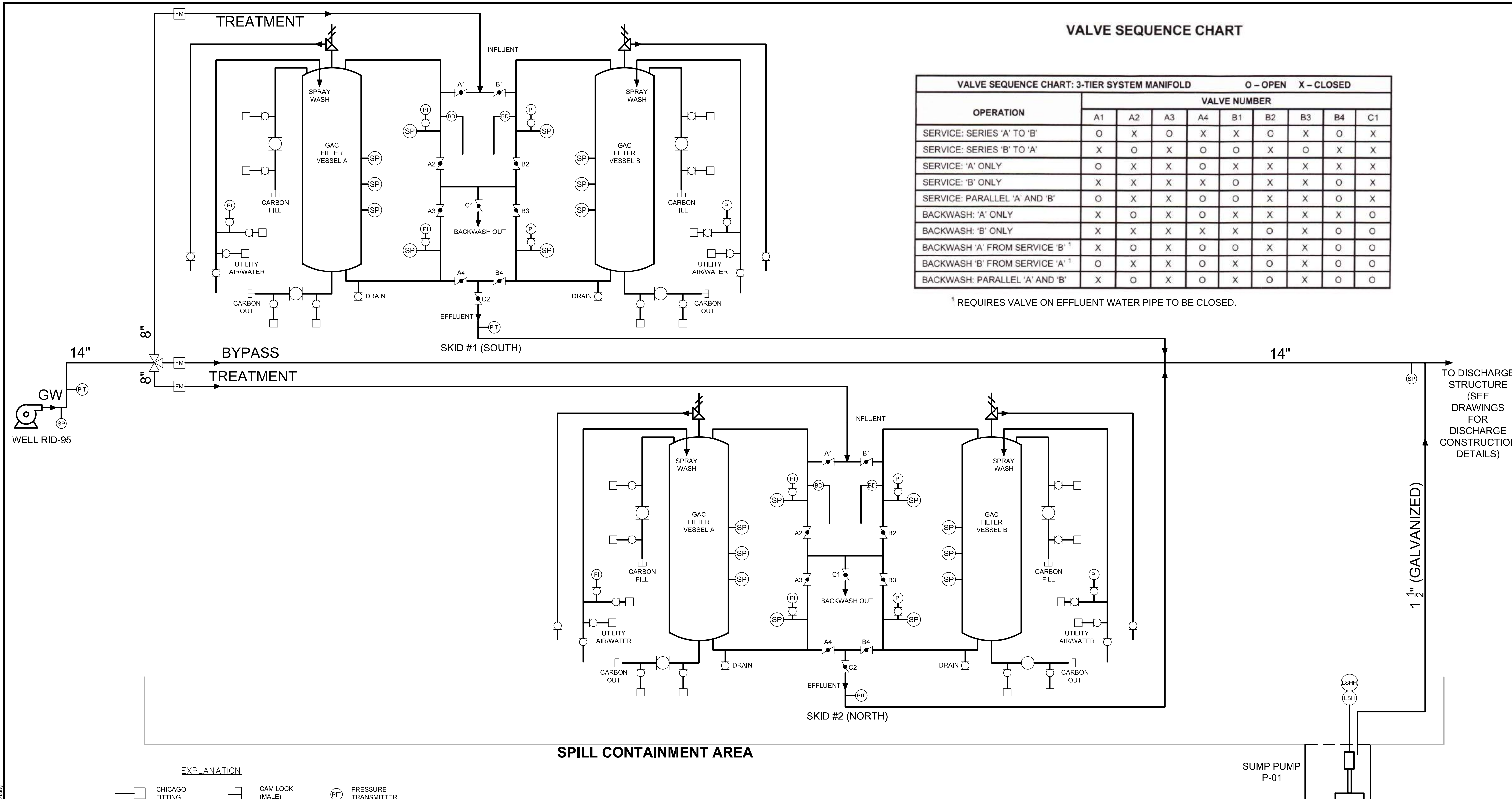
PIPING AND INSTRUMENTATION DIAGRAM
RID-92 WELLHEAD TREATMENT SYSTEM

Roosevelt Irrigation District
West Van Buren Area

By: LD | Date: 12/17/14 | Project No. 802.40

SYNERGY ENVIRONMENTAL, LLC
10645 N. Tatum Blvd.
Suite 200-437
Phoenix, AZ 85028
602-430-2785

Figure 4

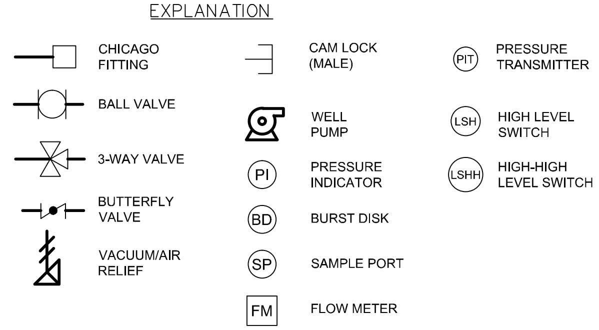


VALVE SEQUENCE CHART

VALVE SEQUENCE CHART: 3-TIER SYSTEM MANIFOLD O – OPEN X – CLOSED									
OPERATION	VALVE NUMBER								
	A1	A2	A3	A4	B1	B2	B3	B4	C1
SERVICE: SERIES 'A' TO 'B'	O	X	O	X	X	O	X	O	X
SERVICE: SERIES 'B' TO 'A'	X	O	X	O	O	X	O	X	X
SERVICE: 'A' ONLY	O	X	X	O	X	X	X	X	X
SERVICE: 'B' ONLY	X	X	X	X	O	X	X	O	X
SERVICE: PARALLEL 'A' AND 'B'	O	X	X	O	O	X	X	O	X
BACKWASH: 'A' ONLY	X	O	X	O	X	X	X	X	O
BACKWASH: 'B' ONLY	X	X	X	X	X	O	X	O	O
BACKWASH 'A' FROM SERVICE 'B' [1]	X	O	X	O	O	X	X	O	O
BACKWASH 'B' FROM SERVICE 'A' [1]	O	X	X	O	X	O	X	O	O
BACKWASH: PARALLEL 'A' AND 'B'	X	O	X	O	X	O	X	O	O

[1] REQUIRES VALVE ON EFFLUENT WATER PIPE TO BE CLOSED.

EXPLANATION

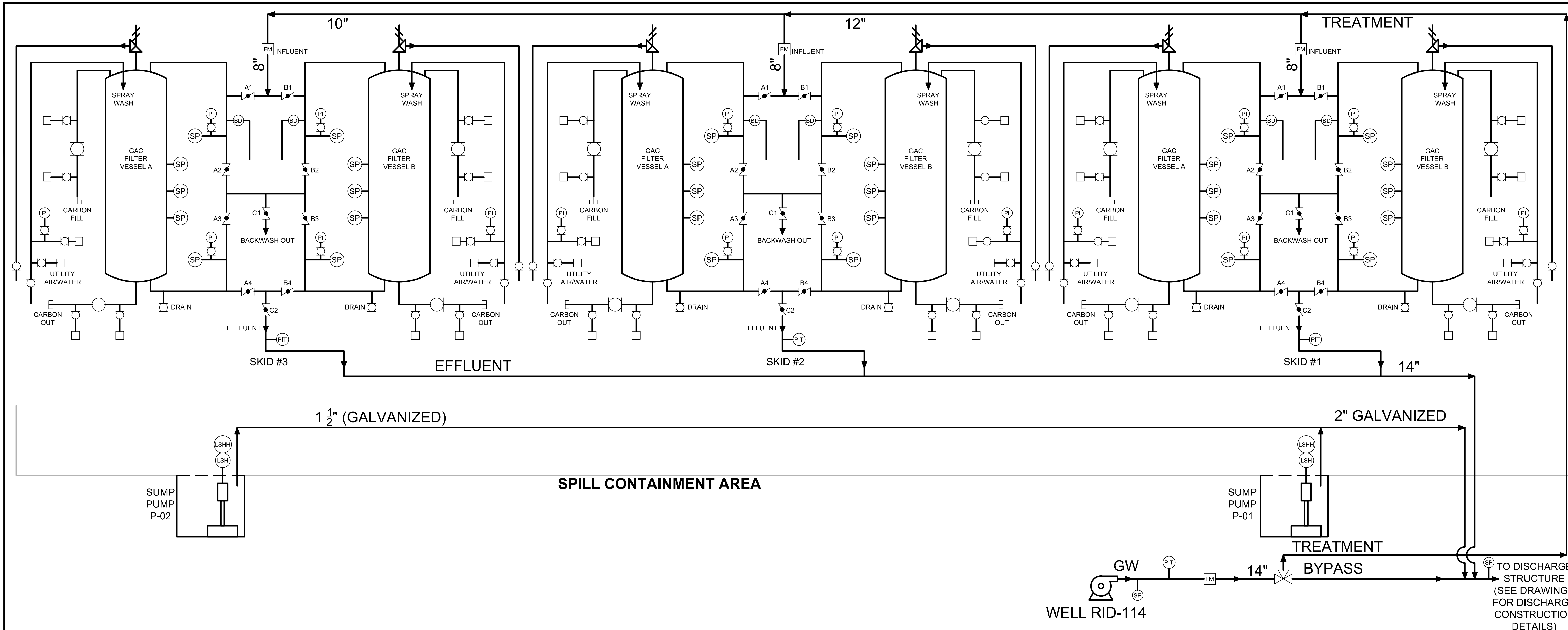


0 5 10
APPROXIMATE SCALE IN FEET

PIPING AND INSTRUMENTATION DIAGRAM
RID-95 WELLHEAD TREATMENT SYSTEM

Roosevelt Irrigation District
West Van Buren Area

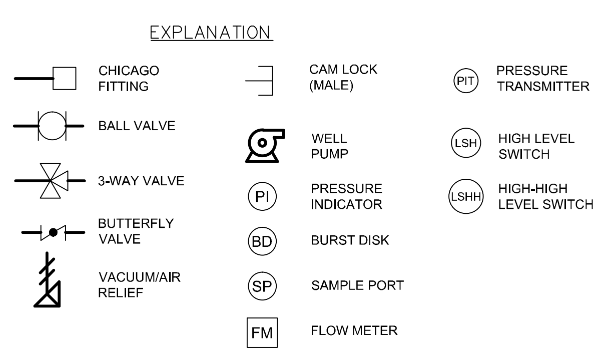
By: LD	Date: 10/07/14	Project No. 802.40
SYNERGY ENVIRONMENTAL, LLC	10645 N. Tatum Blvd. Suite 200-437 Phoenix, AZ 85028 602-430-2785	Figure 5



VALVE SEQUENCE CHART

VALVE SEQUENCE CHART: 3-TIER SYSTEM MANIFOLD O – OPEN X – CLOSED									
OPERATION	VALVE NUMBER								
	A1	A2	A3	A4	B1	B2	B3	B4	C1
SERVICE: SERIES 'A' TO 'B'	O	X	O	X	X	O	X	O	X
SERVICE: SERIES 'B' TO 'A'	X	O	X	O	O	X	O	X	X
SERVICE: 'A' ONLY	O	X	X	O	X	X	X	X	X
SERVICE: 'B' ONLY	X	X	X	X	O	X	X	O	X
SERVICE: PARALLEL 'A' AND 'B'	O	X	X	O	O	X	X	O	X
BACKWASH: 'A' ONLY	X	O	X	O	X	X	X	X	O
BACKWASH: 'B' ONLY	X	X	X	X	X	O	X	O	O
BACKWASH 'A' FROM SERVICE 'B' [1]	X	O	X	O	O	X	X	O	O
BACKWASH 'B' FROM SERVICE 'A' [1]	O	X	X	O	X	O	X	O	O
BACKWASH: PARALLEL 'A' AND 'B'	X	O	X	O	X	O	X	O	O

[1] REQUIRES VALVE ON EFFLUENT WATER PIPE TO BE CLOSED.



0 5 10
APPROXIMATE SCALE IN FEET

PIPING AND INSTRUMENTATION DIAGRAM
RID-114 WELLHEAD TREATMENT SYSTEM

Roosevelt Irrigation District
West Van Buren Area

By: LD	Date: 10/07/14	Project No. 802.40
SYNERGY ENVIRONMENTAL, LLC 10645 N. Tatum Blvd. Suite 200-437 Phoenix, AZ 85028 602-430-2785		Figure 6

SYNERGY ENVIRONMENTAL, LLC

APPENDIX A

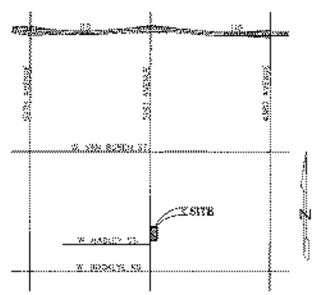
RID-89 Wellhead Treatment System Drawings

ROOSEVELT IRRIGATION DISTRICT
SITE #89 WATER TREATMENT INSTALLATION

LOCATED IN
A PORTION OF SECTION 9, T.1.N., R.2.E.
OF THE G. & S.R.M., MARICOPA COUNTY, ARIZONA

ENGINEERS NOTES

1. MARICOPA ASSOCIATION OF GOVERNMENTS (M.A.G.) UNIFORM STANDARD SPECIFICATIONS AND DETAILS FOR PUBLIC WORKS CONSTRUCTION (LATEST EDITION INCLUDING LATEST REVISION AND CURRENT SUPPLEMENTALS THEREOF PER THE LOCAL TOWN OR CITY) ARE INCORPORATED INTO THIS PLAN IN THEIR ENTIRETY.
2. ALL WORK REQUIRED TO COMPLETE THE CONSTRUCTION COVERED BY THIS PLAN SHALL BE IN ACCORDANCE WITH THE M.A.G. STANDARD SPECIFICATIONS AND DETAILS AND CURRENT SUPPLEMENTS THEREOF PER THE LOCAL CITY OR TOWN UNLESS SPECIFIED OTHERWISE IN THESE PLANS OR ELSEWHERE IN THE CONTRACT DOCUMENTS. CONTRACTORS SHALL FAMILIARIZE THEMSELVES WITH ALL REQUIRED STANDARD SPECIFICATIONS, DETAILS AND SUPPLEMENTS PRIOR TO BIDDING THE WORK FOR THE CONSTRUCTION COVERED BY THIS PLAN.
3. THE CONTRACTOR IS RESPONSIBLE FOR ALL METHODS, SEQUENCING, AND SAFETY CONCERNS ASSOCIATED WITH THIS PROJECT DURING CONSTRUCTION, UNLESS SPECIFICALLY ADDRESSED OTHERWISE IN THIS PLAN OR ELSEWHERE IN THE CONTRACT.
4. THE CONTRACTOR IS TO COMPLY WITH ALL LOCAL, STATE, AND FEDERAL LAWS AND REGULATIONS APPLICABLE TO THE CONSTRUCTION COVERED BY THIS PLAN.
5. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING AND COMPLYING WITH ALL PERMITS REQUIRED TO COMPLETE ALL WORK COVERED BY THIS PLAN.
6. THE QUANTITIES AND SITE CONDITIONS DEPICTED IN THESE PLANS ARE FOR INFORMATIONAL PURPOSES ONLY AND ARE SUBJECT TO ERROR AND OMISSION. CONTRACTORS SHALL SATISFY THEMSELVES AS TO ACTUAL QUANTITIES AND SITE CONDITIONS PRIOR TO BIDDING THE WORK FOR THE CONSTRUCTION COVERED BY THIS PLAN.
7. A REASONABLE EFFORT HAS BEEN MADE TO SHOW THE LOCATIONS OF EXISTING UNDERGROUND FACILITIES AND UTILITIES IN THE CONSTRUCTION AREA. THE CONTRACTOR IS RESPONSIBLE FOR ANY DAMAGE TO UTILITIES AND/OR FACILITIES CAUSED DURING THEIR CONSTRUCTION OPERATIONS. THE CONTRACTOR SHALL CALL 48 HOURS IN ADVANCE FOR BLUE STAKE (1-800-STAKE-IT) PRIOR TO ANY EXCAVATION.
8. THE CONTRACTOR IS RESPONSIBLE FOR ALL COORDINATION OF CONSTRUCTION AFFECTING UTILITIES AND THE COORDINATION OF ANY NECESSARY UTILITY RELOCATION WORK.
9. ALL PAVING, GRADING, EXCAVATION, TRENCHING, PIPE BEDDING, CUT FILL AND BACKFILL SHALL COMPLY WITH THE RECOMMENDATIONS SET FORTH IN THE SOILS (GEOTECHNICAL) REPORT FOR THIS PROJECT IN ADDITION TO THE REFERENCED REQUIRED SPECIFICATIONS AND DETAILS. THE CONTRACTOR SHALL BE AWARE THAT CERTAIN UTILITIES REQUIRE PROPER ATTENTION AND CAREFUL PLANNING DURING SITE CONSTRUCTION. PLEASE NOTE THAT UTILITIES ON THESE PLANS MAY NOT EXHIBIT THE FULL PROTECTIVE COVER REQUIRED DURING THE SUBGRADE PREPARATION PHASE OF THE CONSTRUCTION. IN SUCH INSTANCES, THE CONTRACTOR SHALL PROVIDE ADDITIONAL PROTECTION (SUCH AS RAMPING) OR INCREASED PIPE STRENGTH TO PROVIDE THE NECESSARY PROTECTION REQUIRED TO PREVENT DAMAGE DURING THE CONSTRUCTION OF THIS PROJECT. THE CONTRACTOR SHALL HOLD THE ENGINEER HARMLESS IN ALL CASES FOR DAMAGES TO UTILITIES WHEN INADEQUATE PROTECTIVE MEASURES OCCUR.
10. THE CONTRACTOR IS TO VERIFY THE LOCATION AND THE ELEVATIONS OF ALL EXISTING UTILITIES AT POINTS OF TIE-IN PRIOR TO COMMENCING ANY NEW CONSTRUCTION. SHOULD ANY LOCATION OR ELEVATION DIFFER FROM THAT SHOWN ON THESE PLANS, THE CONTRACTOR SHALL CONTACT THE OWNER'S AGENT.
11. CONTRACTOR TO VERIFY AND COORDINATE ALL DIMENSIONS AND SITE LAYOUT WITH ARCHITECT'S FINAL SITE PLAN AND FINAL BUILDING DIMENSIONS BEFORE STARTING WORK. REPORT DISCREPANCIES TO OWNER'S AGENT.
12. COORDINATION BETWEEN ALL PARTIES IS ESSENTIAL PART OF CONTRACT.
13. CONTRACTOR IS RESPONSIBLE FOR PROJECT AND SITE CONDITIONS, AND TO WORK WITH WEATHER CONDITIONS AS THE PROJECT SITE MAY BE LOCATED IN A FLOOD PRONE AREA AND SUBJECT TO FLOODING AND ITS HAZARDS.
14. THE CONTRACTOR IS TO VERIFY THE LOCATION, ELEVATION, CONDITION, AND PAVEMENT CROSS-SLOPE OF ALL EXISTING SURFACES AT POINTS OF TIE-IN AND MATCHING, PRIOR TO COMMENCEMENT OF GRADING, PAVING, CURB AND GUTTER, OR OTHER SURFACE CONSTRUCTION. SHOULD EXISTING LOCATIONS, ELEVATIONS, CONDITION, OR PAVEMENT CROSS-SLOPE DIFFER FROM THAT SHOWN ON THESE PLANS, RESULTING IN THE DESIGN INTENT REFLECTED ON THESE PLANS NOT ABLE TO BE CONSTRUCTED, THE CONTRACTOR SHALL NOTIFY THE OWNER'S AGENT IMMEDIATELY FOR DIRECTION ON HOW TO PROCEED PRIOR TO COMMENCEMENT OF CONSTRUCTION. THE CONTRACTOR ACCEPTS RESPONSIBILITY FOR ALL COSTS ASSOCIATED WITH CORRECTIVE ACTION IF THESE PROCEDURES ARE NOT FOLLOWED.
15. CONTRACTOR IS RESPONSIBLE TO COORDINATE UTILITY CROSSINGS AT CULVERT CROSSINGS BEFORE STARTING WORK ON CULVERT. COORDINATE WITH OWNER REPRESENTATIVE. VERIFY UTILITY LINES AND/OR CONDUITS ARE IN PLACE BEFORE STARTING CULVERT WORK.
16. CONSTRUCT RETENTION BASIN AS SHOWN. CONTRACTOR TO SCARIFY BOTTOM OF BASIN TWO FEET DEEP AND NOT ALLOW COMPACTION OVER 90%.
17. THIS PROJECT REQUIRES A REGULAR ONGOING MAINTENANCE PROGRAM FOR THE DESIGNED DRAINAGE SYSTEM(S) TO PRESERVE THE DESIGN INTEGRITY AND THE ABILITY TO PERFORM ITS OPERATIONAL INTENT. FAILURE TO PROVIDE MAINTENANCE WILL JEOPARDIZE THE DRAINAGE SYSTEM(S)' PERFORMANCE AND MAY LEAD TO ITS INABILITY TO PERFORM PROPERLY AND/OR CAUSE DAMAGE ELSEWHERE IN THE PROJECT.
18. SEWER LINES DESIGNED IN PROFILE AND PUBLIC WATER LINES ARE REQUIRED TO BE ASBUILT AND THE INSTALLATION AND TESTING WITNESSED BY A PROFESSIONAL ENGINEER IN ACCORDANCE WITH ARIZONA ADMINISTRATIVE CODES R18-9-E301 "4.01 GENERAL PERMIT: SEWAGE COLLECTIONS SYSTEMS" AND R18-5-507 AND 508 "APPROVAL OF CONSTRUCTION" AND "RECORD DRAWINGS", RESPECTIVELY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY OWNER 72 HOURS IN ADVANCE WHEN THOSE SYSTEMS ARE READY TO BE WITNESSED.
19. THE WORK PRODUCT PRESENTED IS BELIEVED TO BE COMPLIANT WITH THE INTENT OF THE CURRENT AMERICANS DISABILITIES ACT (ADA) REQUIREMENTS AS INTERPRETED BY THE REVIEWING AGENCY(S). IF CONSTRUCTION OF THE PROJECT IS DELAYED, THIS WORK PRODUCT SHOULD BE UPDATED TO ACCOUNT FOR ANY RELEVANT ADA UPDATES BEFORE CONSTRUCTION BEGINS.
20. LOWEST FLOOR (LF) REFERS TO EITHER FLOOR/SLAB ELEVATION OR TOP OF BASEMENT SLAB. LF ELEVATIONS ON THE GRADING AND DRAINAGE PLANS FOR RESIDENTIAL UNITS REFLECT SLAB ON GRADE CONDITIONS AND CANNOT BE LOWERED WITHOUT AGENCY APPROVAL IN LOCATIONS WHERE "SPECIAL FLOOD HAZARD AREAS" EXIST. IN NON-FLOOD HAZARD LOCATIONS, TO ENSURE THAT ADEQUATE RESIDENTIAL LOT DRAINAGE CAN BE ACHIEVED, A PROFESSIONAL ENGINEER SHOULD BE CONSULTED IF THE LF FOR THE SLAB IS PROPOSED TO BE LOWERED, OR IF A BASEMENT IS TO BE CONSTRUCTED.



VICINITY MAP
N.T.S.

OWNER
ROOSEVELT IRRIGATION DISTRICT
103 W. BASELINE ROAD
BUCKEYE, AZ 85326
CONTACT: DONOVAN NEESE
PH: 623-386-2046

TREATMENT DESIGNER
SYNERGY ENVIRONMENTAL LLC
10645 N TATUM BLVD., SUITE 200-437
PHOENIX, AZ 85028
CONTACT: JOEL PETERSON
PH: 480-284-3518

MECHANICAL ENGINEER
TAYLOR RYMAR CORPORATION
60 E RIO SALADO PARKWAY, SUITE 1010
TEMPE, AZ 85281
CONTACT: CHRIS MARONEY
PH: 480-951-0517
FAX: 480-951-2353

STRUCTURAL ENGINEER
PK ASSOCIATES LLC
7434 E MCDONALD DR.
SCOTTSDALE, ARIZONA 85250
CONTACT: STEVE SLONAKER
PH: 480-922-8834
FX: 480-922-1730

CIVIL ENGINEER
WOOD, PATEL AND ASSOCIATES
2051 W NORTHERN AVE, SUITE 100
PHOENIX, ARIZONA 85029
CONTACT: DARRELL SMITH
PH: 602-335-8500
FX: 602-335-8580

LEGEND

EXISTING	DESCRIPTION	PROPOSED
⊙	SURVEY MARKER	
	CURB & GUTTER	
— OHE —	OVERHEAD ELECTRIC LINE	
	CONCRETE ELEVATION	
	NATURAL GRADE	
	TOP OF CURB / GUTTER ELEVATION	
	PAVEMENT ELEVATION	
UP	UTILITY POLE	
	STREET LITE	
C.B.	CATCH BASIN	
	SIGN	

(602) 263-1100
1-800-STAKE-IT

ROOSEVELT IRRIGATION DISTRICT
SITE #89 WATER TREATMENT INSTALLATION
PHOENIX, ARIZONA
GRADING AND DRAINAGE PLAN

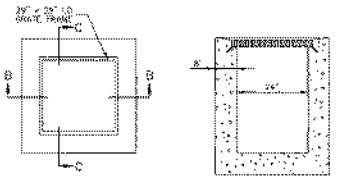
EXPIRES: 10-12-13

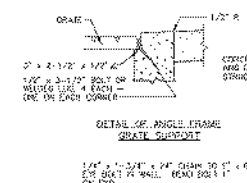
WOOD/PATEL

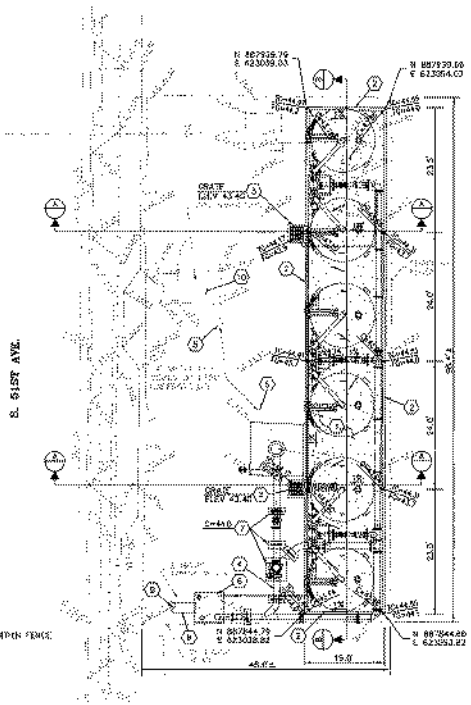
CIVIL ENGINEERS
HYDROLOGISTS
LAND SURVEYORS
CONSTRUCTION MANAGERS

(602) 335-8500

ENGINEER: D. SMITH
DESIGNER: A. MATTHEWS
CAD TECHNICIAN: R. JESSUP
SCALE (HORIZONTAL): N.T.S.
SCALE (VERTICAL): N/A
DATE
JOB NUMBER
SHEET 1 OF 3







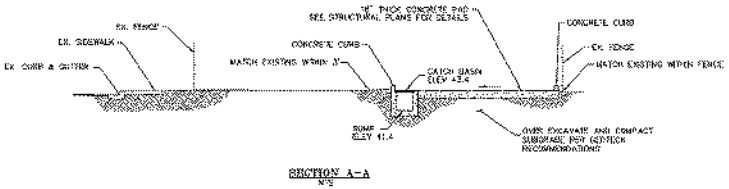
CONSTRUCTION NOTES

1. CONSTRUCT CONCRETE PAD OVER COMPACTED SUBGRADE, PER STRUCTURAL PLANS & SOIL REPORT RECOMMENDATION.
2. CONSTRUCT 6" CURB ON TOP OF SLAB PER STRUCTURAL PLANS.
3. CONSTRUCT GRATE FRAME AND GRATE PER DETAIL ON THIS SHEET. SEE STRUCTURAL PLANS FOR CONCRETE SUMP BASIN DETAIL.
4. PIPING PER TAYLOR RYMAR CORPORATION PLANS.
5. REMOVE EXISTING PIPING PER TAYLOR RYMAR PLANS. BACKFILL AND COMPACT TRENCH PER GEOTECH RECOMMENDATIONS.
6. CONSTRUCT DISCHARGE STRUCTURE PER ROOSEVELT IRRIGATION DISTRICT DETAIL ON SHEET 3.
7. CONSTRUCT CONCRETE PAD OVER COMPACTED SUBGRADE PER STRUCTURAL PLANS & GEOTECH RECOMMENDATION. CONTRACTOR TO VERIFY LOCATION IN THE FIELD.
8. INSTALL 24" R.C.P. CLASS III WITH JOINT GASKETS PER ASTM C 443. TRENCH EXCAVATION SHALL CONFORM TO M.A.G. SPECIFICATION 601.
9. CONNECT TO EXISTING IRRIGATION LATERAL.
10. REMOVE EXISTING IRRIGATION DISCHARGE STRUCTURE.

NOTE:

1. GEOTECH REPORT PREPARED BY AYER ENGINEERING CONSULTANTS, GEOTECHNICAL EXPLORATION ROOSEVELT IRRIGATION DISTRICT WATER TREATMENT PLANT – SE SOUTH WEST AVENUE NORTH OF WEST BUCKEYE ROAD PHOENIX, ARIZONA, DATED OCTOBER 28TH, 2011

2. CONCRETE FINISHED ELEVATIONS ALLOW FOR SURFACE DRAINAGE TO THE SUMP INLET. CONTRACTOR TO INSTALL SHIMS AND LEVEL AS NECESSARY. SEE STRUCTURAL DETAILS FOR GRADE TOLERANCES.



ROOSEVELT IRRIGATION DISTRICT
SITE #89 WATER TREATMENT INSTALLATION

PHOENIX, ARIZONA

GRADING AND DRAINAGE PLAN

EXPIRES 09-30-13

WOOD/PATEL

ENGINEER

DESIGNER

CAD TECHNICIAN

PROJECT ENGINEER

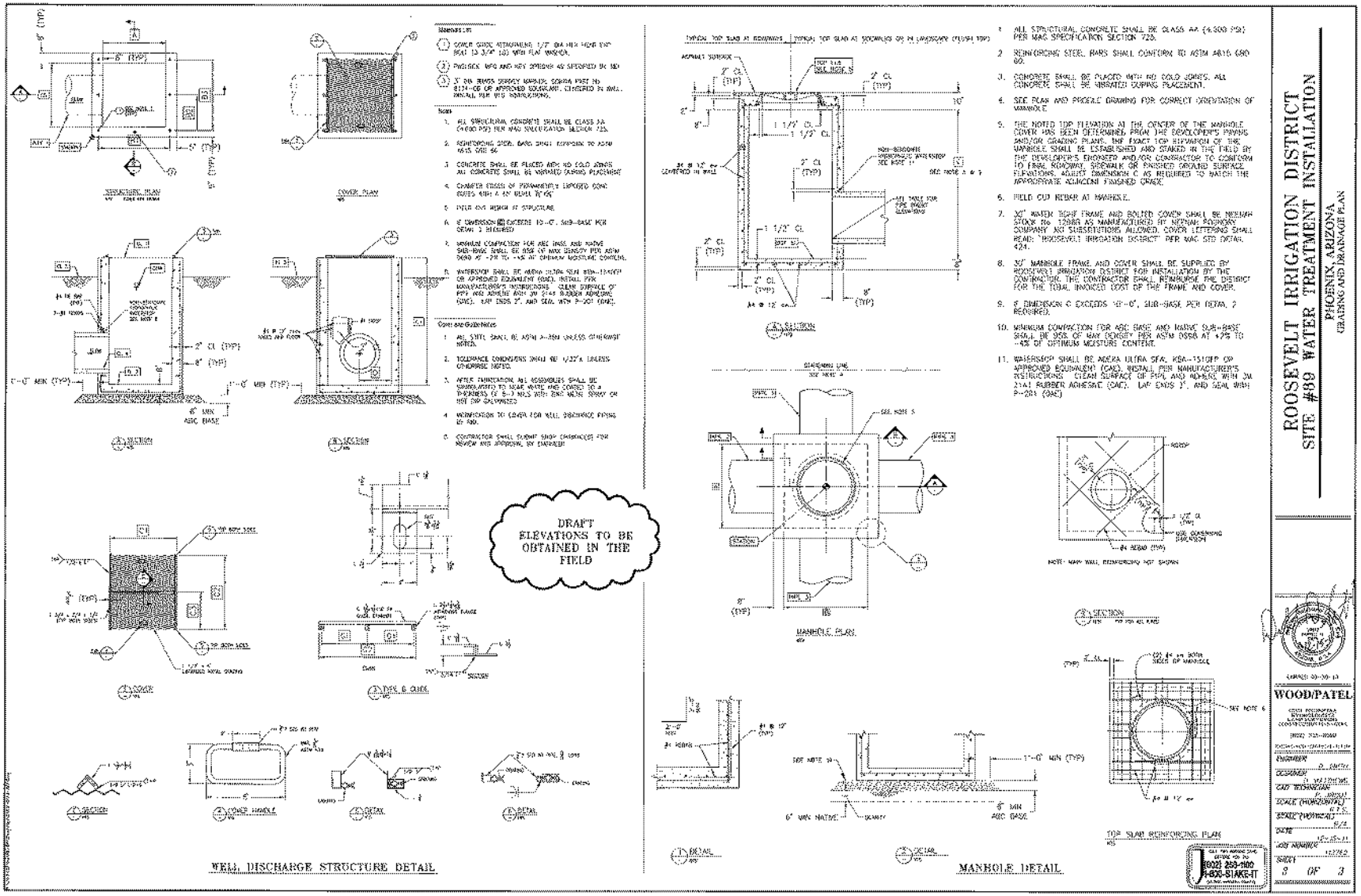
SCALE (VERTICAL)

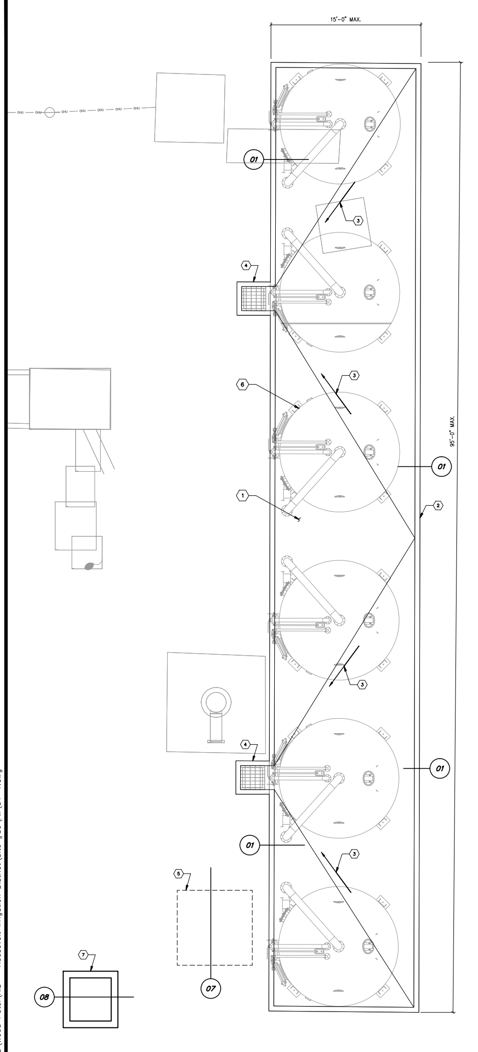
DATE

JOB NUMBER

SHEET 2 OF 3

(602) 263-1100
1-800-STAKE-IT


DRAFT
ELEVATIONS TO BE
OBTAINED IN THE
FIELD
WELL DISCHARGE STRUCTURE DETAIL
MANHOLE DETAIL
ROOSEVELT IRRIGATION DISTRICT
SITE #89 WATER TREATMENT INSTALLATION
PHOENIX, ARIZONA
GRADING AND DRAINAGE PLAN
WOOD/PATEL
(602) 253-1100
1-800-STAKE-IT
SHEET 3 OF 3



RID #89 WELL SITE
EQUIPMENT PAD

3/16" = 1'-0"

PLAN KEYNOTES:

1. 16" THICK CONCRETE MAT WITH #5 AT 10" O.C. EACH WAY TOP AND BOTTOM.
2. 8" TALL CONCRETE CURB PER DETAIL 01.
3. SLOPE PAD 1% TOWARD SUMP PIT.
4. SUMP PIT PER DETAIL 02 SHEET S1.2.
5. 7'-6"x7'-6"x36" DEEP CONCRETE PAD FOOTING WITH 10 #7 EACH WAY TOP AND BOTTOM. BYPASS VALVE DESIGN BY OTHERS. FOR LOCATION OF VALVE SEE MECHANICAL DRAWINGS. (CONTRACTOR OPTION FOR DRILLED PIER. SEE DETAIL 07/S1.2)
6. SIEMENS TANK ASSEMBLY PER MECH'L (185 KIPS MAX. WEIGHT)
7. WATER DISCHARGE STRUCTURE PER DETAIL 08/S1.2.

BUILDING CODE:

2006 EDITION OF THE INTERNATIONAL BUILDING CODE, WITH CITY OF PHOENIX AMENDMENTS.

LOADS:

SIEMENS HP 1220 ADSORPTION SYSTEM = 185,000 LBS. PER SKID (2 TANKS PER SKID, 6 TANKS TOTAL THIS SITE)

WIND:

90 MPH BASIC WIND SPEED, EXPOSURE C.
Iw = 1.0.
INTERNAL PRESSURE COEFFICIENT (GCpi) = 0.18.

SEISMIC:

OCCUPANCY CATEGORY = II.
Ie = 1.0.
DESIGN CATEGORY = B.
SITE CLASS D.
Ss = 0.174, S1 = 0.060.

FOUNDATIONS:

SOIL REPORT BY ATEK ENGINEERING CONSULTANTS; JOB NO.110059; DATED OCTOBER 26, 2011; MAT FOUNDATIONS SHALL BEAR ON 18" CONTROLLED COMPACTED FILL IN ACCORDANCE WITH THE ABOVE REPORT. BOTTOM OF FOOTING TO BE 12" MINIMUM BELOW FINISHED GRADE. THESE FOOTING DEPTHS ARE MINIMUMS AND THE CONTRACTOR SHALL COORDINATE WITH SOILS REPORT AND OTHERS TRADES TO ENSURE THESE MINIMUMS ARE SUFFICIENT FOR THE WORK. COMPACTED FILL SHALL EXTEND 5'-0" BEYOND EACH EDGE OF FOOTING. FINISHED GRADE IS DEFINED AS LOWEST ADJACENT GRADE WITHIN 5 FEET. DESIGN SOIL BEARING VALUE = 2000 PSF. FOUNDATION EXCAVATIONS SHALL BE INSPECTED BY SOILS ENGINEER PRIOR TO PLACEMENT OF CONCRETE.

CONCRETE:

MINIMUM 28 DAY STRENGTH 4,000 PSI (w/c = 0.45): (TYPE II, U.N.O.)
- 3,000 PSI MIN. BEFORE SETTING EQUIPMENT

MECHANICALLY VIBRATE ALL CONCRETE WHEN PLACED. MAXIMUM SLUMP 4 1/2" FOR CONCRETE WITHOUT PLASTICIZER. IF PLASTICIZER IS USED, A HIGHER FINAL SLUMP MAY BE ALLOWED UPON STRUCTURAL ENGINEER'S APPROVAL. CAST CLOSURE POUR AROUND COLUMNS AFTER COLUMN DEAD LOAD IS APPLIED.

REINFORCING:

ASTM A615 (Fy = 60 KSI) DEFORMED BARS FOR ALL BARS. ALL GRADE 60 REINFORCING TO BE WELDED SHALL BE ASTM A706. WELDED WIRE FABRIC PER ASTM A185, WIRE PER ASTM A82. NO TACK WELDING OF REINFORCING BARS ALLOWED WITHOUT PRIOR REVIEW OF PROCEDURE WITH THE STRUCTURAL ENGINEER. LATEST ACI CODE AND DETAILING MANUAL APPLY. CLEAR CONCRETE COVERAGES AS FOLLOWS:

CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH ------------- 3"
EXPOSED TO EARTH OR WEATHER
#6 OR LARGER ------------------------------------ 2"
#5 AND SMALLER ---------------------------------- 1 1/2"
ALL OTHER PER LATEST EDITION OF ACI 318.

LAP SPLICES IN CONCRETE:

LAP SPLICES, UNLESS NOTED OTHERWISE, SHALL BE CLASS "B" TENSION LAP SPLICES PER LATEST EDITION OF ACI 318. STAGGER SPLICES A MINIMUM OF ONE LAP LENGTH.

ALL SPLICE LOCATIONS SUBJECT TO APPROVAL BY THE STRUCTURAL ENGINEER. PROVIDE BENT CORNER BARS TO MATCH AND LAP WITH HORIZONTAL BARS AT ALL CORNERS AND INTERSECTIONS PER TYPICAL DETAILS. REINFORCING BAR SPACING GIVEN ARE MAXIMUM ON CENTERS. ALL BARS PER CRSI SPECIFICATIONS AND HANDBOOK. DOWEL ALL VERTICAL REINFORCING TO FOUNDATION WITH STANDARD 90-DEGREE HOOKS UNLESS NOTED OTHERWISE. SECURELY TIE ALL BARS IN LOCATION BEFORE PLACING CONCRETE.

NOTES ON CRACKING OF CONCRETE STRUCTURES:

CRACKING IS INHERENT TO THE MATERIAL PROPERTIES OF CONCRETE CONSTRUCTION WHILE EVERY EFFORT HAS BEEN MADE TO MINIMIZE THE EFFECTS OF UNSIGHTLY CRACKING, THE PRESENCE OF CRACKS ARE NORMAL AND UNAVOIDABLE. THE DESIGN OF THE CONCRETE STRUCTURAL ITEMS HAVE BEEN ANALYZED USING A "CRACKING SECTION." THE PRESENCE OF THE CRACKING SHOULD NOT BE CONSIDERED DETRIMENTAL TO THE STRUCTURE. CRACKS LARGER THAN 5 MILS SHALL BE FILLED AND SEALED WITH AN APPROVED CRACK FILLER TO PREVENT FUTURE DETERIORATION. ALLOWANCE SHALL BE MADE IN THE CONSTRUCTION BUDGET FOR SEALING OF SUCH CRACKS. IN SOME CASE, CRACKS DO NOT APPEAR UNTIL WELL AFTER CONSTRCUTION HAS BEEN COMPLETED. IT IS THE RESPONSIBILTY OF THE OWNER TO MAINTAIN THE STRUCTURE PROPERLY OVER THE LIFE OF THE STRUCTURE. CONCRETE CRACKS, SHOULD THEY OCCUR, SHALL BE FILLED AND SEALED TO PREVENT PREMATURE DETERIORATION OF THE STRUCTURE.

SHOP DRAWINGS:

SHOP DRAWINGS SHALL BE SUBMITTED FOR ALL STRUCTURAL ITEMS IN ADDITION TO ITEMS REQUIRED BY MECHANICAL SPECIFICATIONS.

THE CONTRACTOR SHALL REVIEW ALL SHOP DRAWINGS PRIOR TO SUBMITTAL. ITEMS NOT IN ACCORDANCE WITH CONTRACT DOCUMENTS SHALL BE FLAGGED UPON HIS REVIEW.

VERIFY ALL DIMENSIONS WITH MECHANICAL AND ALL FINISHED GRADE WITH CIVIL DRAWINGS.

ANY CHANGES, SUBSTITUTIONS, OR DEVIATIONS FROM CONTRACT DOCUMENTS SHALL BE CLOUDED BY MANUFACTURER OR FABRICATOR. ANY OF THE AFOREMENTIONED WHICH ARE NOT CLOUDED OR FLAGGED BY SUBMITTING PARTIES, SHALL NOT BE CONSIDERED APPROVED AFTER ENGINEER'S REVIEW, UNLESS NOTED ACCORDINGLY.

THE ENGINEER HAS THE RIGHT TO APPROVE OR DISAPPROVE ANY CHANGES TO CONTRACT DOCUMENTS AT ANYTIME BEFORE OR AFTER SHOP DRAWING REVIEW.

THE SHOP DRAWINGS DO NOT REPLACE THE CONTRACT DOCUMENTS. ITEMS OMITTED OR SHOWN INCORRECTLY AND ARE NOT FLAGGED BY THE STRUCTURAL ENGINEER OR ARCHITECT ARE NOT TO BE CONSIDERED CHANGES TO CONTRACT DOCUMENTS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO MAKE SURE ITEMS ARE CONSTRUCTED TO CONTRACT DOCUMENTS.

THE ADEQUACY OF ENGINEERING DESIGNS AND LAYOUT PERFORMED BY OTHERS RESTS WITH THE DESIGNING OR SUBMITTING AUTHORITY.

REVIEWING IS INTENDED ONLY AS AN AID TO THE CONTRACTOR IN OBTAINING CORRECT SHOP DRAWINGS. RESPONSIBILITY FOR CORRECTNESS SHALL REST WITH THE CONTRACTOR.

EPOXY ANCHORS IN CONCRETE:

INJECTABLE ADHESIVE SHALL BE USED FOR INSTALLATION OF REINFORCING STEEL DOWELS OR THREADED ANCHOR RODS AND INSERTS INTO NEW OR EXISTING CONCRETE OR SOLID GROUTED CONCRETE MASONRY UNITS ONLY WHERE SPECIFIED ON PLANS. IF USE IS REQUESTED FOR OTHER THAN WHERE NOTED CONTACT STRUCTURAL ENGINEER THROUGH ARCHITECT FOR APPROVAL. ADHESIVE SHALL BE FURNISHED IN SIDE BY SIDE PACKS WHICH KEEP COMPONENT A AND COMPONENT B SEPARATE. USE ONLY INJECTION TOOLS AND STATIC MIXING NOZZLES RECOMENDED BY MANUFACTURER. MANUFACTURER?S INSTRUCTIONS SHALL BE FOLLOWED.

ANCHORS USED MUST HAVE I.C.C. APPROVAL AND INCLUDE HILTI HY-150 FOR MASONRY (ESR-1967), HILTI HIT-RE 500-SD FOR CONCRETE (ESR-2322) AND SIMPSON STRONG TIE SET (ESR-1772) FOR MASONRY OR EQUIVALENT. THE USE OF ANY EPOXY ANCHOR MUST BE APPROVED BY THE ENGINEER OF RECORD.

GENERAL:

ENTIRE CONTRACT DOCUMENTS SHALL BE USED TO BUILD BUILDING. SOME CRITICAL ITEMS REQUIRED BY OTHER DISCIPLINES MAY NOT BE SHOWN ON STRUCTURAL DRAWING (i.e. MECHANICAL, PLUMBING LOADS, ANS SUPPORT PLATES ETC.)

ITEMS SHOWN BY OTHER DISCIPLINES WITH REFERENCE TO STRUCTURAL DRAWING BUT NOT SHOWN ON THESE STRUCTURAL DOCUMENT SHALL BE CONSIDERED DESIGN BUILD ITEMS. CONTRACTOR SHALL SUBMIT DESIGN BY OTHERS FOR REVIEW.

THE STRUCTURAL CONSTRUCTION DOCUMENTS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE ALL MEASURES NECESSARY TO PROTECT THE STRUCTURE DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO, BRACING, SHORING FOR LOADS DUE TO CONSTRUCTION EQUIPMENT, ETC. THE STRUCTURAL ENGINEER SHALL NOT BE RESPONSIBLE FOR THE CONTRACTOR'S MEANS, METHODS, TECHNIQUES, SEQUENCES FOR PROCEDURE OF CONSTRUCTION, OR THE SAFETY PRECAUTIONS AND THE PROGRAMS INCIDENT THERETO (NOR SHALL OBSERVATION VISITS TO THE SITE INCLUDE INSPECTION OF THESE ITEMS).

WHERE REFERENCE IS MADE TO VARIOUS TEST STANDARDS FOR MATERIALS, SUCH STANDARDS SHALL BE THE LATEST EDITION AND/OR ADDENDA.

ESTABLISH AND VERIFY ALL OPENINGS AND INSERTS FOR MECHANICAL, PLUMBING AND ELECTRICAL WITH APPROPRIATE TRADES, DRAWINGS AND SUBCONTRACTORS PRIOR TO CONSTRUCTION.

OPTIONS ARE FOR CONTRACTOR'S CONVENIENCE. IF HE CHOOSES AN OPTION, CONTRACTOR SHALL BE RESPONSIBLE FOR ALL NECESSARY CHANGES AND SHALL COORDINATE ALL DETAILS.

NOTES AND DETAILS ON DRAWINGS SHALL TAKE PRECEDENCE OVER GENERAL STRUCTURAL NOTES AND TYPICAL DETAILS. WHERE NO DETAILS ARE SHOWN, CONSTRUCTION SHALL CONFORM TO SIMILAR WORK ON THE PROJECT.

ALL DIMENSIONS SHOWN (INCLUDING ELEVATIONS) ON STRUCTURAL DRAWINGS ARE TO ASSIST CONTRACTOR IN VERIFICATION. SCALING DIMENSIONS FROM DRAWINGS IS NOT PERMITTED. LOCATION OF ALL ITEMS SHALL BE DETERMINED BY DIMENSIONS OR NOTES ONLY; DO NOT USE GRAPHIC APPEARANCE TO ASSUME SPECIFIC LOCATIONS.

CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF ALL DIMENSIONS WITH MECHANICAL AND FINISHED GRADE WITH CIVIL DRAWINGS PRIOR TO START OF CONSTRUCTION. RESOLVE ANY DISCREPANCY WITH THE ARCHITECT.

TYPICAL DETAILS MAY NOT NECESSARILY BE CUT ON PLANS, BUT APPLY UNLESS NOTED OTHERWISE.

WHERE DISCREPANCIES OCCUR BETWEEN PLANS, DETAILS, GENERAL STRUCTURAL NOTES AND SPECIFICATIONS, THE GREATER REQUIREMENTS SHALL GOVERN.

ANY ENGINEERING DESIGN, PROVIDED BY OTHERS AND SUBMITTED FOR REVIEW, SHALL BEAR THE SEAL OF AN ENGINEER REGISTERED IN THE STATE OF JURISDICTION.

MISCELLANEOUS:

REFER TO MECHANICAL, ELECTRICAL, CIVIL, OR OTHER SPECIALTY ENGINEERING DRAWINGS FOR DIMENSIONS NOT SHOWN, INCLUDING BUT NOT LIMITED TO: SIZE AND LOCATION OF CURBS, EQUIPMENT HOUSEKEEPING PADS, BLOCKOUTS, FLOOR DEPRESSIONS, SUMPS, DRAINS, ANCHOR BOLTS, EMBEDDED ITEMS, ETC. CONTRACTOR SHALL VERIFY DIMENSIONS AND RESOLVE DISCREPANCIES OR CONFLICT PRIOR TO CONSTRUCTION. WHERE SECTIONS ARE INDICATED ON THE PLAN BY A NUMBER AND A DRAWING NUMBER THUS, 1/S5.01, THE INDICATED SECTION (1) IS SHOWN ON STRUCTURAL DRAWING S5.01.

FLOOR FLATNESS/LEVELNESS SHALL MEET MECHANICAL SPECIFICATIONS (1/8" MINIMUM LEVELNESS UNLESS TIGHTER REQUIREMENT IN SPECIFICATIONS) IN HEIGHT FOR ALL STRUCTURAL SYSTEMS. CONTRACTOR SHALL INCLUDE COST FOR LEVELING ALL MAT SLABS IF REQUIRED.

SPECIAL INSPECTION:

PER IBC CHAPTER 17, SPECIAL INSPECTION IS REQUIRED FOR THE FOLLOWING ITEMS:

CONCRETE: VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERRENCED STANDARD (NOTE 1)	IBC REFERENCE
1. Inspection of reinforcing steel.	–	X	ACI 318: 3.5, 7.1–7.7	1913.4
2. Inspect bolts to be installed in concrete prior to and during placement of concrete where allowable loads have been increased.	X	–	ACI 318: APPENDIX D	1912
3. Verifying use of required design mix.	–	X	ACI 318: CH. 4, 5.2–5.4	1904.2.2, 1913.2, 1913.3
4. At the time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	X	–	ASTM C 172 ASTM C 31 ACI 318: 5.6, 5.8	1913.10
5. Inspection of concrete placement for proper application techniques.	X	–	ACI 318: 5.9, 5.10	1913.6, 1913.7, 1913.8
6. Inspection for maintenance of specified curing temperature and techniques.	–	X	ACI 318: 5.11, 5.13	1913.9
7. Inspect formwork for shape, location and dimensions of the concrete member being formed.	–	X	ACI 318: 6.1.1	

NOTES:
1. TABLES TAKEN DIRECTLY FROM IBC FOR REFERENCE.

34635
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Date 12/15/11
ARIZONA, U.S.A.
EXPIRES: 3-31-2012

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ROOSEVELT IRRIGATION DISTRICT #89 WATER TREATMENT INSTALLATION

51ST AVENUE, 1/4 MI. NORTH OF BUCKEYE, PHOENIX, ARIZONA

Sheet Title: GSN AND FOUNDATION PLAN

REVISIONS:

DATE:	12/15/2011
DRAWN BY:	FML
CHECKED BY:	RH
SCALE:	AS NOTED
PROJECT NO:	11332
SHEET	S1.1

Dec 15, 2011 – 5:25pm
F:\E_Drive_Cadd\2011 JOBS\Wood Patel\RID – Roosevelt Irrigation District\Site #89\All\S1-1.dwg

Dec 15, 2011 – 5:37pm
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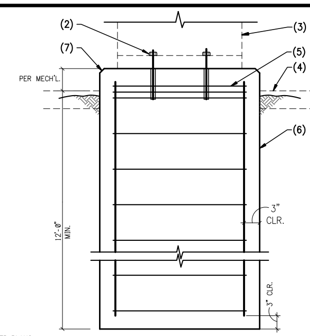
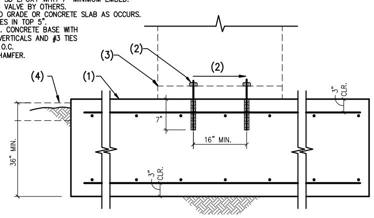


AT CONTRACTOR OPTION

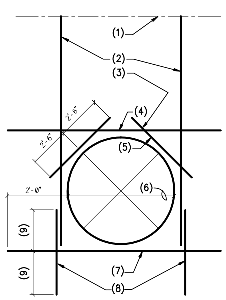
NOTES:

1. CONCRETE PAD PER PLANS.
2. PROVIDE (4) 3/4"ø EPOXY BOLTS FOR BY-PASS VALVE TO MAT CONNECTION. EPOXY WITH HILTI RE 500 SD EPOXY WITH 7" MINIMUM EMBED.
3. BYPASS VALVE BY OTHERS.
4. FINISHED GRADE OR CONCRETE SLAB AS OCCURS.
5. 3 #3 TIES IN TOP 5".
6. 36" DIA. CONCRETE BASE WITH 13 #8 VERTICALS AND #3 TIES AT 12" O.C.
7. 1/2" CHAMFER.



07 CONCRETE PAD AT BYPASS VALVE

NO SCALE

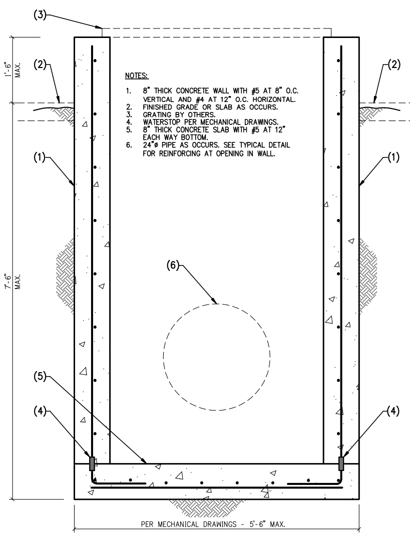


NOTES:

1. LINE OF TOP OF WALL.
2. 2 – #5 VERTICALS EACH SIDE.
3. WHERE 2'–0" CANNOT BE OBTAINED. EXTEND BAR AS FAR AS POSSIBLE AND HOOK OR BEND.
4. 2 – #5 (1 EACH FACE).
5. 2 – #5 TYPICAL CORNER DIAGONAL BARS.
6. WHERE WIDTH OF OPENING EXCEEDS 2 TIMES WALL THICKNESS. JAMB BARS SHALL EXTEND FULL HEIGHT OF WALL.
7. 2 – #5 UNLESS LARGER BARS ARE SHOWN ON PLANS OR DETAILS.
8. DOWELS ARE SAME SIZE AS JAMB BARS.
9. EMBED AND LAP PER G.S.N.

09 24" DIAMTER OPENING IN CONCRETE WALL

NO SCALE



NOTES:

1. 8" THICK CONCRETE WALL WITH #5 AT 8" O.C. VERTICAL AND #4 AT 12" O.C. HORIZONTAL.
2. FINISHED GRADE OR SLAB AS OCCURS.
3. GRATING BY OTHERS.
4. WATERSTOP PER MECHANICAL DRAWINGS.
5. 8" THICK CONCRETE SLAB WITH #5 AT 12" EACH WAY BOTTOM.
6. 24"ø PIPE AS OCCURS. SEE TYPICAL DETAIL FOR REINFORCING AT OPENING IN WALL.

08 SECTION AT WATER DISCHARGE STRUCTURE

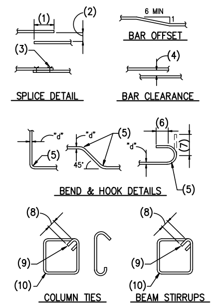
NO SCALE

	CLASS B TENSION SPLICE LENGTHS						COMP. BARS	
CONC. PSI	f'c = 2,500 PSI/ f'c = 3,000 PSI		f'c = 4,000 PSI		f'c = 5,000 PSI AND HIGHER		f'c = ALL	
BAR LOCATION	REGULAR CLASS	TOP CLASS	REGULAR CLASS	TOP CLASS	REGULAR CLASS	TOP CLASS	STD LAP	ENCLOSED W/ SPIRAL TIES
SIZE								
#3	24"	31"	19"	24"	17"	22"	12"	12"
#4	32"	41"	25"	33"	23"	29"	15"	12"
#5	39"	51"	31"	41"	28"	36"	19"	14"
#6	47"	61"	37"	49"	34"	43"	23"	17"
#7	69"	89"	54"	71"	49"	63"	26"	20"
#8	78"	102"	62"	81"	56"	72"	30"	23"
#9	88"	115"	70"	91"	63"	81"	34"	25"
#10	100"	129"	79"	102"	70"	92"	38"	29"
#11	110"	143"	87"	113"	78"	102"	42"	32"

NOTES:
1. TOP BARS ARE ANY HORIZONTAL BARS PLACED SO THAT MORE THAN 12" OF FRESH CONCRETE IS CAST IN THE MEMBER BELOW THE REINFORCEMENT.
2. UNLESS NOTED OTHERWISE, LAP SPLICES IN CONCRETE BEAMS, SLABS, AND WALLS. WILL BE CLASS B TENSION SPLICE LENGTHS. COLUMNS SHALL HAVE STANDARD COMPRESSION LAP SPLICE.
3. CONTACT STRUCTURAL ENGINEER IF CENTER TO CENTER SPACING OF REINFORCING IS LESS THAN OR EQUAL TO 3 BAR DIAMETERS $\leq$3db OR 2db CLEAR SPACING BETWEEN BARS.
4. ALL SPLICES MUST BE FULL CONTACT.
5. SPLICES WITH #14 OR #18 BARS SHALL USE MECHANICAL COUPLERS. (THIS INCLUDES #14 OR #18 BARS TO SMALLER BARS SHOWN IN SCHEDULE).

04 LAP SCHEDULE FOR REINFORCING STEEL

NO SCALE

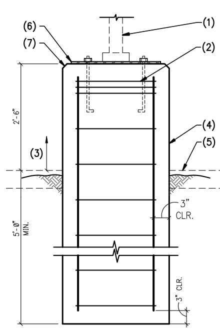


NOTES:

1. LAP – SEE G.S.N.
2. MAXIMUM 1/5 LAP BUT NOT MORE THAN 6".
3. WIRE TIES.
4. 1d (1" MINIMUM).
5. RADIUS=3d FOR BARS NOT OVER #8; 4d FOR #9, #10 AND #11 BARS; 5d FOR #14 AND #18 BARS. 5d FOR ALL GRADE 40 BARS WITH 180 DEGREE HOOK.
6. 4d (4" MINIMUM).
7. 12d (90 DEGREE HOOK).
8. 6d (4" MINIMUM).
9. 135 DEGREE BEND.
10. BEND AROUND 1 1/2" PIN FOR #3 BARS. BEND AROUND 2" PIN FOR #4 BARS. BEND AROUND 2 1/2" PIN FOR #5 BARS.

05 TYPICAL CONCRETE REINFORCING BAR DETAILS

NO SCALE

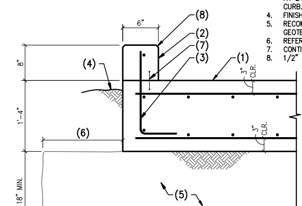


NOTES:

1. LIGHT POLE AND ANCHOR BOLTS BY OTHERS.
2. 3 #3 TIES IN TOP 5".
3. TOP OF LIGHT POLE TO BE 20'–0" ABOVE FINISHED GRADE – MAX.
4. 24" DIA. CONCRETE BASE WITH 6 #6 VERTICALS AND #3 TIES AT 12" O.C.
5. FINISHED GRADE OR CONCRETE SLAB AS OCCURS.
6. BASEPLATE AND ANCHOR BOLTS BY OTHERS.
7. 1/2" CHAMFER.

06 TYPICAL LIGHT POLE BASE

NO SCALE

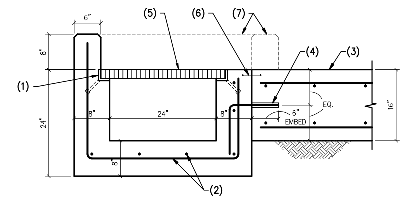


NOTES:

1. MAT FOUNDATION PER PLAN.
2. 8" CONCRETE CURB WITH (1) #4 CONTINUOUS.
3. PROVIDE 1 #4 HOOKED DOWEL AT 24" O.C. – TYPICAL AT CURB.
4. FINISHED GRADE, SEE CIVIL.
5. RECOMPACTED FILL PER GEOTECH REPORT.
6. REFER TO GEOTECH REPORT.
7. CONTINUOUS WATER STOP.
8. 1/2" CHAMFER – TYP.

01 CONCRETE CURB AT MAT FOOTING

NO SCALE

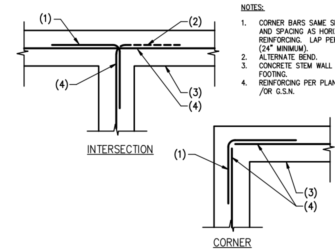


NOTES:

1. 2"x2"x1/4" CONT. GALVANIZED STEEL ANGLE WITH 1/2"ø x6" HEADED STUD AT 12" O.C.
2. #5 REINFORCING AT 10" O.C.
3. CONCRETE MAT FOUNDATION.
4. DRILL AND EPOXY #5 BENT BAR PER GSN. SPACING TO MATCH SUMP PIT REINFORCING.
5. GRATING PER CIVIL DRAWINGS.
6. CONT. WATER STOP.
7. CONCRETE CURB BEYOND.

02 SUMP PIT DETAIL

NO SCALE



NOTES:

1. CORNER BARS SAME SIZE AND SPACING AS HORIZONTAL REINFORCING. LAP PER G.S.N. (24" MINIMUM).
2. ALTERNATE BEND.
3. CONCRETE STEM WALL OR FOOTING.
4. REINFORCING PER PLANS AND /OR G.S.N.

03 PLAN – CORNER REINFORCING IN CONCRETE FOOTING AND/OR STEM WALL

NO SCALE

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ROOSEVELT IRRIGATION DISTRICT #89
WATER TREATMENT INSTALLATION

51ST AVENUE, 1/4 MI. NORTH OF BUCKEYE, PHOENIX, ARIZONA

Sheet Title: DETAILS

REVISIONS:

DATE: 12/15/2011
DRAWN BY: FML
CHECKED BY: RH
SCALE: AS NOTED
PROJECT NO: 11332
SHEET
S1.2

ABBREVIATIONS

AC	AIR CONDITIONING UNIT
AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
AH	AIR HANDLER (SPLIT REFRIG)
AHU	AIR HANDLING UNIT
AL	ACOUSTICAL LINING
AP	ACCESS PANEL
BB	ELECTRIC BASEBOARD RADIATION
B	BOILER
BDD	BACK DRAFT DAMPER
BFC	BELOW FINISHED CEILING
BOB	BOTTOM OF BEAM
BOD	BOTTOM OF DUCT
BOP	BOTTOM OF PIPE
C	CHILLER
CD	CEILING DIFFUSER
CFM	CUBIC FEET PER MINUTE
CHWP	CHILLED WATER PUMP
CHWR	CHILLED WATER RETURN
CHWS	CHILLED WATER SUPPLY
CO	CLEAN OUT
CP	CONDENSATE PUMP
CWR	CONDENSER WATER RETURN
CWS	CONDENSER WATER SUPPLY
CT	COOLING TOWER
CU	CONDENSING UNIT
CUH	CABINET UNIT HEATER
CVB	CONSTANT VOLUME BOX
CWP	CONDENSER WATER PUMP
DB	DRY BULB
DS	DUCT SILENCER
DWP	DOMESTIC WATER PUMP
EAT	ENTERING AIR TEMPERATURE
EC	ELECTRICAL CONTRACTOR
EF	EXHAUST FAN
EJ	EXPANSION JOINT
ER	EXHAUST REGISTER
ESP	EXTERNAL STATIC PRESSURE
ET	EXPANSION TANK
EWT	ENTERING WATER TEMPERATURE
EWC	ELECTRIC WATER COOLER
FA	FREE AREA
FX	FLEXIBLE CONNECTION
FC	FAN COIL UNIT
FD	FIRE DAMPER
FLR	FLOOR
FOB	FLAT ON BOTTOM
FOT	FLAT ON TOP
FOP	FUEL OIL PUMP
FP	FIRE PUMP
FPM	FEET PER MINUTE
FTR	FINNED TUBE RADIATION
GC	GENERAL CONTRACTOR
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
HD	HAND DAMPER
HP	HEAT PUMP
HV	HEATING AND VENTILATING UNIT
HWC	HOT WATER CONVERTER
HWP	HOT WATER PUMP
HWR	HEATING HOT WATER RETURN
HWS	HEATING HOT WATER SUPPLY
HX	HEAT EXCHANGER
HZ	HERTZ
ID	INSIDE DIAMETER
LAT	LEAVING AIR TEMPERATURE
LWT	LEAVING WATER TEMPERATURE
LD	LINEAR DIFFUSER
LF	LINEAR FEET
MC	MECHANICAL CONTRACTOR
MTD	MOUNTED
MOD	MOTOR OPERATED DAMPER
MUA	MAKE-UP AIR UNIT
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
NIC	NOT IN CONTRACT
NK	NECK
OA	OUTSIDE AIR
OAI	OUTSIDE AIR INTAKE
OAT	OUTSIDE AIR TEMPERATURE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OBD	OPPOSED BLADE DAMPER
PBD	PARALLEL BLADE DAMPER
PRV	PRESSURE REDUCING VALVE
PTAC	PACKAGED TERMINAL AIR CONDITIONER
RA	RETURN AIR
RG	RETURN AIR GRILLE
RR	RETURN AIR REGISTER
RCP	REFLECTED CEILING PLAN
RHC	REHEAT COIL
RF	RETURN FAN
SA	SUPPLY AIR
SR	SUPPLY AIR REGISTER
SCG	SMOKE CONTROL GRILLE
SD	SMOKE DAMPER
SEF	SMOKE EXHAUST FAN
SF	SUPPLY FAN
SP	STATIC PRESSURE
TG	TRANSFER GRILLE
TYP	TYPICAL
UH	UNIT HEATER
UON	UNLESS OTHERWISE NOTED
VAV	VARIABLE AIR VOLUME UNIT
VD	VOLUME DAMPER
VTR	VENT THRU ROOF
WB	WET BULB
WMS	WIRE MESH SCREEN

MECHANICAL SYMBOL SCHEDULE:

NOT ALL SYMBOLS USED. ALL MOUNTING HEIGHTS TO CENTER OF BOX AND ALL DEVICES TO COMPLY WITH ADA REQUIREMENTS, WHERE APPLICABLE.

DUCTWORK SYMBOLS:

DOUBLE LINE / SINGLE LINE

- EXISTING EQUIPMENT OR DUCTWORK TO BE REMOVED.
- EXISTING DUCTWORK TO REMAIN
- 20/12 — DUCT SIZE, FIRST FIGURE IS SIDE SHOWN
- AD — ACCESS DOOR
- RADIUS ELBOW (R=1.5)
- VANED ELBOW
- BRANCH DUCT TAKE-OFF
- D / R — RISE OR DROP DIRECTION OF AIR FLOW
- FLEXIBLE CONNECTION (FXC)
- TRANSITION, RECTANGULAR TO ROUND
- DUCT SECTION, SUPPLY
- DUCT SECTION, RETURN
- DUCT SECTION, EXHAUST
- UP — CHANGE IN ELEVATION (UP), (DN)
- ROUND DUCT VERTICAL OFFSET (USING 45° ELBOWS U.N.O.)
- FLEXIBLE DUCT AND SPIN-IN
- ### — CEILING SUPPLY DIFFUSER WITH DESIGN CFM ARROWS INDICATE THROW PATTERN OTHER THAN 4-WAY
- ### — CEILING RETURN GRILL WITH DESIGN CFM
- ### — CEILING EXHAUST GRILLE WITH DESIGN CFM
- #/# ### — SIDEWALL/DUCT MOUNTED SUPPLY GRILLE W/NECKSIZE AND CFM
- #/# ### — SIDEWALL RET/EXH GRILLE W/NECKSIZE AND CFM
- UC — UNDERCUT DOOR
- DL — DOOR LOUVER (FREE AREA REQUIRED INDICATED IN SQUARE FEET)
- FD — FIRE (1 1/2 HOUR) (FD)
- MANUAL (BALANCING)
- SD — SMOKE
- CONTROL
- FS — FIRE / SMOKE (FD/SM)
- BUTTERFLY DAMPER
- SLIDE
- DP — DIFFERENTIAL PRESSURE SENSOR
- R — RESISTANCE TEMPERATURE SENSOR
- S — "VENTILATION SYSTEM EMERGENCY SHUTOFF"
- SD — SMOKE DETECTOR
- M — MOISTURE SENSOR (RELATIVE HUMIDITY)
- D — LOW POINT DUCT DRAIN
- SP — DUCT MOUNTED STATIC PRESSURE SENSOR TRANSMITTER

PIPING SYMBOLS:

- EXISTING PIPING TO REMAIN (SERVICE AS INDICATED)
- EXISTING PIPING TO BE REMOVED (SERVICE AS INDICATED)
- NEW PIPING (SERVICE AS INDICATED)
- DIRECTION OF FLOW
- DIRECTION OF PITCH
- CWS — CONDENSER WATER SUPPLY
- CWR — CONDENSER WATER RETURN
- CHWS — CHILLED WATER SUPPLY
- CHWR — CHILLED WATER RETURN
- CGS — CHILLED GLYCOL SUPPLY
- CGR — CHILLED GLYCOL RETURN
- HWS — HEATING HOT WATER SUPPLY
- HWR — HEATING HOT WATER RETURN
- LPS — LOW PRESSURE STEAM (PSI 15)
- MPS — MEDIUM PRESSURE STEAM (PSI 30)
- HPS — HIGH PRESSURE STEAM (PSI 125)
- LPC — LOW PRESSURE CONDENSATE
- PC — PUMPED CONDENSATE
- UNION
- FLANGED CONNECTION
- REDUCER, CONCENTRIC
- REDUCER, ECCENTRIC
- TEE, TURNED DOWN
- TEE, TURNED UP
- CAP
- CONNECTION, TOP
- ELBOW, TURNED UP
- ELBOW, TURNED DOWN
- CONNECTION, BOTTOM
- "Y" STRAINER WITH BLOWDOWN
- GATE
- GLOBE
- BUTTERFLY
- CHECK
- BALL
- PNEUMATIC CYLINDER OPERATED
- SOLENOID OPERATED
- 3-WAY

REFERENCE SYMBOLS:

- XX / X.XX — SECTION NUMBER; BUILDING SECTION REFERENCE; SHEET WHERE SECTION IS DRAWN
- XX / X.XX — DETAIL NUMBER; DETAIL REFERENCE; SHEET WHERE DETAIL IS DRAWN
- X / X-X — EQUIPMENT IDENTITY (SEE EQUIPMENT ABBREVIATION LIST AND SCHEDULES); EQUIPMENT NUMBER; SYSTEM NUMBER (IF APPLICABLE)
- POINT OF CONNECTION

SHEET INDEX

PROJECT GENERAL NOTES - HVAC

1. ALL WORK SHALL CONFORM TO 2006 INTERNATIONAL MECHANICAL CODE, ALL STATE AND LOCAL CODES, RULES AND REGULATIONS AND ORDINANCES.
2. SUBMISSION OF PROPOSAL DIRECTLY OR INDIRECTLY IN CONNECTION WITH THIS WORK SHALL IMPLY THAT THE BIDDER HAS EXAMINED THE JOB SITE UNDER WHICH HE WILL BE OBLIGATED TO OPERATE SHOULD HE BE AWARDED THE WORK UNDER THIS CONTRACT. NO EXTRA CHARGE WILL BE ALLOWED FOR FAILURE OF ANY BIDDER TO EXAMINE THE SITE PRIOR TO BID.
3. CONTRACTOR SHALL VISIT THE SITE AND VERIFY ALL DIMENSIONS IN THE FIELD, AND SHALL ADVISE THE ARCHITECT/ENGINEER AND THE OWNER OF ANY DISCREPANCIES BEFORE PERFORMING THE WORK.
4. CONTRACTOR SHALL SECURE AND PAY ALL FEES AND PERMITS PERTAINING TO THE CONTRACT.
5. ALL EQUIPMENT SHALL BE INSTALLED IN STRICT COMPLIANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS. THE CONTRACTOR SHALL PROVIDE ALL HANGERS AND SUPPORTS REQUIRED FOR A COMPLETE INSTALLATION.
6. CONTRACTOR SHALL BE RESPONSIBLE FOR WORKMEN'S IDENTIFICATION AND BADGING, SAFETY AND FIRE PROTECTION, CONTRACTOR'S LIABILITY INSURANCE, BARRICADES, WARNING SIGNS, TRASH REMOVAL, CUTTING AND PATCHING.
7. CONTRACTOR SHALL SCHEDULE ALL SHUTDOWNS THAT AFFECT UTILITIES AND PORTIONS OF THE BUILDING THAT MUST REMAIN IN OPERATION WITH THE OWNER.
8. CONTRACTOR SHALL COORDINATE ALL WORK WITH THE OWNER AND ALL OTHER CONTRACTORS.
9. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL RIGGING, HANDLING AND PROTECTION OF MATERIALS.
10. CONTRACTOR SHALL PROVIDE LABOR TO RECEIVE, UNLOAD, STORE, PROTECT AND TRANSFER TO POINT OF INSTALLATION, OWNER FURNISHED ITEMS.
11. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CORING AS IT RELATES TO HIS WORK.

RECORD DRAWING
(04/23/12)

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ROOSEVELT IRRIGATION DISTRICT #89
WATER TREATMENT INSTALLATION
51ST AVENUE, 1/4 MI. NORTH OF BUCKEYE, PHOENIX, ARIZONA

Sheet Title:
MECHANICAL ABBREVIATIONS, SYMBOLS & NOTES

REVISIONS:

DATE:	12/14/2011
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CHECKED BY:	DLB
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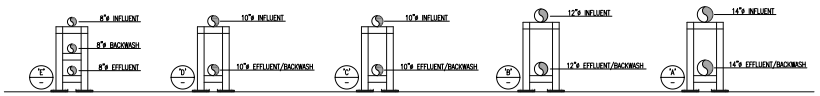
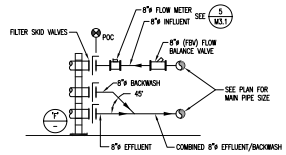
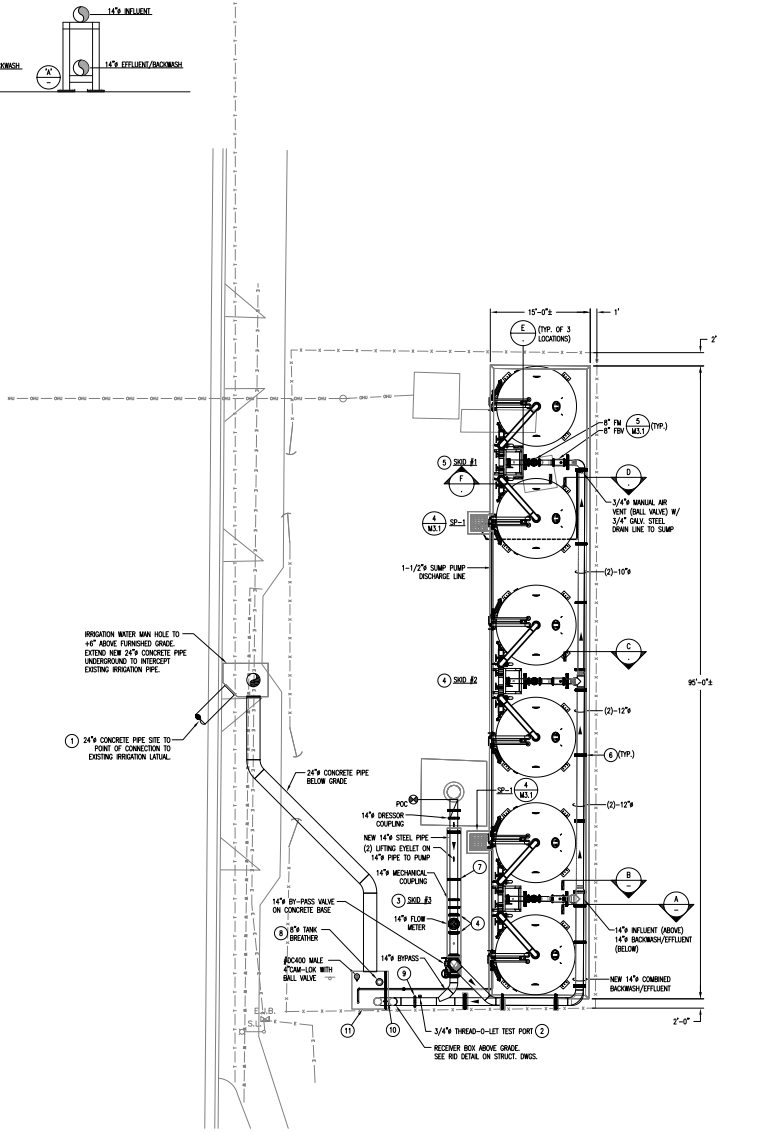




PIPING SECTIONS

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



WELLSITE #89 PIPING PLAN

SCALE: 1/8" = 1'-0"

NORTH

KEY NOTES:

1. PROVIDE MINIMUM OF 48" EARTH COVER OVER BURIED PIPE SECTION TO ALLOW HEAVY EQUIPMENT TRAVEL OVER PIPE.
2. 3/4" THREADED-O-LET FOR PIPE LINE TEST PORT.
3. SIEMENS MODEL #HP1220 (NEW) 1,000-GPM CAPACITY LOAC VESSEL SKID #3 (LEAD/LAG).
4. SIEMENS MODEL #HP1220 (NEW) 1,000-GPM CAPACITY LOAC VESSEL SKID #2 (LEAD/LAG).
5. SIEMENS MODEL #HP1220 (NEW) 1,000-GPM CAPACITY LOAC VESSEL SKID #1 (LEAD/LAG).
6. PIPE SUPPORT (TYP.) ANCHORED TO CONCRETE PAD.
7. PIPE SUPPORT (TYP.) SEE STRUCTURAL DWG. FOR CONCRETE PAD DETAILS.
8. CARBON FILTER/TANK BREATHER.
9. (1)-14"ø MECHANICAL COUPLING.
10. 1/4"x6"x4"x2"ø WELDED LIFTING EYELET.
11. INSTALL NEW "AR-TIGHT" 3/8" STEEL PLATE LID ON RECEIVER BOX.
    -RECEIVER BOX LID SHALL BE FURNISHED AND INSTALLED BY MECH. CONTRACTOR.
    -LID SHALL BE CLEANED AND RECEIVE FULL EPOXY PRIMER COAT AND FINISH COAT AFTER ALL WELDING AND CUTTING OPERATIONS ARE COMPLETE.
    -PROVIDE (2)-WELDED STEEL LIFTING EYELETS ON TOP OF COVER.
    -PERIMETER OF LID, AND "CUT-OUT" OPENING OF 14" DISCHARGE PIPE SHALL BE MADE AIR TIGHT BY SEALING WITH 'RTV' FLEXIBLE SEALANT USE DOW CORNING #734 "ONE-PART" SOLVENT-LESS SILICONE SEALANT, OR EQUAL. APPLY SEALANT PER MANUFACTURER'S INSTRUCTIONS.

UNDERGROUND PIPE

BACKFILL & COMPACTION

OVER-EXCAVATE PIPE TRENCH TO ALLOW FOR HAND-PLACEMENT OF A 3" DEPTH OF COMPACTED CLEAN SAND BEDDING BENEATH THE PIPE.

BACKFILL TRENCH WITH COMPACTED HAND-PLACED CLEAN SAND TO A COVERING DEPTH OF 12" OVER THE PIPE.

BACKFILL REMAINDER OF TRENCH WITH NATIVE SOIL REMOVE ALL DEBRIS, ROCKS AND HARD SOIL MATERIALS GREATER THAN 1" SIZE FROM BACKFILL MATERIAL.

COMPACT ALL BACKFILL MATERIAL PLACED INTO TRENCH IN 6" LAYERS. COMPACTION SHALL COMPLY WITH REQUIREMENTS OF THE SITE GEO-TECHNICAL REPORT.

MIN. REQUIREMENTS SHALL COMPLY WITH MAG STANDARD 601.4. WITH COMPACTION PER MAG STANDARD TABLE 601.2.

PIPE PRESSURE TESTING

1. PRESSURE TEST DIRECT-BURIED STEEL PIPE AT 100 PSIG WATER PRESSURE BEFORE EXTERNAL CORROSION PROTECTION IS APPLIED TO WELDED JOINTS. HOLD TEST PRESSURE FOR 4 HOURS WITHOUT EVIDENCE OF PRESSURE LOSS OR LEAKAGE. REPAIR ALL LEAK SITES AND RETEST TO PROVE LEAKTIGHT BEFORE COVERING PIPE JOINT(S).
2. PRESSURE TEST ALL ABOVE-GROUND WATER PIPE IN MANNER LISTED IN WATER PIPING NOTE 1.9 ON SHEET M4.1.

NOTE:
PIPING ELEVATIONS ARE APPROXIMATE. ALLOW FOR FIELD GROUTING OF VESSEL. SUPPORT LEGS AND EQUIPMENT PAD SLOPE.

RECORD DRAWING (04/23/12)

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ROOSEVELT IRRIGATION DISTRICT #89
WATER TREATMENT INSTALLATION
51ST AVENUE, 1/4 MI. NORTH OF BUCKEYE, PHOENIX, ARIZONA
Sheet Title: WELLSITE #89 PIPING PLAN

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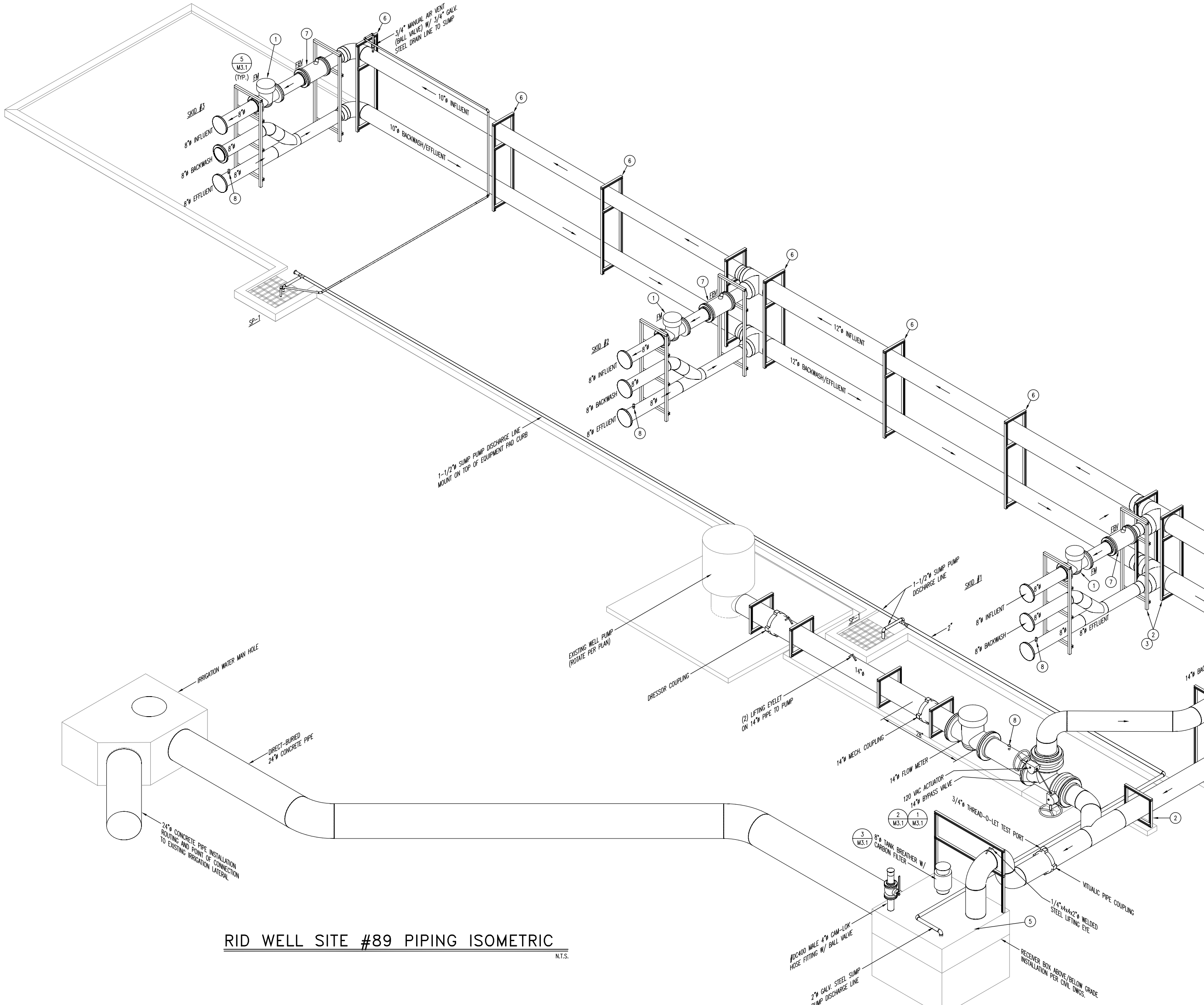

RID WELL SITE #89 PIPING ISOMETRIC

N.T.S.

GENERAL NOTES:

A. ALL SITE EXCAVATION BACKFILL SHALL BE PERFORMED TO REQUIREMENTS OF THE GEO-TECHNICAL REPORT FOR THIS SITE.

(#) KEY NOTES:

1. INSTALL 8" FLANGES FOR PIPE LINE FLOW METER. FLOW METERS ARE FURNISHED BY VERTECH AND INSTALLED BY MECH. CONTR. FLOW METER WIRING IS PROVIDED BY OTHERS.
2. ANCHOR PIPE SUPPORT TO MAIN CONCRETE EQUIPMENT PAD, OR TO CONCRETE PADS LOCATED 'AT GRADE'. REFER TO STRUCTURAL DWG'S FOR PAD LOCATION AND SIZES.
3. ALL PIPE SUPPORTS SHALL BE CONSTRUCTED WITH UNISTRUT (P1001) FORMED METAL MEMBERS AND ACCESSORY FITTINGS, OR FULL-WELDED STRUCTURAL STEEL MEMBERS. PROVIDE INTERNAL AND EXTERNAL BRACING OF EACH PIPE SUPPORT TO MAKE IT 'RIGID', INSTALL 1-1/2"x1-1/2" STEEL ANGLE CLIPS AT EACH PIPE SUPPORT TO KEEP PIPE CENTERED.
4. INSTALL 14" FLANGE FOR PIPE LINE FLOW METER. FLOW METER IS FURNISHED BY VERTECH AND INSTALLED BY MECH. CONTR. FLOW METER WIRING IS PROVIDED BY OTHERS.
5. STEEL RECEIVER LID, 3/8" PLATE, FURNISHED AND INSTALLED BY MECH. CONTR. SEE KEYNOTE '11' ON SHEET M1.1.
6. OFFSET PIPE SUPPORTS FOR INFLUENT PIPING TO CLEAR OUTER SURFACE OF EACH FILTER VESSEL.
7. 8" FLOW BALANCE VALVE-FURNISHED AND INSTALLED BY PIPING CONTRACTOR.
8. 1/2"ø WELDED THREAD-O-LET W/ 1/2"ø PIPE PLUG.

RECORD DRAWING
(04/23/12)

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ROOSEVELT IRRIGATION DISTRICT #89
WATER TREATMENT INSTALLATION

51ST AVENUE, 1/4 MI. NORTH OF BUCKEYE, PHOENIX, ARIZONA

Sheet Title: RID #89 WELL SITE PIPING ISOMETRIC

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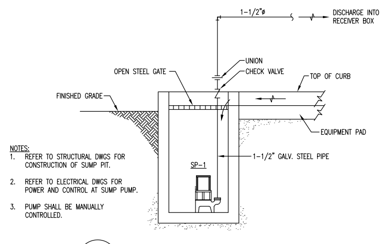
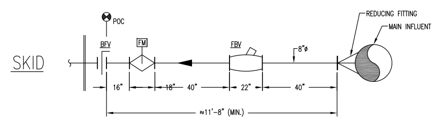
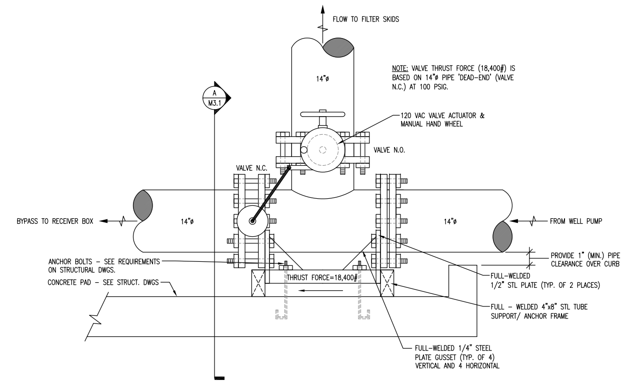


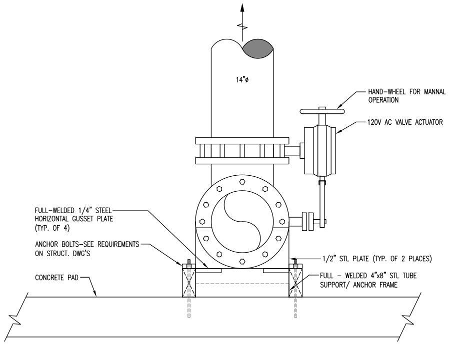
4 / M3.1 **SUMP PUMP DETAIL**©
NOT TO SCALE



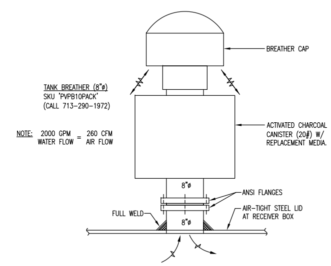
5 / M3.1 **FLOW METER & BALANCE VALVE PLACEMENT DETAIL**©
NOT TO SCALE



1 / M3.1 **BY-PASS VALVE DETAIL**©
NOT TO SCALE



2 / M3.1 **SECTION 'A'**
NOT TO SCALE



3 / M3.1 **RECEIVER BOX BREATHER DETAIL**©
NOT TO SCALE

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ROOSEVELT IRRIGATION DISTRICT #89
WATER TREATMENT INSTALLATION
51ST AVENUE, 1/4 MI. NORTH OF BUCKEYE, PHOENIX, ARIZONA

Sheet Title: MECHANICAL DETAILS

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SUMP PUMP SCHEDULE

MARK	LOCATION AND SERVICE	GPM	HEAD FEET	MOTOR HP	VOLT/PH	SINGLE OR DUPLEX	MANUFACTURER AND MODEL NUMBER	REMARKS
SP-1	EQUIPMENT PAD SUMP	50	24	3/4	115/60	SINGLE	ZOELLER MODEL N145	NOTES 1,2,3

NOTES:
1. SUMP PUMP SHALL BE FURNISHED AND INSTALLED BY PIPING CONTRACTOR.
2. SUMP PUMP SHALL BE FURNISHED WITHOUT FACTORY-INSTALLED AUTOMATIC CONTROL. MANUAL CONTROL OF PUMP OPERATION SHALL BE PROVIDED THRU MANUAL SWITCH FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR.
3. SUMP PUMP SHALL BE FACTORY EQUIPPED WITH A 20 FOOT, UL LISTED, NEOPRENE POWER CORD WITH MOLDED PLUG AND GROUND WIRE.

AUTOMATIC CONTROL VALVE SCHEDULE

MARK	LOCATION AND SERVICE	VALVE TYPE	BODY DUTY	PIPE CONNECTIONS		VALVE ACTUATOR			MANUFACTURER & MODEL #	REMARKS
				SIZE	TYPE	TYPE	ACTION	POWER IN		
CV-1	EQUIPMENT PAD-BYPASS VALVE	3-WAY (CI.TEE)	DIVERTING	14"ø	150# FLG.	ROTARY ELEC.	2-POS. ON/OFF	120V AC	VSI #3S2000SS-14/1200	NOTES 1,2,3,4,5

NOTES:
1. CONTROL VALVE/ACTUATOR SHALL BE FURNISHED AND INSTALLED BY PIPING CONTRACTOR CONTROL POWER AND CONTROL WIRING SHALL BE FURNISHED AND INSTALLED BY CONTROLS CONTRACTOR.
2. ACTUATOR ENCLOSURE SHALL BE RATED NEMA 4, WATERTIGHT.
3. PIPING CONTRACTOR SHALL REVIEW CONTROL VALVE DETAIL IN DRAWINGS, TO CONFIRM VALVE ORIENTATION AND FLOW DIRECTION, PRIOR TO ORDERING VALVE ASSEMBLY.
4. VALVE ASSEMBLY SHALL CONSIST OF A 14"ø 125# FLANGED DUCTILE-IRON TEE BODY MOUNTED WITH (2)-14"ø THREADED LUG-BODY BUTTERFLY VALVES (EPDM SEAT, 304 SS DISC, 416 SS SHAFT, PTFE BUSHINGS, 316 SS SHAFT-PINS) RATED FOR 100 PSI. ACTUATOR SHALL BE MOUNTED ON PRIMARY (N.O.) VALVE STEM AND CONNECTED TO (N.C.) VALVE STEM BY A STAINLESS STEEL LINKAGE.
5. VALVE/ ACTUATOR SUPPLIER: VSI-VALVE SOLUTIONS, INC. (SALES@VALVESOLUTIONS.COM) OR 770-740-0800.

MECHANICAL GENERAL SPECIFICATIONS

1.00 SCOPE OF WORK

1.1. THE CONTRACTOR IS RESPONSIBLE FOR ALL WORK, MATERIALS, AND LABOR TO SATISFY A COMPLETE WORKING SYSTEM WHETHER SPECIFIED OR IMPLIED.

1.2. ALL WORK IS TO BE PERFORMED IN STRICT COMPLIANCE WITH ALL CODES AND REGULATIONS GOVERNING WORK OF THIS NATURE.

1.3. THE CONTRACTOR SHALL, BEFORE SUBMITTING ANY PROPOSAL, EXAMINE THE PROPOSED SITE AND SHALL DETERMINE FOR HIMSELF THE CONDITIONS THAT MAY EFFECT THE WORK. NO ALLOWANCE SHALL BE MADE IF THE CONTRACTOR FAILS TO MAKE SUCH EXAMINATIONS.

1.4. ALL EQUIPMENT AND MATERIALS SHALL BE AS SPECIFIED OR "APPROVED EQUAL" BY THE ENGINEER.

2.00 ELECTRICAL

2.1. CONTRACTOR TO COORDINATE WITH ELECTRICAL CONTRACTOR FOR LOCATION OF WIRING FOR POWERED EQUIPMENT.

3.00 MISCELLANEOUS

3.1. DO NOT SCALE THIS DRAWING FOR EXACT DIMENSIONS. VERIFY ALL FIGURES, CONDITIONS, AND DIMENSIONS AT THE JOB SITE.

3.2. THE MECHANICAL PLANS ARE INTENDED TO BE DIAGRAMMATICAL AND ARE BASED ON ONE MANUFACTURER'S EQUIPMENT. THEY ARE NOT INTENDED TO SHOW EVERY ITEM IN ITS EXACT LOCATION, THE EXACT DIMENSIONS, OR ALL THE DETAILS OF THE EQUIPMENT. THE CONTRACTOR SHALL VERIFY THE ACTUAL DIMENSIONS OF THE EQUIPMENT PROPOSED TO ENSURE THAT THE EQUIPMENT WILL FIT IN THE AVAILABLE SPACE.

PIPE SUPPORT

1.00 PIPE SUPPORT

1.1. USE 'FORMED METAL' (UNISTRUT) COMPONENTS OR WELDED STRUCTURAL STEEL SHAPES.

1.2. ANCHOR PIPE SUPPORT INTO CONCRETE PADS WITH 5/8"ø EXPANSION BOLTS.

1.3. PAINT UNCOATED STEEL TO MATCH PIPING.

WATER PIPING

1.00 MATERIAL WATER PIPING

1.1. 2" AND SMALLER: SCH. 40 GALVANIZED STEEL WITH THREADED FITTINGS, ASTM A-120.

1.2. 2" AND LARGER: SCH. 40 BLACK STEEL WITH WELDED OR FLANGED FITTINGS, ASTM A-120.

1.3. 2" AND SMALLER UNIONS SHALL BE MALLEABLE IRON BODY FOR FERROUS PIPING, BRONZE BODY FOR COPPER PIPING, GALVANIZED FOR GALVANIZED PIPING, THREADED OR SOLDER ENDS.

1.4. 2-1/2" AND LARGER UNIONS SHALL 150# BE FORGED STEEL FLANGES FOR FERROUS PIPING.

1.5. BALL VALVES – GENERAL SHUTOFF SERVICE OF WATER:
A. 2" AND SMALLER BALL VALVES SHALL BE 150SWP, 400WOG, BRONZE TWO PIECE BODY, FULL PORT, STAINLESS STEEL BALL, TEFLON SEAT AND RINGS, LEVER HANDLE AND SOLDER OR THREADED ENDS.

1.6. BUTTERFLY VALVES – GENERAL SHUTOFF SERVICE OF WATER:
A. 2-1/2" AND LARGER BUTTERFLY VALVES SHALL BE CAST IRON BODY, BRONZE DISC, SEATS AND SEATS SHALL BE CAPABLE OF SERVICE TO 250F, LUG ENDS, EXTENDED NECK, 10 POSITION LEVER HANDLE WITH MEMORY STOP.

1.7. CHECK VALVES – GENERAL SERVICE OF WATER:
A. 2" AND SMALLER CHECK VALVES SHALL BE 150SWP, 300WOG, BRONZE BODY, SWING CHECK DISC, THREADED ENDS, SUITABLE FOR HORIZONTAL OR VERTICAL INSTALLATION.
B. 2-1/2" AND LARGER CHECK VALVES SHALL BE 125SWP, 200WOG, CAST IRON BODY, SWING CHECK DISC, BRONZE TRIM, FLANGED ENDS, SUITABLE FOR HORIZONTAL OR VERTICAL INSTALLATION.

1.8. BALANCING VALVES – GENERAL SHUTOFF AND BALANCING SERVICE OF WATER:
A. 3" AND SMALLER BALANCING VALVE SHALL BE BRONZE BODY, BRASS BALL, TFE SEAT RINGS, DIFFERENTIAL PRESSURE READOUT PORTS WITH CHECK VALVES, DRAIN/PURGE PORT,MEMORY STOP FEATURE, CALIBRATED POINTER INDICATING DEGREE OF VALVE OPENING, TIGHT SHUTOFF WITH SOLDER OR THREADED ENDS.
B. 5" PIPE SIZE AND LARGER BALANCING VALVE SHALL BE CAST IRON BODY, BRASS VANE, DIFFERENTIAL PRESSURE READOUT PORTS WITH CHECK VALVES, MEMORY STOP FEATURE, CALIBRATED POINTER WITH FLANGED ENDS. BELL & GOSSETT #CB-8F.

1.9. TEST SHALL BE PERFORMED BY CONTRACTOR AND WITNESSED BY AUTHORIZED INSPECTOR. ALL PIPING SHALL BE TESTED TO WORKING PRESSURE OF NOT LESS THAT 100 PSIG. WHERE OPERATING PRESSURES EXCEED 50 PSIG, TEST PRESSURE SHALL BE TWO TIMES THE WORKING PRESSURE. TEST DURATION SHALL BE AT LEAST 30 MINUTES.

1.10. PAINT EXPOSED PIPING (EXCEPT GALVANIZED PIPE) WITH CORROSION RESISTANT PRIMER AND FLAT ENAMEL FINISH COAT. FINISH COAT COLOR SELECTION SHALL BE BY OWNER.

1.11. WRAP DIRECT-BURIED STEEL PIPE WITH 20-MIL PVC TAPE OR CONTINUOUS SLEEVE. EXTEND PIPE WRAP TO 12" ABOVE GRADE AND SEAL WATER TIGHT.

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(04/23/12)

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ROOSEVELT IRRIGATION DISTRICT #89
WATER TREATMENT INSTALLATION
51ST AVENUE, 1/4 MI. NORTH OF BUCKEYE, PHOENIX, ARIZONA

Sheet Title:
MECHANICAL SCHEDULES AND SPECIFICATIONS

REVISIONS:

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SHEET	M4.1

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ELECTRICAL DRAWING SPECIFICATION

1.0 GENERAL:

1.1. ALL ELECTRICAL WORK SHALL COMPLY WITH ALL APPLICABLE CITY, COUNTY, STATE, AND SERVING ELECTRICAL UTILITY CODES, ORDINANCES, RULES, AND REGULATIONS. THE ENTIRE INSTALLATION SHALL COMPLY WITH OR SURPASS THE REQUIREMENTS OF THE ADOPTED EDITION OF THE NATIONAL ELECTRICAL CODE.

1.2. THE COMPLETE INSTALLATION SHALL BE IN ACCORDANCE WITH THE A.D.A.A.G. (AMERICANS WITH DISABILITIES ACT ACCESSIBILITY GUIDELINES).

1.3. UNLESS SPECIFICALLY NOTED, ALL MATERIAL SHALL BE NEW, OF FIRST CLASS QUALITY, SHALL BE U.L. LISTED AND LABELED, AND FREE OF DEFECTS.

1.4. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY LOSS OR DAMAGE CAUSED BY HIM OR HIS WORKMEN TO THE SITE AND EXISTING SYSTEMS DURING THE COURSE OF CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING OR REPLACING SUCH LOSS OR DAMAGE AT NO ADDITIONAL COST TO THE OWNER.

1.5. DRAWINGS ARE DIAGRAMMATIC IN NATURE AND CANNOT SHOW EVERY CONNECTION. JUNCTION BOXES, WIRE, CONDUIT, ETC. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING A COMPLETE AND FUNCTIONAL ELECTRICAL SYSTEM.

1.6. ALL EXISTING CONDUIT RUNS ARE NOT SHOWN. VERIFY EXISTING CONDUIT LOCATIONS IN FIELD.

1.7. NO DESIGN CHANGES SHALL BE MADE TO THE ELECTRICAL SYSTEM WITHOUT THE PRIOR APPROVAL OF THE ELECTRICAL ENGINEER AND THE ELECTRICAL INSPECTOR.

2.0. SCOPE OF WORK:

2.1. FURNISH ALL MATERIALS, TOOLS AND LABOR AND PAY ALL PERMITS AND FEES REQUIRED FOR THE ELECTRICAL INSTALLATION UNLESS OTHERWISE NOTED ON PLANS. ALL PERMITS AND INSPECTIONS SHALL BE PROVIDED AS REQUIRED BY THE LOCAL CODE AUTHORITY.

2.2. THE CONTRACTOR SHALL VISIT THE SITE TO DETERMINE EXISTING CONDITIONS PRIOR TO SUBMITTING A BID.

2.3. THIS PROJECT CONSISTS OF DEMOLITION, REMODEL, AND NEW CONSTRUCTION IN THE NOTED AREAS, VERIFY WITH OWNER IN FIELD ALL DEMOLITION WORK PRIOR TO BID.

2.4. ALL CONDUIT AND CONDUCTORS REMOVED UNDER DEMOLITION WORK SHALL NOT BE REUSED.

2.5. UNLESS NOTED OTHERWISE UNDER THE PROJECTS GENERAL CONDITIONS, AT THE COMPLETION OF THIS PROJECT, TURN OVER TO OWNER'S REPRESENTATIVE ALL REMOVED DEVICES AND/OR EQUIPMENT.

2.6. WHERE IT IS IMPOSSIBLE TO REMOVE CONDUITS AS SHOWN ON DRAWINGS (SUCH AS BELOW OR EMBEDDED IN CONCRETE FLOOR SLAB), REMOVE CONDUCTORS, CUT, CAP, AND ABANDON CONDUIT BELOW FLOOR LINE.

2.7. THE CONTRACTOR SHALL VERIFY LOCATION OF ALL EXISTING SITE UTILITIES BEFORE DIGGING TRENCHES.

2.8. VERIFY AND COORDINATE THE FOLLOWING WITH THE MECHANICAL AND CONTROLS CONTRACTOR:

a)LOCATION OF EQUIPMENT; E.G. MOTORS, HEATERS, T-STATS, CONTROL PANELS, ETC.

b)EQUIPMENT ELEC CHARACTERISTICS; E.G. VOLTAGE, PHASE, HP, AMPS, CONTROL WIRING, ETC.

2.9. CONCEAL ALL CONDUIT WORK. WHERE THIS IS IMPOSSIBLE, CONTACT OWNER AND COORDINATE IN FIELD.

2.10. COORDINATE ALL POWER OUTAGES WITH THE OWNERS REPRESENTATIVE IN ADVANCE.

2.11. RESTORE ALL SURFACES THAT WERE DAMAGED (PAINTING, PATCHING, PLASTERING, ETC.,) DUE TO THE INSTALLATION OR REMOVAL OF ELECTRICAL ITEMS.

2.12. PANEL DESIGNATIONS SHOWN ON THESE DRAWINGS ARE GIVEN FOR CLARIFICATION OF CIRCUITING ONLY AND MAY NOT CORRESPOND TO THE DESIGNATIONS FOUND IN THE FIELD.

2.13. FULLY GUARANTEE THE INSTALLATION FOR A PERIOD OF ONE YEAR FROM THE DATE OF FINAL ACCEPTANCE BY THE OWNER, AGAINST ANY IMPERFECT WORKMANSHIP AND MALFUNCTION OF EQUIPMENT. ANY WORK IDENTIFIED TO BE DEFECTIVE WITHIN THE GUARANTEE PERIOD SHALL BE PROMPTLY REPAIRED OR REPLACE AT NO ADDITIONAL COST THE THE OWNER.

2.14. FOR EQUIPMENT BEING REMOVED OR REPLACED, THE ELECTRICAL CONTRACTOR SHALL DE-ENERGIZE THE EQUIPMENT AND MAKE IT SAFE PRIOR TO REMOVAL. COMPLY WITH OSHA REQUIREMENTS FOR LOCKING OUT AND TAGGING EQUIPMENT TO PREVENT INADVERTENT RE-ENERGIZING.

3.0. SUBMITTALS:

3.1. PROVIDE A MINIMUM OF SIX (6) SETS OF SHOP DRAWINGS FOR THE FOLLOWING; LIGHTING FIXTURES, DISCONNECT SWITCHES, PANELBOARDS, STARTERS, SERVICE ENTRANCE EQUIPMENT. ALL SHOP DRAWING SUBMITTALS SHALL BE BOUND, LABELED, AND MARKED TO IDENTIFY EXACTLY WHICH ITEM SHALL BE PROVIDED. SUBMIT ALL SHOP DRAWINGS FOR REVIEW AT THE SAME TIME.

3.2. SUBMIT UTILITY COORDINATION DRAWINGS AS REQUIRED BY THE LOCAL UTILITIES.

4.0. SUBSTITUTIONS:

4.1. EQUIPMENT LISTED BY BRAND NAME OR CATALOG NUMBER SHALL BE INTERPRETED AS ESTABLISHING A STANDARD OF QUALITY. SUBSTITUTIONS WILL BE CONSIDERED IF A WRITTEN REQUEST IS SUBMITTED TO THE ARCHITECT/ENGINEER A MINIMUM OF EIGHT (8) DAYS PRIOR TO THE BID DATE. THE REQUEST SHALL INCLUDE THE FOLLOWING:

a)A STATEMENT DECLARING THAT THE EQUIPMENT PROPOSED IS EQUAL TO THAT SPECIFIED BY HAVING THE SAME PHYSICAL CHARACTERISTICS AND DIMENSIONS, AND WILL MEET THE DRAWING LAYOUT AND STRUCTURAL CONDITIONS.

b)THE SPECIFIED AND SUBMITTAL CATALOG NUMBERS OF THE EQUIPMENT UNDER CONSIDERATION.

c)AN EQUIPMENT CUT SHEET WITH DRAWING, DIMENSIONS AND SPECIFICATIONS.

d)SAMPLE MAY BE REQUIRED AT THE ENGINEERS DISCRETION.

4.2. ALL LIGHTING FIXTURES SUBMITTED FOR APPROVAL MUST HAVE THE INFORMATION AS DESCRIBED ABOVE, AS WELL AS THE FOLLOWING INFORMATION:

a)MANUFACTURE'S DATA SHOWING CATALOG NUMBERS.

b)CONSTRUCTION DETAILS.

c)PHOTOMETRIC OR ISOLUX CURVES.

d)TABLE OF COEFFICIENTS OF UTILIZATION.

e)RECOMMENDED MAINTENANCE FACTOR AND BRIGHTNESS READING.

f)FOOTCANDLE CALCULATIONS AS REQUESTED.

4.3. ANY CONFLICT ARISING FROM THE USE OF SUBSTITUTED MATERIAL SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR, WHO SHALL BEAR ALL COSTS REQUIRED TO MAKE THE EQUIPMENT COMPLY WITH THE INTENT OF THE PLANS AND SPECIFICATIONS.

4.4. NO MATERIAL OR APPARATUS SHALL BE SUBSTITUTED AFTER THE BID OPENING UNLESS APPROVED IN WRITING BY THE ENGINEER.

4.5. MANUFACTURERS SHALL NOT BE CONSIDERED APPROVED AS EQUAL UNTIL LISTED IN A FORMAL ADDENDUM. LISTING AS EQUAL DOES NOT RELIEVE THE MANUFACTURER FROM MEETING THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.

5.0. CONDUIT AND WIRE:

5.1. WHERE WIRING AND CONDUIT SIZES ARE INDICATED FOR HOMERUNS, THESE SIZES APPLY TO THE ENTIRE LENGTH FROM THE PROTECTIVE DEVICE IN THE PANEL TO THE EQUIPMENT OR LAST WIRING DEVICE.

5.2. SCHEDULE 40 PVC CONDUIT SHALL BE USED FOR ALL UNDERGROUND EXTERIOR CONDUIT, IN SLABS, BELOW SLAB ON GRADE AND IN CONCRETE OR MASONRY WALLS. ALL BENDS OVER 30 DEGREES SHALL BE MADE WITH WRAPPED INTERMEDIATE METAL CONDUIT. USE LONG SWEEP FITTINGS FOR ALL 90 DEGREE BENDS. ALL PLASTIC CONDUIT, EXCEPT THAT USED FOR COMMUNICATIONS, SHALL BE PROVIDED WITH A CODE SIZED EQUIPMENT GROUNDING CONDUCTOR. DO NOT USE PVC IN EXPOSED LOCATIONS.

5.3. ALL BELOW GRADE CONDUIT SHALL BE INSTALLED A MINIMUM OF 24 INCHES BELOW FINISHED GRADE. BELOW GRADE CONDUIT SHALL BE 3/4 INCH DIAMETER, MINIMUM.

5.4. ALL WIRING SHALL BE IN CONDUIT. RIGID OR INTERMEDIATE METALLIC CONDUIT (IMC) SHALL BE USED FOR ALL EXPOSED CONDUIT, WHERE SUBJECT TO MOISTURE, OR WHERE SUBJECT TO PHYSICAL DAMAGE.

5.5. FLEXIBLE METALLIC CONDUIT SHALL BE USED FOR ALL CONNECTIONS TO MOTORS, OR EQUIPMENT SUBJECT TO VIBRATION. LIQUID-TIGHT CONDUIT SHALL BE USED WHERE SUBJECT TO MOISTURE. BOND FLEXIBLE CONDUIT PER N.E.C. REQUIREMENTS.

5.6. INSTALL A PULL WIRE IN ALL EMPTY CONDUITS.

5.7. ALL CONDUCTORS SHALL BE COPPER. MINIMUM BRANCH CIRCUIT WIRING SHALL BE #12 AWG. OTHER SIZES AS INDICATED ON THE DRAWINGS OR AS REQUIRED BY CODE. INSULATION SHALL BE THHN/THWN FOR CONDUCTORS #6 AND SMALLER AND XHHW FOR #4 AND LARGER.

5.8. CIRCUIT NUMBERS ARE SHOWN FOR CIRCUIT IDENTIFICATION. CIRCUITING SHALL AGREE WITH NUMBERING ON THE PANEL SCHEDULE PROVIDED. BALANCE THE LOAD AS EVENLY AS POSSIBLE BETWEEN EACH PHASE LEG.

5.9. ALL SECONDARY SERVICES, FEEDERS AND BRANCH CIRCUIT CONDUCTORS SHALL BE COLOR CODED AS FOLLOWS:

208/120 VOLT	PHASE	480/277 VOLT
BLACK	A	BROWN
RED	B	ORANGE
BLUE	C	YELLOW
WHITE	NEUTRAL	GRAY
GREEN	GROUND	GREEN

5.10. CONTROL WIRES SHALL BE PURPLE OR VIOLET. ALL BRANCH CIRCUIT CONDUCTORS SHALL HAVE SOLID COLOR COMPOUND OR SOLID COLOR COATING. COORDINATE EXACT REQUIREMENTS WITH CONTROLS CONTRACTOR AND NOTIFY ENGINEER OF ANY DISCREPANCIES.

5.11. WRAP UNDERGROUND STEEL CONDUIT WITH HALF LAPPED SCOTCH #50 TAPE OR PROVIDE PVC COATED PIPE.

6.0. GROUNDING:

6.1. GROUNDING OF ELECTRICAL SERVICE AND EQUIPMENT SHALL BE PER THE APPLICABLE SECTIONS OF N.E.C. ARTICLE 250, AND AS SHOWN ON THE DRAWINGS.

6.2. PROVIDE AN INSULATED EQUIPMENT GROUNDING CONDUCTORS, IN ACCORDANCE WITH N.E.C. 250-122, IN ALL CONDUITS WITH CONDUCTORS.

7.0. NOT USED:

8.0. EQUIPMENT:

8.1. ALL ELECTRICAL COMPONENTS INSTALLED OUTDOORS, EXPOSED TO WEATHER OR IN DAMP LOCATIONS SHALL BE WEATHERPROOF, NEMA 3R.

8.2. THE SERVICE ENTRANCE ASSEMBLY AND ALL OF ITS COMPONENTS SHALL BE BRACED TO WITHSTAND A MINIMUM OF 100% OF AVAILABLE FAULT CURRENT SUPPLIED BY THE POWER COMPANY.

8.3. PROVIDE AT THE COMPLETION OF THE PROJECT NEATLY TYPED ACCURATE PANELBOARD DIRECTORIES INDICATING ALL BRANCH CIRCUITS AND SPARES. ALL SPARES SHALL BE LEFT IN THE OFF POSITION.

8.4. PROVIDE A 120 VOLT, 20 AMP, WEATHERPROOF GFCI RECEPTACLE WITHIN 25 FEET AND ACCESSIBLE TO ALL MECHANICAL EQUIPMENT.

8.5. LABEL ALL SERVICE ENTRANCE EQUIPMENT, PANELBOARDS AND MAJOR SINGLE LINE COMPONENTS WITH PERMANENTLY AFFIXED PHENOLIC LETTERING (2" MINIMUM). LABEL ALL RECEPTACLES, DEVICES, JUNCTION BOXES, DISCONNECT SWITCHES, LUMINAIRES, ETC. WITH VINYL ADHESIVE TAPE INDICATING PANEL AND CIRCUIT NUMBER.

8.6. PANELBOARDS SHALL HAVE COPPER BUS, WITH FULL NEUTRAL AND GROUND BUSSES. MINIMUM AIC RATING SHALL BE 10,000 AMPS. PANELS SHALL HAVE LOCKING DOORS WITH MATCHING KEYS. PANELS SHALL BE MANUFACTURED BY SQUARE "D", GENERAL ELECTRIC, CUTLER HAMMER OR SIEMENS. LOAD CENTERS ARE NOT ACCEPTABLE.

8.7. ALL BRANCH CIRCUIT PANEL BOXES SHALL BE MINIMUM 5-3/4 INCHES DEEP AND 20 INCHES WIDE. PROVIDE MOUNTING HARDWARE IN ALL SPACES FOR FUTURE DEVICES.

8.8. ALL SAFETY SWITCHES SHALL BE HEAVY DUTY TYPE, WITH COVER INTERLOCK AND HANDLE LOCK OFF PROVISIONS. SWITCHES SHALL BE MANUFACTURED BY SQUARE "D", GENERAL ELECTRIC, CUTLER HAMMER OR SIEMENS. RATING AND FUSING SHALL BE AS SHOWN ON THE DRAWINGS. COORDINATE FUSING FOR SWITCHES SERVING MECHANICAL EQUIPMENT WITH MANUFACTURERS RECOMMENDED FUSE SIZE.

8.9. DRY TYPE TRANSFORMERS SHALL BE 60 HZ, WITH KVA RATINGS AS NOTED ON THE DRAWINGS. TRANSFORMERS SHALL BE TOTALLY ENCLOSED, EXCEPT FOR VENTILATION OPENINGS AND BE PROVIDED WITH WEATHER HOOD SUITABLE FOR OUTDOOR INSTALLATION. TRANSFORMERS SHALL HAVE A SHEET STEEL ENCLOSURE, AND CORE AND COIL ASSEMBLY SHALL BE ISOLATED FROM THE MOUNTING FRAME WITH VIBRATION ISOLATORS. PROVIDE SIX (6), 2-1/2% TAPS, FOUR (4) BELOW AND TWO (2) ABOVE NORMAL. INSTALL TRANSFORMER A MINIMUM OF 6 INCHES FROM ADJACENT WALLS OR STRUCTURES. TRANSFORMERS SHALL BE MANUFACTURED BY SQUARE "D", SIEMENS, GENERAL ELECTRIC, OR CUTLER HAMMER.

8.10. TIME CLOCKS SHALL MEET THE REQUIREMENTS OF THE 2006 IECC. PROVIDE WITH COMBINATION 7-DAY AND SEASONAL PROGRAM SCHEDULE AND MINIMUM 4 HOUR BATTERY BACK UP. INTERMATIC MODEL #ET7011150R OR EQUAL.

9.0. WIRING DEVICES:

9.1. SWITCHES SHALL BE OF THE QUIET TYPE, SPECIFICATION GRADE, 20 AMP, 120/277 VOLT AC. HUBBELL 1221 (SINGLE POLE), 1223 (THREE-WAY), EQUAL BY LEVITON OR PASS & SEYMOUR.

9.2. RECEPTACLES, UNLESS NOTED OTHERWISE, SHALL BE DUPLEX, 120 VOLT, 20 AMP, GROUNDING TYPE, NEMA 5-20R. HUBBELL 5362, OR EQUAL BY LEVITON OR PASS & SEYMOUR.

9.3. PROVIDE ALL WIRING DEVICES WITH APPROPRIATE COVERPLATES. PROVIDE BLANK COVER PLATES FOR ALL EMPTY BOXES. COVERPLATES SHALL BE LEXAN, PLASTIC OR STAINLESS STEEL IN FINISHED AREA. GALVANIZED COVERPLATES MAY BE USED IN EQUIPMENT ROOMS.

ELECTRICAL ABBREVIATIONS AND SYMBOL SCHEDULE:

NOTE: NOT ALL SYMBOLS MAY BE USED ON THIS PROJECT. ALL MOUNTING HEIGHTS TO CENTER OF BOX, UNO. ALL DEVICES SHALL COMPLY WITH ADA REQUIREMENTS, WHERE APPLICABLE.

ABBREVIATIONS:

A	AMPERES
AC	ALTERNATING CURRENT
AF	AMPERES FRAME (RATING)
AFC	AVAILABLE FAULT CURRENT
AFG	ABOVE FINISHED GRADE
AFF	ABOVE FINISHED FLOOR
AHU	AIR HANDLING UNIT
AIC	AMPERES INTERRUPTING CAPACITY
AL	ALUMINUM
AT	AMPERES TRIP (SETTING)
AUX	AUXILIARY
BRKR	BREAKER
C	CONDUIT
CB	CIRCUIT BREAKER
CKT	CIRCUIT
COMB	COMBINATION
COMM	COMMUNICATIONS
CP	CONTROL PANEL
CPT	CONTROL POWER TRANSFORMER
CT	CURRENT TRANSFORMER
CU	COPPER
DC	DIRECT CURRENT
DISC	DISCONNECT
DP	POWER DISTRIBUTION PANEL
DWG	DRAWING
EC	ELECTRICAL CONTRACTOR
EDF	ELECTRIC DRINKING FOUNTAIN
EF	EXHAUST FAN
EG	EQUIPMENT GROUND
ELEC	ELECTRICAL – ELECTRIC
EM	EMERGENCY
EMT	ELECTRICAL METALLIC TUBING
EO	ELECTRICALLY OPERATED
F	FUSE
FA	FIRE ALARM
FAAP	FIRE ALARM ANNUNCIATE PANEL
FACP	FIRE ALARM CONTROL PANEL
FSD	FIRE SMOKE DAMPER
FDR	FEEDER
FLA	FULL LOAD AMPERES
FLEX	FLEXIBLE
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GND	GROUND
HID	HIGH INTENSITY DISCHARGE
HP	HORSE POWER
HOA	HAND-OFF-AUTO
JB	JUNCTION BOX
KV	KILOVOLTS
KVA	KILOVOLTS-AMPERES
KW	KILOWATTS
LTG	LIGHTING
MBJ	MAIN BONDING JUMPER
MC	MECHANICAL CONTRACTOR
MCA	MINIMUM CIRCUIT AMPACITY
MCC	MOTOR CONTROL CENTER
MECH	MECHANICAL
MH	MANHOLE
MISC	MISCELLANEOUS
MTD	MOUNTED
MTG	MOUNTING
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NEU	NEUTRAL
NF	NON-FUSED
NIC	NOT IN CONTRACT
NL	NIGHT LIGHT
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OL'S	OVERLOADS
P	POLE
PA	PUBLIC ADDRESS
PB	PUSH BUTTON
PH	PHASE
PNL	PANEL
PT	POTENTIAL TRANSFORMER
PWR	POWER
RECP	RECEPTACLE
RLA	RUNNING LOAD AMPERES
RSC	RIGID STEEL CONDUIT
RTU	ROOF TOP UNIT
SCHED	SCHEDULE
SES	SERVICE ENTRANCE SECTION
SS	SPECIAL SYSTEMS
SWBD	SWITCHBOARD
TMB	TELEPHONE MOUNTING BOARD
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
V	VOLTS
VP	VANDAL PROOF
W	WIRE
WG	WIRE GUARD
WH	WATER HEATER
WP	WEATHER PROOF (WHILE IN USE)

GENERAL SYMBOLS:

- RECESSED OR SURFACE JUNCTION BOX IN ACCESSIBLE LOCATION WITH FLEXIBLE CONDUIT CONNECTION.
- MOTOR, HP, VOLTAGE, & PHASE AS INDICATED MECH EQUIP SCHEDULE.
- ELECTRICAL PANELBOARD, 480/277V, 3PH, 4W, WITH GND, UNO. FLUSH/SURFACE MOUNT AT +6'-0" AFF TO TOP. STUB OUT THREE 3/4"C INTO ACCESSIBLE CEILING SPACE.
- ELECTRICAL PANELBOARD, 208/120V, 3PH, 4W WITH GND, UNO. FLUSH/SURFACE MOUNT AT +6'-0" AFF TO TOP. STUB OUT THREE 3/4"C INTO ACCESSIBLE CEILING SPACE.
- TRANSFORMER, TYPE AND RATING AS SPECIFIED ON PLAN.
- SERVICE ENTRANCE SECTION, DISTRIBUTION PANELBOARD, OR MOTOR CONTROL CENTER, AS SPECIFIED ON PLAN.
- CONDUIT CONCEALED IN FINISHED AREAS OR ABOVE CEILING SPACE.
- UNDERGROUND CONDUIT OR CONCEALED IN CONCRETE OR BELOW FLOOR AS NOTED.
- CONDUIT TURNING UP
- CONDUIT TURNING DOWN
- CONDUIT STUB OUT, AS NOTED ON PLANS
- HOME RUN TO PANELBOARD OR AS NOTED. ALL CONDUCTORS SHALL BE COPPER & HAVE CODE SIZED GROUNDING CONDUCTORS. MINIMUM BRANCH CIRCUIT WIRING SHALL BE #12 AWG. OTHER SIZES AS INDICATED ON THE DRAWINGS, ELECTRICAL SCHEDULES, OR AS REQUIRED BY CODE. INSULATION SHALL BE THHN/THWN FOR CONDUCTORS #6 AND SMALLER AND XHHW FOR #4 AND LARGER.

SINGLE LINE DIAGRAM SYMBOLS:

- LSIG – LONG-TIME/SHORT-TIME/INSTANTANEOUS/GROUND FAULT TRIP SETTINGS
- CIRCUIT BREAKER
- FUSIBLE SWITCH, SIZE AS INDICATED ON PLANS
- MOTOR STARTER, # INDICATES NEMA SIZE
- 480V DRAW-OUT CIRCUIT BREAKER
- DRAW-OUT FUSE
- COMBINATION MOTOR CONTROLLER, FUSIBLE SWITCH TYPE
- COMBINATION MOTOR CONTROLLER, CIRCUIT BREAKER TYPE
- GROUND
- METER
- GFP – GROUND FAULT PROTECTION
- CURRENT TRANSFORMER
- DPM – DIGITAL POWER METER
- DISTRIBUTION TRANSFORMER
- DELTA CONNECTION
- WYE CONNECTION WITH GROUND
- FEED THROUGH LUG CONNECTION
- ELECTRICAL PANEL BOARD, MAIN LUG ONLY
- ELECTRICAL PANEL BOARD, MAIN CIRCUIT BREAKER

CONTROLS SYMBOLS:

NOTE: PROVIDE NEMA 3R ENCLOSURE IN EXTERIOR APPLICATIONS.

- $ – SINGLE POLE TOGGLE SWITCH MTD AT +48" AFF
- $K – SINGLE POLE KEY OPERATED SWITCH MTD AT +48" AFF
- $M – HP RATED MANUAL MOTOR STARTER WITH SWITCH CONTROL & THERMAL OVERLOAD PROTECTION.
- MOTOR CONTROLLER. FURNISHED WITH EQUIPMENT.
- MOTOR CONTROLLER. FURNISHED BY ELECTRICAL CONTRACTOR.
- HEAVY DUTY SAFETY DISCONNECT SWITCH, 250V-30A-3P, UNO. HP RATED, REFER TO EQUIP SCHEDULE(S) FOR FUSES AND OTHER SPECIFICATIONS
- COMBINATION MOTOR STARTER/DISCONNECT SWITCH, FUSIBLE WITH 120V CONTROL TRANSFORMER, H/A SWITCH, AND PILOT LIGHT IN ENCLOSURE. FUSE PER EQUIPMENT MANUFACTURER'S RECOMMENDATIONS OR EQUIP SCHEDULE SPECIFICATIONS. SUBSCRIPT INDICATES STARTER SIZE.
- VFD – VARIABLE FREQUENCY DRIVE. FURNISHED BY MECHANICAL CONTRACTOR, INSTALLED BY ELECTRICAL CONTRACTOR.
- TS – TIME SWITCH
- PC – PHOTOCELL. ROOF MOUNTED, UNO

POWER SYMBOLS:

NOTE: WEATHER PROOF WHERE OUTSIDE MTD AT +72" AFG, UNO

- SPECIAL PURPOSE RECEPTACLE, 250V-400V, NEMA CONFIG & MTG HEIGHT AS SPECIFIED ON EQUIP SCHEDULE OR AS REQUIRED FOR INTENDED USE.
- DUPLEX RECEPTACLE, 20A-2P-3W, NEMA 5-20R, MTD AT +16" AFF, UNO
- DOUBLE DUPLEX RECEPTACLE, (2) 20A-2P-3W, NEMA 5-20R
- SINGLE RECEPTACLE, 30A-2P-3W, NEMA 5-30R MTD AT +16" AFF, UNO
- SINGLE, DUPLEX, OR DBL-DUPLEX RECP W/SWITCHED LEG MTD AT +16", UNO

LIGHTING SYMBOLS:

NOTE: REFER TO LIGHTING FIXTURE SCHEDULE FOR LUMINAIRE SPECIFICATIONS.
NOTE: SUBSCRIPT INDICATES LUMINAIRE TYPE.

- DOUBLE OR SINGLE ARM POLE MTD AREA LIGHT WITH CONCRETE BASE
- BOLLARD OR POST MTD AREA LIGHT
- SURFACE CEILING MTD INCANDESCENT, FLUORESCENT, OR HID FIXTURE
- SURFACE WALL MTD INCANDESCENT, FLUORESCENT, OR HID FIXTURE

GENERAL PROJECT NOTES:

A. ALL WORK TO BE PERFORMED IN ACCORDANCE WITH THE N.E.C. AND ALL APPLICABLE LOCAL CODES AND ORDINANCES.

B. ALL CONTRACTORS SHALL VERIFY LOCATION OF ALL EXISTING SITE UTILITIES BEFORE DIGGING TRENCHES.

C. THE ELECTRICAL CONTRACTOR SHALL VERIFY REQUIREMENTS FOR EQUIPMENT FURNISHED BY OTHERS TO BE CONNECTED TO THE THE ELECTRICAL SYSTEM. THE ELECTRICAL CONTRACTOR SHALL PROVIDE ALL MATERIALS NECESSARY, SUCH AS WIRE, CONDUIT, FUSE, TRANSFORMERS, ETC. FOR PROPER INSTALLATION AND ELECTRICAL OPERATION OF SUCH EQUIPMENT.

D. ELECTRICAL CONTRACTOR SHALL CONTACT THE ENGINEERS OFFICE IN WRITING WITH A REQUEST FOR INFORMATION (RFI) PRIOR TO PROCEEDING WITH ANY WORK NOT CLEARLY SHOWN IN DOCUMENTS HEREIN. ENGINEER WILL NOT ASSUME RESPONSIBILITY FOR WORK NOT AUTHORIZED TO CHANGES TO CONTRACT DOCUMENTS.

OBSERVATION SCHEDULE:

1. CONTACT THE ENGINEER 48 HOURS PRIOR TO SCHEDULING AN OBSERVATION FOR ANY INSPECTION BY THE LOCAL JURISDICTION. THE ENGINEER, OR HIS REPRESENTATIVE SHALL VERIFY COMPLIANCE WITH THESE DOCUMENTS. ANY WORK THAT DOES NOT COMPLY WITH THESE DOCUMENTS SHALL BE CORRECTED BY THE ELECTRICAL CONTRACTORS EXPENSE.

2. PUNCH WALK-THROUGH, AFTER ENERGIZING ALL EQUIPMENT.

REFERENCE SYMBOLS

- EQP / #: MECH EQUIP IDENTIFICATION. REFER TO EQUIP SCHED FOR ELECTRICAL REQUIREMENTS
- EQUIPMENT TAG NUMBER
- f: FEEDER IDENTIFICATION. REFER TO FEEDER SCHED FOR CONDUCTOR DETAILS
- f#: AVAIL FAULT CURRENT IDENTIFICATION. REFER TO AFC TABLE FOR FURTHER DETAILS

SHEET INDEX

RECORD DRAWING (4/23/2012)

THIS IS PART OF A RECORD DOCUMENT. RECORD DOCUMENTS ARE BASED ON REPORTS SUBMITTED BY OTHERS. ENGINEER CANNOT ASSURE NOR ASSUME ANY RESPONSIBILITY OR LIABILITY FOR THE ACCURACY OF RECORD DOCUMENTS. USERS OF RECORD DOCUMENTS ARE CAUTIONED AND ADVISED TO OBTAIN INDEPENDENT VERIFICATION OF ACTUAL CONDITIONS.

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ROOSEVELT IRRIGATION DISTRICT #89
WATER TREATMENT INSTALLATION
51ST AVENUE, 1/4 MI. NORTH OF BUCKEYE, PHOENIX, ARIZONA

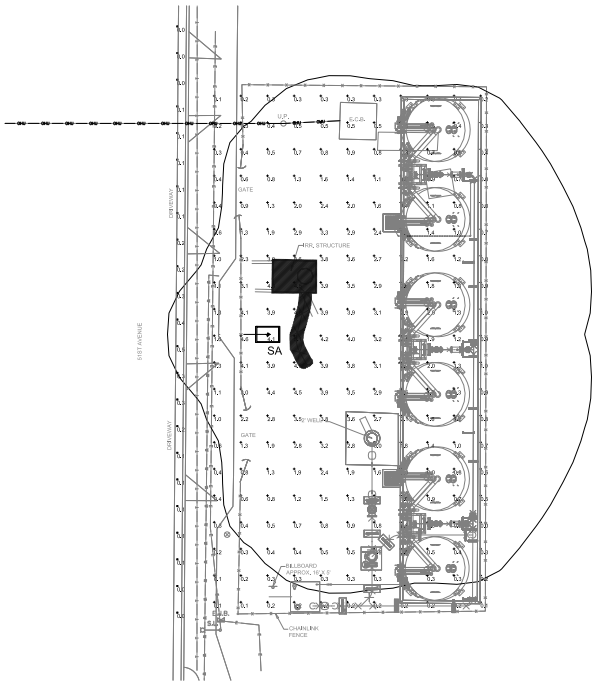
Sheet Title:
ELECTRICAL SPECIFICATIONS AND SYMBOLS LIST

REVISIONS:

DATE:	12/14/2011
DRAWN BY:	CRL
CHECKED BY:	JOD
SCALE:	AS NOTED
PROJECT NO:	011175.00
SHEET	E0.0

Apr 24, 2012 - 9:57am
\\TRCFNP\Project Files\2011 Projects\011175.00 - RID Water Treatment\Electrical\RID-89\As-built\Electrical Drawings - 89.dwg

Calculation Summary							
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min
PROPOERTY LINE	Illuminance	Fc	0.15	0.5	0.0	N.A.	N.A.
SITE	Illuminance	Fc	1.46	5.1	0.0	N.A.	N.A.



PHOTOMETRIC SITE PLAN

1" = 10'-0"

GENERAL NOTES:

A. ALL EXTERIOR LIGHT FIXTURES TO COMPLY WITH LOCAL NIGHT SKY ORDINANCE.

B. ALL EXTERIOR ELECTRICAL EQUIPMENT TO BE RATED FOR WEATHER-PROOF/ NEMA-3R APPLICATIONS.

C. ALL FIXTURES INSTALLED OUTDOORS SHALL BE RATED FOR DAMP/WET LOCATIONS AS REQUIRED. THE CONTRACTOR SHALL COORDINATE DAMP/WET LOCATION RATING PER NEC ARTICLE 410-4. ALL INSTALLATIONS SHALL CONFORM TO NEC ARTICLE 410, ALL SUB ARTICLES.

D. CONTRACTOR TO COORDINATE EXACT SITE LIGHTING FIXTURE LOCATIONS WITH OWNER. ALL CONFLICTS SHALL BE IMMEDIATELY REPORTED TO THE ENGINEER AND ARCHITECT.

E. ALL EXTERNAL LIGHTING SHALL BE SO LOCATED AND DESIGNED TO PREVENT LIGHTING RAYS FROM BEING DIRECTED OFF THE PROPERTY UPON WHICH THE LIGHTING IS LOCATED.

F. REFER TO LIGHTING FIXTURE SCHEDULE ON SHEET E2.0 FOR LIGHT FIXTURE TYPES AND SPECIFICATIONS.

RECORD DRAWING
(4/23/2012)

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ROOSEVELT IRRIGATION DISTRICT #89
WATER TREATMENT INSTALLATION
51ST AVENUE, 1/4 MI. NORTH OF BUCKEYE, PHOENIX, ARIZONA
Sheet Title: PHOTOMETRIC SITE PLAN

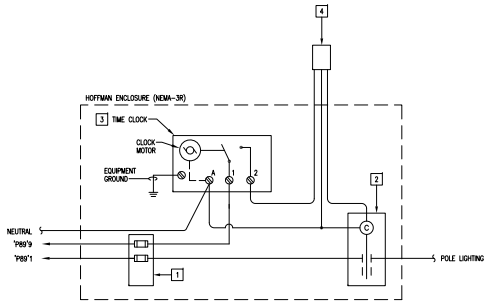
REVISIONS:

DATE:	12/14/2011
DRAWN BY:	CRL
CHECKED BY:	JOD
SCALE:	AS NOTED
PROJECT NO:	011175.00
SHEET	E0.1

Apr 24, 2012 - 9:56am
\\TRCFNP\Project Files\2011 Projects\011175.00 - RID Water Treatment\Electrical\RID-89\As-built\Electrical Drawings - 89.dwg

PANEL "P89" (NEW)			SQUARE 'D' 7.5KVA MINI POWER ZONE					40 AMP SECONDARY MAIN CIRCUIT BREAKER		
240/120V 1ø 3W			SURFACE MOUNTED					20A PRIMARY MAIN CIRCUIT BREAKER (25K AIC)		
USE OR AREA SERVED	CB	LOAD TYPE	LOAD PER PHASE (VA) A#		B#		LOAD TYPE	CB	USE OR AREA SERVED
SECURITY POLE LIGHTS	20 1	C	1	295			N	20 1	VERTECH CONTROL PANEL
				1200		2			
BUSSED SPACE		N	3			4	N	20 1	TANK SKID SUMP PUMP
					864				
BUSSED SPACE		N	5			6	N	20 1	TANK SKID SUMP PUMP
				864					
BUSSED SPACE		N	7			8	N		BUSSED SPACE
TIMECLOCK/CONTACTOR	20 1	N	9	180		10	N	20 1	CONVENIENCE RECEPTACLE
				180					
BUSSED SPACE		N	11			12	N		BUSSED SPACE
LOAD PER PHASE NON-CONTINUOUS				2424	864	2793 VA / 120 V = 23 AMPS			
LOAD PER PHASE CONTINUOUS				295	0				
25% OF CONTINUOUS				74	0				
-				0	0	TOTAL KVA= 3657 VA			
TOTAL				2793	864	10,000 A.I.C. BRANCH BREAKERS			

NOTES: 1. "C" LOAD TYPES ARE CONTINUOUS OR LARGEST MOTOR LOADS AND "N" LOAD TYPES ARE NON-CONTINUOUS.

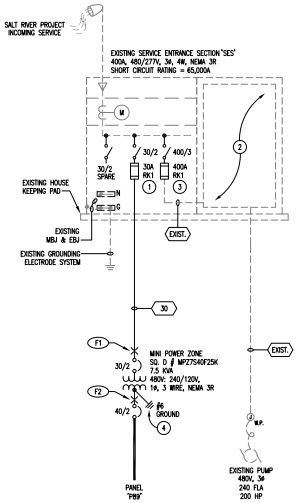


KEY NOTES:

1. FUSE BLOCK WITH 20A CURRENT LIMITING CLASS J DUAL ELEMENT TIME DELAY FUSES.
2. 2 POLE ELECTRICALLY HELD CONTACTOR, SQUARE 'D' LO20V02 OR EQUAL WITH 30A CONTACTS, 5000A WITHSTAND RATING MINIMUM.
3. TIMECLOCK "INTERMATIC" MODEL #ET70115OR OR EQUAL.
4. PHOTOCELL "INTERMATIC" #K4236 MOUNT ON ROOF FACING NORTH.

EXTERIOR LIGHTING CONTROL DIAGRAM

NO SCALE



ELECTRICAL SINGLE-LINE DIAGRAM

NO SCALE

FEEDER SCHEDULE:

SYMBOL	PARALLEL SETS	CONDUIT AND CONDUCTOR SIZE	NOTE:
30	1	2#10, 1 #10 GND, 3/4"C	

LOAD CALCULATIONS:

SES, 400A, 480/277V, 3PH, 4W

NEW PANEL "P89"		x 100% =	2793 VA
EXISTING HIGH DEMAND AT 0.8 pf		x 125% =	292500 VA
		SUB TOTAL =	295293 VA
	295293 VA	AT 480V 3 PHASE =	355 AMPS

AVAILABLE FAULT CURRENT:

1. ALL VALUES ARE SYMMETRICAL, BASED ON BUSSMANN SPD CALCULATIONS AS INDICATED.
2. ALL EQUIPMENT SHALL BE FULLY RATED.
3. AFC = AVAILABLE FAULT CURRENT.

LABEL	FAULT LOCATION	TYPE OF CALCULATION	Cable	Conduit Type	Conductor Type	AFC(1) or AFC(PRI)	V or V(PRI)	VSEC)	L	C VALUE	KVA	SZ	N	f or f1	M or M1	AFC(2) or AFC(SEC)
F1	MINI-POWER ZONE XFMR PRIMARY	AFC AT END OF A FEEDER	#10	NON-MAGNETIC	COPPER	65000	480						1	4.1412	0.1945	12643
F2	MINI-POWER ZONE XFMR SECONDARY	AFC AT SEC. OF 1-PHASE XFMR				12643	480	240	15	981	7.5	3.3		46.1945	0.0212	536

AFC AT THE END OF A FEEDER

DEFINITIONS
AFC(1) = AFC AT THE BEGINNING OF THE FEEDER
AFC(2) = AFC AT THE END OF THE FEEDER
N = NUMBER OF CONDUCTORS IN PARALLEL PER PHASE
C = "C" VALUE AS DEFINED IN THE BUSSMANN SPD HANDBOOK
V = LINE-TO-LINE VOLTAGE
L = LENGTH OF FEEDER (IN FEET)

CALCULATIONS

$$f = \frac{1.732 \times L \times AFC(1)}{n \times C \times V}$$

$$M = \frac{1}{1+f}$$

$$AFC(2) = AFC(1) \times M$$

AFC AT THE SECONDARY OF A THREE PHASE TRANSFORMER

DEFINITIONS
AFC(PRI) = AFC AT PRIMARY TERMINALS OF TRANSFORMER
AFC(SEC) = AFC AT SECONDARY TERMINALS OF TRANSFORMER
V(PRI) = LINE-TO-LINE VOLTAGE AT TRANSFORMER PRIMARY
%Z = TRANSFORMER PERCENT IMPEDANCE
KVA = RATED KVA OF TRANSFORMER

CALCULATIONS

$$f1 = \frac{AFC(PRI) \times V(PRI) \times 1.73 \times \%Z}{100,000 \times KVA}$$

$$M1 = \frac{1}{1+f1}$$

$$AFC(SEC) = \frac{V\ PRIMARY}{V\ SECONDARY} \times M1 \times AFC(1)$$

GENERAL NOTES:

A. CONDUCTOR SIZES BASED ON THHN/XHHW-2, 90° C, 600V, INSULATED, COPPER WIRE APPLIED AT 60° C AMPACITIES SIZES UP TO #1 AWG, AND 75° C, AMPACITIES FOR SIZES #1 AWG OR LARGER.

B. NO DESIGN CHANGES MAY BE MADE TO THE SYSTEM WITHOUT THE PRIOR APPROVAL OF THE DESIGN ENGINEER AND THE ELECTRICAL INSPECTOR.

C. DASHED-SHADED LINES INDICATE EXISTING EQUIPMENT. SOLID-BOLD LINES INDICATE NEW EQUIPMENT U.N.O.

KEY NOTES:

1. PROVIDE NEW SUB-MAIN SWITCH IN EXISTING CUTLER-HAMMER SES. PROVIDE LISTED COVER PLATES AS REQUIRED TO MAINTAIN A DEAD FRONT. VERIFY NEW SWITCH REQUIREMENTS WITH CUTLER-HAMMER AND COORDINATE NEW SWITCH INSTALLATION AND POWER OUTAGES WITH POWER COMPANY.
2. EXISTING SES CONTROL CABINET WITH CONTACTORS AND REDUCED VOLTAGE STARTING CONTROLS FOR EXISTING IRRIGATION PUMP MOTOR TO REMAIN. COORDINATE WITH KELLER ELECTRICAL AND VERTECH CONTROLS FOR ANY CONTROL PROVISION OR MODIFICATION REQUIREMENTS.
3. REPLACE EXISTING 400A/3P SWITCH WITH SMALLER PROFILE SWITCH TO MAKE ROOM FOR NEW 30A/3P SWITCH. PROVIDE RETROFIT KIT WITH NEW 400/3 CUTLER-HAMMER SWITCH #FDPK365R AND CONNECTOR KIT #KPRL489X. VERIFY NEW SWITCH REQUIREMENTS WITH CUTLER-HAMMER AND COORDINATE NEW SWITCH INSTALLATION AND POWER OUTAGES WITH POWER COMPANY.
4. TIE TO EXISTING SES GROUNDING ELECTRODE SYSTEM.

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ROOSEVELT IRRIGATION DISTRICT #89
WATER TREATMENT INSTALLATION
51ST AVENUE, 1/4 MI. NORTH OF BUCKEYE, PHOENIX, ARIZONA
Sheet Title:
SINGLE-LINE DIAGRAM, PANELS, AND CALCULATIONS

REVISIONS:

DATE:	12/14/2011
DRAWN BY:	CRL
CHECKED BY:	JOD
SCALE:	AS NOTED
PROJECT NO:	011175.00
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Apr. 24, 2012 - 9:54am
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LIGHTING FIXTURE SCHEDULE

MOUNTING: (MTG)
RE – RECESSED
SP – SUSPENDED
CL – CEILING SURFACE
WL – WALL
UC – UNDER CABINET
CV – COVE
PL – POLE
GR – GROUND
UN – UNIVERSAL

DOOR:
FA – FLAT ALUMINUM
FS – FLAT STEEL
RA – REGRESSED ALUMINUM
RS – REGRESSED STEEL

LAMP TYPE:
FL – FLUORESCENT
CF – COMPACT FLUORESCENT
IN – INCANDESCENT
LED – LIGHT EMITTING DIODE
HS – HIGH PRESSURE SODIUM
PSMH – PULSE START METAL HALIDE
MV – MERCURY VAPOR
LV – LOW VOLTAGE
O – OTHER (SEE DESCRIPTION)

BALLAST:
EB – ELECTRONIC BALLAST
ML – MULTI-LEVEL SWITCHING
EM – EMERGENCY BATTERY
HPF – HIGH POWER FACTOR
CWA – CONSTANT WATTAGE AUTO XFMR

LENS/LOUVER: (L/L)
A – .125" ACRYLIC
B – BLACK BAFFLE
C – CLEAR ALZAK
D – PARABOLIC
F – FRESNEL
G – TEMPERED GLASS
H – WALL WASHER
K – KSH12 .125" ACRYLIC
K19 – KSH19 .125" ACRYLIC
L – LOW IRIDESCENT SPECULAR ALUMINUM
N – NONE
O – OTHER (SEE DESCRIPTION)
P – PRISMATIC
PC – POLYCARBONATE
WG – WIRE GUARD

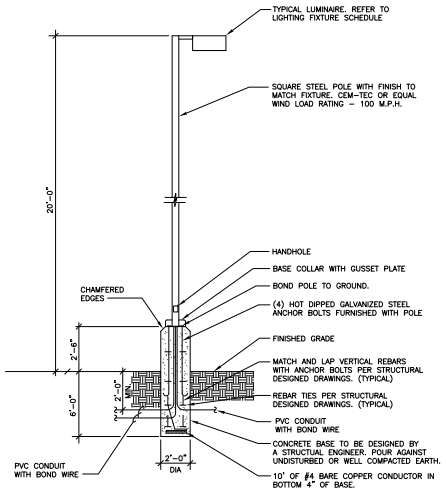
PROVIDE DISCONNECTING MEANS FOR FLUORESCENT LUMINAIRES THAT CAN BE SERVICED IN PLACE WHICH INCLUDES LUMINAIRES THAT UTILIZE DOUBLE ENDED LAMPS, LUMINAIRES CONTAINING A BALLAST(S) & SUPPLIED FROM MULTI-WIRE BRANCH CIRCUITS. THE DISCONNECT MEANS MUST DISCONNECT ALL SUPPLY CONDUCTORS SIMULTANEOUSLY, INCLUDING THE GROUNDED CONDUCTOR. EXCEPTIONS ARE PROVIDED FOR; HAZARDOUS LOCATIONS, EMERGENCY ILLUMINATION, CORD-&-PLUG CONNECTED LUMINAIRES, INDUSTRIAL FACILITIES, & LUMINAIRES NOT SUPPLIED BY A MULTIWIRE BRANCH CIRCUIT WHICH DOES NOT LEAVE THE ILLUMINATED SPACE IN TOTAL DARKNESS. REFER TO NEC 410.130(G) FOR FURTHER CLARIFICATION.

CATALOG NUMBER SHALL NOT BE CONSIDERED COMPLETE AND MATERIAL SHALL NOT BE ORDERED BY MANUFACTURER AND CATALOG NUMBER ONLY. THE COMPLETE DESCRIPTION AND THE SPECIFICATION SHALL BE COORDINATED WITH THE CATALOG NUMBER TO DETERMINE THE EXACT MATERIAL AND ACCESSORIES TO BE ORDERED. THE FIRST MANUFACTURER LISTED IS THE BASIS FOR DESIGN, HOWEVER ANY SUBSTITUTIONS, WHETHER LISTED WITHIN SCHEDULE BELOW OR NOT, MUST BE PRIOR APPROVED IN WRITING BY BOTH ARCHITECT AND ENGINEER.

ALL LAMPS FOR THIS PROJECT SHALL BE FURNISHED AND INSTALLED BY THE ELECTRICAL CONTRACTOR UNLESS OTHERWISE NOTED.

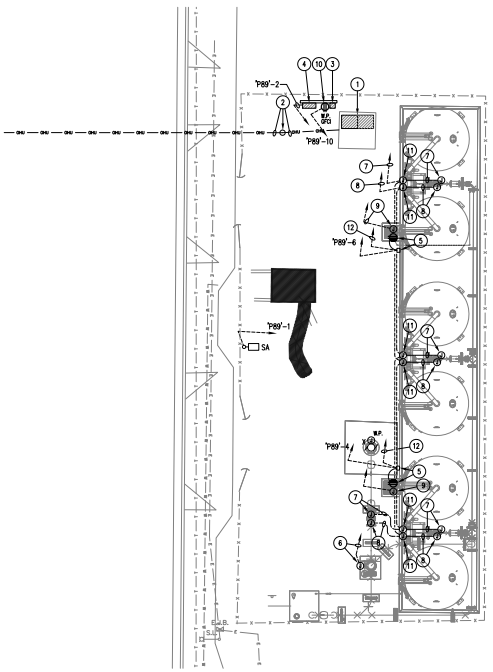
REFER TO SPECIFICATION FOR LAMP AND BALLAST REQUIREMENTS, SHOP DRAWING SUBMITTAL REQUIREMENTS AND ADDITIONAL INFORMATION.

ITEM	DESCRIPTION	SIZE	MTG	LAMPS TYPE	LAMPS QTY	LAMPS SIZE	VOLTAGE	BALLAST	L/L	APPROVED MANUFACTURER / MODEL	LAMP/BALLAST VA
SA	SINGE-HEAD AREA LIGHT FIXTURE SSS POLE 17.5' W/ 2.5' BASE	15.5"X22"X6.5"	PL	PSMH	1	250W PSMH	120	CWA	P	COOPER – LUMARK #MPTR-SL-250-120-LL OR APPROVED EQUAL	295



POLE MOUNTED LIGHT FIXTURE DETAIL

NO SCALE



ELECTRICAL SITE PLAN – NEW WORK

1" = 10'-0"

GENERAL NOTES:

A. ALL CONDUIT ROUTING AND STUB-UP LOCATIONS ARE DIAGRAMMATIC AND SHOWN FOR REFERENCE, CLARITY, AND INTENT PURPOSES ONLY. E.C. SHALL COORDINATE ALL ROUTING AS EXISTING FIELD CONDITIONS AND NEW CONSTRUCTION PERMITS. COORDINATE ROUTING WITH NEW AND EXISTING OBSTRUCTIONS AND WITH ALL APPLICABLE TRADES. COORDINATE STUB-UP LOCATIONS WITH FINAL EQUIPMENT LOCATIONS IN FIELD.

B. ALL EXTERIOR LIGHT FIXTURES TO COMPLY WITH LOCAL NIGHT SKY ORDINANCE.

C. ALL EXTERIOR LIGHTING TO BE FED WITH #10 CU. MINIMUM U.N.O.

D. ALL EXTERIOR ELECTRICAL EQUIPMENT TO BE RATED FOR WEATHER-PROOF/ NEMA-3R APPLICATIONS.

E. ALL FIXTURES INSTALLED OUTDOORS SHALL BE RATED FOR DAMP/WET LOCATIONS AS REQUIRED. THE CONTRACTOR SHALL COORDINATE DAMP/WET LOCATION RATING PER NEC ARTICLE 410-4. ALL INSTALLATIONS SHALL CONFORM TO NEC ARTICLE 410, ALL SUB ARTICLES.

F. CONTRACTOR TO COORDINATE EXACT SITE LIGHTING FIXTURE LOCATIONS WITH OWNER. ALL CONFLICTS SHALL BE IMMEDIATELY REPORTED TO THE ENGINEER AND ARCHITECT.

G. ALL WIRING SHALL BE INSTALLED UNDER-GROUND IN PVC CONDUIT WHERE POSSIBLE. WHERE EXPOSED, PROVIDE IMC CONDUIT WITH WEATHERPROOF FLEX CONNECTIONS.

H. FIXTURE / ITEM IDENTIFIED WITH LETTER:
"X" – INDICATES DEVICE TO REMAIN.
"XR" – INDICATES DEVICE TO BE REMOVED.
"XRR" – INDICATES DEVICE TO BE REMOVED & RELOCATED.

KEY NOTES:

1. EXISTING SERVICE ENTRANCE SECTION TO REMAIN. SEE SINGLE-LINE DIAGRAM ON SHEET E1.0 FOR NEW WORK.
2. EXISTING POWER POLE WITH TRANSFORMERS AND OVER-HEAD POWER LINES TO REMAIN.
3. NEW UNI-STRUT MOUNTED MINI POWER ZONE TRANSFORMER AND PANEL-'P89'. SEE SINGLE-LINE DIAGRAM AND PANEL SCHEDULE ON SHEET E1.0.
4. CONTROL PANEL BY VERTECH. PROVIDE POWER TO CONTROL PANEL AS SHOWN. PROVIDE 3/4" CONDUITS AS INDICATED FOR POWER AND CONTROL WIRING. ALL POWER AND CONTROLS CONDUCTORS FROM CONTROL PANEL TO CONTROL EQUIPMENT SHALL BE PROVIDED BY ELECTRICAL CONTRACTOR AS DIRECTED BY CONTROLS CONTRACTOR. SEE VERTECH CONTROL DRAWINGS FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
5. PROVIDE W.P./GFCI RECEPTACLE FOR 120V, 3/4HP SUMP PUMP POWER CONNECTION AND POST MOUNTED CONTACTOR WITH NEMA-3R ENCLOSURE AND HOA FOR AUTOMATIC AND MANUAL CONTROL OF SUMP PUMP. SQUARE-D CLASS #8502-SBH1-V02-CS, OR EQUAL. COORDINATE EXACT LOCATION AND WIRING REQUIREMENTS WITH CONTROLS CONTRACTOR AND OWNER. COORDINATE EXACT LOCATION OF RECEPTACLE WITH MECHANICAL CONTRACTOR PRIOR TO ROUGH-IN.
6. PROVIDE W.P. J-BOX AND 3/4" CONDUIT AS SHOWN WITH POWER WIRING FROM AUTOMATIC VALVE TO VERTECH CONTROL PANEL. COORDINATE EXACT ROUGH-IN LOCATION, WIRING REQUIREMENTS, CONDUIT ROUTING AND CONNECTION REQUIREMENTS WITH OWNER, MECHANICAL, AND CONTROLS CONTRACTOR. SEE SHEET M2.1 FOR VALVE LOCATION.
7. PROVIDE W.P. J-BOX AND 3/4" CONDUIT AS SHOWN WITH POWER WIRING FROM FLOW METER LOCATION TO VERTECH CONTROL PANEL. COORDINATE EXACT ROUGH-IN LOCATION, WIRING REQUIREMENTS, CONDUIT ROUTING AND CONNECTION REQUIREMENTS WITH OWNER, MECHANICAL, AND CONTROLS CONTRACTOR. SEE SHEET M2.1 FOR FLOW METER LOCATIONS.
8. PROVIDE W.P. J-BOX AND 3/4" CONDUIT AS SHOWN WITH CONTROL CABLING FROM FLOW METER LOCATION TO VERTECH CONTROL PANEL. COORDINATE EXACT ROUGH-IN LOCATION, CABLING REQUIREMENTS, CONDUIT ROUTING AND CONNECTION REQUIREMENTS WITH OWNER, MECHANICAL, AND CONTROLS CONTRACTOR. SEE SHEET M2.1 FOR FLOW METER LOCATIONS.
9. PROVIDE W.P. J-BOX AND 3/4" CONDUIT AS SHOWN WITH CONTROL CABLING FROM LOCATION OF SUMP PUMP HIGH AND LOW LEVEL SENSORS TO VERTECH CONTROL PANEL. COORDINATE EXACT ROUGH-IN LOCATION, CABLING REQUIREMENTS, CONDUIT ROUTING AND CONNECTION REQUIREMENTS WITH OWNER, MECHANICAL, AND CONTROLS CONTRACTOR.
10. PROVIDE W.P./GFCI TYPE CONVENIENCE RECEPTACLE. MOUNT AT +24"AFF ON UNI-STRUT STRUCTURE SUPPORTING MINI POWER ZONE PER KEY-NOTE #3 ABOVE.
11. PROVIDE J-BOX FOR TRANSITIONING FROM UNDER-GROUND TO ABOVE GROUND CONDUIT. COORDINATE EXACT LOCATION IN THE FIELD WITH MECHANICAL AND CONTROLS CONTRACTOR.
12. PROVIDE 3/4" CONDUIT AS SHOWN WITH 120V CONTROL WIRE FROM SUMP PUMP CONTROL CONTACTOR HOA SWITCH (120VAC) TO VERTECH CONTROL PANEL SUMP PUMP RELAY. COORDINATE EXACT ROUGH-IN LOCATION, CABLING REQUIREMENTS, CONDUIT ROUTING AND CONNECTION REQUIREMENTS WITH OWNER, AND CONTROLS CONTRACTOR.

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ROOSEVELT IRRIGATION DISTRICT #89
WATER TREATMENT INSTALLATION
51ST AVENUE, 1/4 MI. NORTH OF BUCKEYE, PHOENIX, ARIZONA
Sheet Title:
ELECTRICAL SITE PLAN – NEW WORK

REVISIONS:

DATE:	12/14/2011
DRAWN BY:	CRL
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SCALE:	AS NOTED
PROJECT NO:	011175.00
SHEET	E2.0

Spinnaker Holdings, LLC

Roosevelt Irrigation District (RID) Water Remediation
SCADA and Control Package
Well #89 RTU Control Panel RID-89

Vertech Project Number P110124

January 5, 2012

WELL #89 RTU CONTROL PANEL RID-89 - DRAWING INDEX				
Drawing Set	Drawing Name	Sheet #	Revision	Description
RID-89	P110124-RID89-01	01	1	Well #89 RTU Control Panel RID-89 - Title Page & Drawing Index
	P110124-RID89-02	02	1	Well #89 RTU Control Panel RID-89 - Symbols & Legends
	P110124-RID89-03	03	1	Well #89 RTU Control Panel RID-89 - General Notes
	P110124-RID89-04	04	1	Well #89 RTU Control Panel RID-89 - 120VAC Power Distribution
	P110124-RID89-05	05	1	Well #89 RTU Control Panel RID-89 - 24VDC Power Distribution 24VDC UPS Power Distribution
	P110124-RID89-06	06	1	Well #89 RTU Control Panel RID-89 - 24VDC UPS Power Distribution S7-1200 CPU 1214C Module PLC01 - 14 Pt. Discrete Input
	P110124-RID89-07	07	1	Well #89 RTU Control Panel RID-89 - S7-1200 CPU 1214C Module PLC01 - 10 Pt. Relay Output & Field Interlocks
	P110124-RID89-08	08	1	Well #89 RTU Control Panel RID-89 - S7-1200 CPU 1214C Module PLC02 - 8 Pt. Analog Input
	P110124-RID89-09	09	1	Well #89 RTU Control Panel RID-89 - S7-1200 CPU 1214C Module PLC03 - 8 Pt. Analog Input
	P110124-RID89-10	10	1	Well #89 RTU Control Panel RID-89 - Enclosure Layout
	P110124-RID89-11	11	1	Well #89 RTU Control Panel RID-89 - Backplate Layout & Bill of Material
	P110124-RID89-12	12	1	Well #89 RTU Control Panel RID-89 - PLC Rack 0 Layout & Bill of Material
	P110124-RID89-13	13	1	Well #89 RTU Control Panel RID-89 - Terminal Strip Layout
	P110124-RID89-14	14	1	Well #89 RTU Control Panel RID-89 - Engraving Schedule

P110124-RID89-01.dwg

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

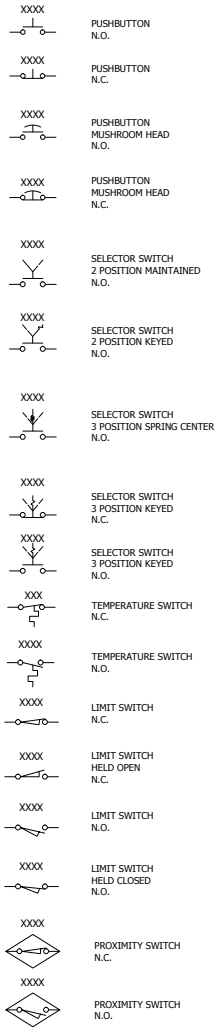
Roosevelt Irrigation District Water Remediation
Well #89 RTU Control Panel RID-89
Title Page
Drawing Index

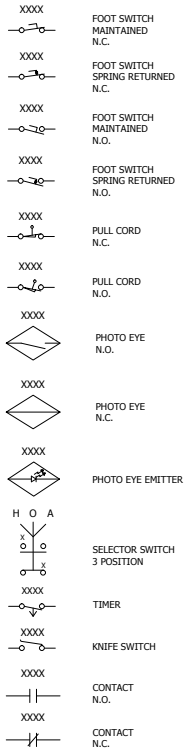
Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-89
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 01 OF 14

SYMBOLS:

LEGENDS:

SWITCHES:





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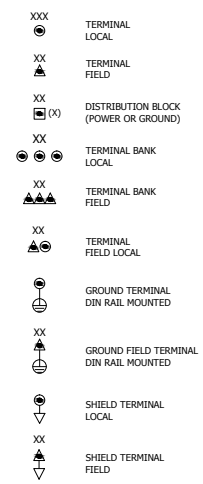
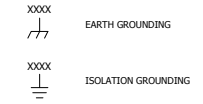


GROUNDING:



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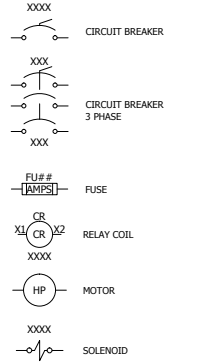

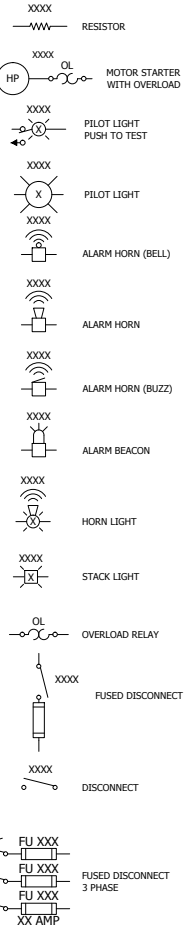

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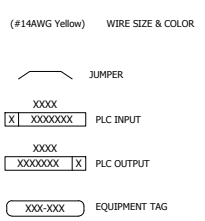

ABBREVIATIONS

SCD	Start Command
SFW	Start Forward
SRV	Start Reverse
RNG	Running
RFW	Running Forward
RRV	Running Reverse
OVL	Overload
DFT	Drive Fault
BRK	Brake
PBL	Push Button Light
RST	Reset
STR	Starter
VFD	Variable Frequency Drive
CBR	Clutch/Brake
CTH	Clutch
PS	Power Supply
CB	Circuit Breaker
ES	EtherNet Switch
PDB	Power Distribution Block
DISC	Disconnect
RCP	Receptacle
TS	Temperature Switch
ECR	Safety Relay
ECRM	Safety Relay Master
ENT	EntherNet/IP
MP	Motor Protector
LR	Line Reactor
MSD	Motor Safety Disconnect
DS	Door Switch
EL	Enclosure Light
DB	Dynamic Break
TVSS	Transient Voltage Surge Suppressor
FU	Fuse
HMT	Hour Meter

P110124-RID89-02.dwg

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #89 RTU Control Panel RID-89
Symbols & Legend

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-89
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 02 OF 14

General Notes:

1. Panel shall be manufactured to UL-508a Standards, and the required UL markings shall be affixed to the interior of the panel. The panel shall ship with a complete as-built drawing set.

2. The following chart shows the standard wire colors for various voltages in the drawing set.

Color	Abbreviation	Usage
Brown	BRN	3-Phase AC - Phase A
Orange	ORG	3-Phase AC - Phase B
Yellow	YEL	3-Phase AC - Phase C
Black	BLK	120VAC Power (Hot)
White	WHT	120VAC Neutral
Red	RED	120VAC Control
Green w/ Yellow Stripe	GRN/YEL	AC Ground
Yellow	YEL	Foreign Power
White w/ Yellow Stripe	WHT/YEL	Foreign Neutral
Purple	PUR	Temporary
Blue	BLU	24VDC Power & Control
White w/ Blue Stripe	WHT/BLU	24VDC Common (Grounded)

3. All analog signal cables shall be Belden 8760; 2-conductor #18AWG (BLK/CLR) twisted/shielded: BLK = Positive (+); CLR = Negative (-).

P110124-RID89-03.dwg

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1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

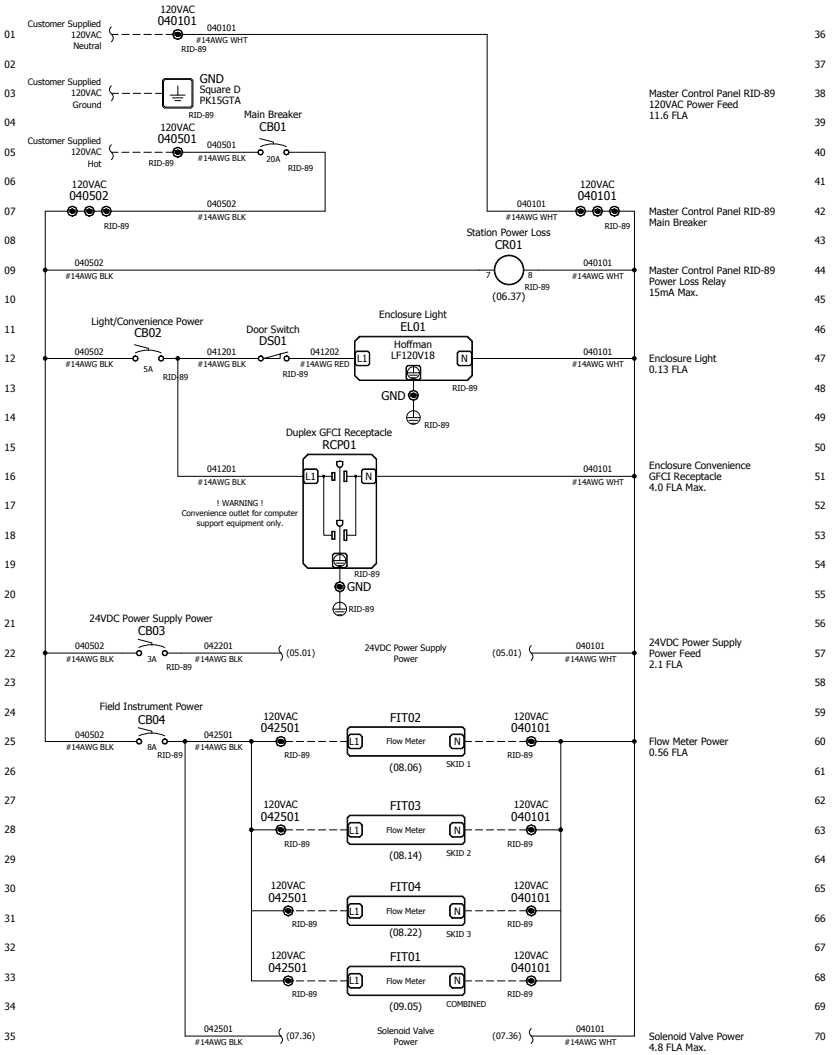
Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #89 RTU Control Panel RID-89
General Notes

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-89
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 03 OF 14

120VAC Power Distribution
RTU Control Panel RID-89



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P110124-RID89-04.dwg

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

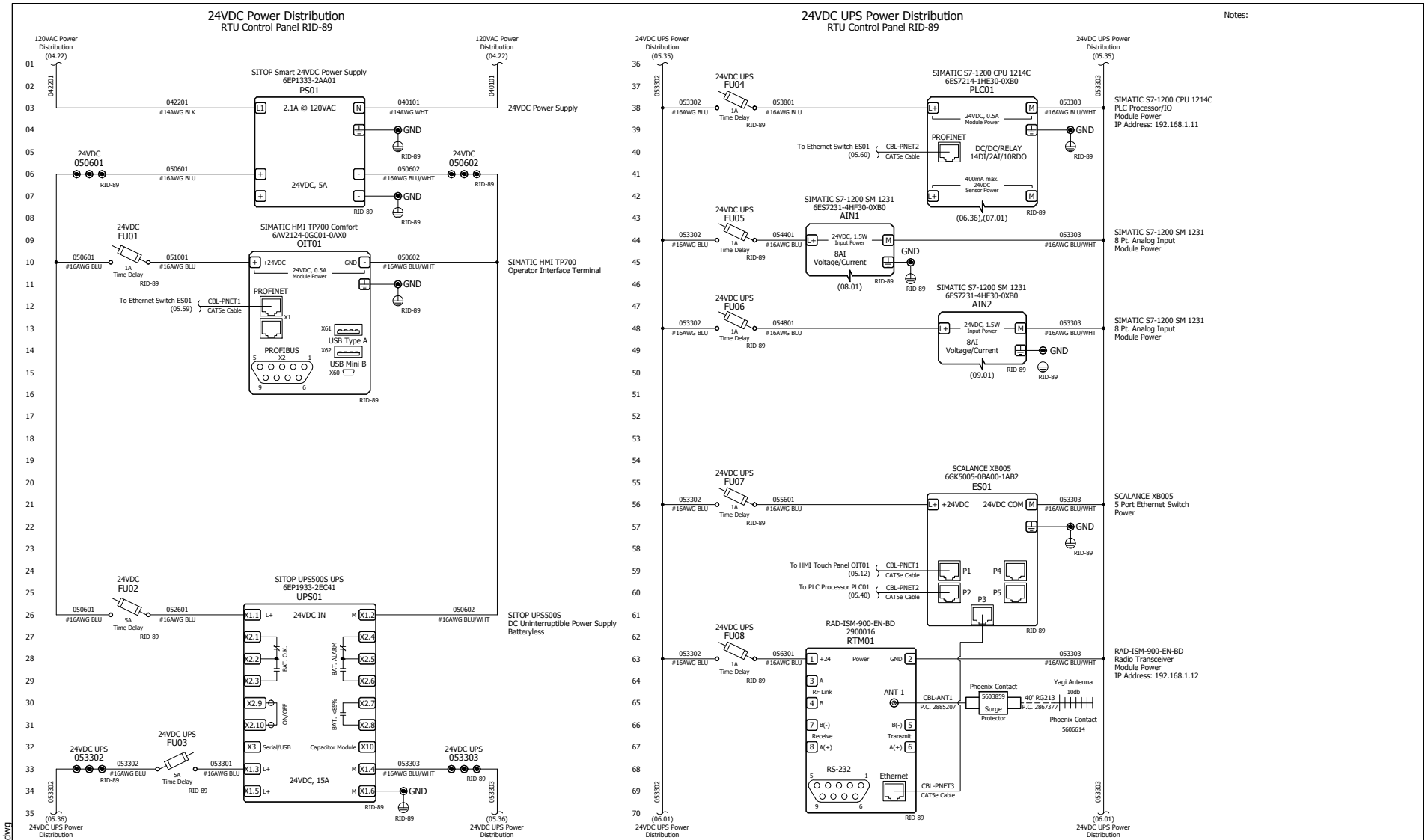
System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #89 RTU Control Panel RID-89
120VAC Power Distribution

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-89
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 04 OF 14



P110124-RID89-05.dwg

Vertech
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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

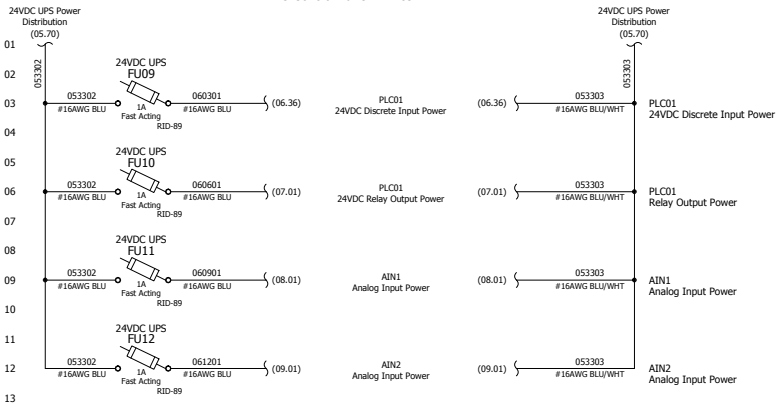
Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

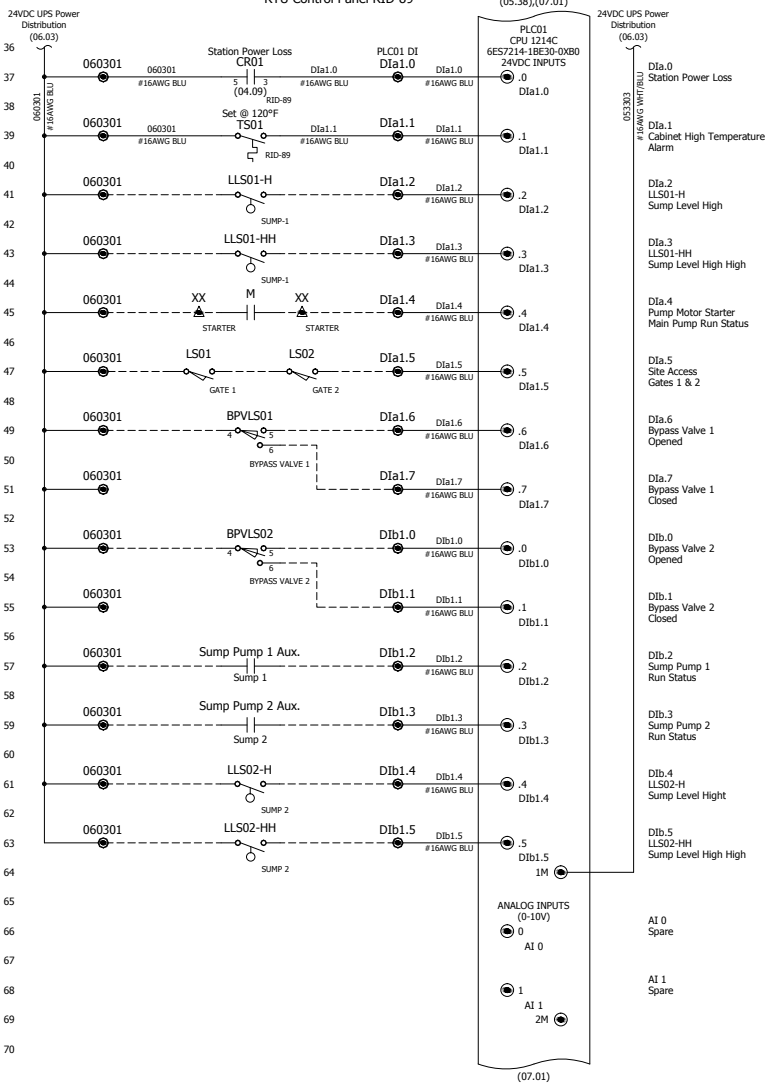
Roosevelt Irrigation District Water Remediation
Well #89 RTU Control Panel RID-89
24VDC Power Distribution
24VDC UPS Power Distribution

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-89
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 05 OF 14

24VDC UPS Power Distribution
RTU Control Panel RID-89



S7-1200 CPU 1214C Module PLC01 - 14 Pt. Discrete Input
RTU Control Panel RID-89



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P110124-RID89-06.dwg

Vertech
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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

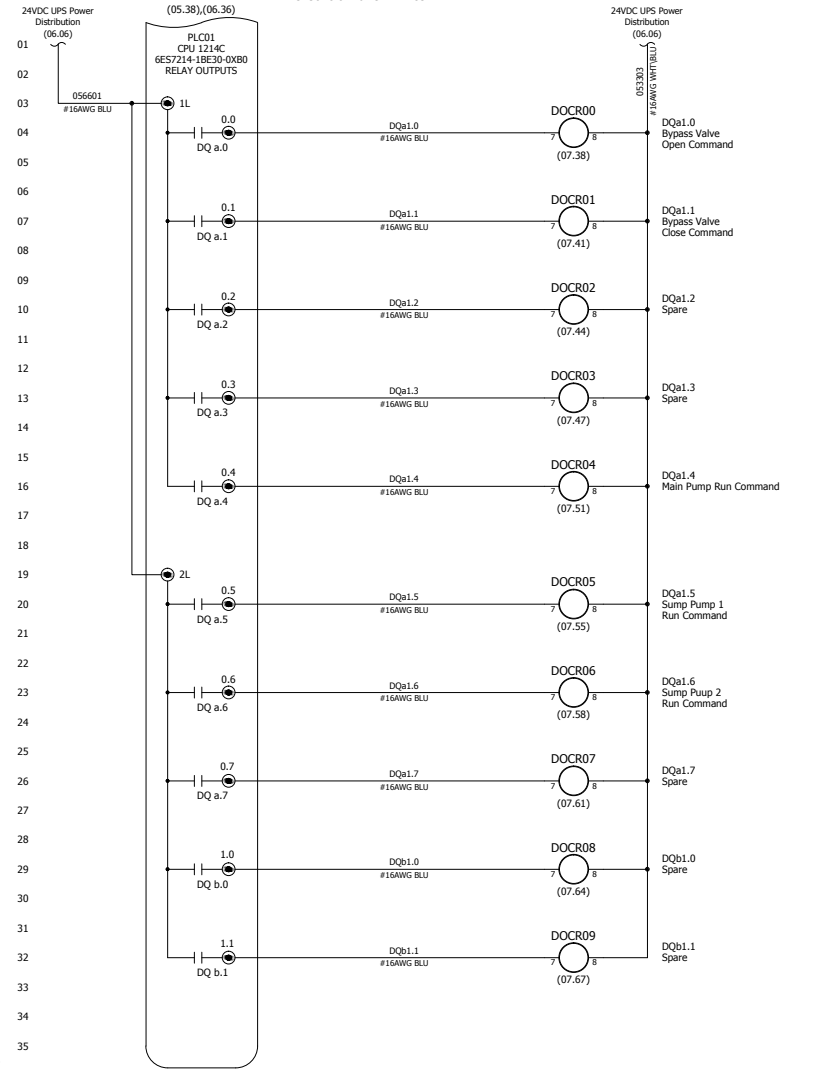
Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #89 RTU Control Panel RID-89
24VDC UPS Power Distibution
S7-1200 CPU 1214C Module PLC01 - 14 Pt. Discrete Input

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-89
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 06 OF 14

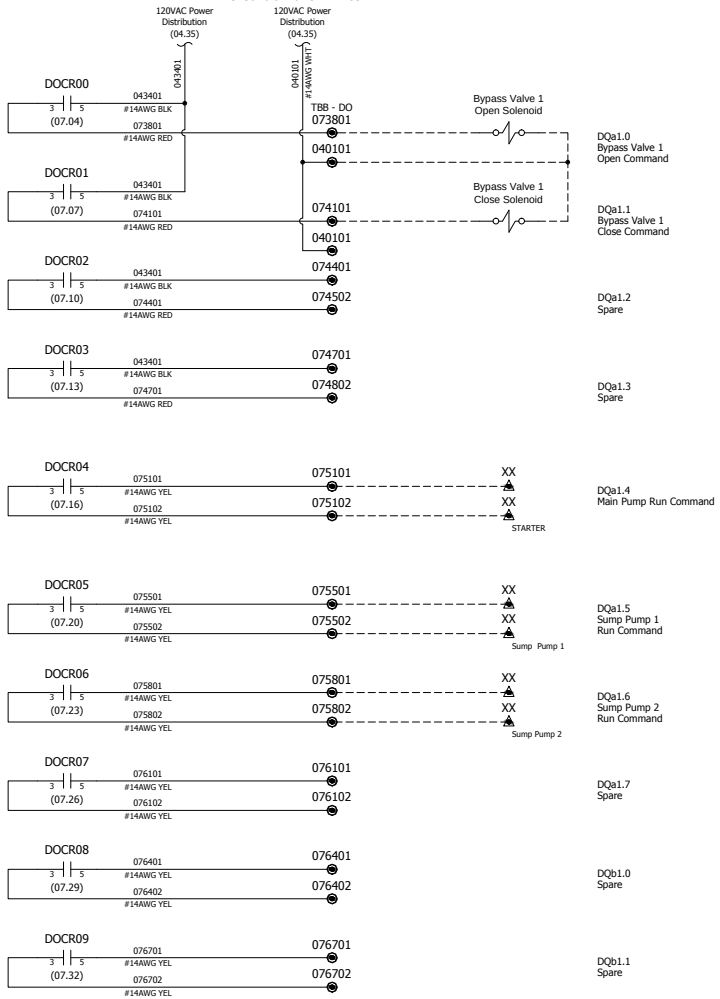
S7-1200 CPU 1214C Module PLC01 - 10 Pt. Relay Output

RTU Control Panel RID-89



S7-1200 CPU 1214C Module PLC01 - Field Interlocks

RTU Control Panel RID-89



Notes:

P110124-RID89-07.dwg

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

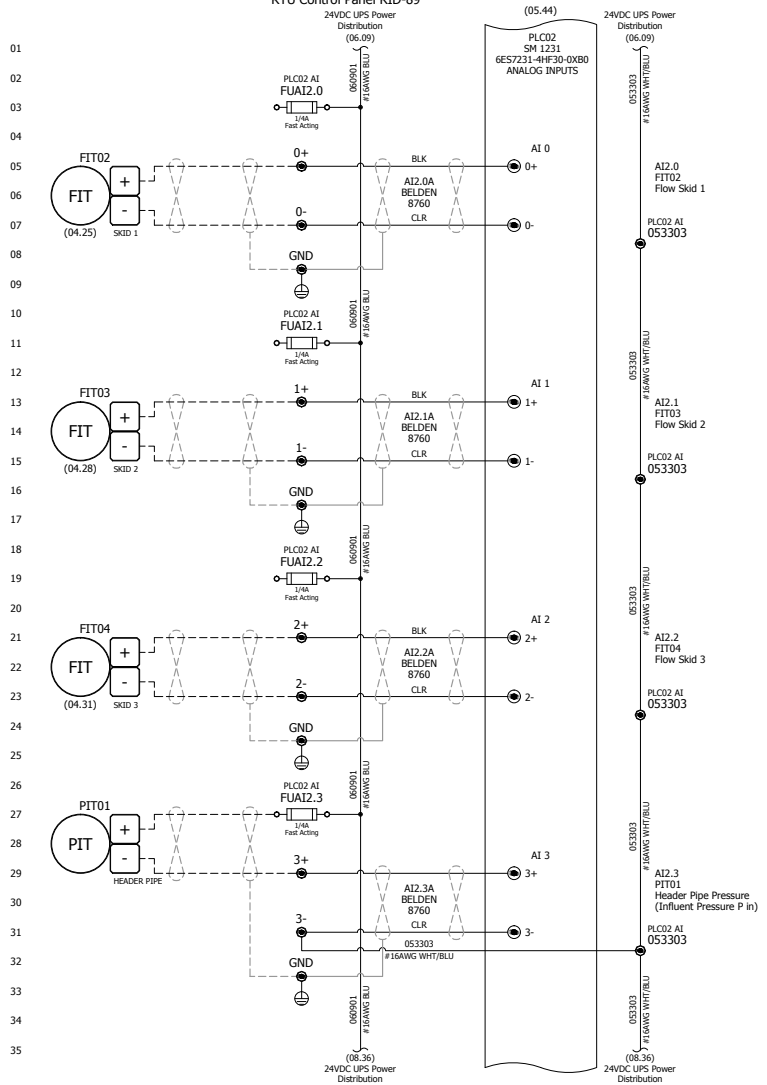
Sheet Description:

Roosevelt Irrigation District Water Remediation Well #89 RTU Control Panel RID-89
S7-1200 CPU 1214C Module PLC01 - 10 Pt. Relay Output
S7-1200 CPU 1214C Module PLC01 - Field Interlocks

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-89
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 07 OF 14

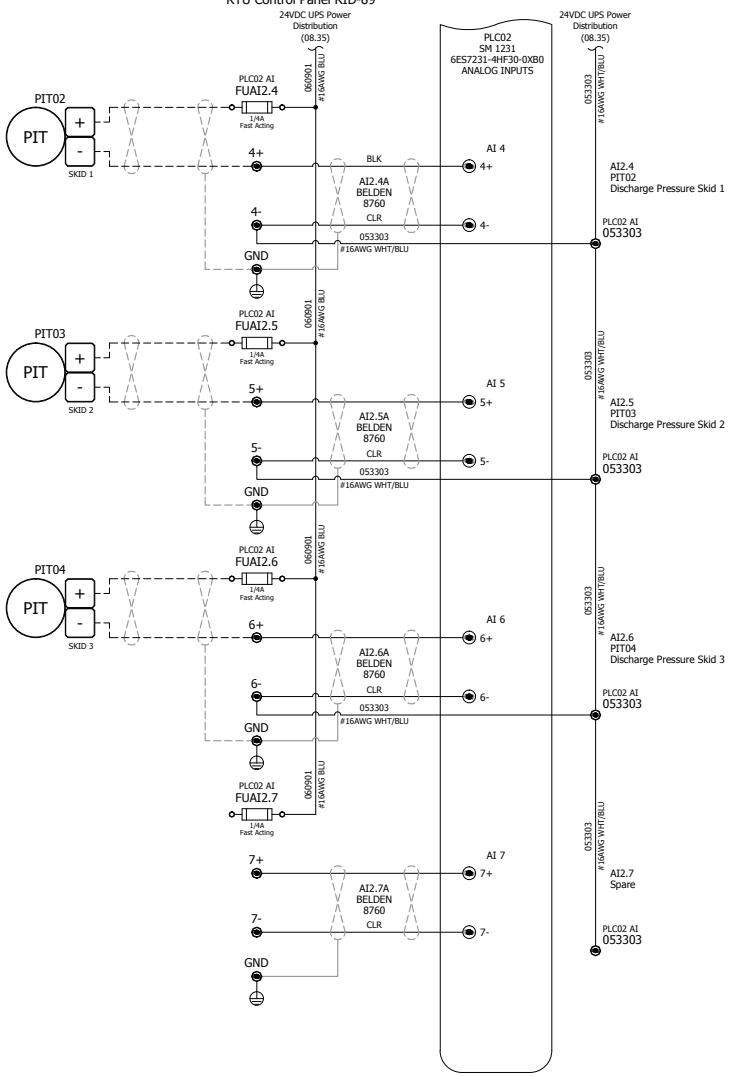
S7-1200 SM 1231 Module PLC02 - 8 Pt. Analog Input

RTU Control Panel RID-89



S7-1200 SM 1231 Module PLC02 - 8 Pt. Analog Input

RTU Control Panel RID-89



Notes:

P110124-RID89-08.dwg

Vertech

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

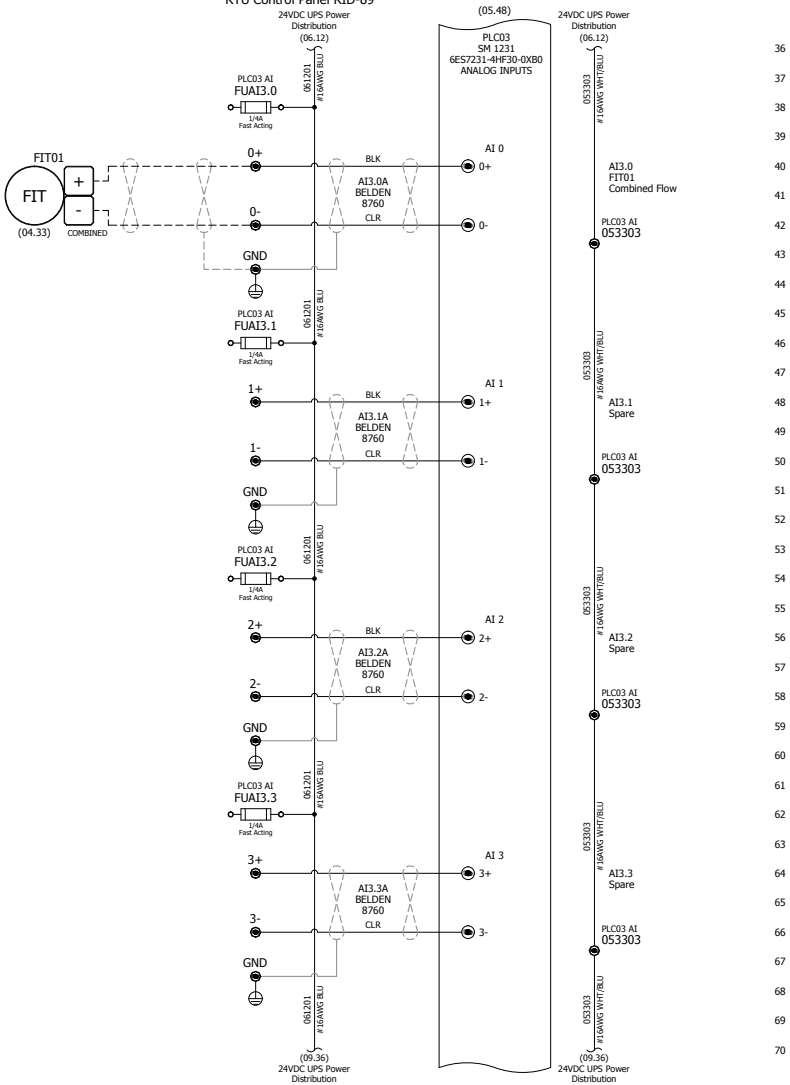
Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #89 RTU Control Panel RID-89
S7-1200 SM 1231 Module PLC02 - 8 Pt. Analog Input

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-89
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 08 OF 14

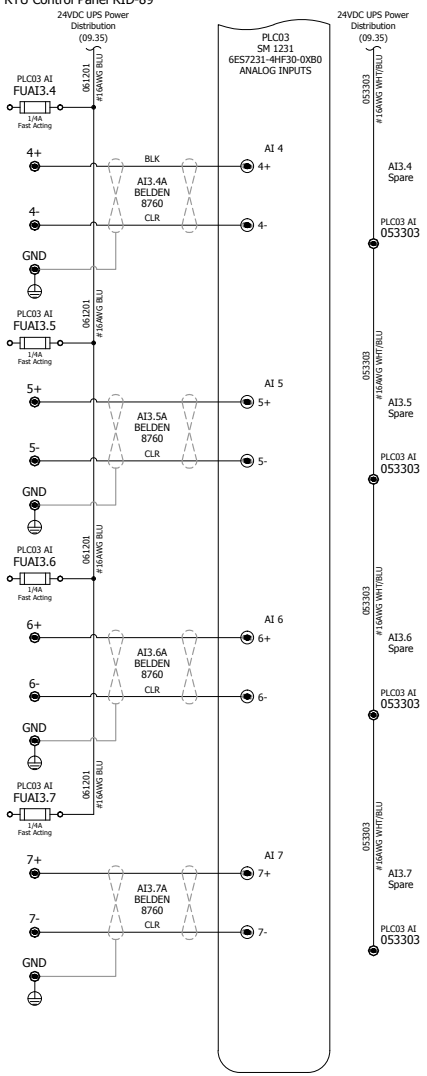
S7-1200 SM 1231 Module PLC03 - 8 Pt. Analog Input

RTU Control Panel RID-89



S7-1200 SM 1231 Module PLC03 - 8 Pt. Analog Input

RTU Control Panel RID-89



Notes:

P110124-RID89-09.dwg

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

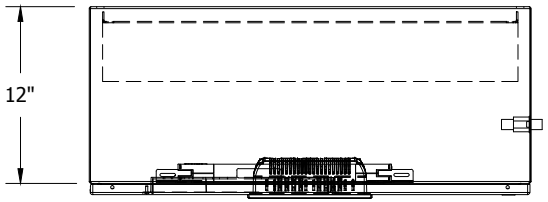
System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

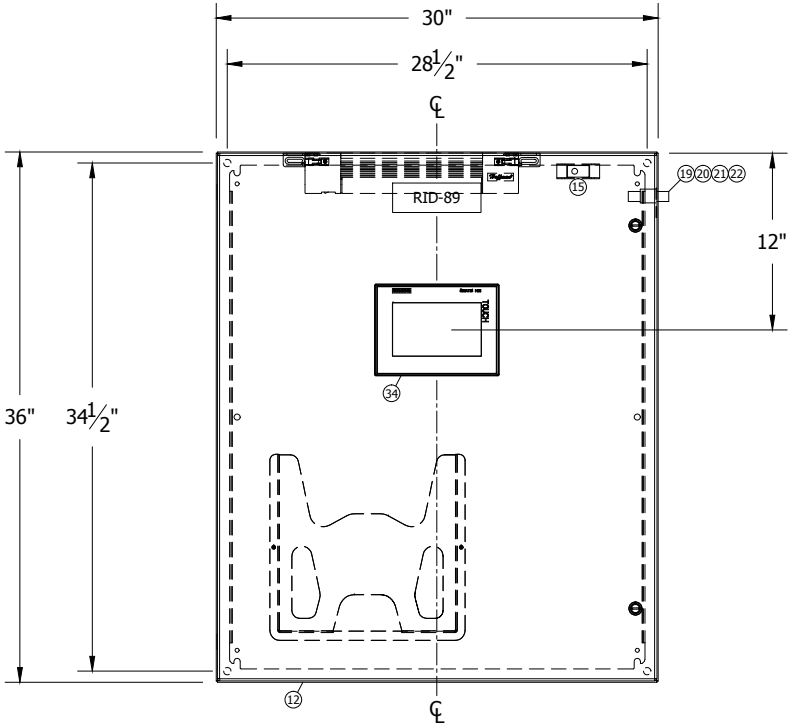
Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #89 RTU Control Panel RID-89
S7-1200 SM 1231 Module PLC03 - 8 Pt. Analog Input

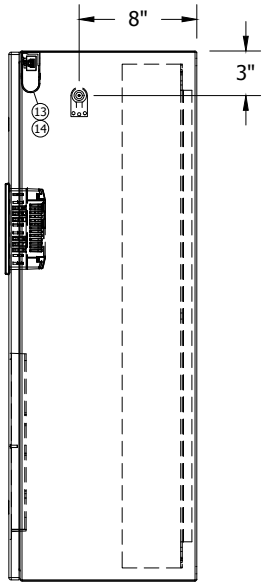
Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-89
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 09 OF 14



Enclosure Top View
RTU Control Panel RID-89



Enclosure Front Elevation
RTU Control Panel RID-89



Enclosure Right Side
RTU Control Panel RID-89

P110124-RID89-10.dwg

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

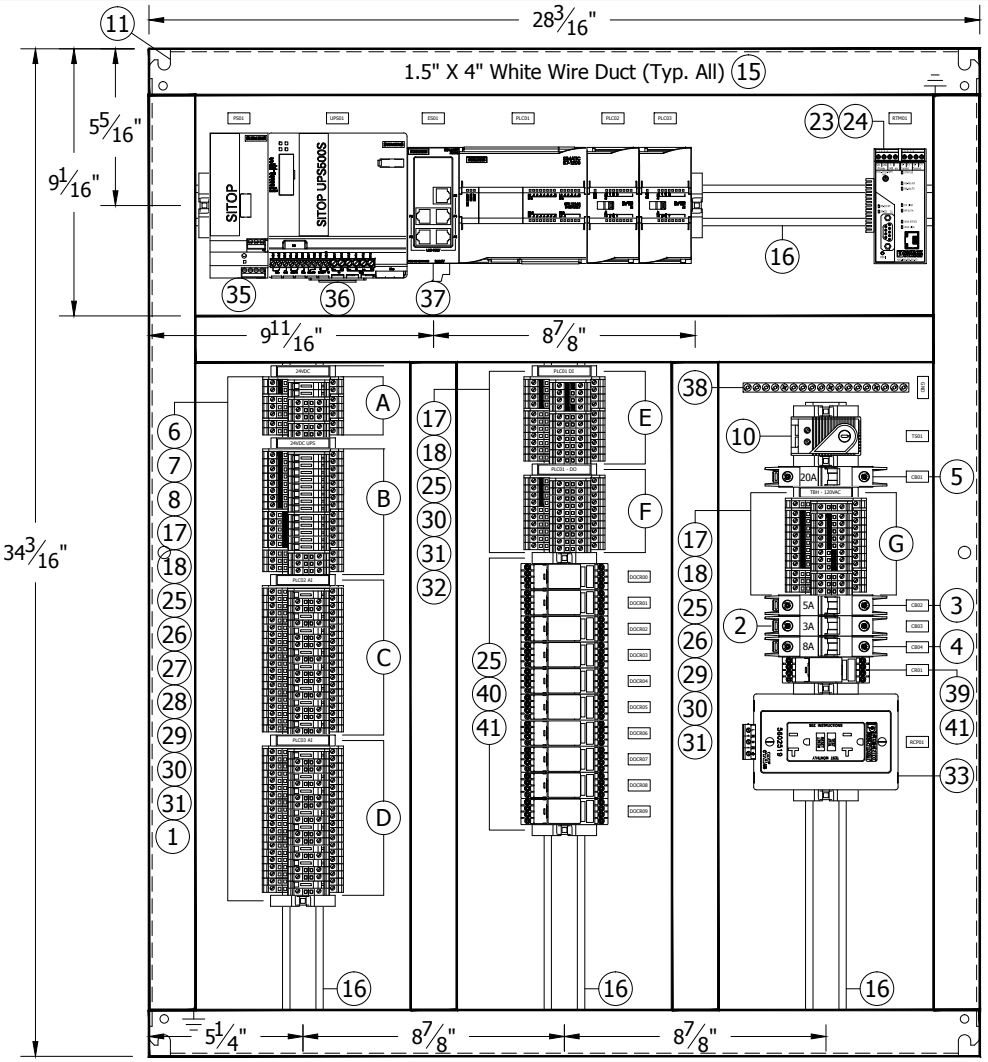
Sheet Description:

Roosevelt Irrigation District Water Remediation Well #89 RTU Control Panel RID-89
Enclosure Layout

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-89
Rev: 1	**Scale:** 1-1/2" = 1'-0"	**Sheet Size:** B	**Sheet Number:** 10 OF 14

◯ WELL #89 RTU CONTROL PANEL RID-89 - BILL OF MATERIAL

Item	Qty.	Part Number	Description	Manufacturer
1	2	GGA5	Fuse, Time Delay, 5mmx20mm, Glass Tube, 125V, 5A	Ferraz Shawmut
2	1	WMZT1C03	Circuit breaker, UL489, 1 Pole, 10KA, Trip Curve C, 3A	Eaton
3	1	WMZT1C05	Circuit breaker, UL489, 1 Pole, 10KA, Trip Curve C, 5A	Eaton
4	1	WMZT1C08	Circuit breaker, UL489, 1 Pole, 10KA, Trip Curve C, 8A	Eaton
5	1	WMZT1C20	Circuit breaker, UL489, 1 Pole, 10KA, Trip Curve C, 20A	Eaton
6	6	GGA1	Fuse, Time Delay, 5mmx20mm, Glass Tube, 125V, 1A	Ferraz Shawmut
7	16	GGM1/4	Fuse, Fast Acting, 5mmx20mm, Glass Tube, 250V, 1/4A	Ferraz Shawmut
8	4	GGM1	Fuse, Fast Acting, 5mmx20mm, Glass Tube, 250V, 1A	Ferraz Shawmut
9	1	ALFSWD	Door switch assembly for enclosure light, remote mount	Hoffman
10	1	ATEMNO	Temperature Control Switch, 1 NO Contact, 15A Max. Resistive/2A Max. Inductive @ 120VAC, 20mA Min., 30-140°F	Hoffman
11	1	CP3630	Panel, CONCEPT Line, Painted Steel, 34.2" X 28.2", fits 36" X 30" enclosure	Hoffman
12	1	CSD363012	Enclosure, CONCEPT Line, NEMA Type 4/12, Wall Mountable, ANSI 61 Grey, 36" X 30" X 12"	Hoffman
13	1	F6T5	Florescent Light Bulb, for 15" PANELITE Enclosure Light	Hoffman
14	1	LF120V15	PANELITE Line Enclosure Lighting Package, 120VAC 50/60Hz, 0.13A, 15", Manual Switch, Bulb not Included	Hoffman
15	16'	T1-1540W	Wireway Duct & Cover, 1.5" x 4" x 72", White, Rigid PVC	Iboco
16	8'	0801733	NS 35/ 7,5 PERF 2000MM, DIN rail, 35mm, 7mm height, 5 pieces 2 meters each	Phoenix Contact
17	8	1004348	KLM-A, Terminal Strip ID Tag, Fits into End Anchor	Phoenix Contact
18	A/R	1051003	ZB6:UNBEDRUCKT, Zack Terminal Marker Strips, White, Unprinted, 10 Strips of 10 Markers	Phoenix Contact
19	1	2818135	CN-UB/MP, Mounting bracket for radio antenna surge suppressor	Phoenix Contact
20	1	2818850	CN-UB-280DC-BB, Surge suppressor for antenna cable	Phoenix Contact
21	1	2867377	RAD-CAB-RG213-40, Antenna Extension Coaxial Cable, 40ft	Phoenix Contact
22	1	5606614	Yagi Antenna Kit, 10dBi	Phoenix Contact
23	1	2885207	RAD-CON-MCX90-N-SS, Adapter Cable, Pigtail, 120cm	Phoenix Contact
24	1	2900016	RAD-ISM-900-EN-BD, Wireless Radio Transceiver with Ethernet, RS-232, RS-485, 900MHz	Phoenix Contact
25	17	3022218	CLIPFIX 35, End Anchor, Snap-on, for 35mm DIN Rail	Phoenix Contact
26	6	3030271	Cross Connector/Jumper for UT-4 Terminal Blocks, Red, 10 Position	Phoenix Contact
27	31	3036819	P-FU 5X20 LED 24, Fuse plug, 6.3A, 500V, 6.2mm, for 5x20mm glass fuses, black, BFI (12-30V), fits UT 2,5/4/6-TG terminal	Phoenix Contact
28	31	3044720	UTTB 4-TG, Terminal block, two-tier, top tier pluggable, screw connection, 26-10AWG, 6.2mm, grey	Phoenix Contact
29	16	3044759	UTTB 4-PE, Ground terminal block, two-tier, feed-through, screw connection, 26-10AWG, 6.2mm, green/yellow	Phoenix Contact
30	49	3044814	UTTB 4, Terminal block, two-tier, feed-through, screw connection, 26-10AWG, 36A, 800V, 6.2mm, grey	Phoenix Contact
31	14	3047293	D-UT 2,5/4-TWIN, Terminal cover, fits UT 2,5/4-MTD/TWIN terminal block, grey	Phoenix Contact
32	2	3047358	FBS-PV UT, Vertical potential bridge, to connect the upper and lower level of 2-tier terminals	Phoenix Contact
33	1	5602519	EM-DUO-120/20/GFI, Receptacle, Duplex, 20A, GFI, DIN Rail Mount	Phoenix Contact
34	1	6AV2124-0GC01-0AX0	Operator Interface Terminal (OIT), SIMATIC TP700 Comfort Touch Panel, Windows CE 6.0, 7" Display, 12MB Memory	Siemens
35	1	6EP1332-5BA10	Power Supply, SITOP PSU 100C, 24VDC @ 4A	Siemens
36	1	6EP1933-2EC41	DC Uninterruptible Power Supply (UPS), SITOP UPS500S	Siemens
37	1	6GK5005-0BA00-1AB2	Industrial Ethernet Switch, SCALANCE XB005, Unmanaged, 5 X 10/100MBIT/S Twisted Pair RJ45, LED-Diagnosis, IP20, 24VDC	Siemens
38	1	PK15GTA	Ground Distribution Block, 15-Terminals	Square D
39	1	C7-A20X120VAC	Control relay, QRC miniature plug-in, general purpose, 120VAC coil, DPDT, 10A contacts, LED indicator	Turck
40	10	C7-A20X24VDC	Control relay, QRC miniature plug-in, general purpose, 24VDC coil, DPDT, 10A contacts, LED indicator	Turck
41	11	S7-M	Socket for miniature relays C7 and C80 series, 8-blade, DIN rail mount, 10A, 250V, replaces former socket S7-C	Turck



Backplate Layout
RTU Control Panel RID-89

P110124-RID89-11.dwg

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

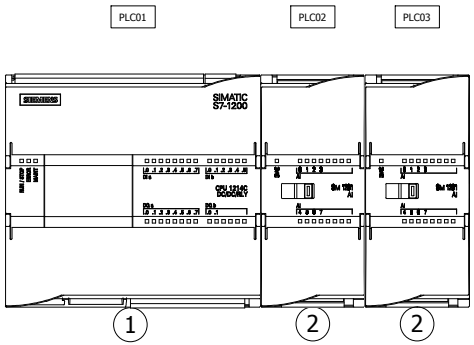
System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #89 RTU Control Panel RID-89
Backplate Layout
Bill of Material

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-89
Rev: 1	**Scale:** 3" = 1'-0"	**Sheet Size:** B	**Sheet Number:** 11 OF 14



◯WELL #89 RTU CONTROL PANEL RID-89 - PLC RACK - BILL OF MATERIAL				
Item	Qty	Part Number	Description	Manufacturer
1	1	6ES7214-1HE30-0XB0	PLC Processor, SIMATIC S7-1200, CPU 1214C, DC/DC/RLY, 14 DI (24VDC), 10DO (Relay) 2A, 2AI (0-10VDC), Power: DC 24V, 50KB Memory	Siemens
2	2	6ES7231-4HF30-0XB0	Analog Input Module, SIMATIC S7-1200, SM 1231, 8 AI, +/-10V, +/-5V, +/-2.5V, OR 0-20 mA, 12 Bit + Sign or 13 Bit ADC	Siemens

P110124-RID89-12.dwg

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REV	DATE	DESCRIPTION	ENG	DSN
1	10/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

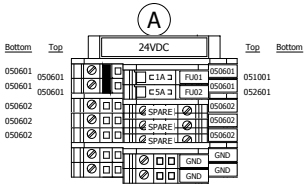
Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #89 RTU Control Panel RID-89
PLC Rack 0 Layout
& Bill of Material

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-89
Rev: 1	**Scale:** 6" = 1'-0"	**Sheet Size:** B	**Sheet Number:** 12 OF 14

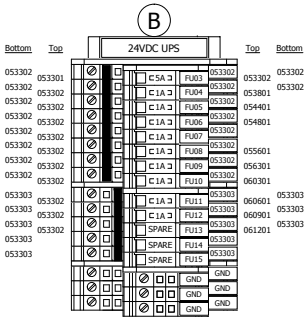
24VDC Power Distribution

RTU Control Panel RID-89



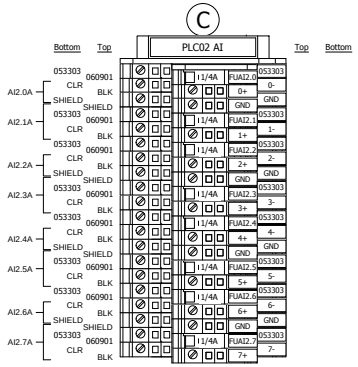
24VDC UPS Power Distribution

RTU Control Panel RID-89



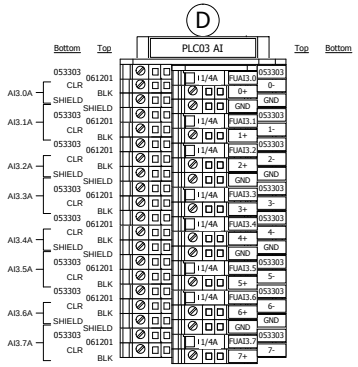
PLC02 - Analog Inputs

RTU Control Panel RID-89



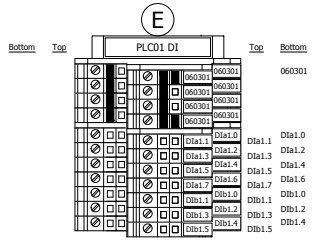
PLC03 - Analog Inputs

RTU Control Panel RID-89



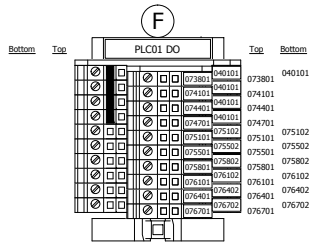
PLC01- 24VDC Discrete Inputs

RTU Control Panel RID-89



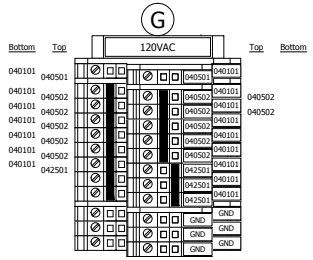
PLC01 - Relay Outputs

RTU Control Panel RID-89



120VAC Power Distribution

RTU Control Panel RID-89



P110124-RID89-13.dwg

Vertech

www.vertech.com

REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

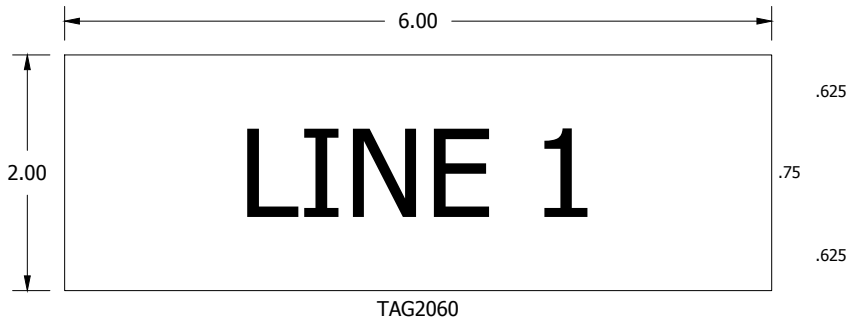
Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

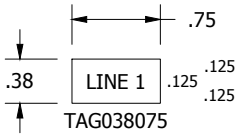
Roosevelt Irrigation District Water Remediation
Well #89 RTU Control Panel RID-89
Terminal Strip Layout

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-89
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 13 OF 14

WELL #89 RTU CONTROL PANEL RID-89 - ENGRAVING SCHEDULE						
Tag	Type	Height	Width	Surface	Core	Text Line 1
1	TAG2060	2.0	6.0	White	Black	RID-89
2	TAG038075	0.375	0.75	White	Black	GND
3	TAG038075	0.375	0.75	White	Black	CB01
4	TAG038075	0.375	0.75	White	Black	CB02
5	TAG038075	0.375	0.75	White	Black	CB03
6	TAG038075	0.375	0.75	White	Black	CB04
7	TAG038075	0.375	0.75	White	Black	
8	TAG038075	0.375	0.75	White	Black	
9	TAG038075	0.375	0.75	White	Black	CR01
10	TAG038075	0.375	0.75	White	Black	EL01
11	TAG038075	0.375	0.75	White	Black	RCP01
12	TAG038075	0.375	0.75	White	Black	PS01
13	TAG038075	0.375	0.75	White	Black	OIT01
14	TAG038075	0.375	0.75	White	Black	UPS01
15	TAG038075	0.375	0.75	White	Black	PLC01
16	TAG038075	0.375	0.75	White	Black	PLC02
17	TAG038075	0.375	0.75	White	Black	PLC03
18	TAG038075	0.375	0.75	White	Black	ES01
19	TAG038075	0.375	0.75	White	Black	RTM01
20	TAG038075	0.375	0.75	White	Black	TS01
21	TAG038075	0.375	0.75	White	Black	DOCR00
22	TAG038075	0.375	0.75	White	Black	DOCR01
23	TAG038075	0.375	0.75	White	Black	DOCR02
24	TAG038075	0.375	0.75	White	Black	DOCR03
25	TAG038075	0.375	0.75	White	Black	DOCR04
26	TAG038075	0.375	0.75	White	Black	DOCR05
27	TAG038075	0.375	0.75	White	Black	DOCR06
28	TAG038075	0.375	0.75	White	Black	DOCR07
29	TAG038075	0.375	0.75	White	Black	DOCR08
30	TAG038075	0.375	0.75	White	Black	DOCR09



TAG2060



TAG038075

P110124-RID89-14.dwg

Vertech
www.vertech.com

REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #89 RTU Control Panel RID-89
Engraving Schedule

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-89
Rev: 1	**Scale:** 1'-0" = 1'-0"	**Sheet Size:** B	**Sheet Number:** 14 OF 14

SYNERGY ENVIRONMENTAL, LLC

APPENDIX B

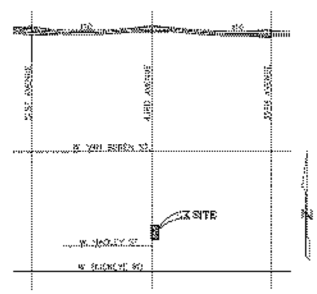
RID-92 Wellhead Treatment System Drawings

ENGINEERS NOTES

1. MARICOPA ASSOCIATION OF GOVERNMENTS (M.A.G.) UNIFORM STANDARD SPECIFICATIONS AND DETAILS FOR PUBLIC WORKS CONSTRUCTION (LATEST EDITION INCLUDING LATEST REVISION AND CURRENT SUPPLEMENTALS THERETO PER THE LOCAL TOWN OR CITY) ARE INCORPORATED INTO THIS PLAN IN THEIR ENTIRETY.
2. ALL WORK REQUIRED TO COMPLETE THE CONSTRUCTION COVERED BY THIS PLAN SHALL BE IN ACCORDANCE WITH THE M.A.G. STANDARD SPECIFICATIONS AND DETAILS AND CURRENT SUPPLEMENTS THERETO FOR THE LOCAL CITY OR TOWN UNLESS SPECIFIED OTHERWISE IN THESE PLANS OR ELSEWHERE IN THE CONTRACT DOCUMENTS. CONTRACTORS SHALL FAMILIARIZE THEMSELVES WITH ALL REQUIRED STANDARD SPECIFICATIONS, DETAILS AND SUPPLEMENTS PRIOR TO BIDDING THE WORK FOR THE CONSTRUCTION COVERED BY THIS PLAN.
3. THE CONTRACTOR IS RESPONSIBLE FOR ALL METHODS, SEQUENCING, AND SAFETY CONCERNS ASSOCIATED WITH THIS PROJECT DURING CONSTRUCTION, UNLESS SPECIFICALLY ADDRESSED OTHERWISE IN THIS PLAN OR ELSEWHERE IN THE CONTRACT.
4. THE CONTRACTOR IS TO COMPLY WITH ALL LOCAL, STATE, AND FEDERAL LAWS AND REGULATIONS APPLICABLE TO THE CONSTRUCTION COVERED BY THIS PLAN.
5. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING AND COMPLYING WITH ALL PERMITS REQUIRED TO COMPLETE ALL WORK COVERED BY THIS PLAN.
6. THE QUANTITIES AND SITE CONDITIONS DEPICTED IN THESE PLANS ARE FOR INFORMATIONAL PURPOSES ONLY AND ARE SUBJECT TO ERROR AND OMISSION. CONTRACTORS SHALL SATISFY THEMSELVES AS TO ACTUAL QUANTITIES AND SITE CONDITIONS PRIOR TO BIDDING THE WORK FOR THE CONSTRUCTION COVERED BY THIS PLAN.
7. A REASONABLE EFFORT HAS BEEN MADE TO SHOW THE LOCATIONS OF EXISTING UNDERGROUND FACILITIES AND UTILITIES IN THE CONSTRUCTION AREA. THE CONTRACTOR IS RESPONSIBLE FOR ANY DAMAGE TO UTILITIES AND/OR FACILITIES CAUSED DURING THEIR CONSTRUCTION OPERATIONS. THE CONTRACTOR SHALL CALL 48 HOURS IN ADVANCE FOR BLUE STAKE (1-800-STAKE-IT) PRIOR TO ANY EXCAVATION.
8. THE CONTRACTOR IS RESPONSIBLE FOR ALL COORDINATION OF CONSTRUCTION AFFECTING UTILITIES AND THE COORDINATION OF ANY NECESSARY UTILITY RELOCATION WORK.
9. ALL PAVING, GRADING, EXCAVATION, TRENCHING, PIPE BEDDING, CUT FILL AND BACKFILL SHALL COMPLY WITH THE RECOMMENDATIONS SET FORTH IN THE SOILS (GEOTECHNICAL) REPORT FOR THIS PROJECT IN ADDITION TO THE REFERENCED REQUIRED SPECIFICATIONS AND DETAILS. THE CONTRACTOR SHALL BE AWARE THAT CERTAIN UTILITIES REQUIRE PROPER ATTENTION AND CAREFUL PLANNING DURING SITE CONSTRUCTION. PLEASE NOTE THAT UTILITIES ON THESE PLANS MAY NOT EXHIBIT THE FULL PROTECTIVE COVER REQUIRED DURING THE SUBGRADE PREPARATION PHASE OF THE CONSTRUCTION. IN SUCH INSTANCES, THE CONTRACTOR SHALL PROVIDE ADDITIONAL PROTECTION (SUCH AS RAMPING) OR INCREASED PIPE STRENGTH TO PROVIDE THE NECESSARY PROTECTION REQUIRED TO PREVENT DAMAGE DURING THE CONSTRUCTION OF THIS PROJECT. THE CONTRACTOR SHALL HOLD THE ENGINEER HARMLESS IN ALL CASES FOR DAMAGES TO UTILITIES WHERE INADEQUATE PROTECTIVE MEASURES OCCUR.
10. THE CONTRACTOR IS TO VERIFY THE LOCATION AND THE ELEVATIONS OF ALL EXISTING UTILITIES AT POINTS OF TIE-IN PRIOR TO COMMENCING ANY NEW CONSTRUCTION. SHOULD ANY LOCATION OR ELEVATION DIFFER FROM THAT SHOWN ON THESE PLANS, THE CONTRACTOR SHALL CONTACT THE OWNER'S AGENT.
11. CONTRACTOR TO VERIFY AND COORDINATE ALL DIMENSIONS AND SITE LAYOUT WITH ARCHITECT'S FINAL SITE PLAN AND FINAL BUILDING DIMENSIONS BEFORE STARTING WORK. REPORT DISCREPANCIES TO OWNER'S AGENT.
12. COORDINATION BETWEEN ALL PARTIES IS ESSENTIAL PART OF CONTRACT.
13. CONTRACTOR IS RESPONSIBLE FOR PROJECT AND SITE CONDITIONS, AND TO WORK WITH WEATHER CONDITIONS AS THE PROJECT SITE MAY BE LOCATED IN A FLOOD PRONE AREA AND SUBJECT TO FLOODING AND ITS HAZARDS.
14. THE CONTRACTOR IS TO VERIFY THE LOCATION, ELEVATION, CONDITION, AND PAVEMENT CROSS-SLOPE OF ALL EXISTING SURFACES AT POINTS OF TIE-IN AND MATCHING, PRIOR TO COMMENCEMENT OF GRADING, PAVING, CURB AND GUTTER, OR OTHER SURFACE CONSTRUCTION. SHOULD EXISTING LOCATIONS, ELEVATIONS, CONDITION, OR PAVEMENT CROSS-SLOPE DIFFER FROM THAT SHOWN ON THESE PLANS, RESULTING IN THE DESIGN INTENT REFLECTED ON THESE PLANS NOT ABLE TO BE CONSTRUCTED, THE CONTRACTOR SHALL NOTIFY THE OWNER'S AGENT IMMEDIATELY FOR DIRECTION ON HOW TO PROCEED PRIOR TO COMMENCEMENT OF CONSTRUCTION. THE CONTRACTOR ACCEPTS RESPONSIBILITY FOR ALL COSTS ASSOCIATED WITH CORRECTIVE ACTION IF THESE PROCEDURES ARE NOT FOLLOWED.
15. CONTRACTOR IS RESPONSIBLE TO COORDINATE UTILITY CROSSINGS AT CULVERT CROSSINGS BEFORE STARTING WORK ON CULVERT. COORDINATE WITH OWNER REPRESENTATIVE. VERIFY UTILITY LINES AND/OR CONDUITS ARE IN PLACE BEFORE STARTING CULVERT WORK.
16. CONSTRUCT RETENTION BASIN AS SHOWN. CONTRACTOR TO SCARIFY BOTTOM OF BASIN TWO FEET DEEP AND NOT ALLOW COMPACTION OVER 85%.
17. THIS PROJECT REQUIRES A REGULAR ONGOING MAINTENANCE PROGRAM FOR THE DESIGNED DRAINAGE SYSTEM(S) TO PRESERVE THE DESIGN INTEGRITY AND THE ABILITY TO PERFORM ITS OPERATIONAL INTENT. FAILURE TO PROVIDE MAINTENANCE WILL JEOPARDIZE THE DRAINAGE SYSTEM(S)' PERFORMANCE AND MAY LEAD TO ITS INABILITY TO PERFORM PROPERLY AND/OR CAUSE DAMAGE ELSEWHERE IN THE PROJECT.
18. SEWER LINES DESIGNED IN PROFILE AND PUBLIC WATER LINES ARE REQUIRED TO BE ASBUILT AND THE INSTALLATION AND TESTING WITNESSED BY A PROFESSIONAL ENGINEER IN ACCORDANCE WITH ARIZONA ADMINISTRATIVE CODES R18-9-E301 "4.01 GENERAL PERMIT: SEWAGE COLLECTIONS SYSTEMS" AND R18-5-507 AND 508 "APPROVAL OF CONSTRUCTION" AND "RECORD DRAWINGS", RESPECTIVELY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY OWNER 72 HOURS IN ADVANCE WHEN THOSE SYSTEMS ARE READY TO BE WITNESSED.
19. THE WORK PRODUCT PRESENTED IS BELIEVED TO BE COMPLIANT WITH THE INTENT OF THE CURRENT AMERICANS DISABILITIES ACT (ADA) REQUIREMENTS AS INTERPRETED BY THE REVIEWING AGENCY(S). IF CONSTRUCTION OF THE PROJECT IS DELAYED, THIS WORK PRODUCT SHOULD BE UPDATED TO ACCOUNT FOR ANY RELEVANT ADA UPDATES BEFORE CONSTRUCTION BEGINS.
20. LOWEST FLOOR (LF) REFERS TO EITHER FLOOR/SLAB ELEVATION OR TOP OF BASEMENT SLAB. LF ELEVATIONS ON THE GRADING AND DRAINAGE PLANS FOR RESIDENTIAL UNITS REFLECT SLAB ON GRADE CONDITIONS AND CANNOT BE LOWERED WITHOUT AGENCY APPROVAL IN LOCATIONS WHERE "SPECIAL FLOOD HAZARD AREAS" EXIST. IN NON-FLOOD HAZARD LOCATIONS, TO ENSURE THAT ADEQUATE RESIDENTIAL LOT DRAINAGE CAN BE ACHIEVED, A PROFESSIONAL ENGINEER SHOULD BE CONSULTED IF THE LF FOR THE SLAB IS PROPOSED TO BE LOWERED, OR IF A BASEMENT IS TO BE CONSTRUCTED.

ROOSEVELT IRRIGATION DISTRICT
SITE #92 WATER TREATMENT INSTALLATION

LOCATED IN
A PORTION OF SECTION 10, T.1.N., R.2.E.
OF THE G. & S.R.M., MARICOPA COUNTY, ARIZONA



VICINITY MAP
N.T.S.

OWNER
ROOSEVELT IRRIGATION DISTRICT
103 W. BASELINE ROAD
BUCKEYE, AZ 85326
CONTACT: DONOVAN NEESE
PH: 623-386-2046

TREATMENT DESIGNER
SYNERGY ENVIRONMENTAL LLC
10645 N TATUM BLVD., SUITE 200-437
PHOENIX, AZ 85028
CONTACT: JOEL PETERSON
PH: 480-284-3518

MECHANICAL ENGINEER
TAYLOR RYMAR CORPORATION
80 E RIO SALADO PARKWAY, SUITE 1010
TEMPE, AZ 85281
CONTACT: CHRIS MARONEY
PH: 480-951-0517
FAX: 480-951-2353

STRUCTURAL ENGINEER
PK ASSOCIATES LLC
7434 E MCDONALD DR
SCOTTSDALE, ARIZONA 85250
CONTACT: STEVE SLOMAKER
PH: 480-922-8854
FX: 480-922-3739

CIVIL ENGINEER
WOOD, PATEL AND ASSOCIATES
2051 W NORTHERN AVE, SUITE 100
PHOENIX, ARIZONA 85021
CONTACT: DARRELL SMITH
PH: 602-335-8500
FX: 602-335-8580

LEGEND

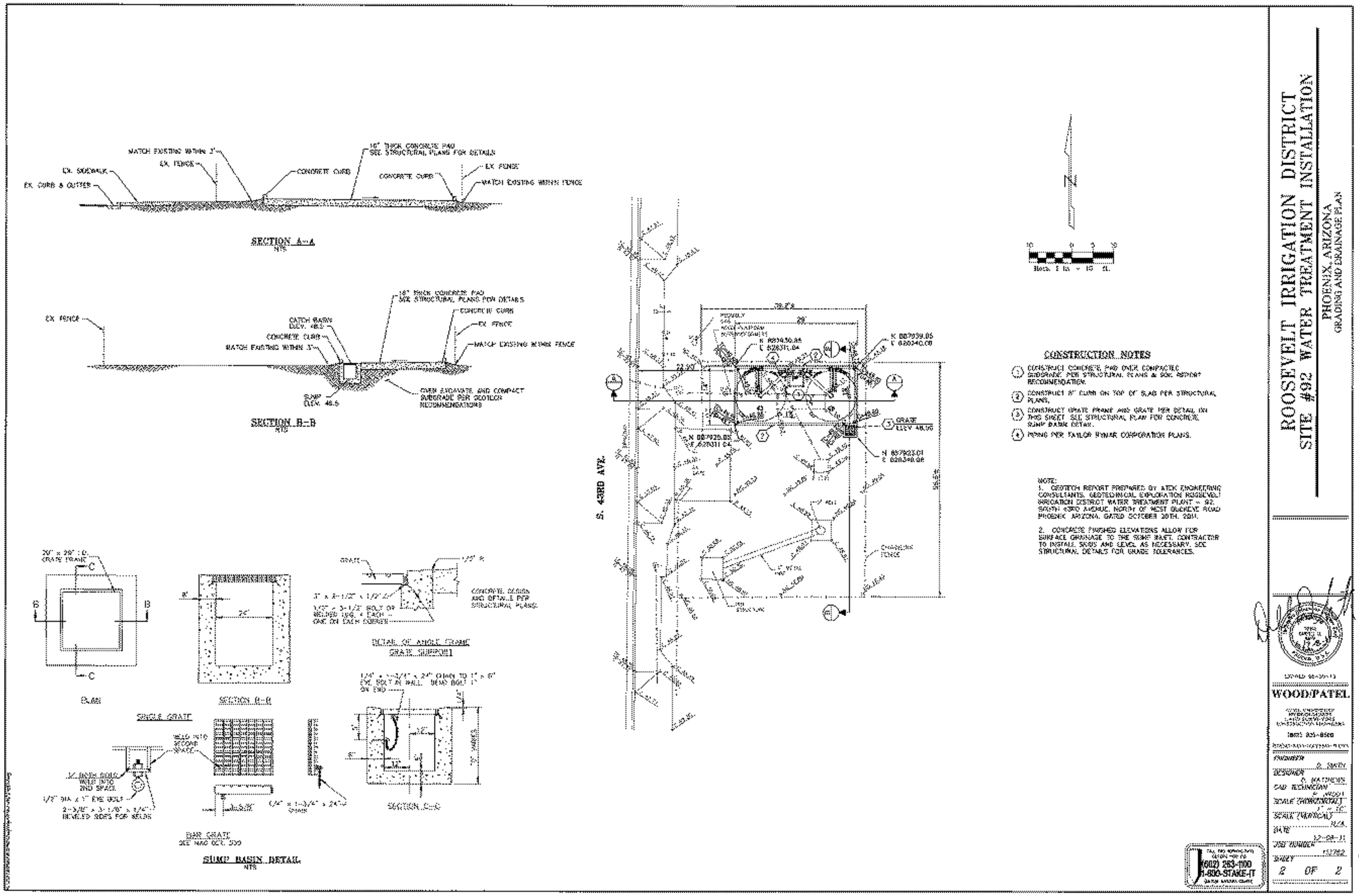
EXISTING	DESCRIPTION	PROPOSED
	SURVEY MARKER	
	CURB & GUTTER	
— OVE —	OVERHEAD ELECTRIC LINE	
	CONCRETE ELEVATION	
	NATURAL GRADE	
	TOP OF CURB GUTTER ELEVATION	
	PAVEMENT ELEVATION	
	UTILITY POLE	
	STREET LITE	
C.B.	CATCH BASIN	
	SIGN	
B.P.	BACKFLOW PREVENTER	
M.H.	MANHOLE	

(602) 263-1100
1-800-STAKE-IT

ROOSEVELT IRRIGATION DISTRICT
SITE #92 WATER TREATMENT INSTALLATION
PHOENIX, ARIZONA
GRADING AND DRAINAGE PLAN

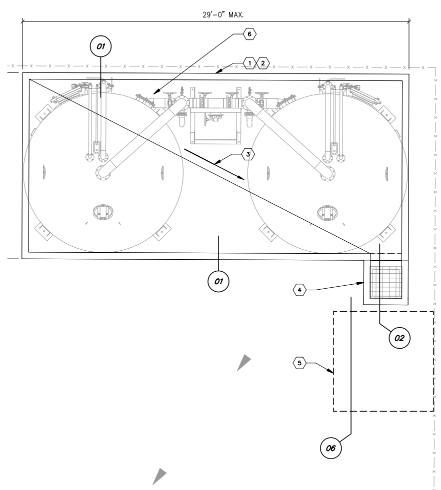
WOOD/PATEL
CIVIL ENGINEERS
HYDROLOGISTS
LAND SURVEYORS
CONSTRUCTION MANAGERS

ENGINEER D. SMITH
DESIGNER
CAD TECHNICIAN
SCALE (HORIZONTAL) N.T.S.
SCALE (VERTICAL) N/A
DATE
JOB NUMBER
SHEET 1 OF 2


ROOSEVELT IRRIGATION DISTRICT
SITE #92 WATER TREATMENT INSTALLATION
PHOENIX, ARIZONA
GRADING AND DRAINAGE PLAN
SECTION A-A
NTS
SECTION B-B
NTS
EX. FENCE
EX. SIDEWALK
EX. CURB & GUTTER
CONCRETE CURB
MATCH EXISTING WITHIN FENCE
S. 43RD AVE.
CONSTRUCTION NOTES
CONSTRUCT 8" CURB ON TOP OF SLAB PER STRUCTURAL PLANS.
PIPING PER TAYLOR RYMAR CORPORATION PLANS.
NOTE:
2. CONCRETE FINISHED ELEVATIONS ALLOW FOR SURFACE DRAINAGE TO THE SUMP INLET. CONTRACTOR TO INSTALL SKIDS AND LEVEL AS NECESSARY. SEE STRUCTURAL DETAILS FOR GRADE TOLERANCES.
PLAN
SINGLE GRATE
SECTION B-B
SECTION C-C
BAR GRATE
SUMP BASIN DETAIL
NTS
WOOD/PATEL
(602) 263-1100
1-800-STAKE-IT
2 OF 2

PLAN KEYNOTES:

1. 16" THICK CONCRETE MAT WITH #5 AT 10" O.C. EACH WAY TOP AND BOTTOM.
2. 8" TALL CONCRETE CURB PER DETAIL 01.
3. SLOPE PAD 1% TOWARD SUMP PIT.
4. SUMP PIT PER DETAIL 02/S1.2.
5. 7'-6"x7'-6"x36" DEEP CONCRETE PAD FOOTING WITH 10 #7 EACH WAY TOP AND BOTTOM. BYPASS VALVE DESIGN BY OTHERS. FOR LOCATION OF VALVE SEE MECHANICAL DRAWINGS. (CONTRACTOR OPTION FOR DRILLED PIER. SEE DETAIL 07 FOR MORE INFORMATION)
6. SIEMENS TANK ASSEMBLY PER MECH'L (185 KIPS MAX. WEIGHT)



RID #92 WELL SITE EQUIPMENT PAD

1/4" = 1'-0"

BUILDING CODE:

2006 EDITION OF THE INTERNATIONAL BUILDING CODE, WITH CITY OF PHOENIX AMENDMENTS.

LOADS:

SIEMENS HP 1220 ADSORPTION SYSTEM = 185,000 LBS. PER SKID (2 TANKS PER SKID, 2 TANKS TOTAL THIS SITE)

WIND:

90 MPH BASIC WIND SPEED, EXPOSURE C.
Iw = 1.0.
INTERNAL PRESSURE COEFFICIENT (GCpi) = 0.18.

SEISMIC:

OCCUPANCY CATEGORY = II.
Ie = 1.0.
DESIGN CATEGORY = B.
SITE CLASS D.
Ss = 0.174, S1 = 0.060.

FOUNDATIONS:

SOIL REPORT BY ATEK ENGINEERING CONSULTANTS; JOB NO.110059; DATED OCTOBER 26, 2011; MAT FOUNDATIONS SHALL BEAR ON 18" CONTROLLED COMPACTED FILL IN ACCORDANCE WITH THE ABOVE REPORT. BOTTOM OF FOOTING TO BE 12" MINIMUM BELOW FINISHED GRADE. THESE FOOTING DEPTHS ARE MINIMUMS AND THE CONTRACTOR SHALL COORDINATE WITH SOILS REPORT AND OTHERS TRADES TO ENSURE THESE MINIMUMS ARE SUFFICIENT FOR THE WORK. COMPACTED FILL SHALL EXTEND 5'-0" BEYOND EACH EDGE OF FOOTING. FINISHED GRADE IS DEFINED AS LOWEST ADJACENT GRADE WITHIN 5 FEET. DESIGN SOIL BEARING VALUE = 2000 PSF. FOUNDATION EXCAVATIONS SHALL BE INSPECTED BY SOILS ENGINEER PRIOR TO PLACEMENT OF CONCRETE.

CONCRETE:

MINIMUM 28 DAY STRENGTH 4,000 PSI (w/c = 0.45): (TYPE II, U.N.O.)
– 3,000 PSI MIN. BEFORE SETTING EQUIPMENT

MECHANICALLY VIBRATE ALL CONCRETE WHEN PLACED. MAXIMUM SLUMP 4 1/2" FOR CONCRETE WITHOUT PLASTICIZER. IF PLASTICIZER IS USED, A HIGHER FINAL SLUMP MAY BE ALLOWED UPON STRUCTURAL ENGINEER'S APPROVAL. CAST CLOSURE POUR AROUND COLUMNS AFTER COLUMN DEAD LOAD IS APPLIED.

REINFORCING:

ASTM A615 (Fy = 60 KSI) DEFORMED BARS FOR ALL BARS. ALL GRADE 60 REINFORCING TO BE WELDED SHALL BE ASTM A706. WELDED WIRE FABRIC PER ASTM A185, WIRE PER ASTM A82. NO TACK WELDING OF REINFORCING BARS ALLOWED WITHOUT PRIOR REVIEW OF PROCEDURE WITH THE STRUCTURAL ENGINEER. LATEST ACI CODE AND DETAILING MANUAL APPLY. CLEAR CONCRETE COVERAGES AS FOLLOWS:

CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH ------------- 3"
EXPOSED TO EARTH OR WEATHER
#6 OR LARGER -- 2"
#5 AND SMALLER ----------------------------------- 1 1/2"
ALL OTHER PER LATEST EDITION OF ACI 318.

LAP SPLICES IN CONCRETE:

LAP SPLICES, UNLESS NOTED OTHERWISE, SHALL BE CLASS "B" TENSION LAP SPLICES PER LATEST EDITION OF ACI 318. STAGGER SPLICES A MINIMUM OF ONE LAP LENGTH.

ALL SPLICE LOCATIONS SUBJECT TO APPROVAL BY THE STRUCTURAL ENGINEER. PROVIDE BENT CORNER BARS TO MATCH AND LAP WITH HORIZONTAL BARS AT ALL CORNERS AND INTERSECTIONS PER TYPICAL DETAILS. REINFORCING BAR SPACING GIVEN ARE MAXIMUM ON CENTERS. ALL BARS PER CRSI SPECIFICATIONS AND HANDBOOK. DOWEL ALL VERTICAL REINFORCING TO FOUNDATION WITH STANDARD 90-DEGREE HOOKS UNLESS NOTED OTHERWISE. SECURELY TIE ALL BARS IN LOCATION BEFORE PLACING CONCRETE.

NOTES ON CRACKING OF CONCRETE STRUCTURES:

CRACKING IS INHERENT TO THE MATERIAL PROPERTIES OF CONCRETE CONSTRUCTION WHILE EVERY EFFORT HAS BEEN MADE TO MINIMIZE THE EFFECTS OF UNSIGHTLY CRACKING, THE PRESENCE OF CRACKS ARE NORMAL AND UNAVOIDABLE. THE DESIGN OF THE CONCRETE STRUCTURAL ITEMS HAVE BEEN ANALYZED USING A "CRACKING SECTION." THE PRESENCE OF THE CRACKING SHOULD NOT BE CONSIDERED DETRIMENTAL TO THE STRUCTURE. CRACKS LARGER THAN 5 MILS SHALL BE FILLED AND SEALED WITH AN APPROVED CRACK FILLER TO PREVENT FUTURE DETERIORATION. ALLOWANCE SHALL BE MADE IN THE CONSTRUCTION BUDGET FOR SEALING OF SUCH CRACKS. IN SOME CASE, CRACKS DO NOT APPEAR UNTIL WELL AFTER CONSTRCUTION HAS BEEN COMPLETED. IT IS THE RESPONSIBILTY OF THE OWNER TO MAINTAIN THE STRUCTURE PROPERLY OVER THE LIFE OF THE STRUCTURE. CONCRETE CRACKS, SHOULD THEY OCCUR, SHALL BE FILLED AND SEALED TO PREVENT PREMATURE DETERIORATION OF THE STRUCTURE.

SHOP DRAWINGS:

SHOP DRAWINGS SHALL BE SUBMITTED FOR ALL STRUCTURAL ITEMS IN ADDITION TO ITEMS REQUIRED BY MECHANICAL SPECIFICATIONS.

THE CONTRACTOR SHALL REVIEW ALL SHOP DRAWINGS PRIOR TO SUBMITTAL. ITEMS NOT IN ACCORDANCE WITH CONTRACT DOCUMENTS SHALL BE FLAGGED UPON HIS REVIEW.

VERIFY ALL DIMENSIONS WITH MECHANICAL AND ALL FINISHED GRADE WITH CIVIL DRAWINGS.

ANY CHANGES, SUBSTITUTIONS, OR DEVIATIONS FROM CONTRACT DOCUMENTS SHALL BE CLOUDED BY MANUFACTURER OR FABRICATOR. ANY OF THE AFOREMENTIONED WHICH ARE NOT CLOUDED OR FLAGGED BY SUBMITTING PARTIES, SHALL NOT BE CONSIDERED APPROVED AFTER ENGINEER'S REVIEW, UNLESS NOTED ACCORDINGLY.

THE ENGINEER HAS THE RIGHT TO APPROVE OR DISAPPROVE ANY CHANGES TO CONTRACT DOCUMENTS AT ANYTIME BEFORE OR AFTER SHOP DRAWING REVIEW.

THE SHOP DRAWINGS DO NOT REPLACE THE CONTRACT DOCUMENTS. ITEMS OMITTED OR SHOWN INCORRECTLY AND ARE NOT FLAGGED BY THE STRUCTURAL ENGINEER OR ARCHITECT ARE NOT TO BE CONSIDERED CHANGES TO CONTRACT DOCUMENTS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO MAKE SURE ITEMS ARE CONSTRUCTED TO CONTRACT DOCUMENTS.

THE ADEQUACY OF ENGINEERING DESIGNS AND LAYOUT PERFORMED BY OTHERS RESTS WITH THE DESIGNING OR SUBMITTING AUTHORITY.

REVIEWING IS INTENDED ONLY AS AN AID TO THE CONTRACTOR IN OBTAINING CORRECT SHOP DRAWINGS. RESPONSIBILITY FOR CORRECTNESS SHALL REST WITH THE CONTRACTOR.

EPOXY ANCHORS IN CONCRETE:

INJECTABLE ADHESIVE SHALL BE USED FOR INSTALLATION OF REINFORCING STEEL DOWELS OR THREADED ANCHOR RODS AND INSERTS INTO NEW OR EXISTING CONCRETE OR SOLID GROUTED CONCRETE MASONRY UNITS ONLY WHERE SPECIFIED ON PLANS. IF USE IS REQUESTED FOR OTHER THAN WHERE NOTED CONTACT STRUCTURAL ENGINEER THROUGH ARCHITECT FOR APPROVAL. ADHESIVE SHALL BE FURNISHED IN SIDE BY SIDE PACKS WHICH KEEP COMPONENT A AND COMPONENT B SEPARATE. USE ONLY INJECTION TOOLS AND STATIC MIXING NOZZLES RECOMENDED BY MANUFACTURER. MANUFACTURER?S INSTRUCTIONS SHALL BE FOLLOWED.

ANCHORS USED MUST HAVE I.C.C. APPROVAL AND INCLUDE HILTI HY-150 FOR MASONRY (ESR-1967), HILTI HIT-RE 500-SD FOR CONCRETE (ESR-2322) AND SIMPSON STRONG TIE SET (ESR-1772) FOR MASONRY OR EQUIVALENT. THE USE OF ANY EPOXY ANCHOR MUST BE APPROVED BY THE ENGINEER OF RECORD.

GENERAL:

ENTIRE CONTRACT DOCUMENTS SHALL BE USED TO BUILD BUILDING. SOME CRITICAL ITEMS REQUIRED BY OTHER DISCIPLINES MAY NOT BE SHOWN ON STRUCTURAL DRAWING (i.e. MECHANICAL, PLUMBING LOADS, ANS SUPPORT PLATES ETC.)

ITEMS SHOWN BY OTHER DISCIPLINES WITH REFERENCE TO STRUCTURAL DRAWING BUT NOT SHOWN ON THESE STRUCTURAL DOCUMENT SHALL BE CONSIDERED DESIGN BUILD ITEMS. CONTRACTOR SHALL SUBMIT DESIGN BY OTHERS FOR REVIEW.

THE STRUCTURAL CONSTRUCTION DOCUMENTS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE ALL MEASURES NECESSARY TO PROTECT THE STRUCTURE DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO, BRACING, SHORING FOR LOADS DUE TO CONSTRUCTION EQUIPMENT, ETC. THE STRUCTURAL ENGINEER SHALL NOT BE RESPONSIBLE FOR THE CONTRACTOR'S MEANS, METHODS, TECHNIQUES, SEQUENCES FOR PROCEDURE OF CONSTRUCTION, OR THE SAFETY PRECAUTIONS AND THE PROGRAMS INCIDENT THERETO (NOR SHALL OBSERVATION VISITS TO THE SITE INCLUDE INSPECTION OF THESE ITEMS).

WHERE REFERENCE IS MADE TO VARIOUS TEST STANDARDS FOR MATERIALS, SUCH STANDARDS SHALL BE THE LATEST EDITION AND/OR ADDENDA.

ESTABLISH AND VERIFY ALL OPENINGS AND INSERTS FOR MECHANICAL, PLUMBING AND ELECTRICAL WITH APPROPRIATE TRADES, DRAWINGS AND SUBCONTRACTORS PRIOR TO CONSTRUCTION.

OPTIONS ARE FOR CONTRACTOR'S CONVENIENCE. IF HE CHOOSES AN OPTION, CONTRACTOR SHALL BE RESPONSIBLE FOR ALL NECESSARY CHANGES AND SHALL COORDINATE ALL DETAILS.

NOTES AND DETAILS ON DRAWINGS SHALL TAKE PRECEDENCE OVER GENERAL STRUCTURAL NOTES AND TYPICAL DETAILS. WHERE NO DETAILS ARE SHOWN, CONSTRUCTION SHALL CONFORM TO SIMILAR WORK ON THE PROJECT.

ALL DIMENSIONS SHOWN (INCLUDING ELEVATIONS) ON STRUCTURAL DRAWINGS ARE TO ASSIST CONTRACTOR IN VERIFICATION. SCALING DIMENSIONS FROM DRAWINGS IS NOT PERMITTED. LOCATION OF ALL ITEMS SHALL BE DETERMINED BY DIMENSIONS OR NOTES ONLY; DO NOT USE GRAPHIC APPEARANCE TO ASSUME SPECIFIC LOCATIONS.

CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF ALL DIMENSIONS WITH MECHANICAL AND FINISHED GRADE WITH CIVIL DRAWINGS PRIOR TO START OF CONSTRUCTION. RESOLVE ANY DISCREPANCY WITH THE ARCHITECT.

TYPICAL DETAILS MAY NOT NECESSARILY BE CUT ON PLANS, BUT APPLY UNLESS NOTED OTHERWISE.

WHERE DISCREPANCIES OCCUR BETWEEN PLANS, DETAILS, GENERAL STRUCTURAL NOTES AND SPECIFICATIONS, THE GREATER REQUIREMENTS SHALL GOVERN.

ANY ENGINEERING DESIGN, PROVIDED BY OTHERS AND SUBMITTED FOR REVIEW, SHALL BEAR THE SEAL OF AN ENGINEER REGISTERED IN THE STATE OF JURISDICTION.

MISCELLANEOUS:

REFER TO MECHANICAL, ELECTRICAL, CIVIL, OR OTHER SPECIALTY ENGINEERING DRAWINGS FOR DIMENSIONS NOT SHOWN, INCLUDING BUT NOT LIMITED TO: SIZE AND LOCATION OF CURBS, EQUIPMENT HOUSEKEEPING PADS, BLOCKOUTS, FLOOR DEPRESSIONS, SUMPS, DRAINS, ANCHOR BOLTS, EMBEDDED ITEMS, ETC. CONTRACTOR SHALL VERIFY DIMENSIONS AND RESOLVE DISCREPANCIES OR CONFLICT PRIOR TO CONSTRUCTION. WHERE SECTIONS ARE INDICATED ON THE PLAN BY A NUMBER AND A DRAWING NUMBER THUS, 1/S5.01, THE INDICATED SECTION (1) IS SHOWN ON STRUCTURAL DRAWING S5.01.

FLOOR FLATNESS/LEVELNESS SHALL MEET MECHANICAL SPECIFICATIONS (1/8" MINIMUM LEVELNESS UNLESS TIGHTER REQUIREMENT IN SPECIFICATIONS) IN HEIGHT FOR ALL STRUCTURAL SYSTEMS. CONTRACTOR SHALL INCLUDE COST FOR LEVELING ALL MAT SLABS IF REQUIRED.

SPECIAL INSPECTION:

PER IBC CHAPTER 17, SPECIAL INSPECTION IS REQUIRED FOR THE FOLLOWING ITEMS:

CONCRETE: VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERRENCED STANDARD (NOTE 1)	IBC REFERENCE
1. Inspection of reinforcing steel.	–	X	ACI 318: 3.5, 7.1-7.7	1913.4
2. Inspect bolts to be installed in concrete prior to and during placement of concrete where allowable loads have been increased.	X	–	ACI 318: APPENDIX D	1912
3. Verifying use of required design mix.	–	X	ACI 318: CH. 4, 5.2-5.4	1904.2.2, 1913.2, 1913.3
4. At the time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	X	–	ASTM C 172 ASTM C 31 ACI 318: 5.6, 5.8	1913.10
5. Inspection of concrete placement for proper application techniques.	X	–	ACI 318: 5.9, 5.10	1913.6, 1913.7, 1913.8
6. Inspection for maintenance of specified curing temperature and techniques.	–	X	ACI 318: 5.11, 5.13	1913.9
7. Inspect formwork for shape, location and dimensions of the concrete member being formed.	–	X	ACI 318: 6.1.1	

NOTES:
1. TABLES TAKEN DIRECTLY FROM IBC FOR REFERENCE.

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ROOSEVELT IRRIGATION DISTRICT #92 WATER TREATMENT INSTALLATION

43RD AVENUE, 1/4 MI. NORTH OF BUCKEYE, PHOENIX, ARIZONA

Sheet Title: GSN AND FOUNDATION PLAN

REVISIONS:

DATE:	12/15/2011
DRAWN BY:	FML
CHECKED BY:	RH
SCALE:	AS NOTED
PROJECT NO:	11322
SHEET	S1.1

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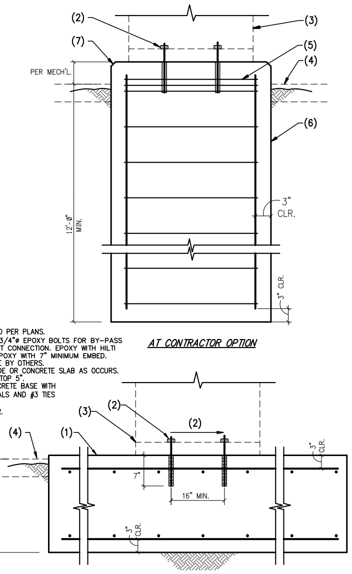


NOTES:

1. CONCRETE PAD PER PLANS.
2. PROVIDE (4) 3/4"ø EPOXY BOLTS FOR BY-PASS VALVE TO MAT CONNECTION. EPOXY WITH HILTI RE 500 SD EPOXY WITH 7" MINIMUM EMBED.
3. BYPASS VALVE BY OTHERS.
4. FINISHED GRADE OR CONCRETE SLAB AS OCCURS.
5. 3 #3 TIES IN TOP 5".
6. 36" DIA. CONCRETE BASE WITH 13 #8 VERTICALS AND #3 TIES AT 12" O.C.
7. 1/2" CHAMFER.

07 CONCRETE PAD AT BYPASS VALVE

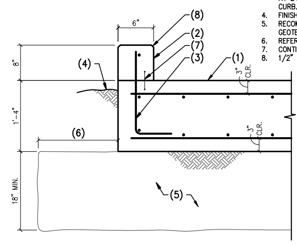
NO SCALE

CONC. PSI	CLASS B TENSION SPLICE LENGTHS						COMP. BARS	
	f'c = 2,500 PSI/ f'c = 3,000 PSI		f'c = 4,000 PSI		f'c = 5,000 PSI AND HIGHER		f'c = ALL	
BAR LOCATION	REGULAR CLASS	TOP CLASS	REGULAR CLASS	TOP CLASS	REGULAR CLASS	TOP CLASS	STD LAP	ENCLOSED W/ SPIRAL TIES
SIZE								
#3	24"	31"	19"	24"	17"	22"	12"	12"
#4	32"	41"	25"	33"	23"	29"	15"	12"
#5	39"	51"	31"	41"	28"	36"	19"	14"
#6	47"	61"	37"	49"	34"	43"	23"	17"
#7	69"	89"	54"	71"	49"	63"	26"	20"
#8	78"	102"	62"	81"	56"	72"	30"	23"
#9	88"	115"	70"	91"	63"	81"	34"	25"
#10	100"	129"	79"	102"	70"	92"	38"	29"
#11	110"	143"	87"	113"	78"	102"	42"	32"

NOTES:
1. TOP BARS ARE ANY HORIZONTAL BARS PLACED SO THAT MORE THAN 12" OF FRESH CONCRETE IS CAST IN THE MEMBER BELOW THE REINFORCEMENT.
2. UNLESS NOTED OTHERWISE, LAP SPLICES IN CONCRETE BEAMS, SLABS, AND WALLS. WILL BE CLASS B TENSION SPLICE LENGTHS. COLUMNS SHALL HAVE STANDARD COMPRESSION LAP SPLICE.
3. CONTACT STRUCTURAL ENGINEER IF CENTER TO CENTER SPACING OF REINFORCING IS LESS THAN OR EQUAL TO 3 BAR DIAMETERS, <3db OR 2db CLEAR SPACING BETWEEN BARS.
4. ALL SPLICES MUST BE FULL CONTACT.
5. SPLICES WITH #14 OR #18 BARS SHALL USE MECHANICAL COUPLERS. (THIS INCLUDES #14 OR #18 BARS TO SMALLER BARS SHOWN IN SCHEDULE).

04 LAP SCHEDULE FOR REINFORCING STEEL

NO SCALE

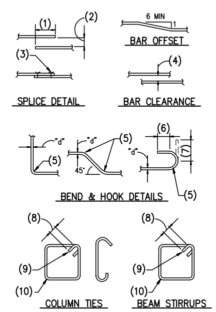


NOTES:

1. MAT FOUNDATION PER PLAN.
2. 8" CONCRETE CURB WITH (1) #4 CONTINUOUS.
3. PROVIDE 1 #4 HOOKED DOWEL AT 24" O.C. – TYPICAL AT CURB.
4. FINISHED GRADE, SEE CIVIL.
5. RECOMPACTED FILL PER GEOTECH REPORT.
6. REFER TO GEOTECH REPORT.
7. CONTINUOUS WATER STOP.
8. 1/2" CHAMFER – TYP.

01 CONCRETE CURB AT MAT FOOTING

NO SCALE

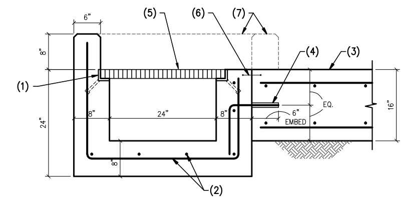


NOTES:

1. LAP – SEE G.S.N.
2. MAXIMUM 1/5 LAP BUT NOT MORE THAN 6".
3. WIRE TIES.
4. 1d (1" MINIMUM).
5. RADIUS=3d FOR BARS NOT OVER #8; 4d FOR #9, #10 AND #11 BARS; 5d FOR #14 AND #18 BARS. 5d FOR ALL GRADE 40 BARS WITH 180 DEGREE HOOK.
6. 4d (4" MINIMUM).
7. 12d (90 DEGREE HOOK).
8. 6d (4" MINIMUM).
9. 135 DEGREE BEND.
10. BEND AROUND 1 1/2" PIN FOR #3 BARS. BEND AROUND 2" PIN FOR #4 BARS. BEND AROUND 2 1/2" PIN FOR #5 BARS.

05 TYPICAL CONCRETE REINFORCING BAR DETAILS

NO SCALE

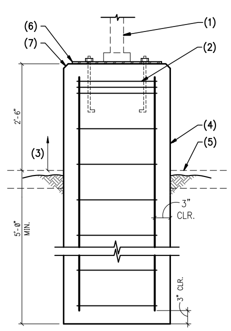


NOTES:

1. 2"x2"x1/4" CONT. GALVANIZED STEEL ANGLE WITH 1/2"ø x6" HEADED STUD AT 12" O.C.
2. #5 REINFORCING AT 10" O.C.
3. CONCRETE MAT FOUNDATION.
4. DRILL AND EPOXY #5 BENT BAR PER GSN. SPACING TO MATCH SUMP PIT REINFORCING.
5. GRATING PER CIVIL DRAWINGS.
6. CONT. WATER STOP.
7. CONCRETE CURB BEYOND.

02 SUMP PIT DETAIL

NO SCALE

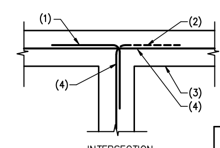


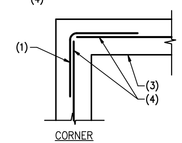
NOTES:

1. LIGHT POLE AND ANCHOR BOLTS BY OTHERS.
2. 3 #3 TIES IN TOP 5".
3. TOP OF LIGHT POLE TO BE 18'-0" ABOVE FINISHED GRADE – MAX.
4. 24" DIA. CONCRETE BASE WITH 6 #6 VERTICALS AND #3 TIES AT 12" O.C.
5. FINISHED GRADE OR CONCRETE SLAB AS OCCURS.
6. BASEPLATE AND ANCHOR BOLTS BY OTHERS.
7. 1/2" CHAMFER.

06 TYPICAL LIGHT POLE BASE

NO SCALE





NOTES:

1. CORNER BARS SAME SIZE AND SPACING AS HORIZONTAL REINFORCING. LAP PER G.S.N. (24" MINIMUM).
2. ALTERNATE BEND.
3. CONCRETE STEM WALL OR FOOTING.
4. REINFORCING PER PLANS AND /OR G.S.N.

03 PLAN – CORNER REINFORCING IN CONCRETE FOOTING AND/OR STEM WALL

NO SCALE

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ROOSEVELT IRRIGATION DISTRICT #92 WATER TREATMENT INSTALLATION

43RD AVENUE, 1/4 MI. NORTH OF BUCKEYE, PHOENIX, ARIZONA

Sheet Title: DETAILS

REVISIONS:

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PROJECT NO:	11322
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ABBREVIATIONS

AC	AIR CONDITIONING UNIT
AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
AH	AIR HANDLER (SPLIT REFRIG)
AHU	AIR HANDLING UNIT
AL	ACOUSTICAL LINING
AP	ACCESS PANEL
BB	ELECTRIC BASEBOARD RADIATION
B	BOILER
BDD	BACK DRAFT DAMPER
BFC	BELOW FINISHED CEILING
BOB	BOTTOM OF BEAM
BOD	BOTTOM OF DUCT
BOP	BOTTOM OF PIPE
C	CHILLER
CD	CEILING DIFFUSER
CFM	CUBIC FEET PER MINUTE
CHWP	CHILLED WATER PUMP
CHWR	CHILLED WATER RETURN
CHWS	CHILLED WATER SUPPLY
CO	CLEAN OUT
CP	CONDENSATE PUMP
CWR	CONDENSER WATER RETURN
CWS	CONDENSER WATER SUPPLY
CT	COOLING TOWER
CU	CONDENSING UNIT
CUH	CABINET UNIT HEATER
CVB	CONSTANT VOLUME BOX
CWP	CONDENSER WATER PUMP
DB	DRY BULB
DS	DUCT SILENCER
DWP	DOMESTIC WATER PUMP
EAT	ENTERING AIR TEMPERATURE
EC	ELECTRICAL CONTRACTOR
EF	EXHAUST FAN
EJ	EXPANSION JOINT
ER	EXHAUST REGISTER
ESP	EXTERNAL STATIC PRESSURE
ET	EXPANSION TANK
EWT	ENTERING WATER TEMPERATURE
EWC	ELECTRIC WATER COOLER
FA	FREE AREA
FX	FLEXIBLE CONNECTION
FC	FAN COIL UNIT
FD	FIRE DAMPER
FLR	FLOOR
FOB	FLAT ON BOTTOM
FOT	FLAT ON TOP
FOP	FUEL OIL PUMP
FP	FIRE PUMP
FPM	FEET PER MINUTE
FTR	FINNED TUBE RADIATION
GC	GENERAL CONTRACTOR
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
HD	HAND DAMPER
HP	HEAT PUMP
HV	HEATING AND VENTILATING UNIT
HWC	HOT WATER CONVERTER
HWP	HOT WATER PUMP
HWR	HEATING HOT WATER RETURN
HWS	HEATING HOT WATER SUPPLY
HX	HEAT EXCHANGER
HZ	HERTZ
ID	INSIDE DIAMETER
LAT	LEAVING AIR TEMPERATURE
LWT	LEAVING WATER TEMPERATURE
LD	LINEAR DIFFUSER
LF	LINEAR FEET
MC	MECHANICAL CONTRACTOR
MTD	MOUNTED
MOD	MOTOR OPERATED DAMPER
MUA	MAKE-UP AIR UNIT
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
NIC	NOT IN CONTRACT
NK	NECK
OA	OUTSIDE AIR
OAI	OUTSIDE AIR INTAKE
OAT	OUTSIDE AIR TEMPERATURE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OBD	OPPOSED BLADE DAMPER
PBD	PARALLEL BLADE DAMPER
PRV	PRESSURE REDUCING VALVE
PTAC	PACKAGED TERMINAL AIR CONDITIONER
RA	RETURN AIR
RG	RETURN AIR GRILLE
RR	RETURN AIR REGISTER
RCP	REFLECTED CEILING PLAN
RHC	REHEAT COIL
RF	RETURN FAN
SA	SUPPLY AIR
SR	SUPPLY AIR REGISTER
SCG	SMOKE CONTROL GRILLE
SD	SMOKE DAMPER
SEF	SMOKE EXHAUST FAN
SF	SUPPLY FAN
SP	STATIC PRESSURE
TG	TRANSFER GRILLE
TYP	TYPICAL
UH	UNIT HEATER
UON	UNLESS OTHERWISE NOTED
VAV	VARIABLE AIR VOLUME UNIT
VD	VOLUME DAMPER
VTR	VENT THRU ROOF
WB	WET BULB
WMS	WIRE MESH SCREEN

MECHANICAL SYMBOL SCHEDULE:

NOT ALL SYMBOLS USED. ALL MOUNTING HEIGHTS TO CENTER OF BOX AND ALL DEVICES TO COMPLY WITH ADA REQUIREMENTS, WHERE APPLICABLE.

DUCTWORK SYMBOLS:

DOUBLE LINE / SINGLE LINE

- EXISTING EQUIPMENT OR DUCTWORK TO BE REMOVED.
- EXISTING DUCTWORK TO REMAIN
- 20/12 — DUCT SIZE, FIRST FIGURE IS SIDE SHOWN
- AD — ACCESS DOOR
- RADIUS ELBOW (R=1.5)
- VANED ELBOW
- BRANCH DUCT TAKE-OFF
- D R — RISE OR DROP DIRECTION OF AIR FLOW
- FLEXIBLE CONNECTION (FXC)
- TRANSITION, RECTANGULAR TO ROUND
- DUCT SECTION, SUPPLY
- DUCT SECTION, RETURN
- DUCT SECTION, EXHAUST
- UP — CHANGE IN ELEVATION (UP), (DN)
- ROUND DUCT VERTICAL OFFSET (USING 45° ELBOWS U.N.O.)
- FLEXIBLE DUCT AND SPIN-IN
- ### — CEILING SUPPLY DIFFUSER WITH DESIGN CFM ARROWS INDICATE THROW PATTERN OTHER THAN 4-WAY
- ### — CEILING RETURN GRILL WITH DESIGN CFM
- ### — CEILING EXHAUST GRILLE WITH DESIGN CFM
- #/# ### — SIDEWALL/DUCT MOUNTED SUPPLY GRILLE W/NECKSIZE AND CFM
- #/# ### — SIDEWALL RET/EXH GRILLE W/NECKSIZE AND CFM
- UC — UNDERCUT DOOR
- DL — DOOR LOUVER (FREE AREA REQUIRED INDICATED IN SQUARE FEET)
- FD — FIRE (1 1/2 HOUR) (FD)
- MANUAL (BALANCING)
- SD — SMOKE
- CONTROL
- FS — FIRE / SMOKE (FD/SM)
- BUTTERYFLY DAMPER
- SLIDE
- DP — DIFFERENTIAL PRESSURE SENSOR
- R — RESISTANCE TEMPERATURE SENSOR
- S — "VENTILATION SYSTEM EMERGENCY SHUTOFF"
- SD — SMOKE DETECTOR
- M — MOISTURE SENSOR (RELATIVE HUMIDITY)
- D — LOW POINT DUCT DRAIN
- SP — DUCT MOUNTED STATIC PRESSURE SENSOR TRANSMITTER

PIPING SYMBOLS:

- EXISTING PIPING TO REMAIN (SERVICE AS INDICATED)
- EXISTING PIPING TO BE REMOVED (SERVICE AS INDICATED)
- NEW PIPING (SERVICE AS INDICATED)
- DIRECTION OF FLOW
- DIRECTION OF PITCH
- CWS — CONDENSER WATER SUPPLY
- CWR — CONDENSER WATER RETURN
- CHWS — CHILLED WATER SUPPLY
- CHWR — CHILLED WATER RETURN
- CGS — CHILLED GLYCOL SUPPLY
- CGR — CHILLED GLYCOL RETURN
- HWS — HEATING HOT WATER SUPPLY
- HWR — HEATING HOT WATER RETURN
- LPS — LOW PRESSURE STEAM (PSI 15)
- MPS — MEDIUM PRESSURE STEAM (PSI 30)
- HPS — HIGH PRESSURE STEAM (PSI 125)
- LPC — LOW PRESSURE CONDENSATE
- PC — PUMPED CONDENSATE
- UNION
- FLANGED CONNECTION
- REDUCER, CONCENTRIC
- REDUCER, ECCENTRIC
- TEE, TURNED DOWN
- TEE, TURNED UP
- CAP
- CONNECTION, TOP
- ELBOW, TURNED UP
- ELBOW, TURNED DOWN
- CONNECTION, BOTTOM
- "Y" STRAINER WITH BLOWDOWN
- GATE
- GLOBE
- BUTTERFLY
- CHECK
- BALL
- PNEUMATIC CYLINDER OPERATED
- S — SOLENOID OPERATED
- 3-WAY

REFERENCE SYMBOLS:

- XX / X.XX — SECTION NUMBER; SHEET WHERE SECTION IS DRAWN — BUILDING SECTION REFERENCE
- XX / X.XX — DETAIL NUMBER; SHEET WHERE DETAIL IS DRAWN — DETAIL REFERENCE
- X / X-X — EQUIPMENT IDENTITY (SEE EQUIPMENT ABBREVIATION LIST AND SCHEDULES); EQUIPMENT NUMBER; SYSTEM NUMBER (IF APPLICABLE)
- POINT OF CONNECTION

SHEET INDEX

M0.0	MECHANICAL ABBREVIATIONS, SYMBOLS & NOTES
M1.1	MECHANICAL PIPING PLAN
M2.1	PIPE ISOMETRIC
M3.1	MECHANICAL DETAILS
M4.1	MECHANICAL SCHEDULES AND SPECIFICATIONS

PROJECT GENERAL NOTES - HVAC

1. ALL WORK SHALL CONFORM TO 2006 INTERNATIONAL MECHANICAL CODE, ALL STATE AND LOCAL CODES, RULES AND REGULATIONS AND ORDINANCES.
2. SUBMISSION OF PROPOSAL DIRECTLY OR INDIRECTLY IN CONNECTION WITH THIS WORK SHALL IMPLY THAT THE BIDDER HAS EXAMINED THE JOB SITE UNDER WHICH HE WILL BE OBLIGATED TO OPERATE SHOULD HE BE AWARDED THE WORK UNDER THIS CONTRACT. NO EXTRA CHARGE WILL BE ALLOWED FOR FAILURE OF ANY BIDDER TO EXAMINE THE SITE PRIOR TO BID.
3. CONTRACTOR SHALL VISIT THE SITE AND VERIFY ALL DIMENSIONS IN THE FIELD, AND SHALL ADVISE THE ARCHITECT/ENGINEER AND THE OWNER OF ANY DISCREPANCIES BEFORE PERFORMING THE WORK.
4. CONTRACTOR SHALL SECURE AND PAY ALL FEES AND PERMITS PERTAINING TO THE CONTRACT.
5. ALL EQUIPMENT SHALL BE INSTALLED IN STRICT COMPLIANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS. THE CONTRACTOR SHALL PROVIDE ALL HANGERS AND SUPPORTS REQUIRED FOR A COMPLETE INSTALLATION.
6. CONTRACTOR SHALL BE RESPONSIBLE FOR WORKMEN'S IDENTIFICATION AND BADGING, SAFETY AND FIRE PROTECTION, CONTRACTOR'S LIABILITY INSURANCE, BARRICADES, WARNING SIGNS, TRASH REMOVAL, CUTTING AND PATCHING.
7. CONTRACTOR SHALL SCHEDULE ALL SHUTDOWNS THAT AFFECT UTILITIES AND PORTIONS OF THE BUILDING THAT MUST REMAIN IN OPERATION WITH THE OWNER.
8. CONTRACTOR SHALL COORDINATE ALL WORK WITH THE OWNER AND ALL OTHER CONTRACTORS.
9. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL RIGGING, HANDLING AND PROTECTION OF MATERIALS.
10. CONTRACTOR SHALL PROVIDE LABOR TO RECEIVE, UNLOAD, STORE, PROTECT AND TRANSFER TO POINT OF INSTALLATION, OWNER FURNISHED ITEMS.
11. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CORING AS IT RELATES TO HIS WORK.

RECORD DRAWING
(04/23/12)

THIS IS PART OF A RECORD DOCUMENT. RECORD DOCUMENTS ARE BASED ON REPORTS SUBMITTED BY OTHERS. ENGINEER CANNOT ASSURE NOR ASSUME ANY RESPONSIBILITY OR LIABILITY FOR THE ACCURACY OF RECORD DOCUMENTS. USERS OF RECORD DOCUMENTS ARE CAUTIONED AND ADVISED TO OBTAIN INDEPENDENT VERIFICATION OF ACTUAL CONDITIONS.

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ROOSEVELT IRRIGATION DISTRICT #92
WATER TREATMENT INSTALLATION
43RD AVENUE, 1/4 MI. NORTH OF BUCKEYE, PHOENIX, ARIZONA

Sheet Title:
MECHANICAL ABBREVIATIONS, SYMBOLS & NOTES

REVISIONS:

DATE:	12/14/2011
DRAWN BY:	RAA
CHECKED BY:	DLB
SCALE:	NONE
PROJECT NO:	011175.00
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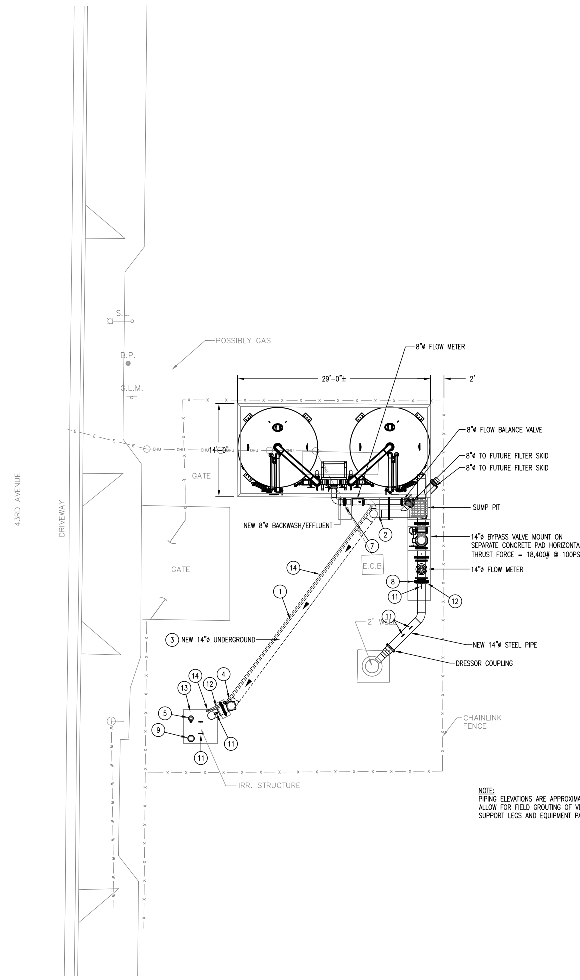

NOTE:
PIPING ELEVATIONS ARE APPROXIMATE.
ALLOW FOR FIELD GROUTING OF VESSEL SUPPORT LEGS AND EQUIPMENT PAD SLOPE.

WELLSITE #92 PIPING PLAN

SCALE: 1/8" = 1'-0"

NORTH

(#) KEY NOTES:

1. PROVIDE MINIMUM OF 48" EARTH COVER OVER BURIED PIPE SECTION TO ALLOW HEAVY EQUIPMENT TRAVEL OVER PIPE.
2. PROVIDE POURED-IN-PLACE CONCRETE THRUST BLOCK AT 90° ELBOWS BELOW GRADE.
3. WRAP STEEL PIPE WITH 20 MIL PVC TAPE OR PIPE SLEEVE TO 12" ABOVE FINISH GRADE SEAL PIPE WRAP WATER TIGHT ABOVE GRADE.
4. 3/4" THREADED-O-LET FOR PIPE LINE TEST PORT.
5. INSTALL #D400 MALE 4"ø HOSE CAM-LOK FITTING W/ 4" BALL VALVE.
6. SIEMENS MODEL #HP1220 (NEW) 1,000-GPM CAPACITY LGAC VESSEL SKID #1 (LEAD/LAG).
7. PIPE SUPPORT (TYP.) ANCHORED TO CONCRETE PAD.
8. PIPE SUPPORT (TYP.) SEE STRUCTURAL DWG. FOR CONCRETE PAD DETAILS.
9. CARBON FILTER/TANK BREATHER.
10. (2)-8"ø MECHANICAL COUPLING.
11. 1/4"x4"x4"x2"ø WELDED LIFTING EYELET.
12. (1)-14"ø MECHANICAL COUPLING.
13. INSTALL NEW 'AIR-TIGHT' 3/8" STEEL PLATE LID ON RECEIVER BOX.
    - RECEIVER BOX LID SHALL BE FURNISHED AND INSTALLED BY MECH. CONTRACTOR.
    - LID SHALL BE CLEANED AND RECEIVE FULL EPOXY PRIMER COAT AND FINISH COAT AFTER ALL WELDING AND CUTTING OPERATIONS ARE COMPLETE.
    - PROVIDE (2)-WELDED STEEL LIFTING EYELETS ON TOP OF COVER.
    - PROVIDE 1/8"x1"x1" WELDED ANGLE FRAME TO SET AND SEAL COVER AT TOP OF RECEIVER BOX. ANCHOR FRAME TO CURB OF CONCRETE RECEIVER BOX.
    - PERIMETER OF LID, AND 'CUT-OUT' OPENING OF 14" DISCHARGE PIPE SHALL BE MADE AIR TIGHT BY SEALING WITH 'RTV' FLEXIBLE SEALANT USE DOW CORNING #734 'ONE-PART' SOLVENT-LESS SILICONE SEALANT, OR EQUAL. APPLY SEALANT PER MANUFACTURER'S INSTRUCTIONS.
14. RUN 2"ø GALV. STEEL SUMP PUMP DISCHARGE LINE IN SAME TRENCH AS 14"ø PIPE.

UNDERGROUND PIPE

BACKFILL & COMPACTION

OVER-EXCAVATE PIPE TRENCH TO ALLOW FOR HAND-PLACEMENT OF A 3" DEPTH OF COMPACTED CLEAN SAND BEDDING BENEATH THE PIPE.

BACKFILL TRENCH WITH COMPACTED HAND-PLACED CLEAN SAND TO A COVERING DEPTH OF 12" OVER THE PIPE.

BACKFILL REMAINDER OF TRENCH WITH NATIVE SOIL REMOVE ALL DEBRIS, ROCKS AND HARD SOIL MATERIALS GREATER THAN 1" SIZE FROM BACKFILL MATERIAL.

COMPACT ALL BACKFILL MATERIAL PLACED INTO TRENCH IN 6" LAYERS. COMPACTION SHALL COMPLY WITH REQUIREMENTS OF THE SITE GEO-TECHNICAL REPORT.

MIN. REQUIREMENTS SHALL COMPLY WITH MAG STANDARD 601.4.
WITH COMPACTION PER MAG STANDARD TABLE 601.2.

PIPE PRESSURE TESTING

1. PRESSURE TEST DIRECT-BURIED STEEL PIPE AT 100 PSIG WATER PRESSURE BEFORE EXTERNAL CORROSION PROTECTION IS APPLIED TO WELDED JOINTS. HOLD TEST PRESSURE FOR 4 HOURS WITHOUT EVIDENCE OF PRESSURE LOSS OR LEAKAGE. REPAIR ALL LEAK SITES AND RETEST TO PROVE LEAKTIGHT BEFORE COVERING PIPE JOINT(S).
2. PRESSURE TEST ALL ABOVE-GROUND WATER PIPE IN MANNER LISTED IN WATER PIPING NOTE 1.9 ON SHEET M4.1.

RECORD DRAWING (04/23/12)

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ROOSEVELT IRRIGATION DISTRICT #92
WATER TREATMENT INSTALLATION
43RD AVENUE, 1/4 MI. NORTH OF BUCKEYE, PHOENIX, ARIZONA

Sheet Title: WELLSITE #92 PIPING PLAN

REVISIONS:

DATE:	12/14/2011
DRAWN BY:	RAA
CHECKED BY:	DLB
SCALE:	AS NOTED
PROJECT NO:	011175.00
SHEET	M1.1

Apr 23, 2012 – 2:02pm
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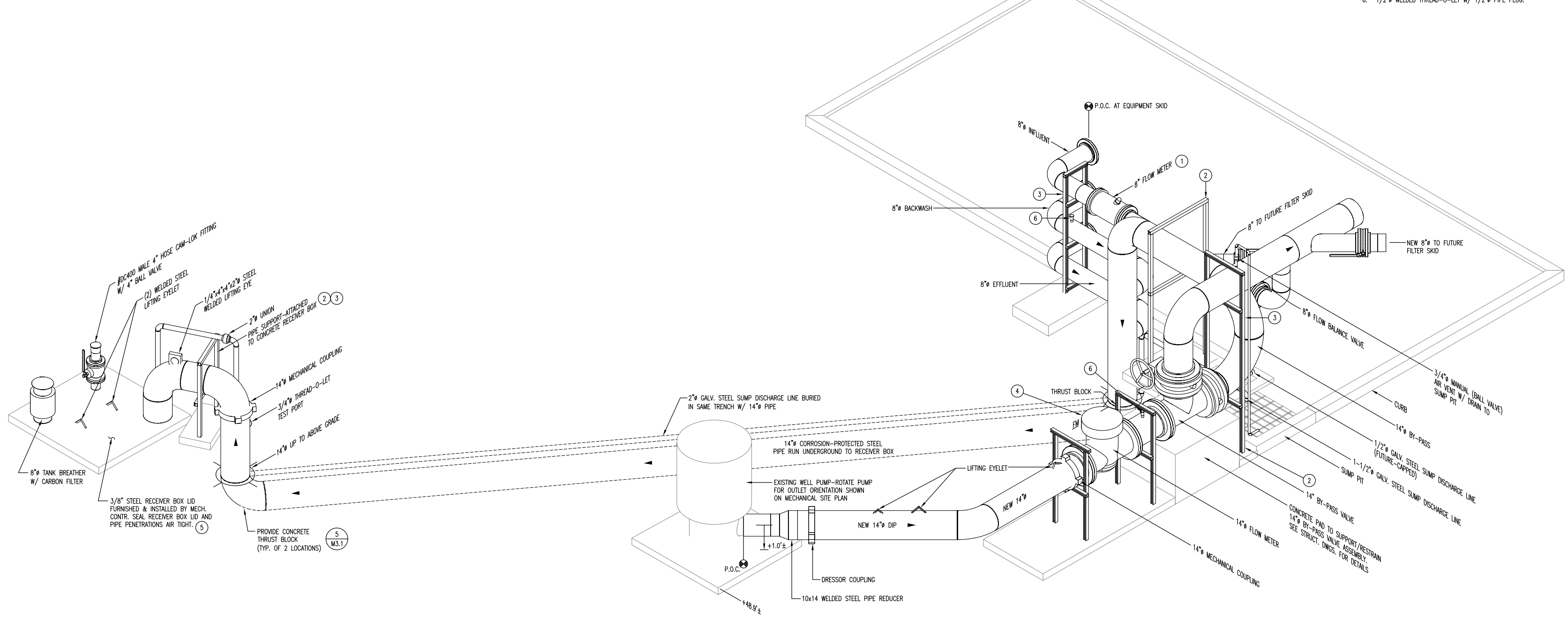
⊕ KEY NOTES:

1. INSTALL 8" FLANGES FOR PIPE LINE FLOW METER. FLOW METERS ARE FURNISHED BY VERTECH AND INSTALLED BY MECH. CONTR. FLOW METER WIRING IS PROVIDED BY OTHERS.
2. ANCHOR PIPE SUPPORT TO MAIN CONCRETE EQUIPMENT PAD, OR TO CONCRETE PADS LOCATED 'AT GRADE'. REFER TO STRUCTURAL DWG'S FOR PAD LOCATION AND SIZES.
3. ALL PIPE SUPPORTS SHALL BE CONSTRUCTED WITH UNISTRUT (P1001) FORMED METAL MEMBERS AND ACCESSORY FITTINGS, OR FULL-WELDED STRUCTURAL STEEL MEMBERS. PROVIDE INTERNAL AND EXTERNAL BRACING OF EACH PIPE SUPPORT TO MAKE IT 'RIGID', INSTALL 1-1/2"x1-1/2" STEEL ANGLE CLIPS AT EACH PIPE SUPPORT TO KEEP PIPE CENTERED.
4. INSTALL 14" FLANGE FOR PIPE LINE FLOW METER. FLOW METER IS FURNISHED BY VERTECH AND INSTALLED BY MECH. CONTR. FLOW METER WIRING IS PROVIDED BY OTHERS.
5. STEEL RECEIVER LID, 3/8" PLATE, FURNISHED AND INSTALLED BY MECH. CONTR. SEE KEYNOTE '13' ON SHEET M1.1.
6. 1/2"ø WELDED THREAD-O-LET W/ 1/2"ø PIPE PLUG.



RID WELL SITE #92 PIPING ISOMETRIC

N.T.S.

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(04/23/12)

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ROOSEVELT IRRIGATION DISTRICT #92
WATER TREATMENT INSTALLATION
43RD AVENUE, 1/4 MI. NORTH OF BUCKEYE, PHOENIX, ARIZONA

Sheet Title: RID WELL SITE #92 PIPING ISOMETRIC

REVISIONS:

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SHEET	M2.1

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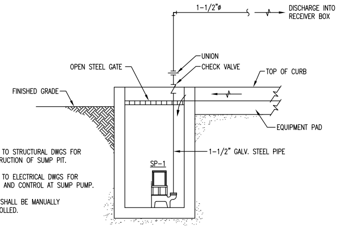
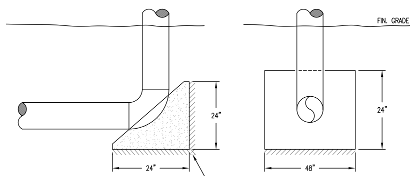


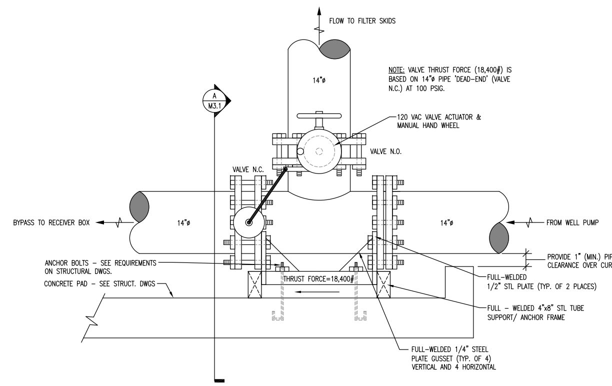
NOTES:
1. REFER TO STRUCTURAL DWGS FOR CONSTRUCTION OF SUMP PIT.
2. REFER TO ELECTRICAL DWGS FOR POWER AND CONTROL AT SUMP PUMP.
3. PUMP SHALL BE MANUALLY CONTROLLED.

4 / M3.1 **SUMP PUMP DETAIL**©
NOT TO SCALE

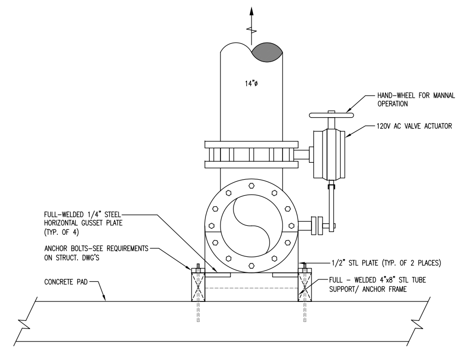


NOTE: POURED CONCRETE SHALL BEAR AGAINST RE-COMPACTED OR UNDISTURBED SOIL.

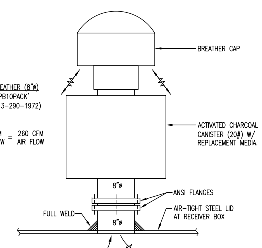
5 / M3.1 **THRUST BLOCK AT PIPING**©
NOT TO SCALE



1 / M3.1 **BY-PASS VALVE DETAIL**©
NOT TO SCALE



2 / M3.1 **SECTION 'A'**
NOT TO SCALE



3 / M3.1 **RECEIVER BOX BREATHER DETAIL**©
NOT TO SCALE

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ROOSEVELT IRRIGATION DISTRICT #92
WATER TREATMENT INSTALLATION
43RD AVENUE, 1/4 MI. NORTH OF BUCKEYE, PHOENIX, ARIZONA

Sheet Title: MECHANICAL DETAILS

REVISIONS:

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SUMP PUMP SCHEDULE

MARK	LOCATION AND SERVICE	GPM	HEAD FEET	MOTOR HP	VOLT/PH	SINGLE OR DUPLEX	MANUFACTURER AND MODEL NUMBER	REMARKS
SP-1	EQUIPMENT PAD SUMP	50	24	3/4	115/60	SINGLE	ZOELLER MODEL N145	NOTES 1,2,3

NOTES:
1. SUMP PUMP SHALL BE FURNISHED AND INSTALLED BY PIPING CONTRACTOR.
2. SUMP PUMP SHALL BE FURNISHED WITHOUT FACTORY-INSTALLED AUTOMATIC CONTROL. MANUAL CONTROL OF PUMP OPERATION SHALL BE PROVIDED THRU MANUAL SWITCH FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR.
3. SUMP PUMP SHALL BE FACTORY EQUIPPED WITH A 20 FOOT, UL LISTED, NEOPRENE POWER CORD WITH MOLDED PLUG AND GROUND WIRE.

AUTOMATIC CONTROL VALVE SCHEDULE

MARK	LOCATION AND SERVICE	VALVE TYPE	BODY DUTY	PIPE CONNECTIONS		VALVE ACTUATOR			MANUFACTURER & MODEL #	REMARKS
				SIZE	TYPE	TYPE	ACTION	POWER IN		
CV-1	EQUIPMENT PAD-BYPASS VALVE	3-WAY (CI.TEE)	DIVERTING	14"ø	150# FLG.	ROTARY ELEC.	2-POS. ON/OFF	120V AC	VSI #3S2000SS-14/1200	NOTES 1,2,3,4,5

NOTES:
1. CONTROL VALVE/ACTUATOR SHALL BE FURNISHED AND INSTALLED BY PIPING CONTRACTOR CONTROL POWER AND CONTROL WIRING SHALL BE FURNISHED AND INSTALLED BY CONTROLS CONTRACTOR.
2. ACTUATOR ENCLOSURE SHALL BE RATED NEMA 4, WATERTIGHT.
3. PIPING CONTRACTOR SHALL REVIEW CONTROL VALVE DETAIL IN DRAWINGS, TO CONFIRM VALVE ORIENTATION AND FLOW DIRECTION, PRIOR TO ORDERING VALVE ASSEMBLY.
4. VALVE ASSEMBLY SHALL CONSIST OF A 14"ø 125# FLANGED DUCTILE-IRON TEE BODY MOUNTED WITH (2)-14"ø THREADED LUG-BODY BUTTERFLY VALVES (EPDM SEAT, 304 SS DISC, 416 SS SHAFT, PTFE BUSHINGS, 316 SS SHAFT-PINS) RATED FOR 100 PSI. ACTUATOR SHALL BE MOUNTED ON PRIMARY (N.O.) VALVE STEM AND CONNECTED TO (N.C.) VALVE STEM BY A STAINLESS STEEL LINKAGE.
5. VALVE/ ACTUATOR SUPPLIER: VSI-VALVE SOLUTIONS, INC. (SALES@VALVESOLUTIONS.COM) OR 770-740-0800.

MECHANICAL GENERAL SPECIFICATIONS

1.00 SCOPE OF WORK

1.1. THE CONTRACTOR IS RESPONSIBLE FOR ALL WORK, MATERIALS, AND LABOR TO SATISFY A COMPLETE WORKING SYSTEM WHETHER SPECIFIED OR IMPLIED.

1.2. ALL WORK IS TO BE PERFORMED IN STRICT COMPLIANCE WITH ALL CODES AND REGULATIONS GOVERNING WORK OF THIS NATURE.

1.3. THE CONTRACTOR SHALL, BEFORE SUBMITTING ANY PROPOSAL, EXAMINE THE PROPOSED SITE AND SHALL DETERMINE FOR HIMSELF THE CONDITIONS THAT MAY EFFECT THE WORK. NO ALLOWANCE SHALL BE MADE IF THE CONTRACTOR FAILS TO MAKE SUCH EXAMINATIONS.

1.4. ALL EQUIPMENT AND MATERIALS SHALL BE AS SPECIFIED OR "APPROVED EQUAL" BY THE ENGINEER.

2.00 ELECTRICAL

2.1. CONTRACTOR TO COORDINATE WITH ELECTRICAL CONTRACTOR FOR LOCATION OF WIRING FOR POWERED EQUIPMENT.

3.00 MISCELLANEOUS

3.1. DO NOT SCALE THIS DRAWING FOR EXACT DIMENSIONS. VERIFY ALL FIGURES, CONDITIONS, AND DIMENSIONS AT THE JOB SITE.

3.2. THE MECHANICAL PLANS ARE INTENDED TO BE DIAGRAMMATICAL AND ARE BASED ON ONE MANUFACTURER'S EQUIPMENT. THEY ARE NOT INTENDED TO SHOW EVERY ITEM IN ITS EXACT LOCATION, THE EXACT DIMENSIONS, OR ALL THE DETAILS OF THE EQUIPMENT. THE CONTRACTOR SHALL VERIFY THE ACTUAL DIMENSIONS OF THE EQUIPMENT PROPOSED TO ENSURE THAT THE EQUIPMENT WILL FIT IN THE AVAILABLE SPACE.

PIPE SUPPORT

1.00 PIPE SUPPORT

1.1. USE 'FORMED METAL' (UNISTRUT) COMPONENTS OR WELDED STRUCTURAL STEEL SHAPES.

1.2. ANCHOR PIPE SUPPORT INTO CONCRETE PADS WITH 5/8"ø EXPANSION BOLTS.

1.3. PAINT UNCOATED STEEL TO MATCH PIPING.

WATER PIPING

1.00 MATERIAL WATER PIPING

1.1. 2" AND SMALLER: SCH. 40 GALVANIZED STEEL WITH THREADED FITTINGS, ASTM A-120.

1.2. 2" AND LARGER: SCH. 40 BLACK STEEL WITH WELDED OR FLANGED FITTINGS, ASTM A-120.

1.3. 2" AND SMALLER UNIONS SHALL BE MALLEABLE IRON BODY FOR FERROUS PIPING, BRONZE BODY FOR COPPER PIPING, GALVANIZED FOR GALVANIZED PIPING, THREADED OR SOLDER ENDS.

1.4. 2-1/2" AND LARGER UNIONS SHALL 150# BE FORGED STEEL FLANGES FOR FERROUS PIPING.

1.5. BALL VALVES - GENERAL SHUTOFF SERVICE OF WATER:
   A. 2" AND SMALLER BALL VALVES SHALL BE 150SWP, 400WOG, BRONZE TWO PIECE BODY, FULL PORT, STAINLESS STEEL BALL, TEFLON SEAT AND RINGS, LEVER HANDLE AND SOLDER OR THREADED ENDS.

1.6. BUTTERFLY VALVES - GENERAL SHUTOFF SERVICE OF WATER:
   A. 2-1/2" AND LARGER BUTTERFLY VALVES SHALL BE CAST IRON BODY, BRONZE DISC, SEATS AND SEATS SHALL BE CAPABLE OF SERVICE TO 250F, LUG ENDS, EXTENDED NECK, 10 POSITION LEVER HANDLE WITH MEMORY STOP.

1.7. CHECK VALVES - GENERAL SERVICE OF WATER:
   A. 2" AND SMALLER CHECK VALVES SHALL BE 150SWP, 300WOG, BRONZE BODY, SWING CHECK DISC, THREADED ENDS, SUITABLE FOR HORIZONTAL OR VERTICAL INSTALLATION.
   B. 2-1/2" AND LARGER CHECK VALVES SHALL BE 125SWP, 200WOG, CAST IRON BODY, SWING CHECK DISC, BRONZE TRIM, FLANGED ENDS, SUITABLE FOR HORIZONTAL OR VERTICAL INSTALLATION.

1.8. BALANCING VALVES - GENERAL SHUTOFF AND BALANCING SERVICE OF WATER:
   A. 3" AND SMALLER BALANCING VALVE SHALL BE BRONZE BODY, BRASS BALL, TFE SEAT RINGS, DIFFERENTIAL PRESSURE READOUT PORTS WITH CHECK VALVES, DRAIN/PURGE PORT,MEMORY STOP FEATURE, CALIBRATED POINTER INDICATING DEGREE OF VALVE OPENING, TIGHT SHUTOFF WITH SOLDER OR THREADED ENDS.
   B. 5" PIPE SIZE AND LARGER BALANCING VALVE SHALL BE CAST IRON BODY, BRASS VANE, DIFFERENTIAL PRESSURE READOUT PORTS WITH CHECK VALVES, MEMORY STOP FEATURE, CALIBRATED POINTER WITH FLANGED ENDS. BELL & GOSSETT #CB-8F.

1.9. TEST SHALL BE PERFORMED BY CONTRACTOR AND WITNESSED BY AUTHORIZED INSPECTOR. ALL PIPING SHALL BE TESTED TO WORKING PRESSURE OF NOT LESS THAT 100 PSIG. WHERE OPERATING PRESSURES EXCEED 50 PSIG, TEST PRESSURE SHALL BE TWO TIMES THE WORKING PRESSURE. TEST DURATION SHALL BE AT LEAST 30 MINUTES.

1.10. PAINT EXPOSED PIPING (EXCEPT GALVANIZED PIPE) WITH CORROSION RESISTANT PRIMER AND FLAT ENAMEL FINISH COAT. FINISH COAT COLOR SELECTION SHALL BE BY OWNER.

1.11. WRAP DIRECT-BURIED STEEL PIPE WITH 20-MIL PVC TAPE OR CONTINUOUS SLEEVE. EXTEND PIPE WRAP TO 12" ABOVE GRADE AND SEAL WATER TIGHT.

RECORD DRAWING
(04/23/12)

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ROOSEVELT IRRIGATION DISTRICT #92
WATER TREATMENT INSTALLATION
43RD AVENUE, 1/4 MI. NORTH OF BUCKEYE, PHOENIX, ARIZONA
Sheet Title:
MECHANICAL SCHEDULES & SPECIFICATIONS

REVISIONS:

DATE: 12/14/2011
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SCALE: NONE
PROJECT NO: 011175.00
SHEET
M4.1

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ELECTRICAL DRAWING SPECIFICATION

1.0 GENERAL:

1.1. ALL ELECTRICAL WORK SHALL COMPLY WITH ALL APPLICABLE CITY, COUNTY, STATE, AND SERVING ELECTRICAL UTILITY CODES, ORDINANCES, RULES, AND REGULATIONS. THE ENTIRE INSTALLATION SHALL COMPLY WITH OR SURPASS THE REQUIREMENTS OF THE ADOPTED EDITION OF THE NATIONAL ELECTRICAL CODE.

1.2. THE COMPLETE INSTALLATION SHALL BE IN ACCORDANCE WITH THE A.D.A.A.G. (AMERICANS WITH DISABILITIES ACT ACCESSIBILITY GUIDELINES).

1.3. UNLESS SPECIFICALLY NOTED, ALL MATERIAL SHALL BE NEW, OF FIRST CLASS QUALITY, SHALL BE U.L. LISTED AND LABELED, AND FREE OF DEFECTS.

1.4. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY LOSS OR DAMAGE CAUSED BY HIM OR HIS WORKMEN TO THE SITE AND EXISTING SYSTEMS DURING THE COURSE OF CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING OR REPLACING SUCH LOSS OR DAMAGE AT NO ADDITIONAL COST TO THE OWNER.

1.5. DRAWINGS ARE DIAGRAMMATIC IN NATURE AND CANNOT SHOW EVERY CONNECTION. JUNCTION BOXES, WIRE, CONDUIT, ETC. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING A COMPLETE AND FUNCTIONAL ELECTRICAL SYSTEM.

1.6. ALL EXISTING CONDUIT RUNS ARE NOT SHOWN. VERIFY EXISTING CONDUIT LOCATIONS IN FIELD.

1.7. NO DESIGN CHANGES SHALL BE MADE TO THE ELECTRICAL SYSTEM WITHOUT THE PRIOR APPROVAL OF THE ELECTRICAL ENGINEER AND THE ELECTRICAL INSPECTOR.

2.0. SCOPE OF WORK:

2.1. FURNISH ALL MATERIALS, TOOLS AND LABOR AND PAY ALL PERMITS AND FEES REQUIRED FOR THE ELECTRICAL INSTALLATION UNLESS OTHERWISE NOTED ON PLANS. ALL PERMITS AND INSPECTIONS SHALL BE PROVIDED AS REQUIRED BY THE LOCAL CODE AUTHORITY.

2.2. THE CONTRACTOR SHALL VISIT THE SITE TO DETERMINE EXISTING CONDITIONS PRIOR TO SUBMITTING A BID.

2.3. THIS PROJECT CONSISTS OF DEMOLITION, REMODEL, AND NEW CONSTRUCTION IN THE NOTED AREAS, VERIFY WITH OWNER IN FIELD ALL DEMOLITION WORK PRIOR TO BID.

2.4. ALL CONDUIT AND CONDUCTORS REMOVED UNDER DEMOLITION WORK SHALL NOT BE REUSED.

2.5. UNLESS NOTED OTHERWISE UNDER THE PROJECTS GENERAL CONDITIONS, AT THE COMPLETION OF THIS PROJECT, TURN OVER TO OWNER'S REPRESENTATIVE ALL REMOVED DEVICES AND/OR EQUIPMENT.

2.6. WHERE IT IS IMPOSSIBLE TO REMOVE CONDUITS AS SHOWN ON DRAWINGS (SUCH AS BELOW OR EMBEDDED IN CONCRETE FLOOR SLAB), REMOVE CONDUCTORS, CUT, CAP, AND ABANDON CONDUIT BELOW FLOOR LINE.

2.7. THE CONTRACTOR SHALL VERIFY LOCATION OF ALL EXISTING SITE UTILITIES BEFORE DIGGING TRENCHES.

2.8. VERIFY AND COORDINATE THE FOLLOWING WITH THE MECHANICAL AND CONTROLS CONTRACTOR:

a)LOCATION OF EQUIPMENT; E.G. MOTORS, HEATERS, T-STATS, CONTROL PANELS, ETC.

b)EQUIPMENT ELEC CHARACTERISTICS; E.G. VOLTAGE, PHASE, HP, AMPS, CONTROL WIRING, ETC.

2.9. CONCEAL ALL CONDUIT WORK. WHERE THIS IS IMPOSSIBLE, CONTACT OWNER AND COORDINATE IN FIELD.

2.10. COORDINATE ALL POWER OUTAGES WITH THE OWNERS REPRESENTATIVE IN ADVANCE.

2.11. RESTORE ALL SURFACES THAT WERE DAMAGED (PAINTING, PATCHING, PLASTERING, ETC.,) DUE TO THE INSTALLATION OR REMOVAL OF ELECTRICAL ITEMS.

2.12. PANEL DESIGNATIONS SHOWN ON THESE DRAWINGS ARE GIVEN FOR CLARIFICATION OF CIRCUITING ONLY AND MAY NOT CORRESPOND TO THE DESIGNATIONS FOUND IN THE FIELD.

2.13. FOR EQUIPMENT BEING REMOVED OR REPLACED, THE ELECTRICAL CONTRACTOR SHALL DE-ENERGIZE THE EQUIPMENT AND MAKE IT SAFE PRIOR TO REMOVAL. COMPLY WITH OSHA REQUIREMENTS FOR LOCKING OUT AND TAGGING EQUIPMENT TO PREVENT INADVERTENT RE-ENERGIZING.

2.14. ELECTRICAL CONTRACTOR SHALL PROVIDE ALL NECESSARY POWER TRENCHING, BACKFILL, CONCRETE PADS FOR TRANSFORMER AND CONDUIT STUBS INTO TRENCH AS REQUIRED BY POWER CO. AND TO THEIR SPECIFICATIONS.

2.15. ACQUIRE TWO COMPLETE SETS OF CONTRACT DRAWINGS AND FURNISH SETS TO THE ELECTRICAL POWER UTILITIES FOR UTILITY DESIGN AND COORDINATION.

2.16. INCLUDE ALL CHARGES THAT MAY APPLY FROM THE POWER UTILITY COMPANIES. PROVIDE ALL WORK REQUIRED FOR THE INSTALLATION OF UTILITY SERVICES.

2.17. PRIMARY SERVICE FOR POWER WERE NOT CONFIRMED AT TIME OF PRINTING AND ARE SHOWN FOR ESTABLISHMENT OF A BASE PRICE ONLY.

2.18. FULLY GUARANTEE THE INSTALLATION FOR A PERIOD OF ONE YEAR FROM THE DATE OF FINAL ACCEPTANCE BY THE OWNER, AGAINST ANY IMPERFECT WORKMANSHIP AND FUNCTION OF EQUIPMENT. ANY WORK IDENTIFIED TO BE DEFECTIVE WITHIN THE GUARANTEE PERIOD SHALL BE PROMPTLY REPAIRED OR REPLACE AT NO ADDITIONAL COST THE THE OWNER.

3.0. SUBMITTALS:

3.1. PROVIDE A MINIMUM OF SIX (6) SETS OF SHOP DRAWINGS FOR THE FOLLOWING; LIGHTING FIXTURES, DISCONNECT SWITCHES, PANELBOARDS, STARTERS, SERVICE ENTRANCE EQUIPMENT. ALL SHOP DRAWING SUBMITTALS SHALL BE BOUND, LABELED, AND MARKED TO IDENTIFY EXACTLY WHICH ITEM SHALL BE PROVIDED. SUBMIT ALL SHOP DRAWINGS FOR REVIEW AT THE SAME TIME.

3.2. SUBMIT UTILITY COORDINATION DRAWINGS AS REQUIRED BY THE LOCAL UTILITIES.

4.0. SUBSTITUTIONS:

4.1. EQUIPMENT LISTED BY BRAND NAME OR CATALOG NUMBER SHALL BE INTERPRETED AS ESTABLISHING A STANDARD OF QUALITY. SUBSTITUTIONS WILL BE CONSIDERED IF A WRITTEN REQUEST IS SUBMITTED TO THE ARCHITECT/ENGINEER A MINIMUM OF EIGHT (8) DAYS PRIOR TO THE BID DATE. THE REQUEST SHALL INCLUDE THE FOLLOWING:

a)A STATEMENT DECLARING THAT THE EQUIPMENT PROPOSED IS EQUAL TO THAT SPECIFIED BY HAVING THE SAME PHYSICAL CHARACTERISTICS AND DIMENSIONS, AND WILL MEET THE DRAWING LAYOUT AND STRUCTURAL CONDITIONS.

b)THE SPECIFIED AND SUBMITTAL CATALOG NUMBERS OF THE EQUIPMENT UNDER CONSIDERATION.

c)AN EQUIPMENT CUT SHEET WITH DRAWING, DIMENSIONS AND SPECIFICATIONS.

d)SAMPLE MAY BE REQUIRED AT THE ENGINEERS DISCRETION.

4.2. ALL LIGHTING FIXTURES SUBMITTED FOR APPROVAL MUST HAVE THE INFORMATION AS DESCRIBED ABOVE, AS WELL AS THE FOLLOWING INFORMATION:

a)MANUFACTURE'S DATA SHOWING CATALOG NUMBERS.

b)CONSTRUCTION DETAILS.

c)PHOTOMETRIC OR ISOLUX CURVES.

d)TABLE OF COEFFICIENTS OF UTILIZATION.

e)RECOMMENDED MAINTENANCE FACTOR AND BRIGHTNESS READING.

f)FOOTCANDLE CALCULATIONS AS REQUESTED.

4.3. ANY CONFLICT ARISING FROM THE USE OF SUBSTITUTED MATERIAL SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR, WHO SHALL BEAR ALL COSTS REQUIRED TO MAKE THE EQUIPMENT COMPLY WITH THE INTENT OF THE PLANS AND SPECIFICATIONS.

4.4. NO MATERIAL OR APPARATUS SHALL BE SUBSTITUTED AFTER THE BID OPENING UNLESS APPROVED IN WRITING BY THE ENGINEER.

4.5. MANUFACTURERS SHALL NOT BE CONSIDERED APPROVED AS EQUAL UNTIL LISTED IN A FORMAL ADDENDUM. LISTING AS EQUAL DOES NOT RELIEVE THE MANUFACTURER FROM MEETING THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.

5.0. CONDUIT AND WIRE:

5.1. WHERE WIRING AND CONDUIT SIZES ARE INDICATED FOR HOMERUNS, THESE SIZES APPLY TO THE ENTIRE LENGTH FROM THE PROTECTIVE DEVICE IN THE PANEL TO THE EQUIPMENT OR LAST WIRING DEVICE.

5.2. SCHEDULE 40 PVC CONDUIT SHALL BE USED FOR ALL UNDERGROUND EXTERIOR CONDUIT, IN SLABS, BELOW SLAB ON GRADE AND IN CONCRETE OR MASONRY WALLS. ALL BENDS OVER 30 DEGREES SHALL BE MADE WITH WRAPPED INTERMEDIATE METAL CONDUIT. USE LONG SWEEP FITTINGS FOR ALL 90 DEGREE BENDS. ALL PLASTIC CONDUIT, EXCEPT THAT USED FOR COMMUNICATIONS, SHALL BE PROVIDED WITH A CODE SIZED EQUIPMENT GROUNDING CONDUCTOR. DO NOT USE PVC IN EXPOSED LOCATIONS.

5.3. ALL BELOW GRADE CONDUIT SHALL BE INSTALLED A MINIMUM OF 24 INCHES BELOW FINISHED GRADE. BELOW GRADE CONDUIT SHALL BE 3/4 INCH DIAMETER, MINIMUM.

5.4. ALL WIRING SHALL BE IN CONDUIT. RIGID OR INTERMEDIATE METALLIC CONDUIT (IMC) SHALL BE USED FOR ALL EXPOSED CONDUIT, WHERE SUBJECT TO MOISTURE, OR WHERE SUBJECT TO PHYSICAL DAMAGE.

5.5. FLEXIBLE METALLIC CONDUIT SHALL BE USED FOR ALL CONNECTIONS TO MOTORS, OR EQUIPMENT SUBJECT TO VIBRATION. LIQUID-TIGHT CONDUIT SHALL BE USED WHERE SUBJECT TO MOISTURE. BOND FLEXIBLE CONDUIT PER N.E.C. REQUIREMENTS.

5.6. INSTALL A PULL WIRE IN ALL EMPTY CONDUITS.

5.7. ALL CONDUCTORS SHALL BE COPPER. MINIMUM BRANCH CIRCUIT WIRING SHALL BE #12 AWG. OTHER SIZES AS INDICATED ON THE DRAWINGS OR AS REQUIRED BY CODE. INSULATION SHALL BE THHN/THWN FOR CONDUCTORS #6 AND SMALLER AND XHHW FOR #4 AND LARGER.

5.8. CIRCUIT NUMBERS ARE SHOWN FOR CIRCUIT IDENTIFICATION. CIRCUITING SHALL AGREE WITH NUMBERING ON THE PANEL SCHEDULE PROVIDED. BALANCE THE LOAD AS EVENLY AS POSSIBLE BETWEEN EACH PHASE LEG.

5.9. ALL SECONDARY SERVICES, FEEDERS AND BRANCH CIRCUIT CONDUCTORS SHALL BE COLOR CODED AS FOLLOWS:

208/120 VOLT	PHASE	480/277 VOLT
BLACK	A	BROWN
RED	B	ORANGE
BLUE	C	YELLOW
WHITE	NEUTRAL	GRAY
GREEN	GROUND	GREEN

5.10. CONTROL WIRES SHALL BE PURPLE OR VIOLET. ALL BRANCH CIRCUIT CONDUCTORS SHALL HAVE SOLID COLOR COMPOUND OR SOLID COLOR COATING. COORDINATE EXACT REQUIREMENTS WITH CONTROLS CONTRACTOR AND NOTIFY ENGINEER OF ANY DISCREPANCIES.

5.11. WRAP UNDERGROUND STEEL CONDUIT WITH HALF LAPPED SCOTCH #50 TAPE OR PROVIDE PVC COATED PIPE.

6.0. GROUNDING:

6.1. GROUNDING OF ELECTRICAL SERVICE AND EQUIPMENT SHALL BE PER THE APPLICABLE SECTIONS OF N.E.C. ARTICLE 250, AND AS SHOWN ON THE DRAWINGS.

6.2. PROVIDE AN INSULATED EQUIPMENT GROUNDING CONDUCTORS, IN ACCORDANCE WITH N.E.C. 250-122, IN ALL CONDUITS WITH CONDUCTORS.

7.0. NOT USED:

8.0. EQUIPMENT:

8.1. ALL ELECTRICAL COMPONENTS INSTALLED OUTDOORS, EXPOSED TO WEATHER OR IN DAMP LOCATIONS SHALL BE WEATHERPROOF, NEMA 3R.

8.2. THE SERVICE ENTRANCE ASSEMBLY AND ALL OF ITS COMPONENTS SHALL BE BRACED TO WITHSTAND A MINIMUM OF 100K OF AVAILABLE FAULT CURRENT SUPPLIED BY THE POWER COMPANY.

8.3. PROVIDE AT THE COMPLETION OF THE PROJECT NEATLY TYPED ACCURATE PANELBOARD DIRECTORIES INDICATING ALL BRANCH CIRCUITS AND SPARES. ALL SPARES SHALL BE LEFT IN THE OFF POSITION.

8.4. PROVIDE A 120 VOLT, 20 AMP, WEATHERPROOF GFCI RECEPTACLE WITHIN 25 FEET AND ACCESSIBLE TO ALL MECHANICAL EQUIPMENT.

8.5. LABEL ALL SERVICE ENTRANCE EQUIPMENT, PANELBOARDS AND MAJOR SINGLE LINE COMPONENTS WITH PERMANENTLY AFFIXED PHENOLIC LETTERING (2" MINIMUM). LABEL ALL RECEPTACLES, DEVICES, JUNCTION BOXES, DISCONNECT SWITCHES, LUMINAIRES, ETC. WITH VINYL ADHESIVE TAPE INDICATING PANEL AND CIRCUIT NUMBER.

8.6. PANELBOARDS SHALL HAVE COPPER BUS, WITH FULL NEUTRAL AND GROUND BUSSES. MINIMUM AIC RATING SHALL BE 10,000 AMPS. PANELS SHALL HAVE LOCKING DOORS WITH MATCHING KEYS. PANELS SHALL BE MANUFACTURED BY SQUARE "D", GENERAL ELECTRIC, CUTLER HAMMER OR SIEMENS. LOAD CENTERS ARE NOT ACCEPTABLE.

8.7. ALL BRANCH CIRCUIT PANEL BOXES SHALL BE MINIMUM 5-3/4 INCHES DEEP AND 20 INCHES WIDE. PROVIDE MOUNTING HARDWARE IN ALL SPACES FOR FUTURE DEVICES.

8.8. ALL SAFETY SWITCHES SHALL BE HEAVY DUTY TYPE, WITH COVER INTERLOCK AND HANDLE LOCK OFF PROVISIONS. SWITCHES SHALL BE MANUFACTURED BY SQUARE "D", GENERAL ELECTRIC, CUTLER HAMMER OR SIEMENS. RATING AND FUSING SHALL BE AS SHOWN ON THE DRAWINGS. COORDINATE FUSING FOR SWITCHES SERVING MECHANICAL EQUIPMENT WITH MANUFACTURERS RECOMMENDED FUSE SIZE.

8.9. DRY TYPE TRANSFORMERS SHALL BE 60 HZ, WITH KVA RATINGS AS NOTED ON THE DRAWINGS. TRANSFORMERS SHALL BE TOTALLY ENCLOSED, EXCEPT FOR VENTILATION OPENINGS AND BE PROVIDED WITH WEATHER HOOD SUITABLE FOR OUTDOOR INSTALLATION. TRANSFORMERS SHALL HAVE A SHEET STEEL ENCLOSURE, AND CORE AND COIL ASSEMBLY SHALL BE ISOLATED FROM THE MOUNTING FRAME WITH VIBRATION ISOLATORS. PROVIDE SIX (6), 2-1/2% TAPS, FOUR (4) BELOW AND TWO (2) ABOVE NORMAL. INSTALL TRANSFORMER A MINIMUM OF 6 INCHES FROM ADJACENT WALLS OR STRUCTURES. TRANSFORMERS SHALL BE MANUFACTURED BY SQUARE "D", SIEMENS, GENERAL ELECTRIC, OR CUTLER HAMMER.

8.10. TIME CLOCKS SHALL MEET THE REQUIREMENTS OF THE 2006 IECC. PROVIDE WITH COMBINATION 7-DAY AND SEASONAL PROGRAM SCHEDULE AND MINIMUM 4 HOUR BATTERY BACK UP. INTERMATIC MODEL #ET70115CR OR EQUAL.

9.0. WIRING DEVICES:

9.1. SWITCHES SHALL BE OF THE QUIET TYPE, SPECIFICATION GRADE, 20 AMP, 120/277 VOLT AC. HUBBELL 1221 (SINGLE POLE), 1223 (THREE-WAY). EQUAL BY LEVITON OR PASS & SEYMOUR.

9.2. RECEPTACLES, UNLESS NOTED OTHERWISE, SHALL BE DUPLEX, 120 VOLT, 20 AMP, GROUNDING TYPE, NEMA 5-20R. HUBBELL 5362, OR EQUAL BY LEVITON OR PASS & SEYMOUR.

9.3. PROVIDE ALL WIRING DEVICES WITH APPROPRIATE COVERPLATES. PROVIDE BLANK COVER PLATES FOR ALL EMPTY BOXES. COVERPLATES SHALL BE LEXAN, PLASTIC OR STAINLESS STEEL IN FINISHED AREA. GALVANIZED COVERPLATES MAY BE USED IN EQUIPMENT ROOMS.

ELECTRICAL ABBREVIATIONS AND SYMBOL SCHEDULE:

NOTE: NOT ALL SYMBOLS MAY BE USED ON THIS PROJECT. ALL MOUNTING HEIGHTS TO CENTER OF BOX, UNO. ALL DEVICES SHALL COMPLY WITH ADA REQUIREMENTS, WHERE APPLICABLE.

ABBREVIATIONS:

A	AMPERES
AC	ALTERNATING CURRENT
AF	AMPERES FRAME (RATING)
AFC	AVAILABLE FAULT CURRENT
AFG	ABOVE FINISHED GRADE
AFF	ABOVE FINISHED FLOOR
AHU	AIR HANDLING UNIT
AIC	AMPERES INTERRUPTING CAPACITY
AL	ALUMINUM
AT	AMPERES TRIP (SETTING)
AUX	AUXILIARY
BRKR	BREAKER
C	CONDUIT
CB	CIRCUIT BREAKER
CKT	CIRCUIT
COMB	COMBINATION
COMM	COMMUNICATIONS
CP	CONTROL PANEL
CPT	CONTROL POWER TRANSFORMER
CT	CURRENT TRANSFORMER
CU	COPPER
DC	DIRECT CURRENT
DISC	DISCONNECT
DP	POWER DISTRIBUTION PANEL
DWG	DRAWING
EC	ELECTRICAL CONTRACTOR
EDF	ELECTRIC DRINKING FOUNTAIN
EF	EXHAUST FAN
EG	EQUIPMENT GROUND
ELEC	ELECTRICAL – ELECTRIC
EM	EMERGENCY
EMT	ELECTRICAL METALLIC TUBING
EO	ELECTRICALLY OPERATED
F	FUSE
FA	FIRE ALARM
FAAP	FIRE ALARM ANNUNCIATE PANEL
FACP	FIRE ALARM CONTROL PANEL
FSD	FIRE SMOKE DAMPER
FDR	FEEDER
FLA	FULL LOAD AMPERES
FLEX	FLEXIBLE
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GND	GROUND
HID	HIGH INTENSITY DISCHARGE
HP	HORSE POWER
HOA	HAND-OFF-AUTO
JB	JUNCTION BOX
KV	KILOVOLTS
KVA	KILOVOLTS-AMPERES
KW	KILOWATTS
LTG	LIGHTING
MBJ	MAIN BONDING JUMPER
MC	MECHANICAL CONTRACTOR
MCA	MINIMUM CIRCUIT AMPACITY
MCC	MOTOR CONTROL CENTER
MECH	MECHANICAL
MH	MANHOLE
MISC	MISCELLANEOUS
MTD	MOUNTED
MTG	MOUNTING
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NEU	NEUTRAL
NF	NON-FUSED
NIC	NOT IN CONTRACT
NL	NIGHT LIGHT
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OL'S	OVERLOADS
P	POLE
PA	PUBLIC ADDRESS
PB	PUSH BUTTON
PH	PHASE
PNL	PANEL
PT	POTENTIAL TRANSFORMER
PWR	POWER
RECP	RECEPTACLE
RLA	RUNNING LOAD AMPERES
RSC	RIGID STEEL CONDUIT
RTU	ROOF TOP UNIT
SCHED	SCHEDULE
SES	SERVICE ENTRANCE SECTION
SS	SPECIAL SYSTEMS
SWBD	SWITCHBOARD
TMB	TELEPHONE MOUNTING BOARD
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
V	VOLTS
VP	VANDAL PROOF
W	WIRE
WG	WIRE GUARD
WH	WATER HEATER
WP	WEATHER PROOF (WHILE IN USE)

GENERAL SYMBOLS:

- RECESSED OR SURFACE JUNCTION BOX IN ACCESSIBLE LOCATION WITH FLEXIBLE CONDUIT CONNECTION.
- MOTOR, HP, VOLTAGE, & PHASE AS INDICATED MECH EQUIP SCHEDULE.
- ELECTRICAL PANELBOARD, 480/277V, 3PH, 4W, WITH GND, UNO. FLUSH/SURFACE MOUNT AT +6'-0" AFF TO TOP. STUB OUT THREE 3/4"C INTO ACCESSIBLE CEILING SPACE.
- ELECTRICAL PANELBOARD, 208/120V, 3PH, 4W WITH GND, UNO. FLUSH/SURFACE MOUNT AT +6'-0" AFF TO TOP. STUB OUT THREE 3/4"C INTO ACCESSIBLE CEILING SPACE.
- KVA TRANSFORMER, TYPE AND RATING AS SPECIFIED ON PLAN.
- SERVICE ENTRANCE SECTION, DISTRIBUTION PANELBOARD, OR MOTOR CONTROL CENTER, AS SPECIFIED ON PLAN.
- CONDUIT CONCEALED IN FINISHED AREAS OR ABOVE CEILING SPACE.
- UNDERGROUND CONDUIT OR CONCEALED IN CONCRETE OR BELOW FLOOR AS NOTED.
- CONDUIT TURNING UP
- CONDUIT TURNING DOWN
- CONDUIT STUB OUT, AS NOTED ON PLANS
- HOME RUN TO PANELBOARD OR AS NOTED. ALL CONDUCTORS SHALL BE COPPER & HAVE CODE SIZED GROUNDING CONDUCTORS. MINIMUM BRANCH CIRCUIT WIRING SHALL BE #12 AWG. OTHER SIZES AS INDICATED ON THE DRAWINGS, ELECTRICAL SCHEDULES, OR AS REQUIRED BY CODE. INSULATION SHALL BE THHN/THWN FOR CONDUCTORS #6 AND SMALLER AND XHHW FOR #4 AND LARGER.

SINGLE LINE DIAGRAM SYMBOLS:

- LSIG LONG-TIME/SHORT-TIME/INSTANTANEOUS/GROUND FAULT TRIP SETTINGS
- CIRCUIT BREAKER
- FUSIBLE SWITCH, SIZE AS INDICATED ON PLANS
- MOTOR STARTER, # INDICATES NEMA SIZE
- 480V DRAW-OUT CIRCUIT BREAKER
- DRAW-OUT FUSE
- COMBINATION MOTOR CONTROLLER, FUSIBLE SWITCH TYPE
- COMBINATION MOTOR CONTROLLER, CIRCUIT BREAKER TYPE
- GROUND
- METER
- GFP GROUND FAULT PROTECTION
- CURRENT TRANSFORMER
- DPM DIGITAL POWER METER
- DISTRIBUTION TRANSFORMER
- DELTA CONNECTION
- WYE CONNECTION WITH GROUND
- FEED THROUGH LUG CONNECTION
- ELECTRICAL PANEL BOARD, MAIN LUG ONLY
- ELECTRICAL PANEL BOARD, MAIN CIRCUIT BREAKER

CONTROLS SYMBOLS:

NOTE: PROVIDE NEMA 3R ENCLOSURE IN EXTERIOR APPLICATIONS.

- $ SINGLE POLE TOGGLE SWITCH MTD AT +48" AFF
- $_M SINGLE POLE KEY OPERATED SWITCH MTD AT +48" AFF
- $_M HP RATED MANUAL MOTOR STARTER WITH SWITCH CONTROL & THERMAL OVERLOAD PROTECTION.
- MOTOR CONTROLLER. FURNISHED WITH EQUIPMENT.
- MOTOR CONTROLLER. FURNISHED BY ELECTRICAL CONTRACTOR.
- HEAVY DUTY SAFETY DISCONNECT SWITCH, 250V-30A-3P, UNO. HP RATED, REFER TO EQUIP SCHEDULE(S) FOR FUSES AND OTHER SPECIFICATIONS
- COMBINATION MOTOR STARTER/DISCONNECT SWITCH, FUSIBLE WITH 120V CONTROL TRANSFORMER, HOA SWITCH, AND PILOT LIGHT IN ENCLOSURE. FUSE PER EQUIPMENT MANUFACTURER'S RECOMMENDATIONS OR EQUIP SCHEDULE SPECIFICATIONS. SUBSCRIPT INDICATES STARTER SIZE.
- VFD VARIABLE FREQUENCY DRIVE. FURNISHED BY MECHANICAL CONTRACTOR, INSTALLED BY ELECTRICAL CONTRACTOR.
- TS TIME SWITCH
- PC PHOTOCELL. ROOF MOUNTED, UNO

POWER SYMBOLS:

NOTE: WEATHER PROOF WHERE OUTSIDE MTD AT +72" AFG, UNO

- SPECIAL PURPOSE RECEPTACLE, 250V-400V, NEMA CONFIG & MTG HEIGHT AS SPECIFIED ON EQUIP SCHEDULE OR AS REQUIRED FOR INTENDED USE.
- DUPLEX RECEPTACLE, 20A-2P-3W, NEMA 5-20R, MTD AT +16" AFF, UNO
- DOUBLE DUPLEX RECEPTACLE, (2) 20A-2P-3W, NEMA 5-20R
- SINGLE RECEPTACLE, 30A-2P-3W, NEMA 5-30R MTD AT +16" AFF, UNO
- SINGLE, DUPLEX, OR DBL-DUPLEX RECP W/SWITCHED LEG MTD AT +16", UNO

LIGHTING SYMBOLS:

NOTE: REFER TO LIGHTING FIXTURE SCHEDULE FOR LUMINAIRE SPECIFICATIONS.
NOTE: SUBSCRIPT INDICATES LUMINAIRE TYPE.

- DOUBLE OR SINGLE ARM POLE MTD AREA LIGHT WITH CONCRETE BASE
- BOLLARD OR POST MTD AREA LIGHT
- SURFACE CEILING MTD INCANDESCENT, FLUORESCENT, OR HID FIXTURE
- SURFACE WALL MTD INCANDESCENT, FLUORESCENT, OR HID FIXTURE

GENERAL PROJECT NOTES:

A. ALL WORK TO BE PERFORMED IN ACCORDANCE WITH THE N.E.C. AND ALL APPLICABLE LOCAL CODES AND ORDINANCES.

B. ALL CONTRACTORS SHALL VERIFY LOCATION OF ALL EXISTING SITE UTILITIES BEFORE DIGGING TRENCHES.

C. THE ELECTRICAL CONTRACTOR SHALL VERIFY REQUIREMENTS FOR EQUIPMENT FURNISHED BY OTHERS TO BE CONNECTED TO THE THE ELECTRICAL SYSTEM. THE ELECTRICAL CONTRACTOR SHALL PROVIDE ALL MATERIALS NECESSARY, SUCH AS WIRE, CONDUIT, FUSE, TRANSFORMERS, ETC. FOR PROPER INSTALLATION AND ELECTRICAL OPERATION OF SUCH EQUIPMENT.

D. ELECTRICAL CONTRACTOR SHALL CONTACT THE ENGINEERS OFFICE IN WRITING WITH A REQUEST FOR INFORMATION (RFI) PRIOR TO PROCEEDING WITH ANY WORK NOT CLEARLY SHOWN IN DOCUMENTS HEREIN. ENGINEER WILL NOT ASSUME RESPONSIBILITY FOR WORK NOT AUTHORIZED TO CHANGES TO CONTRACT DOCUMENTS.

OBSERVATION SCHEDULE:

1. CONTACT THE ENGINEER 48 HOURS PRIOR TO SCHEDULING AN OBSERVATION FOR ANY INSPECTION BY THE LOCAL JURISDICTION. THE ENGINEER, OR HIS REPRESENTATIVE SHALL VERIFY COMPLIANCE WITH THESE DOCUMENTS. ANY WORK THAT DOES NOT COMPLY WITH THESE DOCUMENTS SHALL BE CORRECTED BY THE ELECTRICAL CONTRACTORS EXPENSE.

2. PUNCH WALK-THROUGH, AFTER ENERGIZING ALL EQUIPMENT.

REFERENCE SYMBOLS

- EQP / f — MECH EQUIP IDENTIFICATION. REFER TO EQUIP SCHED FOR ELECTRICAL REQUIREMENTS. EQUIPMENT TAG NUMBER
- f — FEEDER IDENTIFICATION. REFER TO FEEDER SCHED FOR CONDUCTOR DETAILS
- f1 — AVAIL FAULT CURRENT IDENTIFICATION. REFER TO AFC TABLE FOR FURTHER DETAILS

SHEET INDEX

RECORD DRAWING (4/23/2012)

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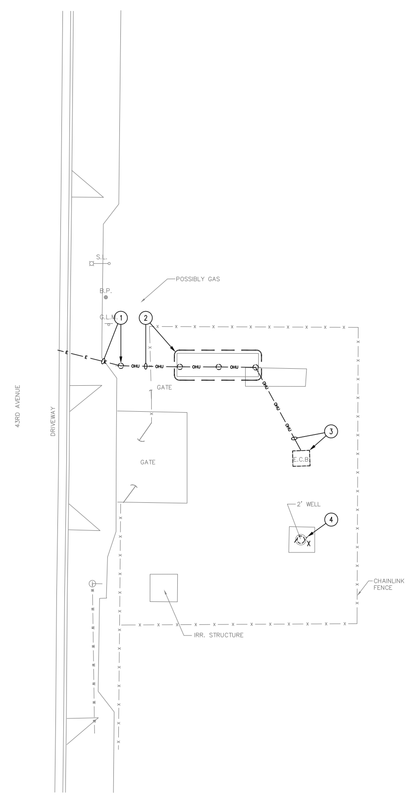
ROOSEVELT IRRIGATION DISTRICT #92
WATER TREATMENT INSTALLATION
43RD AVENUE, 1/4 MI. NORTH OF BUCKEYE, PHOENIX, ARIZONA

Sheet Title:
ELECTRICAL SPECIFICATIONS AND SYMBOLS LIST

REVISIONS:

DATE:	12/14/2011
DRAWN BY:	CRL
CHECKED BY:	JOD
SCALE:	AS NOTED
PROJECT NO:	011175.00
SHEET	E0.0

Apr 24, 2012 - 11:33am
\\TRCFNP\Project Files\2011 Projects\011175.00 - RID Water Treatment\Electrical\RID-92\As-built\Electrical Drawings - 92.dwg



ELECTRICAL SITE PLAN – DEMOLITION WORK

1" = 10'-0"

DEMOLITION NOTES:

A. FOR EQUIPMENT BEING REMOVED OR REPLACED, THE ELECTRICAL CONTRACTOR SHALL DE-ENERGIZE THE EQUIPMENT AND MAKE IT SAFE PRIOR TO REMOVAL. COMPLY WITH OSHA REQUIREMENTS FOR LOCKING OUT AND TAGGING EQUIPMENT TO PREVENT INADVERTENT RE-ENERGIZING.

B. VERIFY CIRCUIT, DEVICES, AND EQUIPMENT SCHEDULED FOR REMOVAL TO ASSURE THAT THEIR REMOVAL WILL NOT ADVERSELY AFFECT ADJACENT AREAS NOT BEING RENOVATED.

C. ELECTRICAL SUBCONTRACTOR SHALL MAINTAIN POWER TO ALL CIRCUIT ADJACENT TO THE CONSTRUCTION AREA. THIS SHALL INCLUDE ANY CIRCUITS PASSING THROUGH THE CONSTRUCTION AREA OR CIRCUITS BEING POWERED FROM POWER PANELS WITHIN THE CONSTRUCTION AREA. EXTEND AND RELOCATE THESE CIRCUITS AS REQUIRED TO MAINTAIN SERVICE AND TO AVOID INTERFERENCE WITH THE NEW WORK. SUBCONTRACTOR SHALL NOTIFY GENERAL CONTRACTORS, SHOULD IT BE NECESSARY TO INTERRUPT POWER TO AREAS ADJACENT TO THIS CONSTRUCTION AREA.

D. DEMOLITION WORK MUST FOLLOW THE CONSTRUCTION PHASING SEQUENCE AND MUST BE COORDINATED WITH GENERAL AND MECHANICAL DRAWINGS AND CONTRACTORS.

E. DEFINITION – THE TERM "CIRCUIT" IN ITS ENTIRETY, SHALL MEAN CONDUIT, FITTINGS, SUPPORTS, JUNCTION BOXES, CONDUCTORS BACK TO THE RESPECTIVE PANEL BOARD (POWER SOURCE); OR TO THE LAST JUNCTION BOX OR DEVICE IF THE REAMING PORTION OF THE CIRCUIT SERVES EXISTING EQUIPMENT OR AREAS WHICH SHALL REMAIN.

F. ELECTRICAL SUBCONTRACTOR SHALL VERIFY ALL LIGHTING CIRCUITS WITHIN THE CONSTRUCTION AREA BEFORE DISCONNECTING POWER. CONTRACTOR SHALL PROVIDE NECESSARY WIRING TO MAINTAIN LIGHTING IN AREAS ADJACENT TO THIS CONSTRUCTION AREA WHICH WOULD BE AFFECTED BY THIS DEMOLITION WORK.

G. ALL DEVICES, JUNCTION BOXES, CIRCUIT NUMBERS, EQUIPMENT SIZES, AND CONDUIT SHOWN ARE FOR REFERENCE ONLY AND MAY NOT INDICATE CORRECT IDENTIFICATION, AND SIZE; AND TOTAL QUANTITIES OF ITEMS SCHEDULED FOR DEMOLITION. VISIT SITE AND FIELD VERIFY THE NUMBER OF DEVICES WITHIN THE CONSTRUCTION PHASE AREA PRIOR TO THE BID AND REMOVAL. REMOVE ALL DEVICES, EQUIPMENT, MATERIAL, AND CIRCUITS IN THEIR ENTIRETY, WHICH INTERFERE WITH THE NEW CONSTRUCTION AND NOT SHOWN ON DRAWINGS AS DIRECTED BY THE ARCHITECT / GENERAL CONTRACTOR.

H. DISPOSAL AND/OR SALVAGING OF MATERIAL AND EQUIPMENT SHALL BE AS DIRECTED BY OWNER / GENERAL CONTRACTOR.

J. ALL OVER-HEAD AND UNDER-GROUND ELECTRICAL, TELEPHONE AND CABLE UTILITIES SHOWN ON THIS SHEET ARE EXISTING TO BE REMOVED AFTER ALL NEW WORK SHOWN ON SHEET E1.0 IS COMPLETED, UNLESS NOTED OTHERWISE. COORDINATE ALL WORK AND COMPLY WITH ALL STIPULATIONS SET BY SERVING UTILITY COMPANY.

K. FIXTURE / ITEM IDENTIFIED WITH LETTER:
'X' – INDICATES DEVICE TO REMAIN.
'XR' – INDICATES DEVICE TO BE REMOVED.
'XRR' – INDICATES DEVICE TO BE REMOVED & RELOCATED.

(#) KEY NOTES:

1. EXISTING POWER POLE WITH EXISTING OVER-HEAD POWER UTILITY LINES TO REMAIN. SEE SHEET E2.0 FOR RE-ROUTING OF OVER-HEAD UTILITY POWER LINES FROM THIS POINT TO NEW PROPOSED POWER POLE WITHIN THE PROPERTY LINE.
2. EXISTING WOOD H-FRAME MOUNTED TRANSFORMER BANK WITH EXISTING OVER-HEAD POWER UTILITY LINES TO BE REMOVED. COORDINATE COMPLETE REMOVAL REQUIREMENTS WITH KELLER ELECTRICAL AND POWER COMPANY.
3. EXISTING SERVICE ENTRANCE SECTION WITH EXISTING OVER-HEAD POWER UTILITY LINES TO BE REMOVED COMPLETELY. COORDINATE COMPLETE REMOVAL REQUIREMENTS WITH POWER COMPANY.
4. EXISTING WELL PUMP TO REMAIN. DEMO EXISTING CIRCUITING FROM EXISTING SES BEING REMOVED AND RE-CONNECT TO NEW SERVICE ENTRANCE SECTION. SEE SHEETS E1.0 AND E2.0 FOR NEW CONNECTION REQUIREMENTS.

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(4/23/2012)

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ROOSEVELT IRRIGATION DISTRICT #92 WATER TREATMENT INSTALLATION

43RD AVENUE, 1/4 MI. NORTH OF BUCKEYE, PHOENIX, ARIZONA

Sheet Title: ELECTRICAL SITE PLAN – DEMOLITION WORK

REVISIONS:

DATE:	12/14/2011
DRAWN BY:	CRL
CHECKED BY:	JDD
SCALE:	AS NOTED
PROJECT NO:	011175.00
SHEET	E0.1

Apr 24, 2012 – 10:07am
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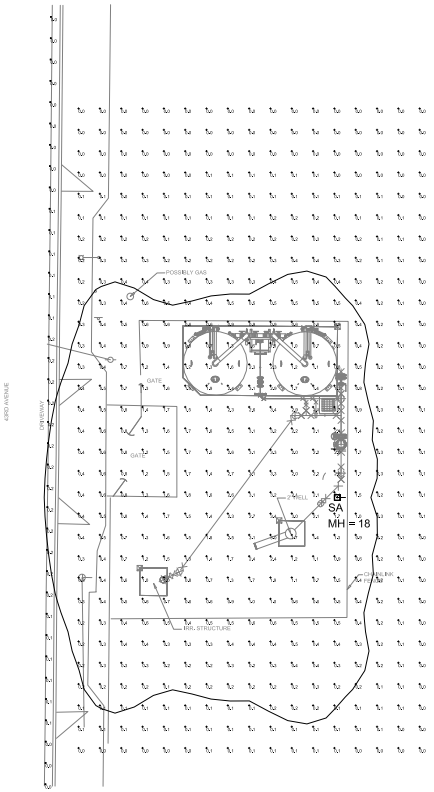
Calculation Summary							
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min
PROPERTY LINE	Illuminance	Fc	0.10	0.2	0.0	N.A.	N.A.
SITE	Illuminance	Fc	0.60	3.4	0.0	N.A.	N.A.



GENERAL NOTES:

A. ALL EXTERIOR LIGHT FIXTURES TO COMPLY WITH LOCAL NIGHT SKY ORDINANCE.

B. ALL EXTERIOR ELECTRICAL EQUIPMENT TO BE RATED FOR WEATHER-PROOF/ NEMA-3R APPLICATIONS.

C. ALL FIXTURES INSTALLED OUTDOORS SHALL BE RATED FOR DAMP/WET LOCATIONS AS REQUIRED. THE CONTRACTOR SHALL COORDINATE DAMP/WET LOCATION RATING PER NEC ARTICLE 410-4. ALL INSTALLATIONS SHALL CONFORM TO NEC ARTICLE 410, ALL SUB ARTICLES.

D. CONTRACTOR TO COORDINATE EXACT SITE LIGHTING FIXTURE LOCATIONS WITH OWNER. ALL CONFLICTS SHALL BE IMMEDIATELY REPORTED TO THE ENGINEER AND ARCHITECT.

E. ALL EXTERNAL LIGHTING SHALL BE SO LOCATED AND DESIGNED TO PREVENT LIGHTING RAYS FROM BEING DIRECTED OFF THE PROPERTY UPON WHICH THE LIGHTING IS LOCATED.

F. REFER TO LIGHTING FIXTURE SCHEDULE ON SHEET E2.0 FOR LIGHT FIXTURE TYPES AND SPECIFICATIONS.

PHOTOMETRIC SITE PLAN

1" = 10'-0"

RECORD DRAWING
(4/23/2012)

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ROOSEVELT IRRIGATION DISTRICT #92
WATER TREATMENT INSTALLATION
43RD AVENUE, 1/4 MI. NORTH OF BUCKEYE, PHOENIX, ARIZONA
Sheet Title: PHOTOMETRIC SITE PLAN

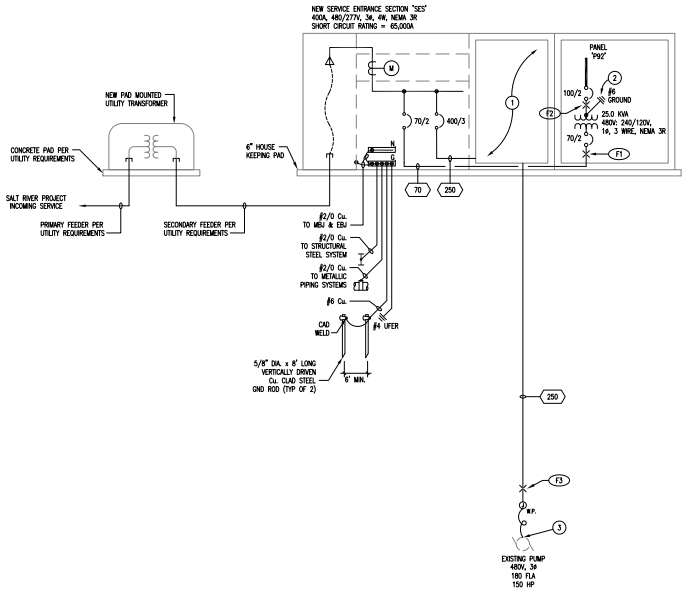
REVISIONS:

DATE:	12/14/2011
DRAWN BY:	CRL
CHECKED BY:	JOD
SCALE:	AS NOTED
PROJECT NO:	011175.00
SHEET	E0.2

Apr 24, 2012 - 10:05am
\\TRCFNP\Project Files\2011 Projects\011175.00 - RID Water Treatment\Electrical\RID-92\As-built\Electrical Drawings - 92.dwg

PANEL "P92" (NEW)			BOLT-ON					100 AMP SECONDARY MAIN CIRCUIT BREAKER		
240/120V 1Ø 3W			INTEGRAL TO SES					70A PRIMARY MAIN CIRCUIT BREAKER (25K AIC)		
		LOAD	LOAD PER PHASE (VA)				LOAD		
USE OR AREA SERVED	CB	TYPE		A#	B#		TYPE	CB	USE OR AREA SERVED
SPARE	30	C	1			N	N	30	SPARE
						2			
		N	3			N	N		
	2					4		2	
SPARE	20	N	5			N	N	25	SPARE
						6			
		N	7			N	N		
	2					8		2	
SPARE	30	N	9			N	N	30	SPARE
	1					10		1	
VERTECH CONTROL PANEL	20	N	11		1200	N	N	20	CONVENIENCE RECEPTACLE
	1				180	12		1	
TANK SKID SUMP PUMP	20	N	13	864		C	C	20	SECURITY POLE LIGHTS
	1			185		14		1	
SPARE	20	N	15			N	N	20	TIMECLOCK/CONTACTOR
	1				180	16		1	
SPARE	20	N	17			N	N	20	SPARE
	1					18		1	
SPARE	20	N	19			N	N	20	SPARE
	1					20		1	
SPARE	15	N	21			N	N	15	SPARE
	1					22		1	
BUSSED SPACE		N	23			N			BUSSED SPACE
						24			
BUSSED SPACE		N	25			N			BUSSED SPACE
						26			
BUSSED SPACE		N	27			N			BUSSED SPACE
						28			
BUSSED SPACE		N	29			N			BUSSED SPACE
						30			
LOAD PER PHASE NON-CONTINUOUS				864	1560	1560 VA / 120 V = 13 AMPS			
LOAD PER PHASE CONTINUOUS				185	0				
25% OF CONTINUOUS				46	0				
–				0	0	TOTAL KVA= 2655 VA			
TOTAL				1095	1560	10,000 A.I.C. BRANCH BREAKERS			

NOTES: 1. "C" LOAD TYPES ARE CONTINUOUS OR LARGEST MOTOR LOADS AND "N" LOAD TYPES ARE NON-CONTINUOUS.



ELECTRICAL SINGLE-LINE DIAGRAM

NO SCALE

GENERAL NOTES:

A. CONDUCTOR SIZES BASED ON THHN/XHHW-2, 90° C, 600V, INSULATED, COPPER WIRE APPLIED AT 60° C AMPACITIES SIZES UP TO #1 AWG, AND 75° C, AMPACITIES FOR SIZES #1 AWG OR LARGER.

B. NO DESIGN CHANGES MAY BE MADE TO THE SYSTEM WITHOUT THE PRIOR APPROVAL OF THE DESIGN ENGINEER AND THE ELECTRICAL INSPECTOR.

C. DASHED-SHADED LINES INDICATE EXISTING EQUIPMENT. SOLID-BOLD LINES INDICATE NEW EQUIPMENT U.N.O.

KEY NOTES:

1. NEW SES PUMP CONTROL CABINET WITH CONTACTORS AND REDUCED VOLTAGE STARTING CONTROLS FOR EXISTING IRRIGATION PUMP MOTOR TO BE DESIGNED BY KELLER ELECTRICAL. BLANK CONTROL CABINET TO BE PROVIDED WITH SES. VERIFY CONTROL CABINET SIZE AND KNOCK-OUT REQUIREMENTS WITH KELLER ELECTRICAL. COORDINATE WITH KELLER ELECTRICAL AND VERTECH CONTROLS DRAWINGS FOR CONTROL PROVISION REQUIREMENTS BY ELECTRICAL CONTRACTOR.
2. TIE TO NEW SES GROUNDING ELECTRODE SYSTEM.
3. EXISTING WELL PUMP TO BE RE-CONNECTED TO NEW SERVICE ENTRANCE SECTION. SEE SHEETS E2.0 FOR ADDITIONAL INFORMATION.

FEEDER SCHEDULE:

SYMBOL	PARALLEL SETS	CONDUIT AND CONDUCTOR SIZE	NOTE:
70	1	2 #4, 1 #8 GND	
250	1	3 250KCM, 1 #4 GND, 2-1/2"C	

LOAD CALCULATIONS:

SES: 400A, 480/277V, 3PH, 4W

NEW PANEL "P92"	x 100% =	2655 VA
EXISTING 150HP 480V-3PH WELL PUMP	x 125% =	186975 VA
	SUB TOTAL =	189630 VA
189630 VA	AT 480V 3 PHASE =	228 AMPS

AVAILABLE FAULT CURRENT:

1. ALL VALUES ARE SYMMETRICAL BASED ON BUSSMANN SPD CALCULATIONS AS INDICATED.
2. ALL EQUIPMENT SHALL BE FULLY RATED.
3. AFC = AVAILABLE FAULT CURRENT.

LABEL	FAULT LOCATION	TYPE OF CALCULATION	Cable	Conduit Type	Conductor Type	AFC(1) or AFC(PRI)	V or V(PRI)	V(SEC)	L	C VALUE	kVA	%Z	N	f or f1	M or M1	AFC(2) or AFC(SEC)
F1	XFMR PRIMARY	AFC AT END OF A FEEDER	#4	NON-MAGNETIC	COPPER	65000	480		15	3625			1	1.0621	0.4849	31521
F2	XFMR SECONDARY	AFC AT SEC. OF 1-PHASE XFMR				31521	480	240			25	3.3		34.5515	0.0289	1773

AFC AT THE END OF A FEEDER

DEFINITIONS
AFC(1) = AFC AT THE BEGINNING OF THE FEEDER
AFC(2) = AFC AT THE END OF THE FEEDER
N = NUMBER OF CONDUCTORS IN PARALLEL PER PHASE
C = "C" VALUE AS DEFINED IN THE BUSSMANN SPD HANDBOOK
V = LINE-TO-LINE VOLTAGE
L = LENGTH OF FEEDER (IN FEET)

CALCULATIONS

$$f = \frac{1.732 \times L \times AFC(1)}{N \times C \times V}$$

$$M = \frac{1}{1+f}$$

$$AFC(2) = AFC(1) \times M$$

AFC AT THE SECONDARY OF A THREE PHASE TRANSFORMER

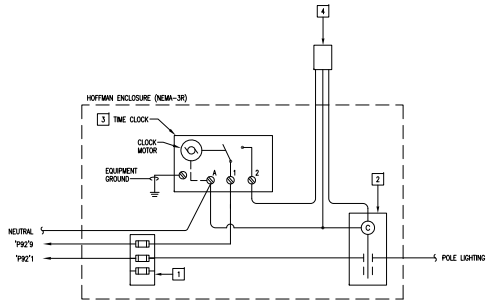
DEFINITIONS
AFC(PRI) = AFC AT PRIMARY TERMINALS OF TRANSFORMER
AFC(SEC) = AFC AT SECONDARY TERMINALS OF TRANSFORMER
V(PRI) = LINE-TO-LINE VOLTAGE AT TRANSFORMER PRIMARY
%Z = TRANSFORMER PERCENT IMPEDANCE
kVA = RATED kVA OF TRANSFORMER

CALCULATIONS

$$f1 = \frac{AFC(PRI) \times V(PRI) \times 1.73 \times \%Z}{100{,}000 \times kVA}$$

$$M1 = \frac{1}{1+f1}$$

$$AFC(SEC) = \frac{V\ PRIMARY}{V\ SECONDARY} \times M1 \times AFC(1)$$



KEY NOTES:

1. FUSE BLOCK WITH 20A CURRENT LIMITING CLASS J DUAL ELEMENT TIME DELAY FUSES.
2. 2 POLE ELECTRICALLY HELD CONTACTOR, SQUARE "D" LO20V02 OR EQUAL WITH 30A CONTACTS, 5000A WITHSTAND RATING MINIMUM.
3. TIMECLOCK "INTERMATIC" MODEL #ET70115CR OR EQUAL.
4. PHOTOCELL "INTERMATIC" #K4236 MOUNT ON ROOF FACING NORTH.

EXTERIOR LIGHTING CONTROL DIAGRAM

NO SCALE

RECORD DRAWING (4/23/2012)

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ROOSEVELT IRRIGATION DISTRICT #92
WATER TREATMENT INSTALLATION
43RD AVENUE, 1/4 MI. NORTH OF BUCKEYE, PHOENIX, ARIZONA

Sheet Title:
SINGLE-LINE DIAGRAM, PANELS, AND CALCULATIONS

REVISIONS:

DATE:	12/14/2011
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LIGHTING FIXTURE SCHEDULE

MOUNTING: (M/O)
- RE – RECESSED
- SP – SUSPENDED
- CL – CEILING SURFACE
- WL – WALL
- UC – UNDER CABINET
- CV – COVE
- PL – POLE
- GR – GROUND
- UN – UNIVERSAL

DOOR:
- FA – FLAT ALUMINUM
- FS – FLAT STEEL
- RA – REGRESSED ALUMINUM
- RS – REGRESSED STEEL

LAMP TYPE:
- FL – FLUORESCENT
- CF – COMPACT FLUORESCENT
- IN – INCANDESCENT
- LED – LIGHT EMITTING DIODE
- HS – HIGH PRESSURE SODIUM
- PSMH – PULSE START METAL HALIDE
- MV – MERCURY VAPOR
- LV – LOW VOLTAGE
- O – OTHER (SEE DESCRIPTION)

BALLAST:
- EB – ELECTRONIC BALLAST
- ML – MULTI–LEVEL SWITCHING
- EM – EMERGENCY BATTERY
- HPF – HIGH POWER FACTOR
- CWA – CONSTANT WATTAGE AUTO XFMR

LENS/LOUVER: (L/L)
- A – .125" ACRYLIC
- B – BLACK BAFFLE
- C – CLEAR ALZAK
- D – PARABOLIC
- F – FRESNEL
- G – TEMPERED GLASS
- H – WALL WASHER
- K – KSH12 .125" ACRYLIC
- K19 – KSH19 .125" ACRYLIC
- L – LOW IRIDESCENT SPECULAR ALUMINUM
- N – NONE
- O – OTHER (SEE DESCRIPTION)
- P – PRISMATIC
- PC – POLYCARBONATE
- WG – WIRE GUARD

PROVIDE DISCONNECTING MEANS FOR FLUORESCENT LUMINAIRES THAT CAN BE SERVICED IN PLACE WHICH INCLUDES LUMINAIRES THAT UTILIZE DOUBLE ENDED LAMPS, LUMINAIRES CONTAINING A BALLAST(S) & SUPPLIED FROM MULTI–WIRE BRANCH CIRCUITS. THE DISCONNECT MEANS MUST DISCONNECT ALL SUPPLY CONDUCTORS SIMULTANEOUSLY, INCLUDING THE GROUNDED CONDUCTOR. EXCEPTIONS ARE PROVIDED FOR; HAZARDOUS LOCATIONS, EMERGENCY ILLUMINATION, CORD–&–PLUG CONNECTED LUMINAIRES, INDUSTRIAL FACILITIES, & LUMINAIRES NOT SUPPLIED BY A MULTIWIRE BRANCH CIRCUIT WHICH DOES NOT LEAVE THE ILLUMINATED SPACE IN TOTAL DARKNESS. REFER TO NEC 410.130(G) FOR FURTHER CLARIFICATION.

CATALOG NUMBER SHALL NOT BE CONSIDERED COMPLETE AND MATERIAL SHALL NOT BE ORDERED BY MANUFACTURER AND CATALOG NUMBER ONLY. THE COMPLETE DESCRIPTION AND THE SPECIFICATION SHALL BE COORDINATED WITH THE CATALOG NUMBER TO DETERMINE THE EXACT MATERIAL AND ACCESSORIES TO BE ORDERED. THE FIRST MANUFACTURER LISTED IS THE BASIS FOR DESIGN, HOWEVER ANY SUBSTITUTIONS, WHETHER LISTED WITHIN SCHEDULE BELOW OR NOT, MUST BE PRIOR APPROVED IN WRITING BY BOTH ARCHITECT AND ENGINEER.

ALL LAMPS FOR THIS PROJECT SHALL BE FURNISHED AND INSTALLED BY THE ELECTRICAL CONTRACTOR UNLESS OTHERWISE NOTED.

REFER TO SPECIFICATION FOR LAMP AND BALLAST REQUIREMENTS, SHOP DRAWING SUBMITTAL REQUIREMENTS AND ADDITIONAL INFORMATION.

ITEM	DESCRIPTION	SIZE	MTG	LAMPS			VOLTAGE	BALLAST	L/L	APPROVED MANUFACTURER / MODEL	LAMP/BALLAST
				TYPE	QTY	SIZE					VA
SA	SINGE–HEAD AREA LIGHT FIXTURE SSS POLE 15.5' W/ 2.5' BASE	15.5"X22"X6.5"	FL	PSMH	1	150W PSMH	120	CWA	P	COOPER – LUMARK #MPTR–SL–150–120–LL OR APPROVED EQUAL	185

RECORD DRAWING
(4/23/2012)

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GENERAL NOTES:

A. ALL CONDUIT ROUTING AND STUB–UP LOCATIONS ARE DIAGRAMMATIC AND SHOWN FOR REFERENCE, CLARITY, AND INTENT PURPOSES ONLY. E.C. SHALL COORDINATE ALL ROUTING AS EXISTING FIELD CONDITIONS AND NEW CONSTRUCTION PERMITS. COORDINATE ROUTING WITH NEW AND EXISTING OBSTRUCTIONS AND WITH ALL APPLICABLE TRADES. COORDINATE STUB–UP LOCATIONS WITH FINAL EQUIPMENT LOCATIONS IN FIELD.

B. ALL EXTERIOR LIGHT FIXTURES TO COMPLY WITH LOCAL NIGHT SKY ORDINANCE.

C. ALL EXTERIOR LIGHTING TO BE FED WITH #10 CU. MINIMUM U.N.O.

D. ALL EXTERIOR ELECTRICAL EQUIPMENT TO BE RATED FOR WEATHER–PROOF/ NEMA–3R APPLICATIONS.

E. ALL FIXTURES INSTALLED OUTDOORS SHALL BE RATED FOR DAMP/WET LOCATIONS AS REQUIRED. THE CONTRACTOR SHALL COORDINATE DAMP/WET LOCATION RATING PER NEC ARTICLE 410–4. ALL INSTALLATIONS SHALL CONFORM TO NEC ARTICLE 410, ALL SUB ARTICLES.

F. CONTRACTOR TO COORDINATE EXACT SITE LIGHTING FIXTURE LOCATIONS WITH OWNER. ALL CONFLICTS SHALL BE IMMEDIATELY REPORTED TO THE ENGINEER AND ARCHITECT.

G. ACTUAL SIZE, QUANTITY, INSTALLATION REQUIREMENTS, AND EXACT ROUTING OF SRP SECONDARY SERVICE CONDUITS TO BE PROVIDED AND INSTALLED PER SRP REQUIREMENTS AND/OR DIRECTION.

H. COORDINATE ALL PROPOSED PRIMARY AND SECONDARY SERVICE FEEDER CONDUIT ROUTINGS AND LOCATIONS WITH POWER COMPANY. VERIFY ALL REQUIREMENTS AND COMPLY AS DIRECTED.

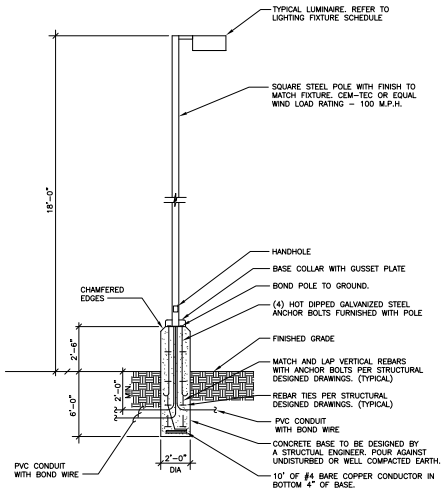
I. SEE POWER COMPANY PLANS FOR REQUIRED TRANSFORMER(S), PULLING ENCLOSURES, SWITCHING CABINETS, CAPACITOR BANKS AND PRIMARY CONDUIT ROUTING. E.C. TO COMPLY WITH ALL POWER COMPANY REQUIREMENTS.

J. ALL WIRING SHALL BE INSTALLED UNDER–GROUND IN PVC CONDUIT WHERE POSSIBLE. WHERE EXPOSED, PROVIDE MC CONDUIT WITH WEATHERPROOF FLEX CONNECTIONS.

G. FIXTURE / ITEM IDENTIFIED WITH LETTER:
- "X" – INDICATES DEVICE TO REMAIN.
- "XR" – INDICATES DEVICE TO BE REMOVED.
- "XRR" – INDICATES DEVICE TO BE REMOVED & RELOCATED.

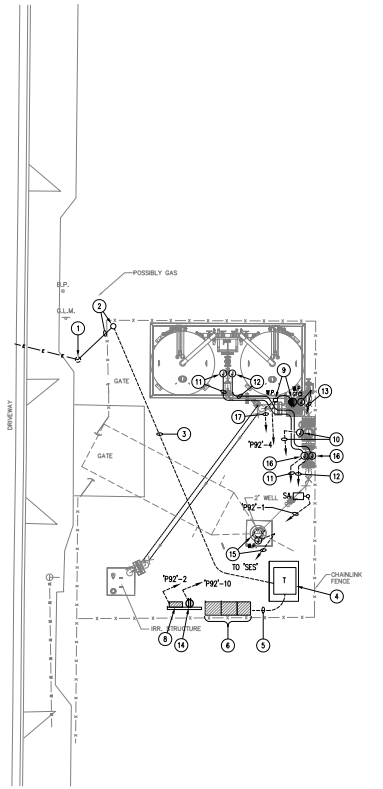
KEY NOTES:

1. EXISTING UTILITY POWER POLE WITH FEEDING OVER–HEAD POWER LINES TO REMAIN.
2. NEW UTILITY POWER POLE. COORDINATE EXACT LOCATION, EXTENSION OF EXISTING OVER–HEAD UTILITY LINES TO THIS POLE, AND ROUTING OF PRIMARY FEEDERS UNDER–GROUND FROM THIS POLE TO NEW UTILITY POWER TRANSFORMER WITH KELLER ELECTRICAL AND POWER COMPANY.
3. INSTALL PRIMARY POWER CONDUITS, PER POWER COMPANY STANDARDS. E.C. SHALL COORDINATE EXACT ROUTING AND COMPLY WITH ALL REQUIREMENTS STIPULATED BY THE POWER COMPANY.
4. PROPOSED LOCATION OF POWER COMPANY PAD MOUNTED TRANSFORMER. PROVIDE CONCRETE PAD PER UTILITY COMPANY STANDARDS. MAINTAIN CLEARANCES OF 12–FEET FROM FRONT AND 3–FEET FROM BACK AND SIDES OF TRANSFORMER AS REQUIRED BY SRP. VERIFY ALL REQUIRED CLEARANCES WITH UTILITY BEFORE PAD INSTALLATION.
5. INSTALL SECONDARY POWER CONDUITS, PER POWER COMPANY STANDARDS. E.C. SHALL COORDINATE EXACT ROUTING AND COMPLY WITH ALL REQUIREMENTS STIPULATED BY THE POWER COMPANY.
6. NEW SERVICE ENTRANCE SECTION WITH CONCRETE HOUSE KEEPING PAD PER POWER COMPANY REQUIREMENTS. SES TO HAVE NEW TRANSFORMER AND PANEL–"P92" BUILT–IN ON A DEDICATED SECTION. REFER TO SINGLE LINE DIAGRAM ON SHEET E1.0 FOR ADDITIONAL INFORMATION. MAINTAIN A MINIMUM OF 24" WORKING CLEARANCE IN FRONT OF SERVICE ENCLOSURE DOORS IN OPEN POSITION.
7. NOT USED.
8. CONTROL PANEL BY VERTECH. PROVIDE POWER TO CONTROL PANEL AS SHOWN. PROVIDE 3/4" CONDUITS AS INDICATED FOR POWER AND CONTROL WIRING. ALL POWER AND CONTROLS CONDUCTORS FROM CONTROL PANEL TO CONTROL EQUIPMENT SHALL BE PROVIDED BY ELECTRICAL CONTRACTOR AS DIRECTED BY CONTROLS CONTRACTOR. SEE VERTECH CONTROL DRAWINGS FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
9. PROVIDE W.P./GFCI RECEPTACLE FOR 120V, 3/4HP SUMP PUMP POWER CONNECTION AND POST MOUNTED CONTACTOR WITH NEMA–3R ENCLOSURE AND HOA FOR AUTOMATIC AND MANUAL CONTROL OF SUMP PUMP. SQUARE–D CLASS #8502–SBH1–V02–CS, OR EQUAL. COORDINATE EXACT LOCATION AND WIRING REQUIREMENTS WITH CONTROLS CONTRACTOR AND OWNER. COORDINATE EXACT LOCATION OF RECEPTACLE WITH MECHANICAL CONTRACTOR PRIOR TO ROUGH–IN.
10. PROVIDE W.P. J–BOX AND 3/4" CONDUIT AS SHOWN WITH POWER WIRING FROM AUTOMATIC VALVE TO VERTECH CONTROL PANEL. COORDINATE EXACT ROUGH–IN LOCATION, WIRING REQUIREMENTS, CONDUIT ROUTING AND CONNECTION REQUIREMENTS WITH OWNER, MECHANICAL, AND CONTROLS CONTRACTOR. SEE SHEET M2.1 FOR VALVE LOCATION.
11. PROVIDE W.P. J–BOX AND 3/4" CONDUIT AS SHOWN WITH POWER WIRING FROM FLOW METER LOCATION TO VERTECH CONTROL PANEL. COORDINATE EXACT ROUGH–IN LOCATION, WIRING REQUIREMENTS, CONDUIT ROUTING AND CONNECTION REQUIREMENTS WITH OWNER, MECHANICAL, AND CONTROLS CONTRACTOR. SEE SHEET M2.1 FOR FLOW METER LOCATIONS.
12. PROVIDE W.P. J–BOX AND 3/4" CONDUIT AS SHOWN WITH CONTROL CABLING FROM FLOW METER LOCATION TO VERTECH CONTROL PANEL. COORDINATE EXACT ROUGH–IN LOCATION, CABLING REQUIREMENTS, CONDUIT ROUTING AND CONNECTION REQUIREMENTS WITH OWNER, MECHANICAL, AND CONTROLS CONTRACTOR. SEE SHEET M2.1 FOR FLOW METER LOCATIONS.
13. PROVIDE W.P. J–BOX AND 3/4" CONDUIT AS SHOWN WITH CONTROL CABLING FROM LOCATION OF SUMP PUMP HIGH AND LOW LEVEL SENSORS TO VERTECH CONTROL PANEL. COORDINATE EXACT ROUGH–IN LOCATION, CABLING REQUIREMENTS, CONDUIT ROUTING AND CONNECTION REQUIREMENTS WITH OWNER, MECHANICAL, AND CONTROLS CONTRACTOR.
14. PROVIDE W.P./GFCI TYPE CONVENIENCE RECEPTACLE. MOUNT AT +24"A/F ON UNI–STRUT STRUCTURE SUPPORTING MINI POWER ZONE PER KEY–NOTE #7 ABOVE.
15. EXISTING WELL PUMP TO REMAIN. RE–CONNECT TO NEW SERVICE ENTRANCE SECTION. SEE SHEET E1.0 FOR ADDITIONAL INFORMATION.
16. PROVIDE J–BOX FOR TRANSITIONING FROM UNDER–GROUND TO ABOVE GROUND CONDUIT. COORDINATE EXACT LOCATION IN THE FIELD WITH MECHANICAL AND CONTROLS CONTRACTOR.
17. PROVIDE 3/4" CONDUIT AS SHOWN WITH 120V CONTROL WIRE FROM SUMP PUMP CONTROL CONTACTOR HOA SWITCH (120VAC) TO VERTECH CONTROL PANEL SUMP PUMP RELAY. COORDINATE EXACT ROUGH–IN LOCATION, CABLING REQUIREMENTS, CONDUIT ROUTING AND CONNECTION REQUIREMENTS WITH OWNER, AND CONTROLS CONTRACTOR.



POLE MOUNTED LIGHT FIXTURE DETAIL

NO SCALE



ELECTRICAL SITE PLAN – NEW WORK

1" = 10'–0"

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ROOSEVELT IRRIGATION DISTRICT #92
WATER TREATMENT INSTALLATION
43RD AVENUE, 1/4 MI. NORTH OF BUCKEYE, PHOENIX, ARIZONA

Sheet Title:
ELECTRICAL SITE PLAN – NEW WORK

REVISIONS:

DATE:	12/14/2011
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Spinnaker Holdings, LLC

Roosevelt Irrigation District (RID) Water Remediation
SCADA and Control Package
Well #92 RTU Control Panel RID-92

Vertech Project Number P110124

January 5, 2012

WELL #92 RTU CONTROL PANEL RID-92 - DRAWING INDEX				
Drawing Set	Drawing Name	Sheet #	Revision	Description
RID-92	P110124-RID92-01	01	1	Well #92 RTU Control Panel RID-92 - Title Page & Drawing Index
	P110124-RID92-02	02	1	Well #92 RTU Control Panel RID-92 - Symbols & Legends
	P110124-RID92-03	03	1	Well #92 RTU Control Panel RID-92 - General Notes
	P110124-RID92-04	04	1	Well #92 RTU Control Panel RID-92 - 120VAC Power Distribution
	P110124-RID92-05	05	1	Well #92 RTU Control Panel RID-92 - 24VDC Power Distribution 24VDC UPS Power Distribution
	P110124-RID92-06	06	1	Well #92 RTU Control Panel RID-92 - 24VDC UPS Power Distribution S7-1200 CPU 1214C Module PLC01 - 14 Pt. Discrete Input
	P110124-RID92-07	07	1	Well #92 RTU Control Panel RID-92 - S7-1200 CPU 1214C Module PLC01 - 10 Pt. Relay Output & Field Interlocks
	P110124-RID92-08	08	1	Well #92 RTU Control Panel RID-92 - S7-1200 CPU 1214C Module PLC02 - 8 Pt. Analog Input
	P110124-RID92-09	09	1	Well #92 RTU Control Panel RID-92 - S7-1200 CPU 1214C Module PLC03 - 8 Pt. Analog Input
	P110124-RID92-10	10	1	Well #92 RTU Control Panel RID-92 - Enclosure Layout
	P110124-RID92-11	11	1	Well #92 RTU Control Panel RID-92 - Backplate Layout & Bill of Material
	P110124-RID92-12	12	1	Well #92 RTU Control Panel RID-92 - PLC Rack 0 Layout & Bill of Material
	P110124-RID92-13	13	1	Well #92 RTU Control Panel RID-92 - Terminal Strip Layout
	P110124-RID92-14	14	1	Well #92 RTU Control Panel RID-92 - Engraving Schedule

P110124-RID92-01.dwg

Vertech
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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

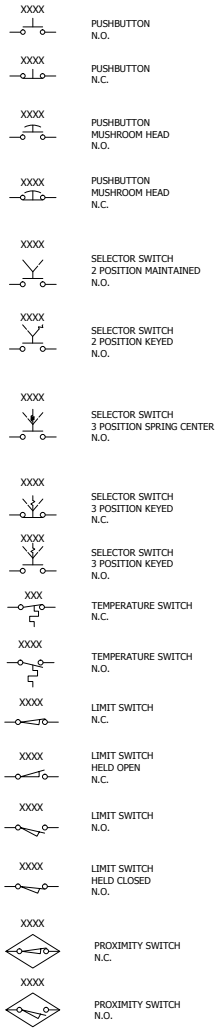
Sheet Description:

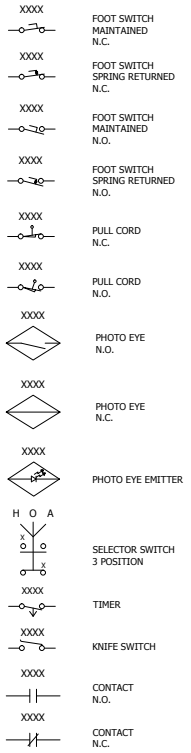
Roosevelt Irrigation District Water Remediation
Well #92 RTU Control Panel RID-92
Title Page
Drawing Index

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-92
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 01 OF 14

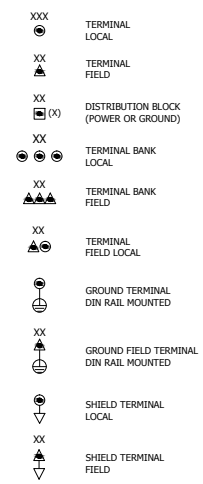
SYMBOLS:

SWITCHES:

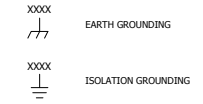




TERMINALS:



GROUNDING:



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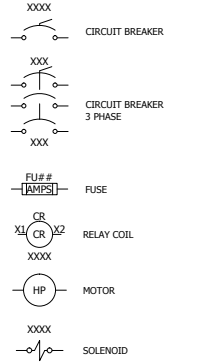

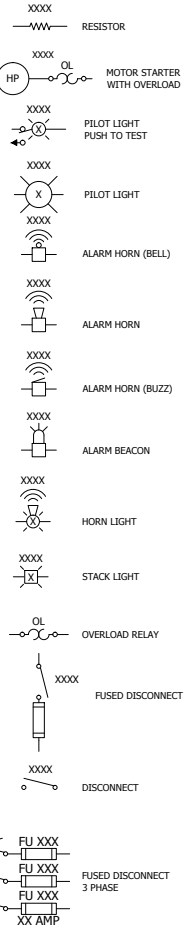

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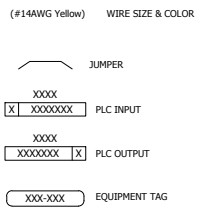

LEGENDS:

ABBREVIATIONS	
SCD	Start Command
SFW	Start Forward
SRV	Start Reverse
RNG	Running
RFW	Running Forward
RRV	Running Reverse
OVL	Overload
DFT	Drive Fault
BRK	Brake
PBL	Push Button Light
RST	Reset
STR	Starter
VFD	Variable Frequency Drive
CBR	Clutch/Brake
CTH	Clutch
PS	Power Supply
CB	Circuit Breaker
ES	EtherNet Switch
PDB	Power Distribution Block
DISC	Disconnect
RCP	Receptacle
TS	Temperature Switch
ECR	Safety Relay
ECRM	Safety Relay Master
ENT	EntherNet/IP
MP	Motor Protector
LR	Line Reactor
MSD	Motor Safety Disconnect
DS	Door Switch
EL	Enclosure Light
DB	Dynamic Break
TVSS	Transient Voltage Surge Suppressor
FU	Fuse
HMT	Hour Meter

P110124-RID92-02.dwg

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #92 RTU Control Panel RID-92
Symbols & Legend

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-92
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 02 OF 14

General Notes:

1. Panel shall be manufactured to UL-508a Standards, and the required UL markings shall be affixed to the interior of the panel. The panel shall ship with a complete as-built drawing set.

2. The following chart shows the standard wire colors for various voltages in the drawing set.

Color	Abbreviation	Usage
Brown	BRN	3-Phase AC - Phase A
Orange	ORG	3-Phase AC - Phase B
Yellow	YEL	3-Phase AC - Phase C
Black	BLK	120VAC Power (Hot)
White	WHT	120VAC Neutral
Red	RED	120VAC Control
Green w/ Yellow Stripe	GRN/YEL	AC Ground
Yellow	YEL	Foreign Power
White w/ Yellow Stripe	WHT/YEL	Foreign Neutral
Purple	PUR	Temporary
Blue	BLU	24VDC Power & Control
White w/ Blue Stripe	WHT/BLU	24VDC Common (Grounded)

3. All analog signal cables shall be Belden 8760; 2-conductor #18AWG (BLK/CLR) twisted/shielded: BLK = Positive (+); CLR = Negative (-).

P110124-RID92-03.dwg

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1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

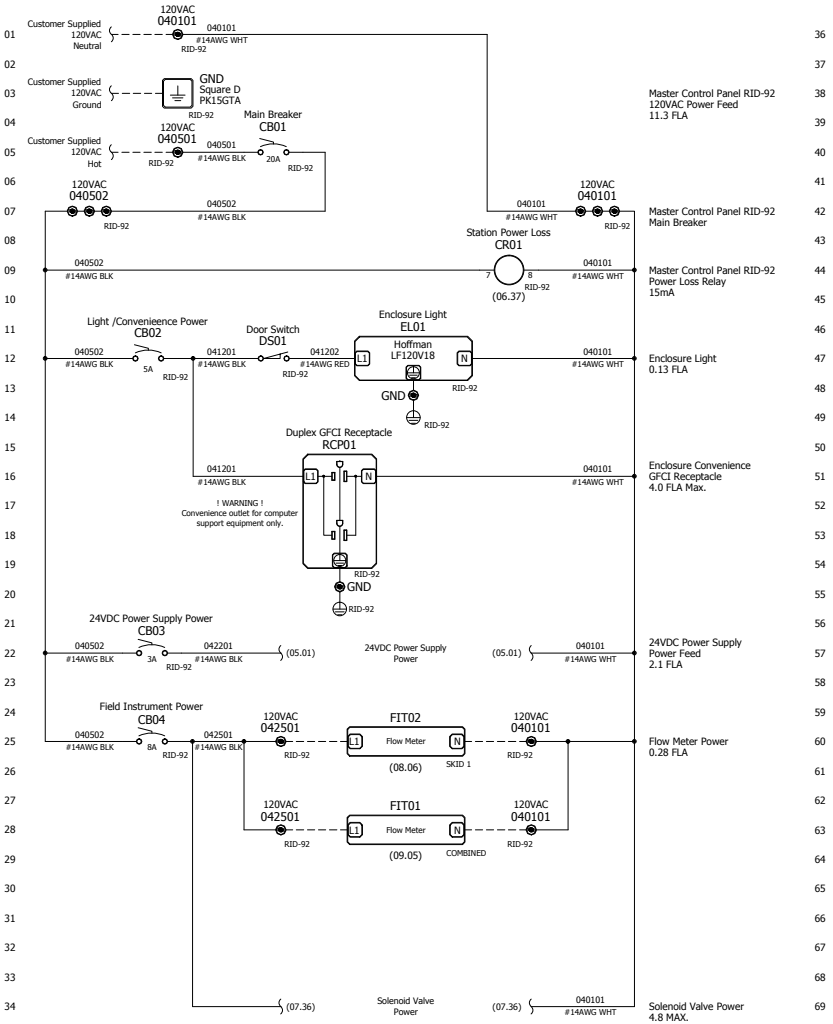
Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #92 RTU Control Panel RID-92
General Notes

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-92
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 03 OF 14

120VAC Power Distribution
RTU Control Panel RID-92



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P110124-RID92-04.dwg

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

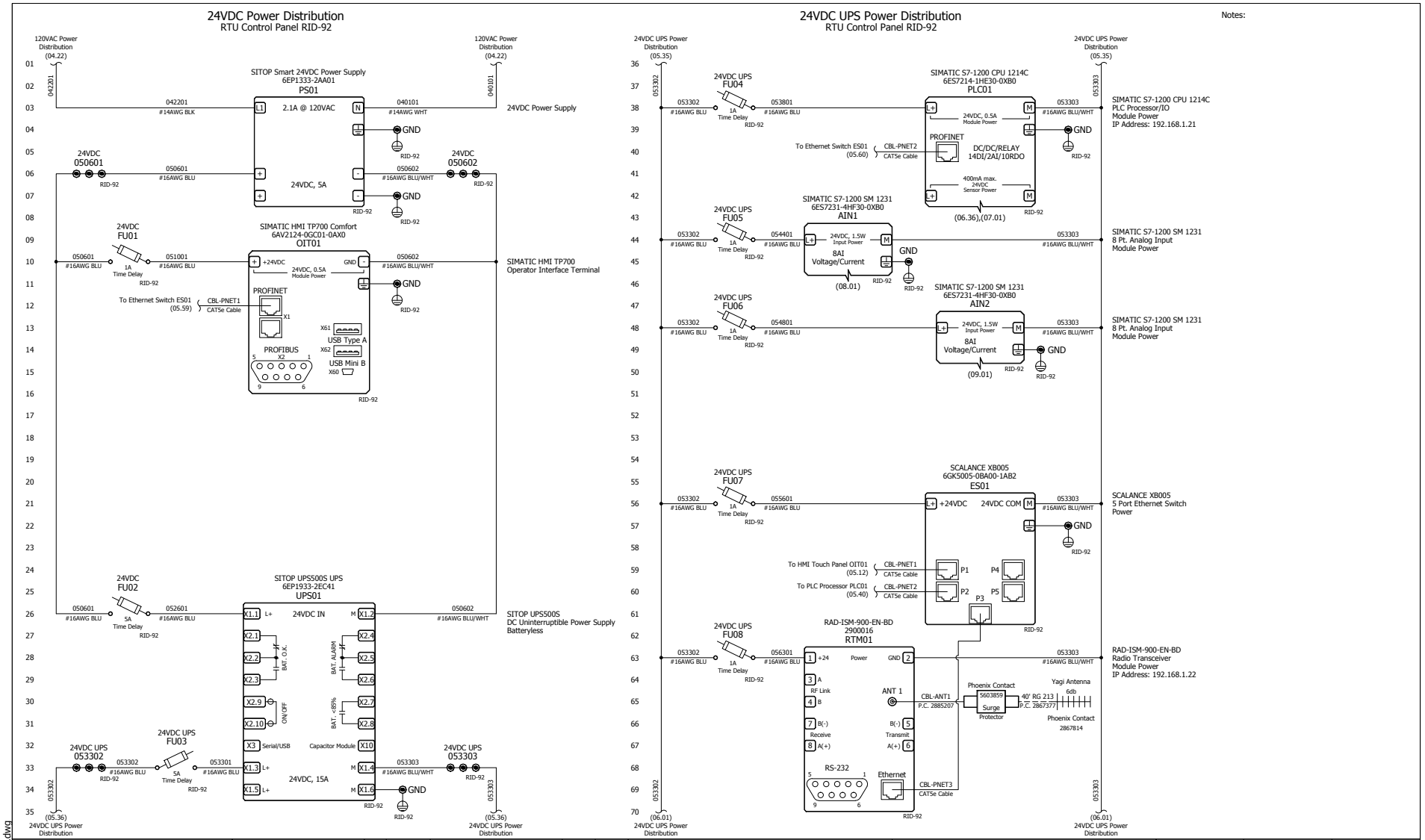
System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #92 RTU Control Panel RID-92
120VAC Power Distribution

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-92
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 04 OF 14



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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

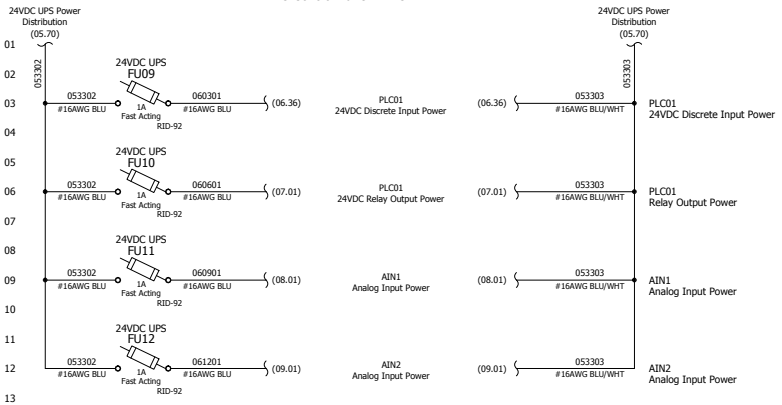
Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

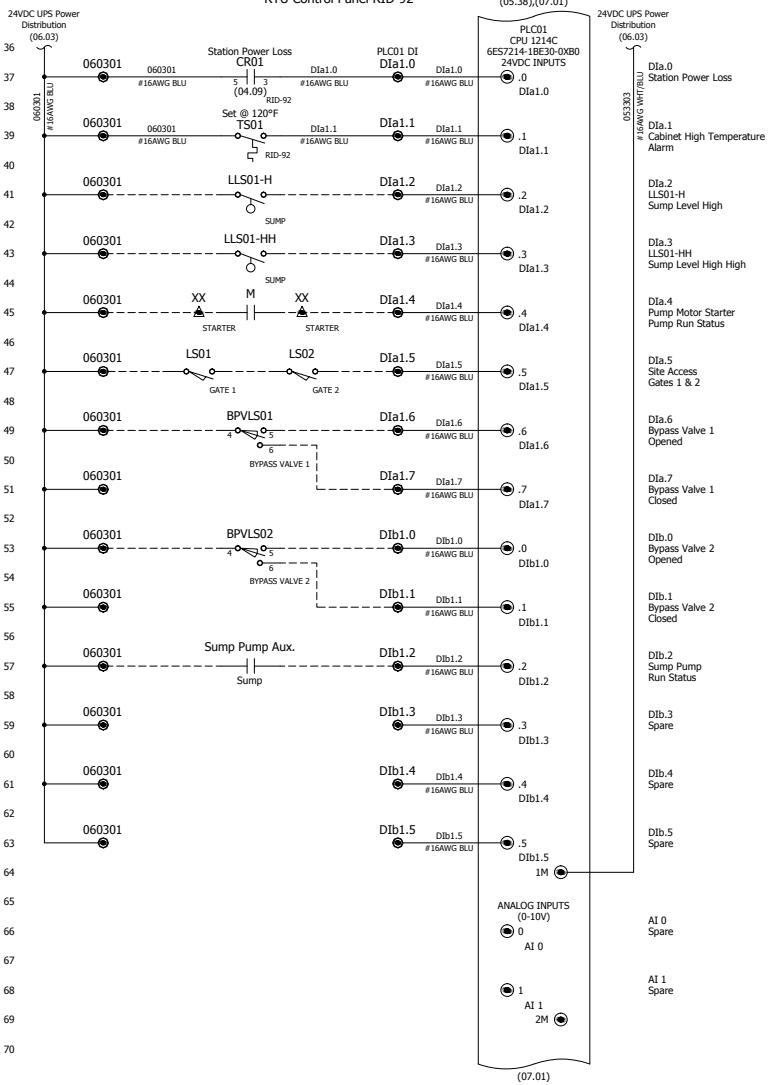
Roosevelt Irrigation District Water Remediation
Well #92 RTU Control Panel RID-92
24VDC Power Distribution
24VDC UPS Power Distribution

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-92
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 05 OF 14

24VDC UPS Power Distribution
RTU Control Panel RID-92



S7-1200 CPU 1214C Module PLC01 - 14 Pt. Discrete Input
RTU Control Panel RID-92



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P110124-RID92-06.dwg

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

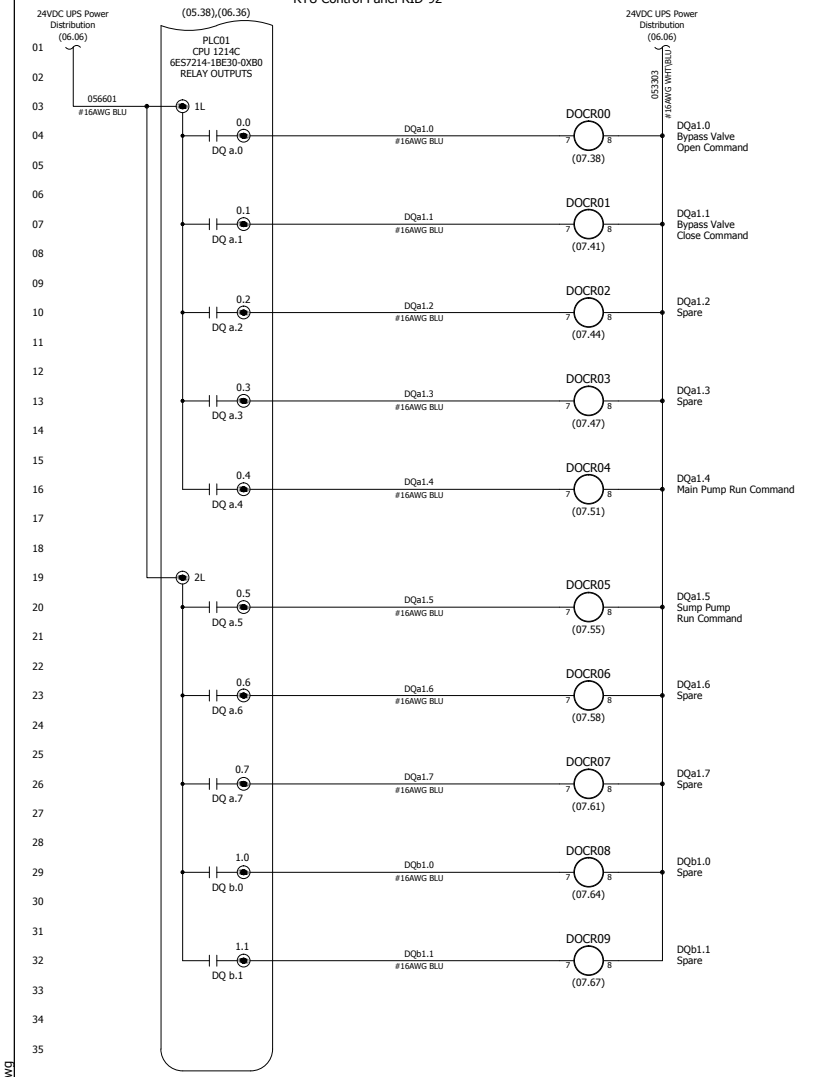
Sheet Description:

Roosevelt Irrigation District Water Remediation Well #92 RTU Control Panel RID-92
24VDC UPS Power Distibution
S7-1200 CPU 1214C Module PLC01 - 14 Pt. Discrete Input

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-92
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 06 OF 14

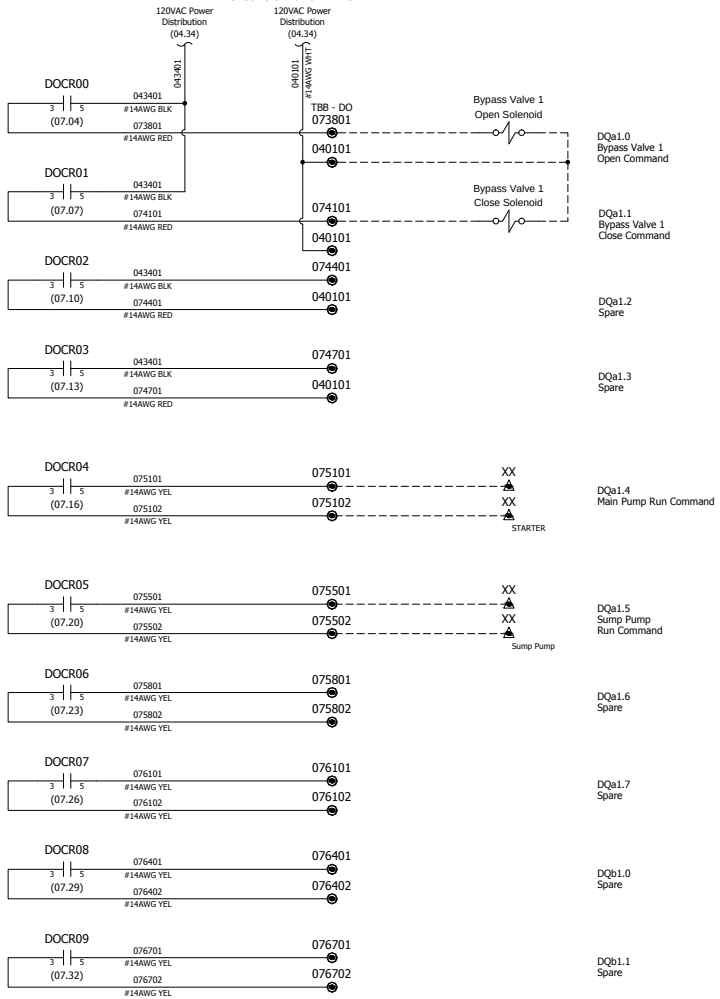
S7-1200 CPU 1214C Module PLC01 - 10 Pt. Relay Output

RTU Control Panel RID-92



S7-1200 CPU 1214C Module PLC01 - Field Interlocks

RTU Control Panel RID-92



Notes:

P110124-RID92-07.dwg

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

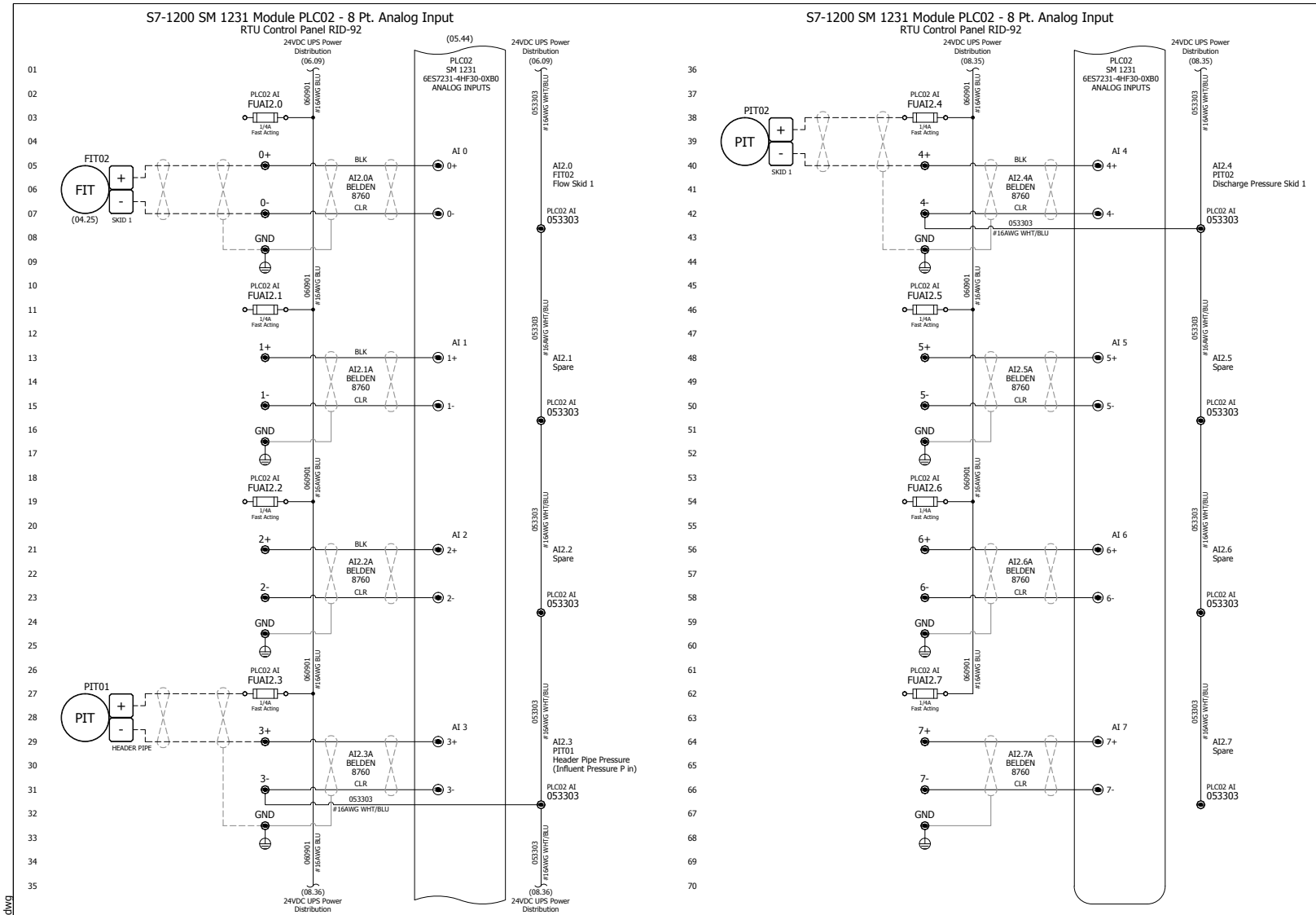
System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation Well #92 RTU Control Panel RID-92
S7-1200 CPU 1214C Module PLC01 - 10 Pt. Relay Output
S7-1200 CPU 1214C Module PLC01 - Field Interlocks

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-92
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 07 OF 14



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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

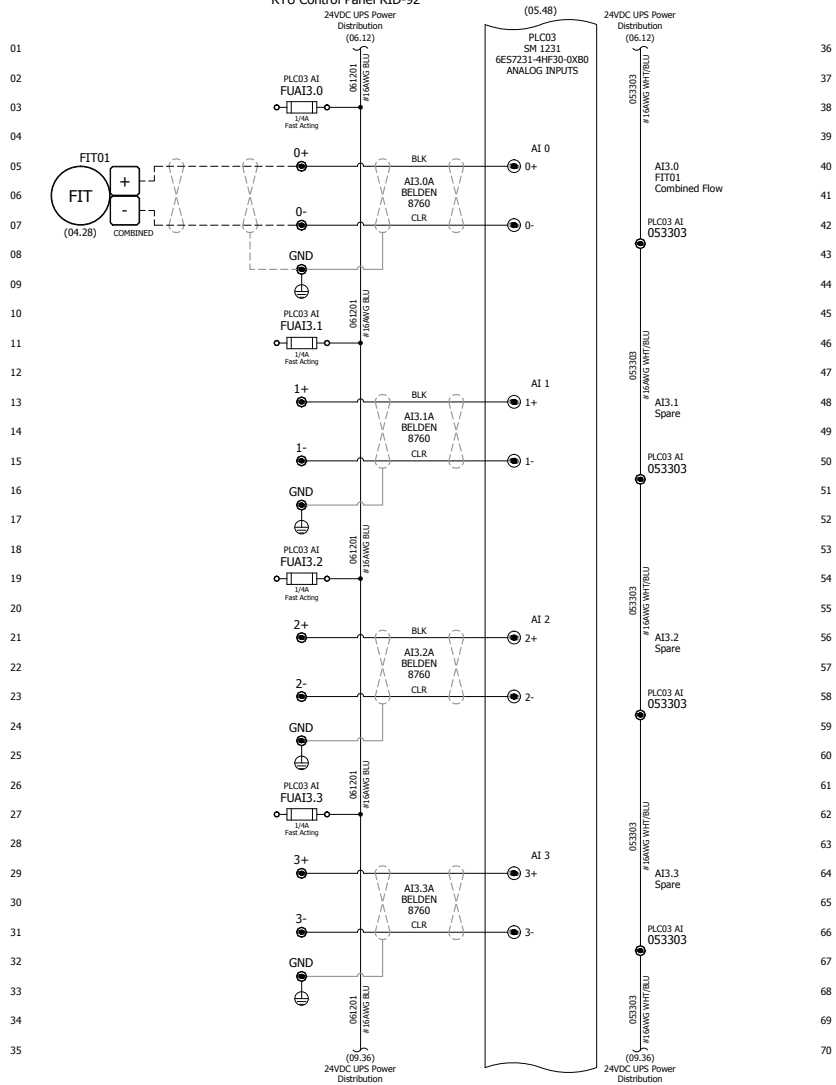
Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #92 RTU Control Panel RID-92
S7-1200 SM 1231 Module PLC02 - 8 Pt. Analog Input

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-92
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 08 OF 14

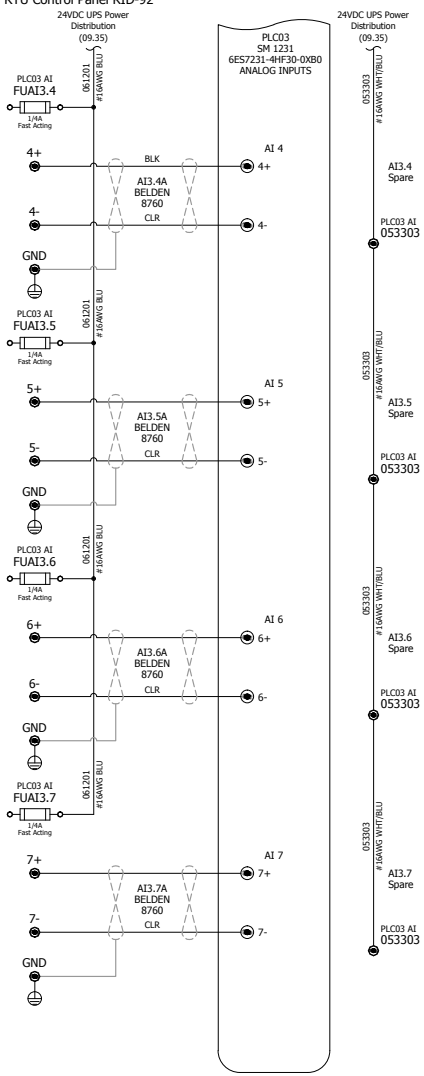
S7-1200 SM 1231 Module PLC03 - 8 Pt. Analog Input

RTU Control Panel RID-92



S7-1200 SM 1231 Module PLC03 - 8 Pt. Analog Input

RTU Control Panel RID-92



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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

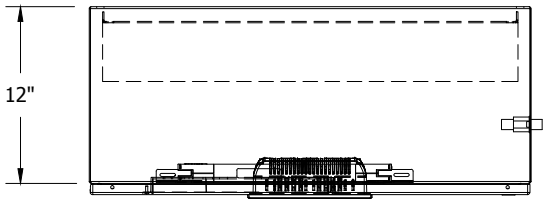
System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

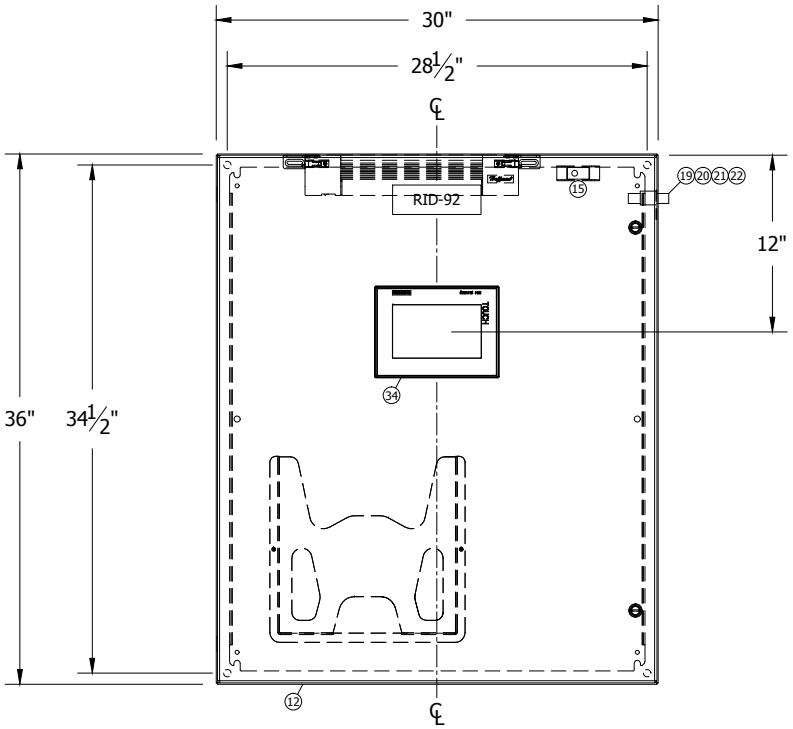
Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #92 RTU Control Panel RID-92
S7-1200 SM 1231 Module PLC03 - 8 Pt. Analog Input

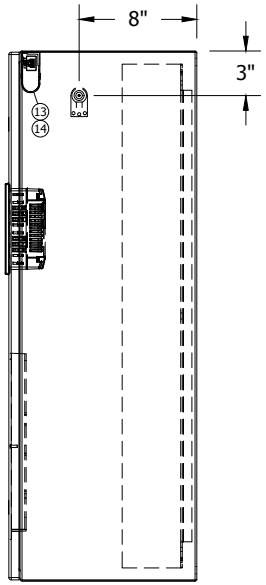
Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-92
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 09 OF 14



Enclosure Top View
RTU Control Panel RID-92



Enclosure Front Elevation
RTU Control Panel RID-92



Enclosure Right Side
RTU Control Panel RID-92

P110124-RID92-10.dwg

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

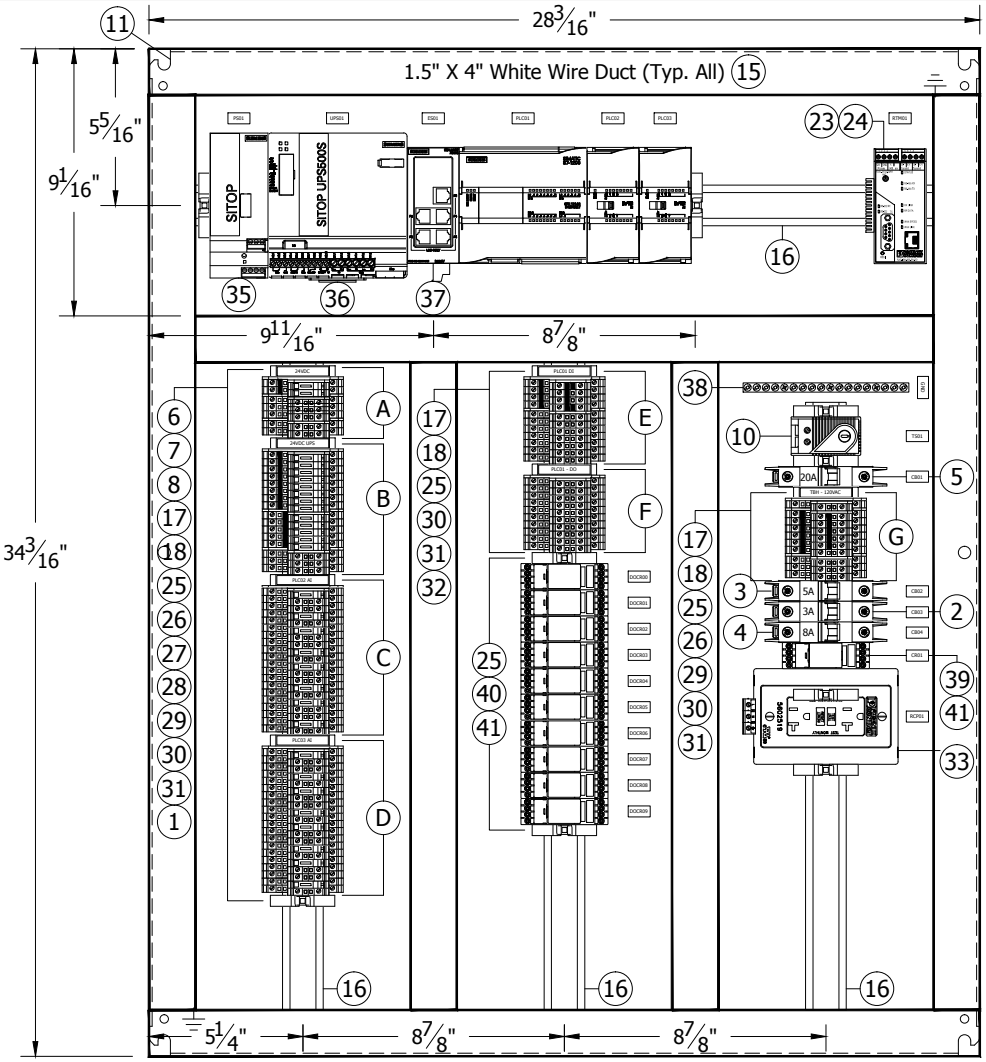
Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #92 RTU Control Panel RID-92
Enclosure Layout

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-92
Rev: 1	**Scale:** 1-1/2" = 1'-0"	**Sheet Size:** B	**Sheet Number:** 10 OF 14

◯ WELL #92 RTU CONTROL PANEL RID-92 - BILL OF MATERIAL

Item	Qty.	Part Number	Description	Manufacturer
1	2	GGA5	Fuse, Time Delay, 5mmx20mm, Glass Tube, 125V, 5A	Ferraz Shawmut
2	1	WMZT1C03	Circuit breaker, UL489, 1 Pole, 10KA, Trip Curve C, 3A	Eaton
3	1	WMZT1C05	Circuit breaker, UL489, 1 Pole, 10KA, Trip Curve C, 5A	Eaton
4	1	WMZT1C08	Circuit breaker, UL489, 1 Pole, 10KA, Trip Curve C, 8A	Eaton
5	1	WMZT1C20	Circuit breaker, UL489, 1 Pole, 10KA, Trip Curve C, 20A	Eaton
6	6	GGA1	Fuse, Time Delay, 5mmx20mm, Glass Tube, 125V, 1A	Ferraz Shawmut
7	16	GGM1/4	Fuse, Fast Acting, 5mmx20mm, Glass Tube, 250V, 1/4A	Ferraz Shawmut
8	4	GGM1	Fuse, Fast Acting, 5mmx20mm, Glass Tube, 250V, 1A	Ferraz Shawmut
9	1	ALFSWD	Door switch assembly for enclosure light, remote mount	Hoffman
10	1	ATEMNO	Temperature Control Switch, 1 NO Contact, 15A Max. Resistive/2A Max. Inductive @ 120VAC, 20mA Min., 30-140°F	Hoffman
11	1	CP3630	Panel, CONCEPT Line, Painted Steel, 34.2" X 28.2", fits 36" X 30" enclosure	Hoffman
12	1	CSD363012	Enclosure, CONCEPT Line, NEMA Type 4/12, Wall Mountable, ANSI 61 Grey, 36" X 30" X 12"	Hoffman
13	1	F6T5	Florescent Light Bulb, for 15" PANELITE Enclosure Light	Hoffman
14	1	LF120V15	PANELITE Line Enclosure Lighting Package, 120VAC 50/60Hz, 0.13A, 15", Manual Switch, Bulb not Included	Hoffman
15	16'	T1-1540W	Wireway Duct & Cover, 1.5" x 4" x 72", White, Rigid PVC	Iboco
16	8'	0801733	NS 35/ 7,5 PERF 2000MM, DIN rail, 35mm, 7mm height, 5 pieces 2 meters each	Phoenix Contact
17	8	1004348	KLM-A, Terminal Strip ID Tag, Fits into End Anchor	Phoenix Contact
18	A/R	1051003	ZB6:UNBEDRUCKT, Zack Terminal Marker Strips, White, Unprinted, 10 Strips of 10 Markers	Phoenix Contact
19	1	2818135	CN-UB/MP, Mounting bracket for radio antenna surge suppressor	Phoenix Contact
20	1	2818850	CN-UB-280DC-BB, Surge suppressor for antenna cable	Phoenix Contact
21	1	2867377	RAD-CAB-RG213-40, Antenna Extension Coaxial Cable, 40ft	Phoenix Contact
22	1	2867814	Yagi Antenna Kit, 6dBi	Phoenix Contact
23	1	2885207	RAD-CON-MCX90-N-SS, Adapter Cable, Pigtail, 120cm	Phoenix Contact
24	1	2900016	RAD-ISM-900-EN-BD, Wireless Radio Transceiver with Ethernet, RS-232, RS-485, 900MHz	Phoenix Contact
25	17	3022218	CLIPFIX 35, End Anchor, Snap-on, for 35mm DIN Rail	Phoenix Contact
26	6	3030271	Cross Connector/Jumper for UT-4 Terminal Blocks, Red, 10 Position	Phoenix Contact
27	31	3036819	P-FU 5X20 LED 24, Fuse plug, 6.3A, 500V, 6.2mm, for 5x20mm glass fuses, black, BFI (12-30V), fits UT 2,5/4/6-TG terminal	Phoenix Contact
28	31	3044720	UTTB 4-TG, Terminal block, two-tier, top tier pluggable, screw connection, 26-10AWG, 6.2mm, grey	Phoenix Contact
29	16	3044759	UTTB 4-PE, Ground terminal block, two-tier, feed-through, screw connection, 26-10AWG, 6.2mm, green/yellow	Phoenix Contact
30	49	3044814	UTTB 4, Terminal block, two-tier, feed-through, screw connection, 26-10AWG, 36A, 800V, 6.2mm, grey	Phoenix Contact
31	14	3047293	D-UT 2,5/4-TWIN, Terminal cover, fits UT 2,5/4-MTD/TWIN terminal block, grey	Phoenix Contact
32	2	3047358	FBS-PV UT, Vertical potential bridge, to connect the upper and lower level of 2-tier terminals	Phoenix Contact
33	1	5602519	EM-DUO-120/20/GFI, Receptacle, Duplex, 20A, GFI, DIN Rail Mount	Phoenix Contact
34	1	6AV2124-0GC01-0AX0	Operator Interface Terminal (OIT), SIMATIC TP700 Comfort Touch Panel, Windows CE 6.0, 7" Display, 12MB Memory	Siemens
35	1	6EP1332-5BA10	Power Supply, SITOP PSU 100C, 24VDC @ 4A	Siemens
36	1	6EP1933-2EC41	DC Uninterruptible Power Supply (UPS), SITOP UPS500S	Siemens
37	1	6GK5005-0BA00-1AB2	Industrial Ethernet Switch, SCALANCE XB005, Unmanaged, 5 X 10/100MBIT/S Twisted Pair RJ45, LED-Diagnosis, IP20, 24VDC	Siemens
38	1	PK15GTA	Ground Distribution Block, 15-Terminals	Square D
39	1	C7-A20X120VAC	Control relay, QRC miniature plug-in, general purpose, 120VAC coil, DPDT, 10A contacts, LED indicator	Turck
40	10	C7-A20X24VDC	Control relay, QRC miniature plug-in, general purpose, 24VDC coil, DPDT, 10A contacts, LED indicator	Turck
41	11	S7-M	Socket for miniature relays C7 and C80 series, 8-blade, DIN rail mount, 10A, 250V, replaces former socket S7-C	Turck



Backplate Layout
RTU Control Panel RID-92

P110124-RID92-11.dwg

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

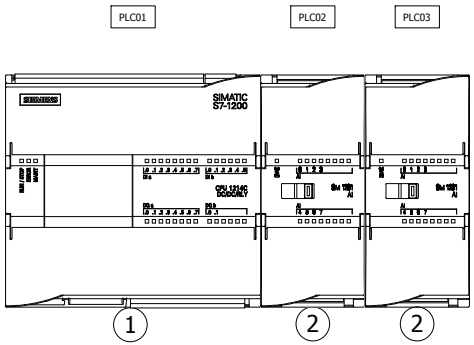
System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #92 RTU Control Panel RID-92
Backplate Layout
Bill of Material

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-92
Rev: 1	**Scale:** 3" = 1'-0"	**Sheet Size:** B	**Sheet Number:** 11 OF 14



◯WELL #92 RTU CONTROL PANEL RID-92 - PLC RACK - BILL OF MATERIAL				
Item	Qty	Part Number	Description	Manufacturer
1	1	6ES7214-1HE30-0XB0	PLC Processor, SIMATIC S7-1200, CPU 1214C, DC/DC/RLY, 14 DI (24VDC), 10DO (Relay) 2A, 2AI (0-10VDC), Power: DC 24V, 50KB Memory	Siemens
2	2	6ES7231-4HF30-0XB0	Analog Input Module, SIMATIC S7-1200, SM 1231, 8 AI, +/-10V, +/-5V, +/-2.5V, OR 0-20 mA, 12 Bit + Sign or 13 Bit ADC	Siemens

P110124-RID92-12.dwg

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

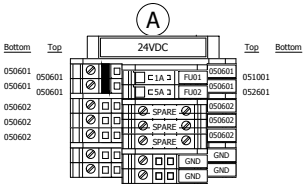
Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #92 RTU Control Panel RID-92
PLC Rack 0 Layout
& Bill of Material

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-92
Rev: 1	**Scale:** 6" = 1'-0"	**Sheet Size:** B	**Sheet Number:** 12 OF 14

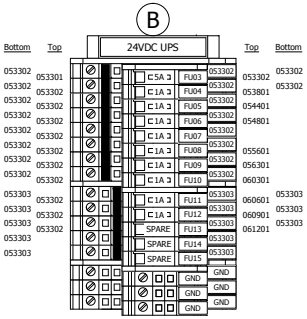
24VDC Power Distribution

RTU Control Panel RID-92



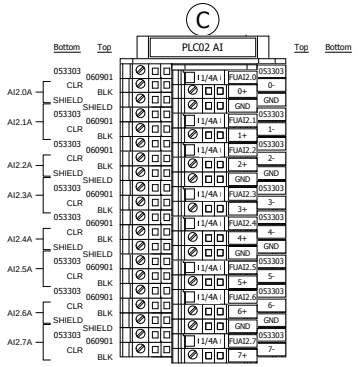
24VDC UPS Power Distribution

RTU Control Panel RID-92



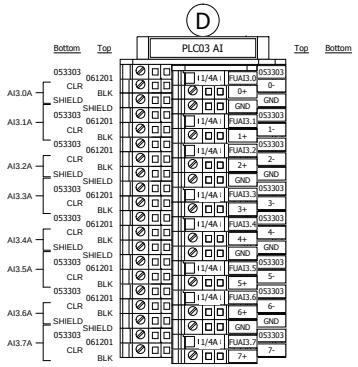
PLC02 - Analog Inputs

RTU Control Panel RID-92



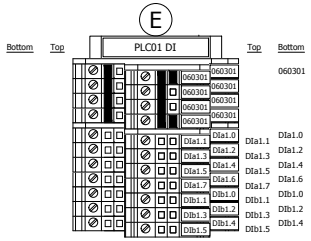
PLC03 - Analog Inputs

RTU Control Panel RID-92



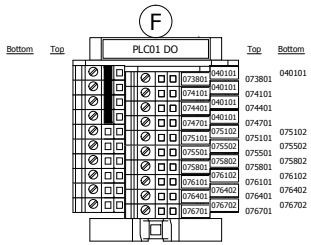
PLC01- 24VDC Discrete Inputs

RTU Control Panel RID-92



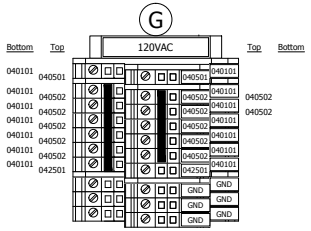
PLC01 - Relay Outputs

RTU Control Panel RID-92



120VAC Power Distribution

RTU Control Panel RID-92



P110124-RID92-13.dwg

Vertech

www.vertech.com

REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #92 RTU Control Panel RID-92
Terminal Strip Layout

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-92
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 13 OF 14

WELL #92 RTU CONTROL PANEL RID-92 - ENGRAVING SCHEDULE						
Tag	Type	Height	Width	Surface	Core	Text Line 1
1	TAG2060	2.0	6.0	White	Black	RID-92
2	TAG038075	0.375	0.75	White	Black	GND
3	TAG038075	0.375	0.75	White	Black	CB01
4	TAG038075	0.375	0.75	White	Black	CB02
5	TAG038075	0.375	0.75	White	Black	CB03
6	TAG038075	0.375	0.75	White	Black	CB04
7	TAG038075	0.375	0.75	White	Black	N/A
8	TAG038075	0.375	0.75	White	Black	N/A
9	TAG038075	0.375	0.75	White	Black	CR01
10	TAG038075	0.375	0.75	White	Black	EL01
11	TAG038075	0.375	0.75	White	Black	RCP01
12	TAG038075	0.375	0.75	White	Black	PS01
13	TAG038075	0.375	0.75	White	Black	OIT01
14	TAG038075	0.375	0.75	White	Black	UPS01
15	TAG038075	0.375	0.75	White	Black	PLC01
16	TAG038075	0.375	0.75	White	Black	PLC02
17	TAG038075	0.375	0.75	White	Black	PLC03
18	TAG038075	0.375	0.75	White	Black	ES01
19	TAG038075	0.375	0.75	White	Black	RTM01
20	TAG038075	0.375	0.75	White	Black	TS01
21	TAG038075	0.375	0.75	White	Black	DOCR00
22	TAG038075	0.375	0.75	White	Black	DOCR01
23	TAG038075	0.375	0.75	White	Black	DOCR02
24	TAG038075	0.375	0.75	White	Black	DOCR03
25	TAG038075	0.375	0.75	White	Black	DOCR04
26	TAG038075	0.375	0.75	White	Black	DOCR05
27	TAG038075	0.375	0.75	White	Black	DOCR06
28	TAG038075	0.375	0.75	White	Black	DOCR07
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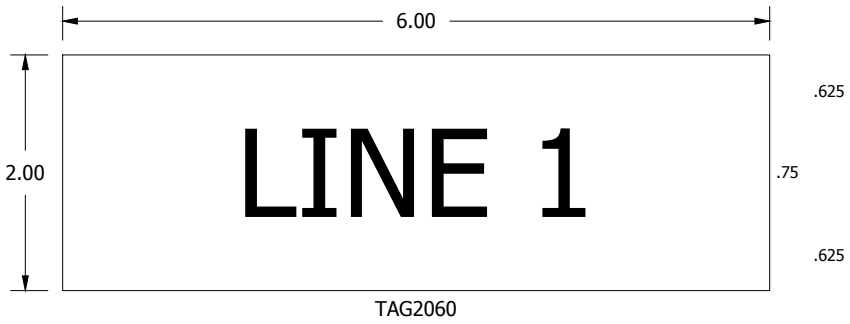
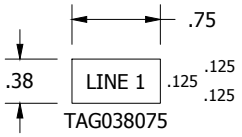


TAG2060



TAG038075

P110124-RID92-14.dwg

Vertech

www.vertech.com

REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #92 RTU Control Panel RID-92
Engraving Schedule

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-92
Rev: 1	**Scale:** 1'-0" = 1'-0"	**Sheet Size:** B	**Sheet Number:** 14 OF 14

SYNERGY ENVIRONMENTAL, LLC

APPENDIX C

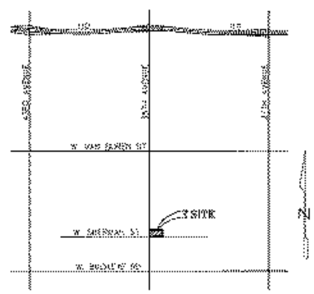
RID-95 Wellhead Treatment System Drawings

ENGINEERS NOTES

1. MARICOPA ASSOCIATION OF GOVERNMENTS (M.A.G.) UNIFORM STANDARD SPECIFICATIONS AND DETAILS FOR PUBLIC WORKS CONSTRUCTION (LATEST EDITION INCLUDING LATEST REVISION AND CURRENT SUPPLEMENTALS THEREOF PER THE LOCAL TOWN OR CITY) ARE INCORPORATED INTO THIS PLAN BY THIS REFERENCE.
2. ALL WORK REQUIRED TO COMPLETE THE CONSTRUCTION COVERED BY THIS PLAN SHALL BE IN ACCORDANCE WITH THE M.A.G. STANDARD SPECIFICATIONS AND DETAILS AND CURRENT SUPPLEMENTS THEREOF FOR THE LOCAL CITY OR TOWN UNLESS SPECIFIED OTHERWISE IN THESE PLANS OR ELSEWHERE IN THE CONTRACT DOCUMENTS. CONTRACTORS SHALL FAMILIARIZE THEMSELVES WITH ALL REQUIRED STANDARD SPECIFICATIONS, DETAILS AND SUPPLEMENTS PRIOR TO BIDDING THE WORK FOR THE CONSTRUCTION COVERED BY THIS PLAN.
3. THE CONTRACTOR IS RESPONSIBLE FOR ALL METHODS, SEQUENCING, AND SAFETY CONCERNS ASSOCIATED WITH THIS PROJECT DURING CONSTRUCTION, UNLESS SPECIFICALLY ADDRESSED OTHERWISE IN THIS PLAN OR ELSEWHERE IN THE CONTRACT.
4. THE CONTRACTOR IS TO COMPLY WITH ALL LOCAL, STATE, AND FEDERAL LAWS AND REGULATIONS APPLICABLE TO THE CONSTRUCTION COVERED BY THIS PLAN.
5. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING AND COMPLYING WITH ALL PERMITS REQUIRED TO COMPLETE ALL WORK COVERED BY THIS PLAN.
6. THE QUANTITIES AND SITE CONDITIONS DEPICTED IN THESE PLANS ARE FOR INFORMATIONAL PURPOSES ONLY AND ARE SUBJECT TO ERROR AND OMISSION. CONTRACTORS SHALL SATISFY THEMSELVES AS TO ACTUAL QUANTITIES AND SITE CONDITIONS PRIOR TO BIDDING THE WORK FOR THE CONSTRUCTION COVERED BY THIS PLAN.
7. A REASONABLE EFFORT HAS BEEN MADE TO SHOW THE LOCATIONS OF EXISTING UNDERGROUND FACILITIES AND UTILITIES IN THE CONSTRUCTION AREA. THE CONTRACTOR IS RESPONSIBLE FOR ANY DAMAGE TO UTILITIES AND/OR FACILITIES CAUSED DURING THEIR CONSTRUCTION OPERATIONS. THE CONTRACTOR SHALL CALL 48 HOURS IN ADVANCE FOR BLUE STAKE (1-800-STAKE-IT) PRIOR TO ANY EXCAVATION.
8. THE CONTRACTOR IS RESPONSIBLE FOR ALL COORDINATION OF CONSTRUCTION AFFECTING UTILITIES AND THE COORDINATION OF ANY NECESSARY UTILITY RELOCATION WORK.
9. ALL PAVING, GRADING, EXCAVATION, TRENCHING, PIPE BEDDING, CUT FILL AND BACKFILL SHALL COMPLY WITH THE RECOMMENDATIONS SET FORTH IN THE SOILS (GEOTECHNICAL) REPORT FOR THIS PROJECT IN ADDITION TO THE REFERENCED REQUIRED SPECIFICATIONS AND DETAILS. THE CONTRACTOR SHALL BE AWARE THAT CERTAIN UTILITIES REQUIRE PROPER ATTENTION AND CAREFUL PLANNING DURING SITE CONSTRUCTION. PLEASE NOTE THAT UTILITIES ON THESE PLANS MAY NOT EXHIBIT THE FULL PROTECTIVE COVER REQUIRED DURING THE SUBGRADE PREPARATION PHASE OF THE CONSTRUCTION. IN SUCH INSTANCES, THE CONTRACTOR SHALL PROVIDE ADDITIONAL PROTECTION (SUCH AS RAMPING OR INCREASED PIPE STRENGTH) TO PROVIDE THE NECESSARY PROTECTION REQUIRED TO PREVENT DAMAGE DURING THE CONSTRUCTION OF THIS PROJECT. THE CONTRACTOR SHALL HOLD THE ENGINEER HARMLESS IN ALL CASES FOR DAMAGES TO UTILITIES WHERE INADEQUATE PROTECTIVE MEASURES OCCUR.
10. THE CONTRACTOR IS TO VERIFY THE LOCATION AND THE ELEVATIONS OF ALL EXISTING UTILITIES AT POINTS OF TIE-IN PRIOR TO COMMENCING ANY NEW CONSTRUCTION. SHOULD ANY LOCATION OR ELEVATION DIFFER FROM THAT SHOWN ON THESE PLANS, THE CONTRACTOR SHALL CONTACT THE OWNER'S AGENT.
11. CONTRACTOR TO VERIFY AND COORDINATE ALL DIMENSIONS AND SITE LAYOUT WITH ARCHITECT'S FINAL SITE PLAN AND FINAL BUILDING DIMENSIONS BEFORE STARTING WORK. REPORT DISCREPANCIES TO OWNER'S AGENT.
12. COORDINATION BETWEEN ALL PARTIES IS ESSENTIAL PART OF CONTRACT.
13. CONTRACTOR IS RESPONSIBLE FOR PROJECT AND SITE CONDITIONS, AND TO WORK WITH WEATHER CONDITIONS AS THE PROJECT SITE MAY BE LOCATED IN A FLOOD PRONE AREA AND SUBJECT TO FLOODING AND ITS HAZARDS.
14. THE CONTRACTOR IS TO VERIFY THE LOCATION, ELEVATION, CONDITION, AND PAVEMENT CROSS-SLOPE OF ALL EXISTING SURFACES AT POINTS OF TIE-IN AND MATCHING, PRIOR TO COMMENCEMENT OF GRADING, PAVING, CURB AND GUTTER, OR OTHER SURFACE CONSTRUCTION. SHOULD EXISTING LOCATIONS, ELEVATIONS, CONDITION, OR PAVEMENT CROSS-SLOPE DIFFER FROM THAT SHOWN ON THESE PLANS, RESULTING IN THE DESIGN INTENT REFLECTED ON THESE PLANS NOT ABLE TO BE CONSTRUCTED, THE CONTRACTOR SHALL NOTIFY THE OWNER'S AGENT IMMEDIATELY FOR DIRECTION ON HOW TO PROCEED PRIOR TO COMMENCEMENT OF CONSTRUCTION. THE CONTRACTOR ACCEPTS RESPONSIBILITY FOR ALL COSTS ASSOCIATED WITH CORRECTIVE ACTION IF THESE PROCEDURES ARE NOT FOLLOWED.
15. CONTRACTOR IS RESPONSIBLE TO COORDINATE UTILITY CROSSINGS AT CULVERT CROSSINGS BEFORE STARTING WORK ON CULVERT. COORDINATE WITH OWNER REPRESENTATIVE. VERIFY UTILITY LINES AND/OR CONDUITS ARE IN PLACE BEFORE STARTING CULVERT WORK.
16. CONSTRUCT RETENTION BASIN AS SHOWN. CONTRACTOR TO SCARIFY BOTTOM OF BASIN TWO FEET DEEP AND NOT ALLOW COMPACTION OVER 80%.
17. THIS PROJECT REQUIRES A REGULAR ONGOING MAINTENANCE PROGRAM FOR THE DESIGNED DRAINAGE SYSTEM(S) TO PRESERVE THE DESIGN INTEGRITY AND THE ABILITY TO PERFORM ITS OPERATIONAL INTENT. FAILURE TO PROVIDE MAINTENANCE WILL JEOPARDIZE THE DRAINAGE SYSTEM(S) PERFORMANCE AND MAY LEAD TO ITS INABILITY TO PERFORM PROPERLY AND/OR CAUSE DAMAGE ELSEWHERE IN THE PROJECT.
18. SEWER LINES DESIGNED IN PROFILE AND PUBLIC WATER LINES ARE REQUIRED TO BE ASBUILT AND THE INSTALLATION AND TESTING WITNESSED BY A PROFESSIONAL ENGINEER IN ACCORDANCE WITH ARIZONA ADMINISTRATIVE CODES R18-9-E301 "4.01 GENERAL PERMIT: SEWAGE COLLECTIONS SYSTEMS" AND R18-5-507 AND 508 "APPROVAL OF CONSTRUCTION" AND "RECORD DRAWINGS", RESPECTIVELY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY OWNER 72 HOURS IN ADVANCE WHEN THOSE SYSTEMS ARE READY TO BE WITNESSED.
19. THE WORK PRODUCT PRESENTED IS BELIEVED TO BE COMPLIANT WITH THE INTENT OF THE CURRENT AMERICANS DISABILITIES ACT (ADA) REQUIREMENTS AS INTERPRETED BY THE REVIEWING AGENCY(S). IF CONSTRUCTION OF THE PROJECT IS DELAYED, THIS WORK PRODUCT SHOULD BE UPDATED TO ACCOUNT FOR ANY RELEVANT ADA UPDATES BEFORE CONSTRUCTION BEGINS.
20. LOWEST FLOOR (LF) REFERS TO EITHER FLOOR/SLAB ELEVATION OR TOP OF BASEMENT SLAB. LF ELEVATIONS ON THE GRADING AND DRAINAGE PLANS FOR RESIDENTIAL UNITS REFLECT SLAB ON GRADE CONDITIONS AND CANNOT BE LOWERED WITHOUT AGENCY APPROVAL IN LOCATIONS WHERE 'SPECIAL FLOOD HAZARD AREAS' EXIST. IN NON-FLOOD HAZARD LOCATIONS, TO ENSURE THAT ADEQUATE RESIDENTIAL LOT DRAINAGE CAN BE ACHIEVED, A PROFESSIONAL ENGINEER SHOULD BE CONSULTED IF THE LF FOR THE SLAB IS PROPOSED TO BE LOWERED, OR IF A BASEMENT IS TO BE CONSTRUCTED.

ROOSEVELT IRRIGATION DISTRICT
SITE #95 WATER TREATMENT INSTALLATION

LOCATED IN
A PORTION OF SECTION 11, T.1.N., R.2.E.
OF THE G. & S.R.M., MARICOPA COUNTY, ARIZONA



VICINITY MAP
N.T.S.

OWNER
ROOSEVELT IRRIGATION DISTRICT
103 W. BASELINE ROAD
BUCKEYE, AZ 85326
CONTACT: DONOVAN NEESE
PH: 623-386-2046

TREATMENT DESIGNER
SYNERGY ENVIRONMENTAL LLC
10045 N TATUM BLVD., SUITE 200-437
PHOENIX, AZ 85028
CONTACT: JOEL PETERSON
PH: 480-204-3818

MECHANICAL ENGINEER
TAYLOR RYMAR CORPORATION
60 E RIO SALADO PARKWAY, SUITE 1010
TEMPE, AZ 85281
CONTACT: CHRIS MARONEY
PH: 480-355-0917
FAX: 480-551-2353

STRUCTURAL ENGINEER
PK ASSOCIATES LLC
7434 E McDONALD DR
SCOTTSDALE, ARIZONA 85250
CONTACT: STEVE SLOWAKER
PH: 480-922-6654
FX: 480-922-3738

CIVIL ENGINEER
WOOD, PATEL, AND ASSOCIATES
2051 W NORTHERN AVE, SUITE 100
PHOENIX, ARIZONA 85029
CONTACT: DARRELL SMITH
PH: 602-335-8500
FX: 602-335-8580

LEGEND

EXISTING	DESCRIPTION	PROPOSED
	SURVEY MARKER	
	CURB & GUTTER	
	OVERHEAD ELECTRIC LINE	
	CONCRETE ELEVATION	C=54.52
	NATURAL GRADE	
	TOP OF CURB GUTTER ELEVATION	TC=56.17 / FG=51.5
	PAVEMENT ELEVATION	
	UTILITY POLE	
	STREET LITE	
	CATCH BASIN	
	SIGN	

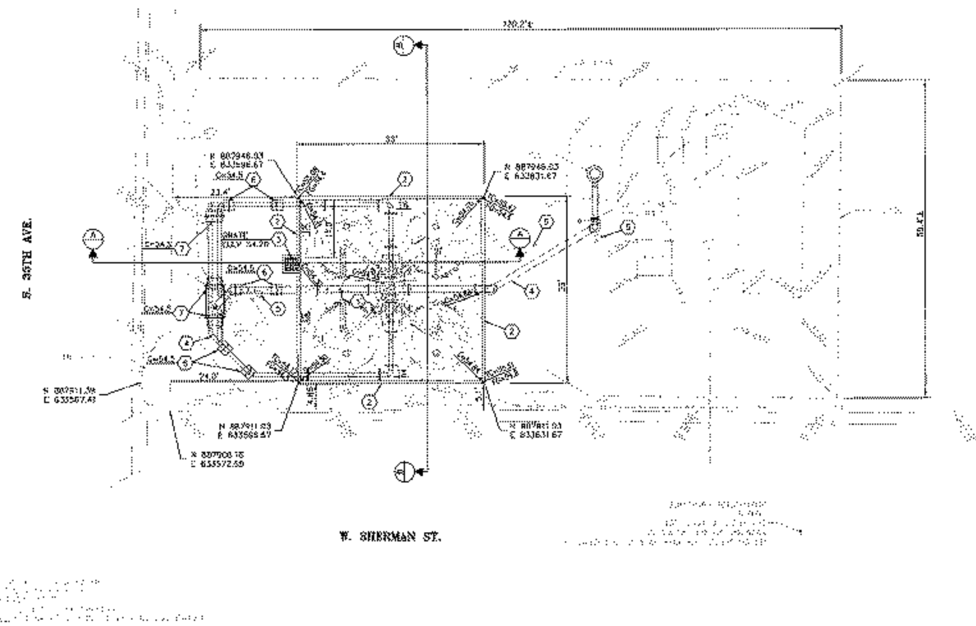
ROOSEVELT IRRIGATION DISTRICT
SITE #95 WATER TREATMENT INSTALLATION
PHOENIX, ARIZONA
GRADING TREATMENT PAD PLAN

(602) 263-1100
1-800-STAKE-IT

EXPIRES 06-30-13

WOOD/PATEL

ENGINEER
DESIGNER
CAD TECHNICIAN
SCALE (HORIZONTAL) N.T.S.
SCALE (VERTICAL) N/A
DATE 11-25-11
JOB NUMBER 115262
SHEET 1 OF 2



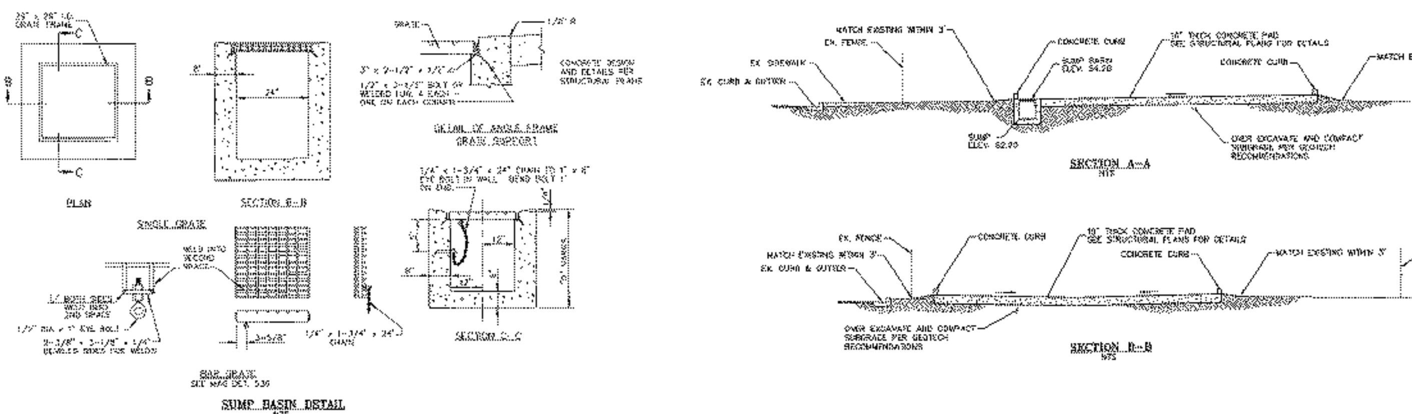
CONSTRUCTION NOTES

1. CONSTRUCT CONCRETE PAD OVER COMPACTED SUBGRADE, PER STRUCTURAL PLANS & GEOTECH RECOMMENDATION.
2. CONSTRUCT 8" CURB ON TOP OF SLAB PER STRUCTURAL PLANS.
3. CONSTRUCT GRATE FRAME AND GRATE PER DETAIL ON THIS SHEET. SEE STRUCTURAL PLAN FOR CONCRETE SUMP BASIN DETAIL.
4. PIPING PER TAYLOR RYMAN CORPORATION PLANS.
5. REMOVE EXISTING BELOW GRADE PIPING PER TAYLOR RYMAN PLANS. BACKFILL AND COMPACT TRENCH PER GEOTECH RECOMMENDATIONS.
6. CONSTRUCT 24"x24" CONCRETE PAD OVER COMPACTED SUBGRADE, PER STRUCTURAL PLANS & GEOTECH RECOMMENDATION. CONTRACTOR TO VERIFY LOCATION IN THE FIELD.
7. CONSTRUCT 24"x35" CONCRETE PAD OVER COMPACTED SUBGRADE, PER STRUCTURAL PLANS & GEOTECH RECOMMENDATION. CONTRACTOR TO VERIFY LOCATION IN THE FIELD.

NOTE:

1. GEOTECH REPORT PREPARED BY ATEK ENGINEERING CONSULTANTS. GEOTECHNICAL EXPLORATION ROOSEVELT IRRIGATION DISTRICT WATER TREATMENT PLANT – 95. NEC OF SOUTH 35TH AVENUE AND WEST SHERMAN STREET PHOENIX, ARIZONA. DATED OCTOBER 25TH, 2011.

2. CONCRETE FINISHED ELEVATIONS ALLOW FOR SURFACE DRAINAGE TO THE SUMP INLET. CONTRACTOR TO INSTALL SKIDS AND LEVEL AS NECESSARY. SEE STRUCTURAL DETAILS FOR GRADE TOLERANCES.



ROOSEVELT IRRIGATION DISTRICT
SITE #95 WATER TREATMENT INSTALLATION

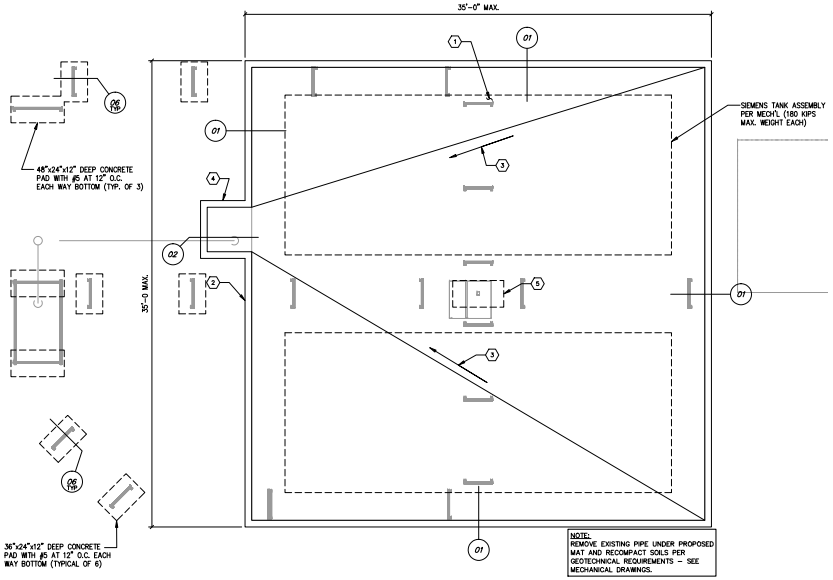
PHOENIX, ARIZONA
GRADING TREATMENT PAD PLAN

WOOD/PATEL

ENGINEER: S. SMITH
DESIGNER: D. MATTHEWS
SCALE (HORIZONTAL): 1" = 10'
SCALE (VERTICAL): N/A
SHEET 2 OF 2

PLAN KEYNOTES:

1. 16" THICK CONCRETE MAT WITH #5 AT 10" O.C. EACH WAY TOP AND BOTTOM.
2. 8" TALL CONCRETE CURB PER DETAIL 01.
3. SLOPE PAD 1% TOWARD SUMP PIT.
4. SUMP PIT.
5. PROVIDE (4) 3/4"ø EPOXY BOLTS FOR BY-PASS VALVE TO MAT CONNECTION. EPOXY WITH HILTI RE 500 SD EPOXY WITH 7" MINIMUM EMBEDMENT. REFERENCE MECHANICAL DRAWINGS FOR DETAIL.



RID #95 WELL SITE EQUIPMENT PAD

1/4" = 1'-0"

BUILDING CODE:

2006 EDITION OF THE INTERNATIONAL BUILDING CODE, WITH CITY OF PHOENIX AMENDMENTS.

LOADS:

SIEMENS HP 1220 ADSORPTION SYSTEM = 185,000 LBS. PER SKID (2 TANKS PER SKID, 4 TANKS TOTAL THIS SITE)

WIND:

90 MPH BASIC WIND SPEED, EXPOSURE C.
Iw = 1.0.
INTERNAL PRESSURE COEFFICIENT (GCpi) = 0.18.

SEISMIC:

OCCUPANCY CATEGORY = II.
Ie = 1.0.
DESIGN CATEGORY = B.
SITE CLASS D.
Ss = 0.174, S1 = 0.060.

FOUNDATIONS:

SOIL REPORT BY ATEK ENGINEERING CONSULTANTS; JOB NO.110059; DATED OCTOBER 25, 2011; MAT FOUNDATIONS SHALL BEAR ON 18" CONTROLLED COMPACTED FILL IN ACCORDANCE WITH THE ABOVE REPORT. BOTTOM OF FOOTING TO BE 12" MINIMUM BELOW FINISHED GRADE. THESE FOOTING DEPTHS ARE MINIMUMS AND THE CONTRACTOR SHALL COORDINATE WITH SOILS REPORT AND OTHERS TRADES TO ENSURE THESE MINIMUMS ARE SUFFICIENT FOR THE WORK. COMPACTED FILL SHALL EXTEND 5'-0" BEYOND EACH EDGE OF FOOTING. FINISHED GRADE IS DEFINED AS LOWEST ADJACENT GRADE WITHIN 5 FEET. DESIGN SOIL BEARING VALUE = 2000 PSF. FOUNDATION EXCAVATIONS SHALL BE INSPECTED BY SOILS ENGINEER PRIOR TO PLACEMENT OF CONCRETE.

CONCRETE:

MINIMUM 28 DAY STRENGTH 4,000 PSI (w/c = 0.45); (TYPE II, U.N.O.)
– 3,000 PSI MIN. BEFORE SETTING EQUIPMENT

MECHANICALLY VIBRATE ALL CONCRETE WHEN PLACED. MAXIMUM SLUMP 4 1/2" FOR CONCRETE WITHOUT PLASTICIZER. IF PLASTICIZER IS USED, A HIGHER FINAL SLUMP MAY BE ALLOWED UPON STRUCTURAL ENGINEER'S APPROVAL. CAST CLOSURE POUR AROUND COLUMNS AFTER COLUMN DEAD LOAD IS APPLIED.

REINFORCING:

ASTM A615 (Fy = 60 KSI) DEFORMED BARS FOR ALL BARS. ALL GRADE 60 REINFORCING TO BE WELDED SHALL BE ASTM A706. WELDED WIRE FABRIC PER ASTM A185, WIRE PER ASTM A82. NO TACK WELDING OF REINFORCING BARS ALLOWED WITHOUT PRIOR REVIEW OF PROCEDURE WITH THE STRUCTURAL ENGINEER. LATEST ACI CODE AND DETAILING MANUAL APPLY. CLEAR CONCRETE COVERAGES AS FOLLOWS:

CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH	3"
EXPOSED TO EARTH OR WEATHER	
#6 OR LARGER	2"
#5 AND SMALLER	1 1/2"
ALL OTHER PER LATEST EDITION OF ACI 318.	

LAP SPLICES IN CONCRETE:

LAP SPLICES, UNLESS NOTED OTHERWISE, SHALL BE CLASS "B" TENSION LAP SPLICES PER LATEST EDITION OF ACI 318. STAGGER SPLICES A MINIMUM OF ONE LAP LENGTH.

ALL SPLICE LOCATIONS SUBJECT TO APPROVAL BY THE STRUCTURAL ENGINEER. PROVIDE BENT CORNER BARS TO MATCH AND LAP WITH HORIZONTAL BARS AT ALL CORNERS AND INTERSECTIONS PER TYPICAL DETAILS. REINFORCING BAR SPACING GIVEN ARE MAXIMUM ON CENTERS. ALL BARS PER CRSI SPECIFICATIONS AND HANDBOOK. DOWEL ALL VERTICAL REINFORCING TO FOUNDATION WITH STANDARD 90-DEGREE HOOKS UNLESS NOTED OTHERWISE. SECURELY TIE ALL BARS IN LOCATION BEFORE PLACING CONCRETE.

NOTES ON CRACKING OF CONCRETE STRUCTURES:

CRACKING IS INHERENT TO THE MATERIAL PROPERTIES OF CONCRETE CONSTRUCTION WHILE EVERY EFFORT HAS BEEN MADE TO MINIMIZE THE EFFECTS OF UNSIGHTLY CRACKING, THE PRESENCE OF CRACKS ARE NORMAL AND UNAVOIDABLE. THE DESIGN OF THE CONCRETE STRUCTURAL ITEMS HAVE BEEN ANALYZED USING A "CRACKING SECTION." THE PRESENCE OF THE CRACKING SHOULD NOT BE CONSIDERED DETRIMENTAL TO THE STRUCTURE. CRACKS LARGER THAN 5 MILS SHALL BE FILLED AND SEALED WITH AN APPROVED CRACK FILLER TO PREVENT FUTURE DETERIORATION. ALLOWANCE SHALL BE MADE IN THE CONSTRUCTION BUDGET FOR SEALING OF SUCH CRACKS. IN SOME CASE, CRACKS DO NOT APPEAR UNTIL WELL AFTER CONSTRUCTION HAS BEEN COMPLETED. IT IS THE RESPONSIBILITY OF THE OWNER TO MAINTAIN THE STRUCTURE PROPERLY OVER THE LIFE OF THE STRUCTURE. CONCRETE CRACKS, SHOULD THEY OCCUR, SHALL BE FILLED AND SEALED TO PREVENT PREMATURE DETERIORATION OF THE STRUCTURE.

SHOP DRAWINGS:

SHOP DRAWINGS SHALL BE SUBMITTED FOR ALL STRUCTURAL ITEMS IN ADDITION TO ITEMS REQUIRED BY MECHANICAL SPECIFICATIONS.

THE CONTRACTOR SHALL REVIEW ALL SHOP DRAWINGS PRIOR TO SUBMITTAL. ITEMS NOT IN ACCORDANCE WITH CONTRACT DOCUMENTS SHALL BE FLAGGED UPON HIS REVIEW.

VERIFY ALL DIMENSIONS WITH MECHANICAL AND ALL FINISHED GRADE WITH CIVIL DRAWINGS.

ANY CHANGES, SUBSTITUTIONS, OR DEVIATIONS FROM CONTRACT DOCUMENTS SHALL BE CLOUDED BY MANUFACTURER OR FABRICATOR. ANY OF THE AFOREMENTIONED WHICH ARE NOT CLOUDED OR FLAGGED BY SUBMITTING PARTIES, SHALL NOT BE CONSIDERED APPROVED AFTER ENGINEER'S REVIEW, UNLESS NOTED ACCORDINGLY.

THE ENGINEER HAS THE RIGHT TO APPROVE OR DISAPPROVE ANY CHANGES TO CONTRACT DOCUMENTS AT ANYTIME BEFORE OR AFTER SHOP DRAWING REVIEW.

THE SHOP DRAWINGS DO NOT REPLACE THE CONTRACT DOCUMENTS. ITEMS OMITTED OR SHOWN INCORRECTLY AND ARE NOT FLAGGED BY THE STRUCTURAL ENGINEER OR ARCHITECT ARE NOT TO BE CONSIDERED CHANGES TO CONTRACT DOCUMENTS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO MAKE SURE ITEMS ARE CONSTRUCTED TO CONTRACT DOCUMENTS.

THE ADEQUACY OF ENGINEERING DESIGNS AND LAYOUT PERFORMED BY OTHERS RESTS WITH THE DESIGNING OR SUBMITTING AUTHORITY.

REVIEWING IS INTENDED ONLY AS AN AID TO THE CONTRACTOR IN OBTAINING CORRECT SHOP DRAWINGS. RESPONSIBILITY FOR CORRECTNESS SHALL REST WITH THE CONTRACTOR.

EPOXY ANCHORS IN CONCRETE:

INJECTABLE ADHESIVE SHALL BE USED FOR INSTALLATION OF REINFORCING STEEL DOWELS OR THREADED ANCHOR RODS AND INSERTS INTO NEW OR EXISTING CONCRETE OR SOLID GROUTED CONCRETE MASONRY UNITS ONLY WHERE SPECIFIED ON PLANS. IF USE IS REQUESTED FOR OTHER THAN WHERE NOTED CONTACT STRUCTURAL ENGINEER THROUGH ARCHITECT FOR APPROVAL. ADHESIVE SHALL BE FURNISHED IN SIDE BY SIDE PACKS WHICH KEEP COMPONENT A AND COMPONENT B SEPARATE. USE ONLY INJECTION TOOLS AND STATIC MIXING NOZZLES RECOMENDED BY MANUFACTURER. MANUFACTURERTS INSTRUCTIONS SHALL BE FOLLOWED.

ANCHORS USED MUST HAVE I.C.C. APPROVAL AND INCLUDE HILTI HY-150 FOR MASONRY (ESR-1967), HILTI HIT-RE 500-SD FOR CONCRETE (ESR-2322) AND SIMPSON STRONG TIE SET (ESR-1772) FOR MASONRY OR EQUIVALENT. THE USE OF ANY EPOXY ANCHOR MUST BE APPROVED BY THE ENGINEER OF RECORD.

GENERAL:

ENTIRE CONTRACT DOCUMENTS SHALL BE USED TO BUILD BUILDING. SOME CRITICAL ITEMS REQUIRED BY OTHER DISCIPLINES MAY NOT BE SHOWN ON STRUCTURAL DRAWING (i.e. MECHANICAL, PLUMBING LOADS, ANS SUPPORT PLATES ETC.)

ITEMS SHOWN BY OTHER DISCIPLINES WITH REFERENCE TO STRUCTURAL DRAWING BUT NOT SHOWN ON THESE STRUCTURAL DOCUMENT SHALL BE CONSIDERED DESIGN BUILD ITEMS. CONTRACTOR SHALL SUBMIT DESIGN BY OTHERS FOR REVIEW.

THE STRUCTURAL CONSTRUCTION DOCUMENTS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE ALL MEASURES NECESSARY TO PROTECT THE STRUCTURE DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO, BRACING, SHORING FOR LOADS DUE TO CONSTRUCTION EQUIPMENT, ETC. THE STRUCTURAL ENGINEER SHALL NOT BE RESPONSIBLE FOR THE CONTRACTOR'S MEANS, METHODS, TECHNIQUES, SEQUENCES FOR PROCEDURE OF CONSTRUCTION, OR THE SAFETY PRECAUTIONS AND THE PROGRAMS INCIDENT THERETO (NOR SHALL OBSERVATION VISITS TO THE SITE INCLUDE INSPECTION OF THESE ITEMS).

WHERE REFERENCE IS MADE TO VARIOUS TEST STANDARDS FOR MATERIALS, SUCH STANDARDS SHALL BE THE LATEST EDITION AND/OR ADDENDA.

ESTABLISH AND VERIFY ALL OPENINGS AND INSERTS FOR MECHANICAL, PLUMBING AND ELECTRICAL WITH APPROPRIATE TRADES, DRAWINGS AND SUBCONTRACTORS PRIOR TO CONSTRUCTION.

OPTIONS ARE FOR CONTRACTOR'S CONVENIENCE. IF HE CHOOSES AN OPTION, CONTRACTOR SHALL BE RESPONSIBLE FOR ALL NECESSARY CHANGES AND SHALL COORDINATE ALL DETAILS.

NOTES AND DETAILS ON DRAWINGS SHALL TAKE PRECEDENCE OVER GENERAL STRUCTURAL NOTES AND TYPICAL DETAILS. WHERE NO DETAILS ARE SHOWN, CONSTRUCTION SHALL CONFORM TO SIMILAR WORK ON THE PROJECT.

ALL DIMENSIONS SHOWN (INCLUDING ELEVATIONS) ON STRUCTURAL DRAWINGS ARE TO ASSIST CONTRACTOR IN VERIFICATION. SCALING DIMENSIONS FROM DRAWINGS IS NOT PERMITTED. LOCATION OF ALL ITEMS SHALL BE DETERMINED BY DIMENSIONS OR NOTES ONLY; DO NOT USE GRAPHIC APPEARANCE TO ASSUME SPECIFIC LOCATIONS.

CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF ALL DIMENSIONS WITH MECHANICAL AND FINISHED GRADE WITH CIVIL DRAWINGS PRIOR TO START OF CONSTRUCTION. RESOLVE ANY DISCREPANCY WITH THE ARCHITECT.

TYPICAL DETAILS MAY NOT NECESSARILY BE CUT ON PLANS, BUT APPLY UNLESS NOTED OTHERWISE.

WHERE DISCREPANCIES OCCUR BETWEEN PLANS, DETAILS, GENERAL STRUCTURAL NOTES AND SPECIFICATIONS, THE GREATER REQUIREMENTS SHALL GOVERN.

ANY ENGINEERING DESIGN, PROVIDED BY OTHERS AND SUBMITTED FOR REVIEW, SHALL BEAR THE SEAL OF AN ENGINEER REGISTERED IN THE STATE OF JURISDICTION.

MISCELLANEOUS:

REFER TO MECHANICAL, ELECTRICAL, CIVIL, OR OTHER SPECIALTY ENGINEERING DRAWINGS FOR DIMENSIONS NOT SHOWN, INCLUDING BUT NOT LIMITED TO: SIZE AND LOCATION OF CURBS, EQUIPMENT HOUSEKEEPING PADS, BLOCKOUTS, FLOOR DEPRESSIONS, SUMPS, DRAINS, ANCHOR BOLTS, EMBEDDED ITEMS, ETC. CONTRACTOR SHALL VERIFY DIMENSIONS AND RESOLVE DISCREPANCIES OR CONFLICT PRIOR TO CONSTRUCTION. WHERE SECTIONS ARE INDICATED ON THE PLAN BY A NUMBER AND A DRAWING NUMBER THUS, 1/S5.01, THE INDICATED SECTION (1) IS SHOWN ON STRUCTURAL DRAWING S5.01.

FLOOR FLATNESS/LEVELNESS SHALL MEET MECHANICAL SPECIFICATIONS (1/8" MINIMUM LEVELNESS UNLESS TIGHTER REQUIREMENT IN SPECIFICATIONS) IN HEIGHT FOR ALL STRUCTURAL SYSTEMS. CONTRACTOR SHALL INCLUDE COST FOR LEVELING ALL MAT SLABS IF REQUIRED.

SPECIAL INSPECTION:

PER IBC CHAPTER 17, SPECIAL INSPECTION IS REQUIRED FOR THE FOLLOWING ITEMS:

CONCRETE: VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERRENCED STANDARD (NOTE 1)	IBC REFERENCE
1. Inspection of reinforcing steel.	–	X	ACI 318: 3.5, 7.1–7.7	1913.4
2. Inspect bolts to be installed in concrete prior to and during placement of concrete where allowable loads have been increased.	X	–	ACI 318: APPENDIX D	1912
3. Verifying use of required design mix.	–	X	ACI 318: CH. 4, 5.2–5.4	1904.2.2, 1913.2, 1913.3
4. At the time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	X	–	ASTM C 172 ASTM C 31 ACI 318: 5.6, 5.8	1913.10
5. Inspection of concrete placement for proper application techniques.	X	–	ACI 318: 5.9, 5.10	1913.6, 1913.7, 1913.8
6. Inspection for maintenance of specified curing temperature and techniques.	–	X	ACI 318: 5.11, 5.13	1913.9
7. Inspect formwork for shape, location and dimensions of the concrete member being formed.	–	X	ACI 318: 6.1.1	

NOTES:
1. TABLES TAKEN DIRECTLY FROM IBC FOR REFERENCE.

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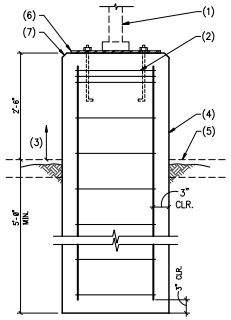
ROOSEVELT IRRIGATION DISTRICT #95 WATER TREATMENT INSTALLATION

709 SOUTH 35TH AVENUE, PHOENIX, ARIZONA

Sheet Title: S1.1 GSN AND FOUNDATION PLAN

REVISIONS:

DATE:	12/15/2011
DRAWN BY:	FML
CHECKED BY:	RH
SCALE:	AS NOTED
PROJECT NO:	11322
SHEET	S1.1



NOTES:
1. LIGHT POLE AND ANCHOR BOLTS BY OTHERS.
2. 3 #3 TIES IN TOP 5".
3. TOP OF LIGHT POLE TO BE 18'-0" ABOVE FINISHED GRADE – MAX.
4. 24" DIA. CONCRETE BASE WITH 6 #6 VERTICALS AND #3 TIES AT 12" O.C.
5. FINISHED GRADE OR CONCRETE SLAB AS OCCURS.
6. BASEPLATE AND ANCHOR BOLTS BY OTHERS.
7. 1/2" CHAMFER.

07 TYPICAL LIGHT POLE BASE

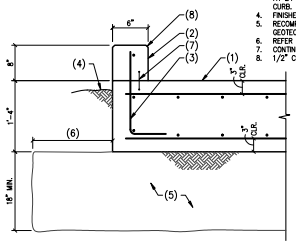
NO SCALE

	CLASS B TENSION SPLICE LENGTHS						COMP. BARS
CONC. PSI	f'c = 2,500 PSI/ f'c = 3,000 PSI		f'c = 4,000 PSI		f'c = 5,000 PSI AND HIGHER		f'c = ALL
BAR LOCATION	REGULAR	TOP	REGULAR	TOP	REGULAR	TOP	STD LAP
SIZE	CLASS	CLASS	CLASS	CLASS	CLASS	CLASS	ENCLOSED W/ SPIRAL TIES
#3	24"	31"	19"	24"	17"	22"	12"
#4	32"	41"	25"	33"	23"	29"	15"
#5	39"	51"	31"	41"	28"	36"	19"
#6	47"	61"	37"	49"	34"	43"	23"
#7	69"	89"	54"	71"	49"	63"	26"
#8	78"	102"	62"	81"	56"	72"	30"
#9	88"	115"	70"	91"	63"	81"	34"
#10	100"	129"	79"	102"	70"	92"	38"
#11	110"	143"	87"	113"	78"	102"	42"

NOTES:
1. TOP BARS ARE ANY HORIZONTAL BARS PLACED SO THAT MORE THAN 12" OF FRESH CONCRETE IS CAST IN THE MEMBER BELOW THE REINFORCEMENT.
2. UNLESS NOTED OTHERWISE, LAP SPLICES IN CONCRETE BEAMS, SLABS, AND WALLS. WILL BE CLASS B TENSION SPLICE LENGTHS. COLUMNS SHALL HAVE STANDARD COMPRESSION LAP SPLICE.
3. CONTACT STRUCTURAL ENGINEER IF CENTER TO CENTER SPACING OF REINFORCING IS LESS THAN OR EQUAL TO 3 BAR DIAMETERS, <3db OR 2db CLEAR SPACING BETWEEN BARS.
4. ALL SPLICES MUST BE FULL CONTACT.
5. SPLICES WITH #14 OR #18 BARS SHALL USE MECHANICAL COUPLERS. (THIS INCLUDES #14 OR #18 BARS TO SMALLER BARS SHOWN IN SCHEDULE).

04 LAP SCHEDULE FOR REINFORCING STEEL

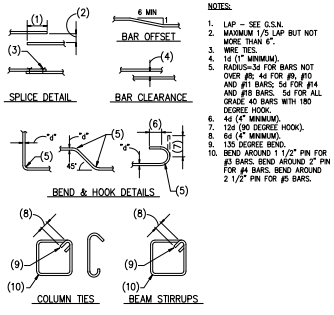
NO SCALE



NOTES:
1. MAT FOUNDATION PER PLAN.
2. 8" CONCRETE CURB WITH (1) #4 CONTINUOUS.
3. PROVIDE 1 #4 HOOKED DOWEL AT 24" O.C. – TYPICAL AT CURB.
4. FINISHED GRADE, SEE CIVIL.
5. RECOMPACTED FILL PER GEOTECH REPORT.
6. REFER TO GEOTECH REPORT.
7. CONTINUOUS WATER STOP.
8. 1/2" CHAMFER – TYP.

01 CONCRETE CURB AT MAT FOOTING

NO SCALE

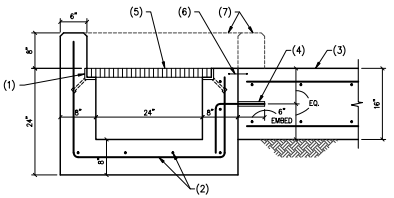


NOTES:
1. LAP – SEE G.S.N.
2. MAXIMUM 1/5 LAP BUT NOT MORE THAN 6".
3. WIRE TIES.
4. 1d (1" MINIMUM).
5. RADIUS=3d FOR BARS NOT OVER #8; 4d FOR #9, #10 AND #11 BARS; 5d FOR #14 AND #18 BARS. 5d FOR ALL GRADE 40 BARS WITH 180 DEGREE HOOK.
6. 4d (4" MINIMUM).
7. 12d (90 DEGREE HOOK).
8. 6d (4" MINIMUM).
9. 135 DEGREE BEND.
10. BEND AROUND 1 1/2" PIN FOR #5 BARS. BEND AROUND 2" PIN FOR #6 BARS. BEND AROUND 2 1/2" PIN FOR #5 BARS.

05 TYPICAL CONCRETE REINFORCING BAR DETAILS

NO SCALE

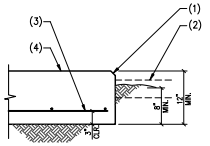
NOTES:
1. 2"x2"x1/4" CONT. GALVANIZED STEEL ANGLE WITH 1/2"ø x6" HEADED STUD AT 12" O.C.
2. #5 REINFORING AT 10" O.C.
3. CONCRETE MAT FOUNDATION.
4. DRILL AND EPOXY #5 BENT BAR PER GSN. SPACING TO MATCH SUMP PIT REINFORCING.
5. GRATING PER CIVIL DRAWINGS.
6. CONT. WATER STOP.
7. CONCRETE CURB BEYOND.



02 SUMP PIT DETAIL

NO SCALE

NOTES:
1. CHAMFER EDGES.
2. CONCRETE SLAB OR FINISHED GRADE WHERE OCCURS.
3. CONCRETE PIPE SUPPORT PAD.
4. REINFORCING PER PLAN.

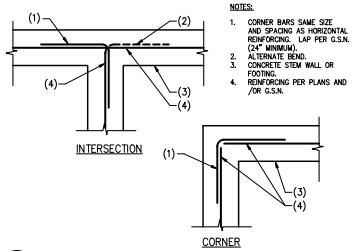


NOTE:
PIPE AND CONNECTION TO PAD BY OTHERS.

06 CONCRETE PIPE SUPPORT PAD ON GRADE

NO SCALE

NOTES:
1. CORNER BARS SAME SIZE AND SPACING AS HORIZONTAL REINFORCING. LAP PER G.S.N. (24" MINIMUM).
2. ALTERNATE BEND.
3. CONCRETE STEM WALL OR FOOTING.
4. REINFORCING PER PLANS AND /OR G.S.N.



03 PLAN – CORNER REINFORCING IN CONCRETE FOOTING AND/OR STEM WALL

NO SCALE

EXPIRES: 3-31-2012

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ROOSEVELT IRRIGATION DISTRICT #95
WATER TREATMENT INSTALLATION

709 SOUTH 35TH AVENUE, PHOENIX, ARIZONA

DETAILS

Sheet Title: S1.1

REVISIONS:

DATE:	12/15/2011
DRAWN BY:	FML
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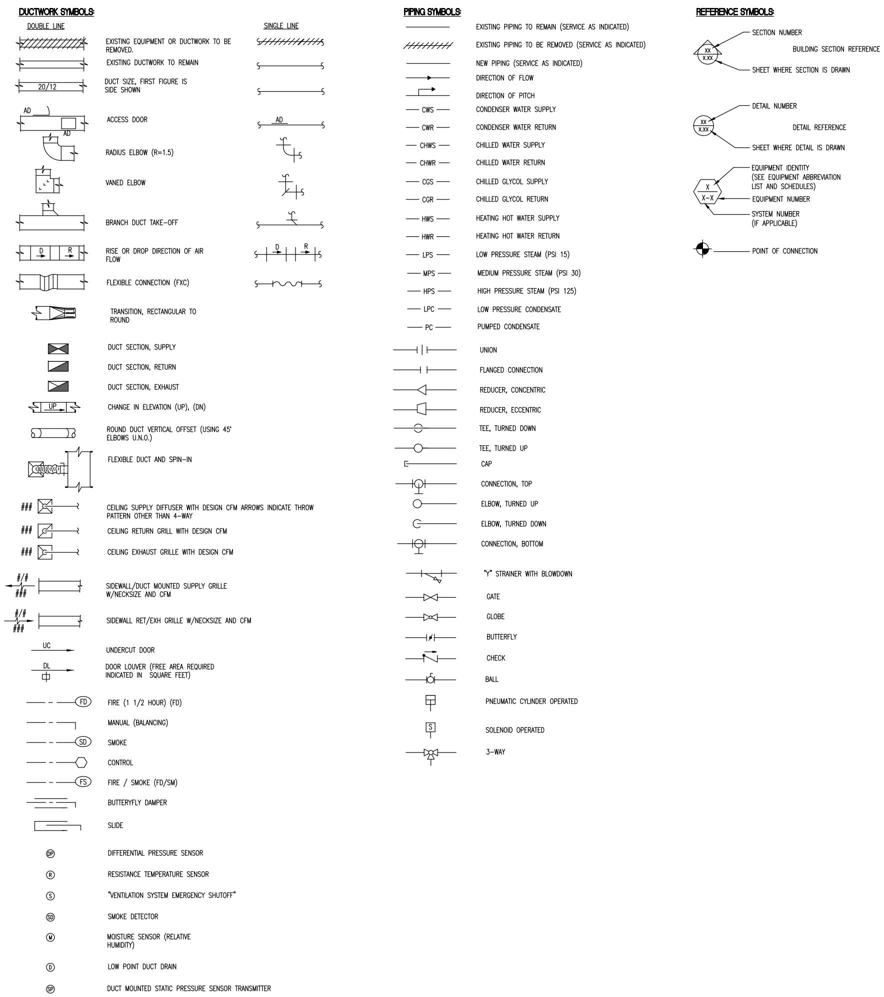
ABBREVIATIONS

AC	AIR CONDITIONING UNIT
AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
AH	AIR HANDLER (SPLIT REFRIG)
AHU	AIR HANDLING UNIT
AL	ACOUSTICAL LINING
AP	ACCESS PANEL
BB	ELECTRIC BASEBOARD RADIATION
B	BOILER
BDD	BACK DRAFT DAMPER
BFC	BELOW FINISHED CEILING
BOB	BOTTOM OF BEAM
BOD	BOTTOM OF DUCT
BOP	BOTTOM OF PIPE
C	CHILLER
CD	CEILING DIFFUSER
CFM	CUBIC FEET PER MINUTE
CHWP	CHILLED WATER PUMP
CHWR	CHILLED WATER RETURN
CHWS	CHILLED WATER SUPPLY
CO	CLEAN OUT
CP	CONDENSATE PUMP
CWR	CONDENSER WATER RETURN
CWS	CONDENSER WATER SUPPLY
CT	COOLING TOWER
CU	CONDENSING UNIT
CUH	CABINET UNIT HEATER
CVB	CONSTANT VOLUME BOX
CWP	CONDENSER WATER PUMP
DB	DRY BULB
DS	DUCT SILENCER
DWP	DOMESTIC WATER PUMP
EAT	ENTERING AIR TEMPERATURE
EC	ELECTRICAL CONTRACTOR
EF	EXHAUST FAN
EJ	EXPANSION JOINT
ER	EXHAUST REGISTER
ESP	EXTERNAL STATIC PRESSURE
ET	EXPANSION TANK
EWT	ENTERING WATER TEMPERATURE
EWC	ELECTRIC WATER COOLER
FA	FREE AREA
FX	FLEXIBLE CONNECTION
FC	FAN COIL UNIT
FD	FIRE DAMPER
FLR	FLOOR
FOB	FLAT ON BOTTOM
FOT	FLAT ON TOP
FOP	FUEL OIL PUMP
FP	FIRE PUMP
FPM	FEET PER MINUTE
FTR	FINNED TUBE RADIATION
GC	GENERAL CONTRACTOR
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
HD	HAND DAMPER
HP	HEAT PUMP
HV	HEATING AND VENTILATING UNIT
HWC	HOT WATER CONVERTER
HWP	HOT WATER PUMP
HWR	HEATING HOT WATER RETURN
HWS	HEATING HOT WATER SUPPLY
HX	HEAT EXCHANGER
HZ	HERTZ
ID	INSIDE DIAMETER
LAT	LEAVING AIR TEMPERATURE
LWT	LEAVING WATER TEMPERATURE
LD	LINEAR DIFFUSER
LF	LINEAR FEET
MC	MECHANICAL CONTRACTOR
MTD	MOUNTED
MOD	MOTOR OPERATED DAMPER
MUA	MAKE-UP AIR UNIT
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
NIC	NOT IN CONTRACT
NK	NECK
OA	OUTSIDE AIR
OAI	OUTSIDE AIR INTAKE
OAT	OUTSIDE AIR TEMPERATURE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OBD	OPPOSED BLADE DAMPER
PBD	PARALLEL BLADE DAMPER
PRV	PRESSURE REDUCING VALVE
PTAC	PACKAGED TERMINAL AIR CONDITIONER
RA	RETURN AIR
RG	RETURN AIR GRILLE
RR	RETURN AIR REGISTER
RCP	REFLECTED CEILING PLAN
RHC	REHEAT COIL
RF	RETURN FAN
SA	SUPPLY AIR
SR	SUPPLY AIR REGISTER
SCG	SMOKE CONTROL GRILLE
SD	SMOKE DAMPER
SEF	SMOKE EXHAUST FAN
SF	SUPPLY FAN
SP	STATIC PRESSURE
TG	TRANSFER GRILLE
TYP	TYPICAL
UH	UNIT HEATER
UON	UNLESS OTHERWISE NOTED
VAV	VARIABLE AIR VOLUME UNIT
VD	VOLUME DAMPER
VTR	VENT THRU ROOF
WB	WET BULB
WMS	WIRE MESH SCREEN

MECHANICAL SYMBOL SCHEDULE:

NOT ALL SYMBOLS USED. ALL MOUNTING HEIGHTS TO CENTER OF BOX AND ALL DEVICES TO COMPLY WITH ADA REQUIREMENTS, WHERE APPLICABLE.



SHEET INDEX

M0.0	MECHANICAL ABBREVIATIONS, SYMBOLS & NOTES
M0.1	MECHANICAL DEMOLITION PLAN
M1.1	MECHANICAL PLAN – NEW WORK
M2.1	PIPE ISOMETRIC
M3.1	MECHANICAL DETAILS
M4.1	MECHANICAL SCHEDULES AND SPECIFICATIONS

PROJECT GENERAL NOTES – HVAC

1. ALL WORK SHALL CONFORM TO 2006 INTERNATIONAL MECHANICAL CODE, ALL STATE AND LOCAL CODES, RULES AND REGULATIONS AND ORDINANCES.
2. SUBMISSION OF PROPOSAL DIRECTLY OR INDIRECTLY IN CONNECTION WITH THIS WORK SHALL IMPLY THAT THE BIDDER HAS EXAMINED THE JOB SITE UNDER WHICH HE WILL BE OBLIGATED TO OPERATE SHOULD HE BE AWARDED THE WORK UNDER THIS CONTRACT. NO EXTRA CHARGE WILL BE ALLOWED FOR FAILURE OF ANY BIDDER TO EXAMINE THE SITE PRIOR TO BID.
3. CONTRACTOR SHALL VISIT THE SITE AND VERIFY ALL DIMENSIONS IN THE FIELD, AND SHALL ADVISE THE ARCHITECT/ENGINEER AND THE OWNER OF ANY DISCREPANCIES BEFORE PERFORMING THE WORK.
4. CONTRACTOR SHALL SECURE AND PAY ALL FEES AND PERMITS PERTAINING TO THE CONTRACT.
5. ALL EQUIPMENT SHALL BE INSTALLED IN STRICT COMPLIANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS. THE CONTRACTOR SHALL PROVIDE ALL HANGERS AND SUPPORTS REQUIRED FOR A COMPLETE INSTALLATION.
6. CONTRACTOR SHALL BE RESPONSIBLE FOR WORKMEN'S IDENTIFICATION AND BADGING, SAFETY AND FIRE PROTECTION, CONTRACTOR'S LIABILITY INSURANCE, BARRICADES, WARNING SIGNS, TRASH REMOVAL, CUTTING AND PATCHING.
7. CONTRACTOR SHALL SCHEDULE ALL SHUTDOWNS THAT AFFECT UTILITIES AND PORTIONS OF THE BUILDING THAT MUST REMAIN IN OPERATION WITH THE OWNER.
8. CONTRACTOR SHALL COORDINATE ALL WORK WITH THE OWNER AND ALL OTHER CONTRACTORS.
9. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL RIGGING, HANDLING AND PROTECTION OF MATERIALS.
10. CONTRACTOR SHALL PROVIDE LABOR TO RECEIVE, UNLOAD, STORE, PROTECT AND TRANSFER TO POINT OF INSTALLATION, OWNER FURNISHED ITEMS.
11. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CORING AS IT RELATES TO HIS WORK.

RECORD DRAWING
(04/23/12)

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Sheet Title:
MECHANICAL ABBREVIATIONS, SYMBOLS & NOTES

REVISIONS:

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CHECKED BY:	DB
SCALE:	NONE
PROJECT NO:	011175.00
SHEET	M0.0

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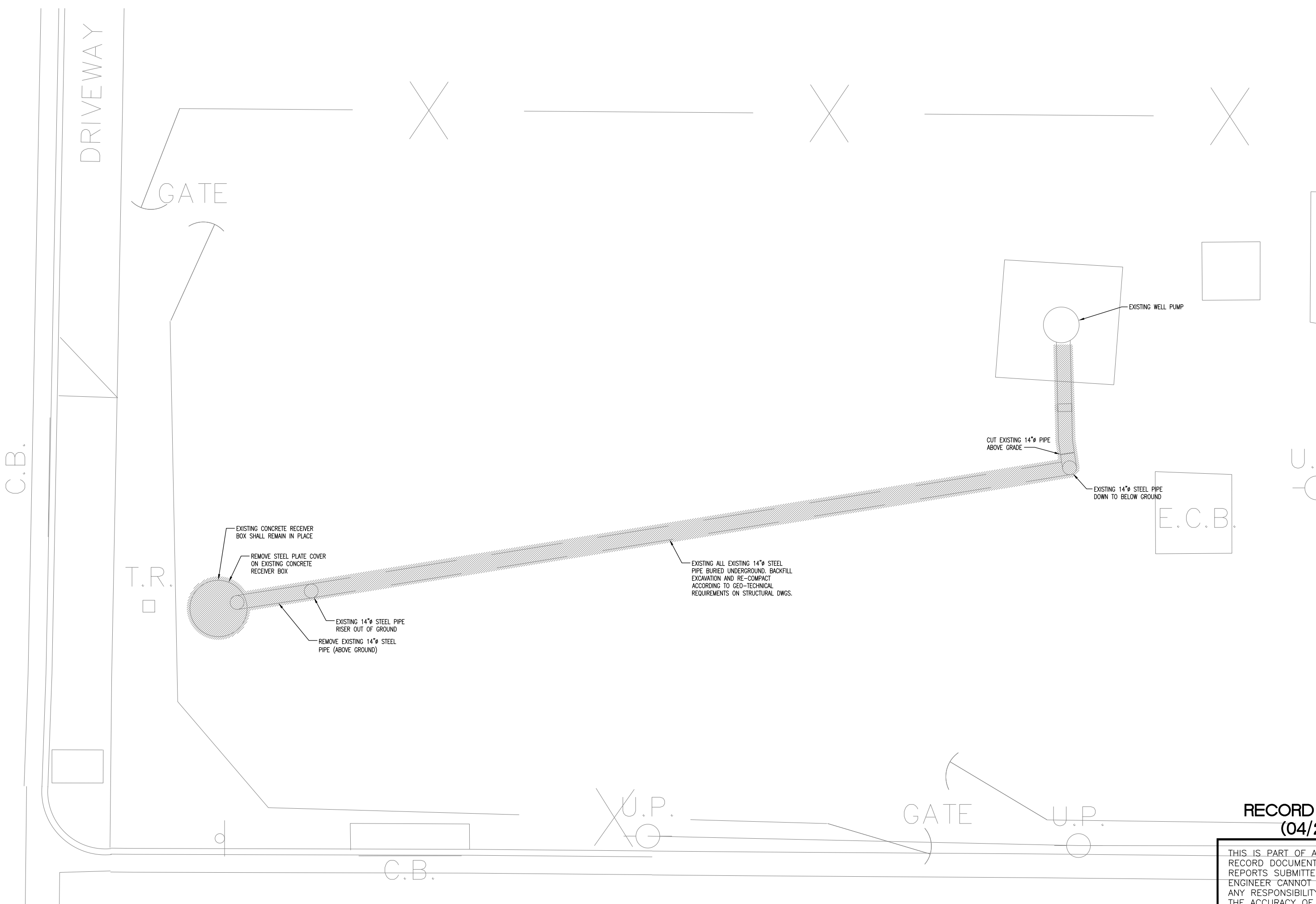

GENERAL NOTES:

A. REMOVE EXISTING PIPING AS INDICATED ON DRAWING.

B. BACKFILL AND RE-COMPACT PIPE EXCAVATION ACCORDING TO REQUIREMENTS OF THE GEOTECHNICAL REPORT.

RID #95 WELL SITE
SITE MECHANICAL DEMOLITION PLAN

1/4" = 1'-0"

RECORD DRAWING
(04/23/12)

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ROOSEVELT IRRIGATION DISTRICT #95
WATER TREATMENT INSTALLATION
709 SOUTH 35TH AVENUE, PHOENIX, ARIZONA

Sheet Title: RID SITE #95 DEMO PLAN

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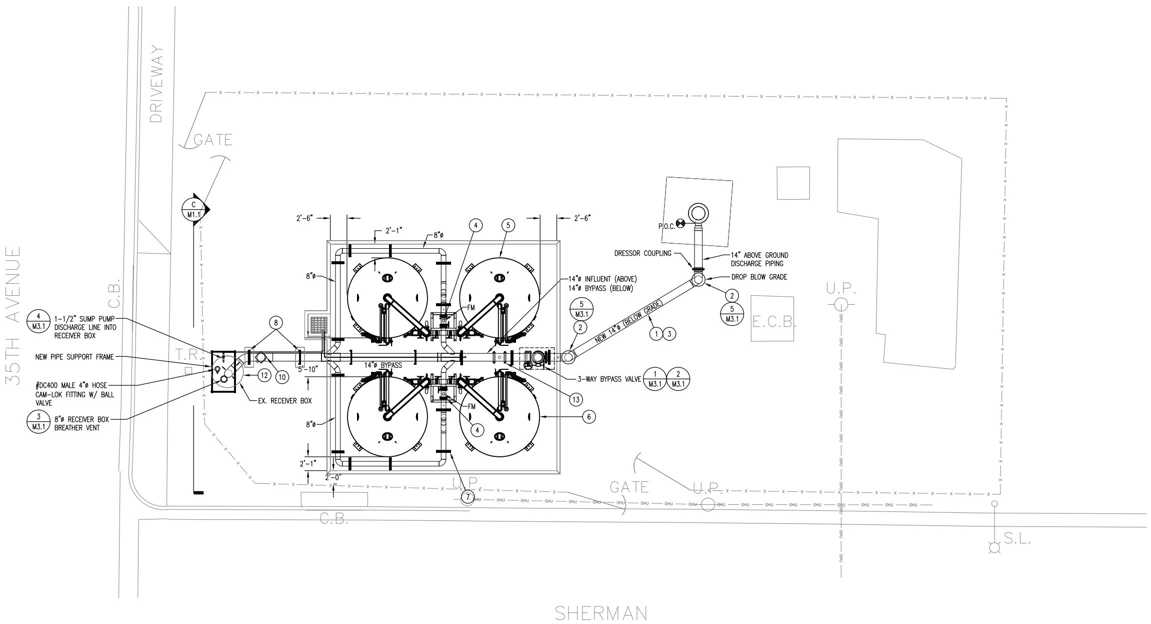
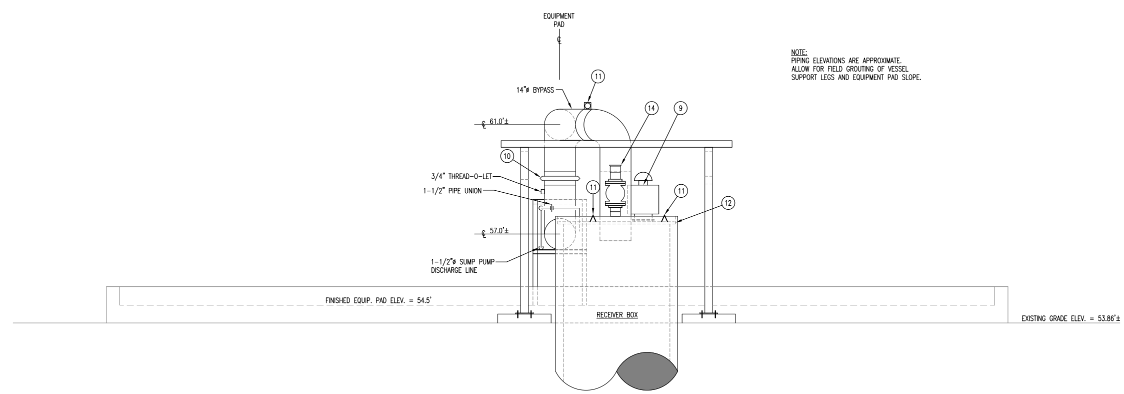


WELLSITE #95 PIPING PLAN

1/8" = 1'-0"



NOTE:
PIPING ELEVATIONS ARE APPROXIMATE. ALLOW FOR FIELD GROUTING OF VESSEL SUPPORT LEGS AND EQUIPMENT PAD SLOPE.

SECTION 'C'

1/2" = 1'-0"

KEY NOTES:

1. PROVIDE MINIMUM OF 48" EARTH COVER OVER BURIED PIPE SECTION TO ALLOW HEAVY EQUIPMENT TRAVEL OVER PIPE.
2. PROVIDE POURED-IN-PLACE CONCRETE THRUST BLOCK AT 90° ELBOWS BELOW GRADE.
3. WRAP STEEL PIPE WITH 20 MIL PVC TAPE OR PIPE SLEEVE TO 12" ABOVE FINISH GRADE SEAL PIPE WRAP WATER TIGHT ABOVE GRADE.
4. 8"ø FLOW METER. PIPING CONTRACTOR SHALL INSTALL PIPE LINE FLOW METER FURNISHED BY VERTECH.
5. SIEMENS MODEL #HP1220 (NEW) 1,000-GPM CAPACITY LGAC VESSEL SKID #2 (LEAD/LAG).
6. SIEMENS MODEL #HP1220 (NEW) 1,000-GPM CAPACITY LGAC VESSEL SKID #1 (LEAD/LAG).
7. PIPE SUPPORT (TYP.) ANCHORED TO CONCRETE PAD.
8. PIPE SUPPORT (TYP.) SEE STRUCTURAL DWG. FOR CONCRETE PAD DETAILS.
9. CARBON FILTER/TANK BREATHER.
10. (1)-14"ø MECHANICAL COUPLING.
11. 1/4"x4"x4"x2"ø WELDED LIFTING EYELET.
12. INSTALL NEW 'AIR-TIGHT' 3/8" THICK STEEL PLATE LID ON RECEIVER BOX.
    - RECEIVER BOX LID SHALL BE FURNISHED AND INSTALLED BY MECH. CONTRACTOR.
    - LID SHALL BE CLEANED AND RECEIVE FULL EPOXY PRIMER COAT AND FINISH COAT AFTER ALL WELDING AND CUTTING OPERATIONS ARE COMPLETE.
    - PROVIDE (2)-WELDED STEEL LIFTING EYELETS ON TOP OF COVER.
    - PERIMETER OF LID, AND 'CUT-OUT' OPENING OF 14" DISCHARGE PIPE SHALL BE MADE AIR TIGHT BY SEALING WITH 'RTV' FLEXIBLE SEALANT USE DOW CORNING #734 'ONE-PART' SOLVENT-LESS SILICONE SEALANT, OR EQUAL. APPLY SEALANT PER MANUFACTURER'S INSTRUCTIONS.
13. 14"ø FLOW METER. PIPING CONTRACTOR SHALL INSTALL FLOW METER FURNISHED BY VERTECH.
14. #DC400 MALE 4"ø HOSE CAM-LOK FITTING W/ BALL VALVE.

UNDERGROUND PIPE

BACKFILL & COMPACTION

OVER-EXCAVATE PIPE TRENCH TO ALLOW FOR HAND-PLACEMENT OF A 3" DEPTH OF COMPACTED CLEAN SAND BEDDING BENEATH THE PIPE.

BACKFILL TRENCH WITH COMPACTED HAND-PLACED CLEAN SAND TO A COVERING DEPTH OF 12" OVER THE PIPE.

BACKFILL REMAINDER OF TRENCH WITH NATIVE SOIL REMOVE ALL DEBRIS, ROCKS AND HARD SOIL MATERIALS GREATER THAN 1" SIZE FROM BACKFILL MATERIAL.

COMPACT ALL BACKFILL MATERIAL PLACED INTO TRENCH IN 6" LAYERS. COMPACTION SHALL COMPLY WITH REQUIREMENTS OF THE SITE GEO-TECHNICAL REPORT.

MIN. REQUIREMENTS SHALL COMPLY WITH MAG STANDARD 601.4. WITH COMPACTION PER MAG STANDARD TABLE 601.2.

PIPE PRESSURE TESTING

1. PRESSURE TEST DIRECT-BURIED STEEL PIPE AT 100 PSIG WATER PRESSURE BEFORE EXTERNAL CORROSION PROTECTION IS APPLIED TO WELDED JOINTS. HOLD TEST PRESSURE FOR 4 HOURS WITHOUT EVIDENCE OF PRESSURE LOSS OR LEAKAGE. REPAIR ALL LEAK SITES AND RETEST TO PROVE LEAKTIGHT BEFORE COVERING PIPE JOINT(S).
2. PRESSURE TEST ALL ABOVE-GROUND WATER PIPE IN MANNER LISTED IN WATER PIPING NOTE 1.9 ON SHEET M4.1.

RECORD DRAWING (04/23/12)

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ROOSEVELT IRRIGATION DISTRICT #95
WATER TREATMENT INSTALLATION
709 SOUTH 35TH AVENUE, PHOENIX, ARIZONA

Sheet Title: WELLSITE #95 PIPING PLAN

REVISIONS:

DATE:	12/14/2011
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CHECKED BY:	DLB
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PROJECT NO:	011175.00
SHEET	M1.1

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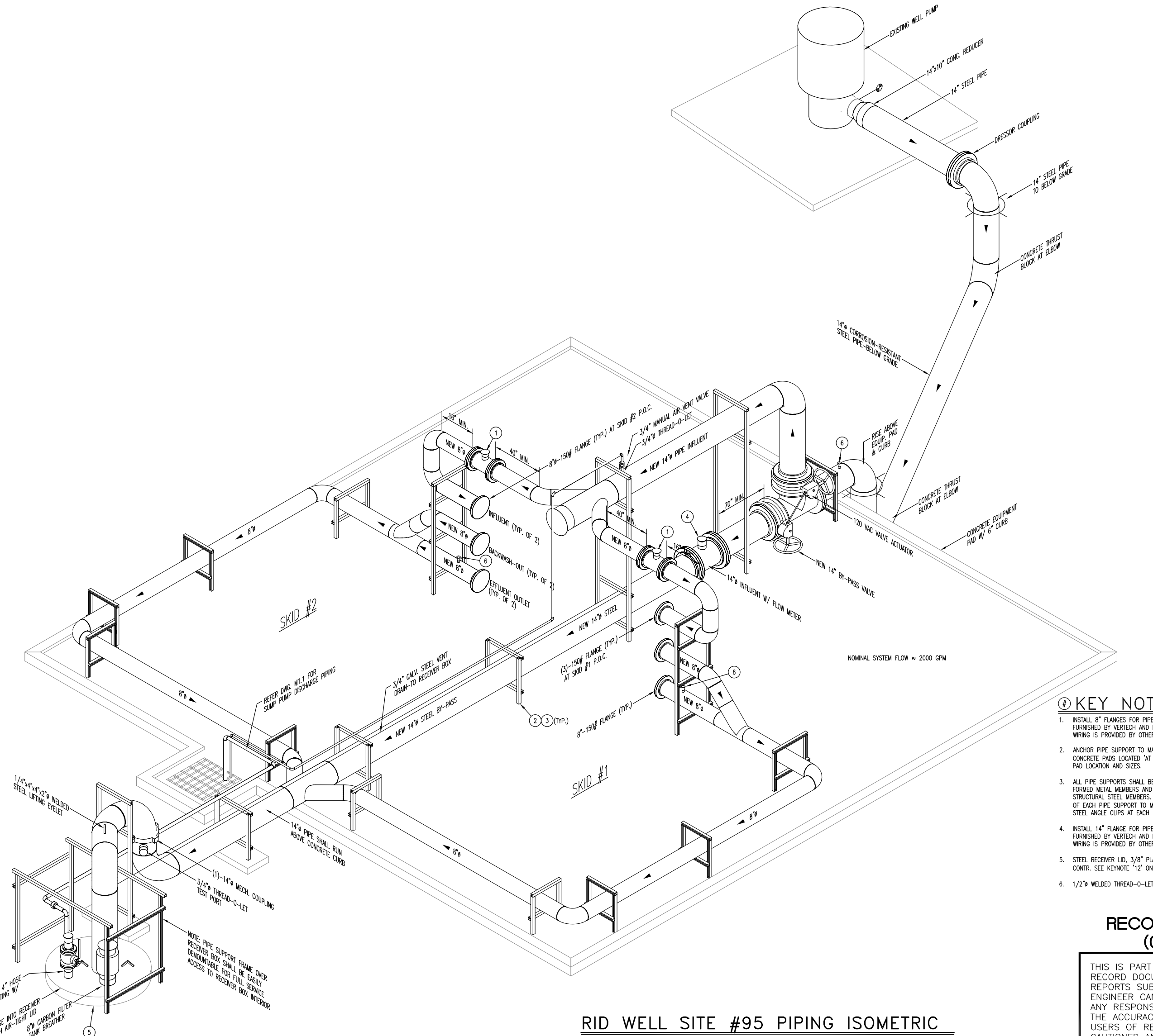

RID WELL SITE #95 PIPING ISOMETRIC

N.T.S.

KEY NOTES:

1. INSTALL 8" FLANGES FOR PIPE LINE FLOW METER. FLOW METERS ARE FURNISHED BY VERTECH AND INSTALLED BY MECH. CONTR. FLOW METER WIRING IS PROVIDED BY OTHERS.
2. ANCHOR PIPE SUPPORT TO MAIN CONCRETE EQUIPMENT PAD, OR TO CONCRETE PADS LOCATED 'AT GRADE'. REFER TO STRUCTURAL DWG'S FOR PAD LOCATION AND SIZES.
3. ALL PIPE SUPPORTS SHALL BE CONSTRUCTED WITH UNISTRUT (P1001) FORMED METAL MEMBERS AND ACCESSORY FITTINGS, OR FULL-WELDED STRUCTURAL STEEL MEMBERS. PROVIDE INTERNAL AND EXTERNAL BRACING OF EACH PIPE SUPPORT TO MAKE IT 'RIGID', INSTALL 1-1/2"x1-1/2" STEEL ANGLE CLIPS AT EACH PIPE SUPPORT TO KEEP PIPE CENTERED.
4. INSTALL 14" FLANGE FOR PIPE LINE FLOW METER. FLOW METER IS FURNISHED BY VERTECH AND INSTALLED BY MECH. CONTR. FLOW METER WIRING IS PROVIDED BY OTHERS.
5. STEEL RECEIVER LID, 3/8" PLATE, FURNISHED AND INSTALLED BY MECH. CONTR. SEE KEYNOTE '12' ON SHEET M1.1.
6. 1/2"ø WELDED THREAD-O-LET W/ 1/2"ø PIPE PLUG.

RECORD DRAWING
(04/23/12)

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ROOSEVELT IRRIGATION DISTRICT #95 WATER TREATMENT INSTALLATION

709 SOUTH 35TH AVENUE, PHOENIX, ARIZONA

Sheet Title: RID #95 WELL SITE PIPING ISOMETRIC

REVISIONS:

DATE:	12/14/2011
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CHECKED BY:	DLB
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PROJECT NO:	011175.00
SHEET	M2.1

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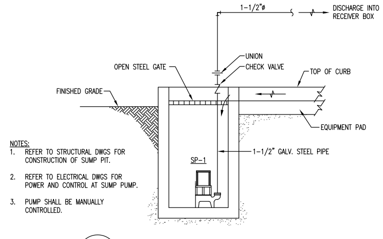
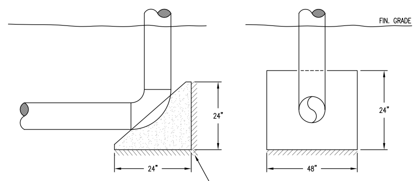


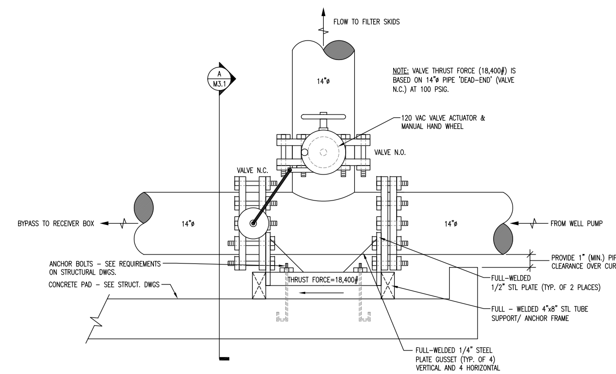
NOTES:
1. REFER TO STRUCTURAL DWGS FOR CONSTRUCTION OF SUMP PIT.
2. REFER TO ELECTRICAL DWGS FOR POWER AND CONTROL AT SUMP PUMP.
3. PUMP SHALL BE MANUALLY CONTROLLED.

4 / M3.1 **SUMP PUMP DETAIL©**
NOT TO SCALE

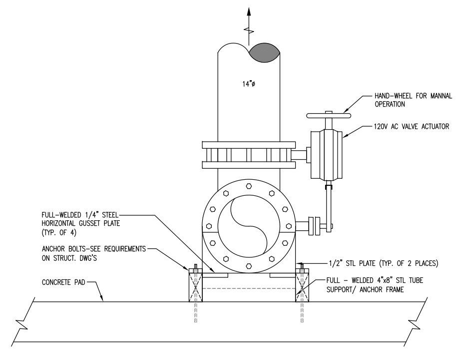


NOTE: POURED CONCRETE SHALL BEAR AGAINST RE-COMPACTED OR UNDISTURBED SOIL.

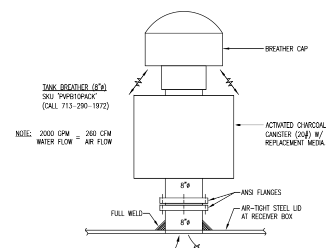
5 / M3.1 **THRUST BLOCK AT PIPING©**
NOT TO SCALE



1 / M3.1 **BY-PASS VALVE DETAIL©**
NOT TO SCALE



2 / M3.1 **SECTION 'A'**
NOT TO SCALE



3 / M3.1 **RECEIVER BOX BREATHER DETAIL©**
NOT TO SCALE

RECORD DRAWING
(04/18/12)

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ROOSEVELT IRRIGATION DISTRICT #95
WATER TREATMENT INSTALLATION
709 SOUTH 35TH AVENUE, PHOENIX, ARIZONA

Sheet Title: MECHANICAL DETAILS

REVISIONS:

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SUMP PUMP SCHEDULE

MARK	LOCATION AND SERVICE	GPM	HEAD FEET	MOTOR HP	VOLT/PH	SINGLE OR DUPLEX	MANUFACTURER AND MODEL NUMBER	REMARKS
SP-1	EQUIPMENT PAD SUMP	50	24	3/4	115/60	SINGLE	ZOELLER MODEL N145	NOTES 1,2,3

NOTES:
1. SUMP PUMP SHALL BE FURNISHED AND INSTALLED BY PIPING CONTRACTOR.
2. SUMP PUMP SHALL BE FURNISHED WITHOUT FACTORY-INSTALLED AUTOMATIC CONTROL. MANUAL CONTROL OF PUMP OPERATION SHALL BE PROVIDED THRU MANUAL SWITCH FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR.
3. SUMP PUMP SHALL BE FACTORY EQUIPPED WITH A 20 FOOT, UL LISTED, NEOPRENE POWER CORD WITH MOLDED PLUG AND GROUND WIRE.

AUTOMATIC CONTROL VALVE SCHEDULE

MARK	LOCATION AND SERVICE	VALVE TYPE	BODY DUTY	PIPE CONNECTIONS		VALVE ACTUATOR			MANUFACTURER & MODEL #	REMARKS
				SIZE	TYPE	TYPE	ACTION	POWER IN		
CV-1	EQUIPMENT PAD-BYPASS VALVE	3-WAY (CI.TEE)	DIVERTING	14"ø	150# FLG.	ROTARY ELEC.	2-POS. ON/OFF	120V AC	VSI #3S2000SS-14/1200	NOTES 1,2,3,4,5

NOTES:
1. CONTROL VALVE/ACTUATOR SHALL BE FURNISHED AND INSTALLED BY PIPING CONTRACTOR CONTROL POWER AND CONTROL WIRING SHALL BE FURNISHED AND INSTALLED BY CONTROLS CONTRACTOR.
2. ACTUATOR ENCLOSURE SHALL BE RATED NEMA 4, WATERTIGHT.
3. PIPING CONTRACTOR SHALL REVIEW CONTROL VALVE DETAIL IN DRAWINGS, TO CONFIRM VALVE ORIENTATION AND FLOW DIRECTION, PRIOR TO ORDERING VALVE ASSEMBLY.
4. VALVE ASSEMBLY SHALL CONSIST OF A 14"ø 125# FLANGED DUCTILE-IRON TEE BODY MOUNTED WITH (2)-14"ø THREADED LUG-BODY BUTTERFLY VALVES (EPDM SEAT, 304 SS DISC, 416 SS SHAFT, PTFE BUSHINGS, 316 SS SHAFT-PINS) RATED FOR 100 PSI. ACTUATOR SHALL BE MOUNTED ON PRIMARY (N.O.) VALVE STEM AND CONNECTED TO (N.C.) VALVE STEM BY A STAINLESS STEEL LINKAGE.
5. VALVE/ ACTUATOR SUPPLIER: VSI-VALVE SOLUTIONS, INC. (SALES@VALVESOLUTIONS.COM) OR 770-740-0800.

MECHANICAL GENERAL SPECIFICATIONS

1.00 SCOPE OF WORK

1.1. THE CONTRACTOR IS RESPONSIBLE FOR ALL WORK, MATERIALS, AND LABOR TO SATISFY A COMPLETE WORKING SYSTEM WHETHER SPECIFIED OR IMPLIED.

1.2. ALL WORK IS TO BE PERFORMED IN STRICT COMPLIANCE WITH ALL CODES AND REGULATIONS GOVERNING WORK OF THIS NATURE.

1.3. THE CONTRACTOR SHALL, BEFORE SUBMITTING ANY PROPOSAL, EXAMINE THE PROPOSED SITE AND SHALL DETERMINE FOR HIMSELF THE CONDITIONS THAT MAY EFFECT THE WORK. NO ALLOWANCE SHALL BE MADE IF THE CONTRACTOR FAILS TO MAKE SUCH EXAMINATIONS.

1.4. ALL EQUIPMENT AND MATERIALS SHALL BE AS SPECIFIED OR "APPROVED EQUAL" BY THE ENGINEER.

2.00 ELECTRICAL

2.1. CONTRACTOR TO COORDINATE WITH ELECTRICAL CONTRACTOR FOR LOCATION OF WIRING FOR POWERED EQUIPMENT.

3.00 MISCELLANEOUS

3.1. DO NOT SCALE THIS DRAWING FOR EXACT DIMENSIONS. VERIFY ALL FIGURES, CONDITIONS, AND DIMENSIONS AT THE JOB SITE.

3.2. THE MECHANICAL PLANS ARE INTENDED TO BE DIAGRAMMATICAL AND ARE BASED ON ONE MANUFACTURER'S EQUIPMENT. THEY ARE NOT INTENDED TO SHOW EVERY ITEM IN ITS EXACT LOCATION, THE EXACT DIMENSIONS, OR ALL THE DETAILS OF THE EQUIPMENT. THE CONTRACTOR SHALL VERIFY THE ACTUAL DIMENSIONS OF THE EQUIPMENT PROPOSED TO ENSURE THAT THE EQUIPMENT WILL FIT IN THE AVAILABLE SPACE.

PIPE SUPPORT

1.00 PIPE SUPPORT

1.1. USE 'FORMED METAL' (UNISTRUT) COMPONENTS OR WELDED STRUCTURAL STEEL SHAPES.

1.2. ANCHOR PIPE SUPPORT INTO CONCRETE PADS WITH 5/8"ø EXPANSION BOLTS.

1.3. PAINT UNCOATED STEEL TO MATCH PIPING.

WATER PIPING

1.00 MATERIAL WATER PIPING

1.1. 2" AND SMALLER: SCH. 40 GALVANIZED STEEL WITH THREADED FITTINGS, ASTM A-120.

1.2. 2" AND LARGER: SCH. 40 BLACK STEEL WITH WELDED OR FLANGED FITTINGS, ASTM A-120.

1.3. 2" AND SMALLER UNIONS SHALL BE MALLEABLE IRON BODY FOR FERROUS PIPING, BRONZE BODY FOR COPPER PIPING, GALVANIZED FOR GALVANIZED PIPING, THREADED OR SOLDER ENDS.

1.4. 2-1/2" AND LARGER UNIONS SHALL 150# BE FORGED STEEL FLANGES FOR FERROUS PIPING.

1.5. BALL VALVES - GENERAL SHUTOFF SERVICE OF WATER:
A. 2" AND SMALLER BALL VALVES SHALL BE 150SWP, 400WOG, BRONZE TWO PIECE BODY, FULL PORT, STAINLESS STEEL BALL, TEFLON SEAT AND RINGS, LEVER HANDLE AND SOLDER OR THREADED ENDS.

1.6. BUTTERFLY VALVES - GENERAL SHUTOFF SERVICE OF WATER:
A. 2-1/2" AND LARGER BUTTERFLY VALVES SHALL BE CAST IRON BODY, BRONZE DISC, SEATS AND SEATS SHALL BE CAPABLE OF SERVICE TO 250F, LUG ENDS, EXTENDED NECK, 10 POSITION LEVER HANDLE WITH MEMORY STOP.

1.7. CHECK VALVES - GENERAL SERVICE OF WATER:
A. 2" AND SMALLER CHECK VALVES SHALL BE 150SWP, 300WOG, BRONZE BODY, SWING CHECK DISC, THREADED ENDS, SUITABLE FOR HORIZONTAL OR VERTICAL INSTALLATION.
B. 2-1/2" AND LARGER CHECK VALVES SHALL BE 125SWP, 200WOG, CAST IRON BODY, SWING CHECK DISC, BRONZE TRIM, FLANGED ENDS, SUITABLE FOR HORIZONTAL OR VERTICAL INSTALLATION.

1.8. BALANCING VALVES - GENERAL SHUTOFF AND BALANCING SERVICE OF WATER:
A. 3" AND SMALLER BALANCING VALVE SHALL BE BRONZE BODY, BRASS BALL, TFE SEAT RINGS, DIFFERENTIAL PRESSURE READOUT PORTS WITH CHECK VALVES, DRAIN/PURGE PORT,MEMORY STOP FEATURE, CALIBRATED POINTER INDICATING DEGREE OF VALVE OPENING, TIGHT SHUTOFF WITH SOLDER OR THREADED ENDS.
B. 5" PIPE SIZE AND LARGER BALANCING VALVE SHALL BE CAST IRON BODY, BRASS VANE, DIFFERENTIAL PRESSURE READOUT PORTS WITH CHECK VALVES, MEMORY STOP FEATURE, CALIBRATED POINTER WITH FLANGED ENDS. BELL & GOSSETT 'CB-8F'.

1.9. TEST SHALL BE PERFORMED BY CONTRACTOR AND WITNESSED BY AUTHORIZED INSPECTOR. ALL PIPING SHALL BE TESTED TO WORKING PRESSURE OF NOT LESS THAT 100 PSIG. WHERE OPERATING PRESSURES EXCEED 50 PSIG, TEST PRESSURE SHALL BE TWO TIMES THE WORKING PRESSURE. TEST DURATION SHALL BE AT LEAST 30 MINUTES.

1.10. PAINT EXPOSED PIPING (EXCEPT GALVANIZED PIPE) WITH CORROSION RESISTANT PRIMER AND FLAT ENAMEL FINISH COAT. FINISH COAT COLOR SELECTION SHALL BE BY OWNER.

1.11. WRAP DIRECT-BURIED STEEL PIPE WITH 20-MIL PVC TAPE OR CONTINUOUS SLEEVE. EXTEND PIPE WRAP TO 12" ABOVE GRADE AND SEAL WATER TIGHT.

RECORD DRAWING (04/23/12)

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ROOSEVELT IRRIGATION DISTRICT #95
WATER TREATMENT INSTALLATION
709 SOUTH 35TH AVENUE, PHOENIX, ARIZONA

Sheet Title:
MECHANICAL SCHEDULES AND SPECIFICATIONS

REVISIONS:

DATE:	12/14/2011
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CHECKED BY:	DLB
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PROJECT NO:	011175.00
SHEET	M4.1

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ELECTRICAL DRAWING SPECIFICATION

1.0 GENERAL:

1.1. ALL ELECTRICAL WORK SHALL COMPLY WITH ALL APPLICABLE CITY, COUNTY, STATE, AND SERVING ELECTRICAL UTILITY CODES, ORDINANCES, RULES, AND REGULATIONS. THE ENTIRE INSTALLATION SHALL COMPLY WITH OR SURPASS THE REQUIREMENTS OF THE ADOPTED EDITION OF THE NATIONAL ELECTRICAL CODE.

1.2. THE COMPLETE INSTALLATION SHALL BE IN ACCORDANCE WITH THE A.D.A.A.G. (AMERICANS WITH DISABILITIES ACT ACCESSIBILITY GUIDELINES).

1.3. UNLESS SPECIFICALLY NOTED, ALL MATERIAL SHALL BE NEW, OF FIRST CLASS QUALITY, SHALL BE U.L. LISTED AND LABELED, AND FREE OF DEFECTS.

1.4. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY LOSS OR DAMAGE CAUSED BY HIM OR HIS WORKMEN TO THE SITE AND EXISTING SYSTEMS DURING THE COURSE OF CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING OR REPLACING SUCH LOSS OR DAMAGE AT NO ADDITIONAL COST TO THE OWNER.

1.5. DRAWINGS ARE DIAGRAMMATIC IN NATURE AND CANNOT SHOW EVERY CONNECTION. JUNCTION BOXES, WIRE, CONDUIT, ETC. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING A COMPLETE AND FUNCTIONAL ELECTRICAL SYSTEM.

1.6. ALL EXISTING CONDUIT RUNS ARE NOT SHOWN. VERIFY EXISTING CONDUIT LOCATIONS IN FIELD.

1.7. NO DESIGN CHANGES SHALL BE MADE TO THE ELECTRICAL SYSTEM WITHOUT THE PRIOR APPROVAL OF THE ELECTRICAL ENGINEER AND THE ELECTRICAL INSPECTOR.

2.0. SCOPE OF WORK:

2.1. FURNISH ALL MATERIALS, TOOLS AND LABOR AND PAY ALL PERMITS AND FEES REQUIRED FOR THE ELECTRICAL INSTALLATION UNLESS OTHERWISE NOTED ON PLANS. ALL PERMITS AND INSPECTIONS SHALL BE PROVIDED AS REQUIRED BY THE LOCAL CODE AUTHORITY.

2.2. THE CONTRACTOR SHALL VISIT THE SITE TO DETERMINE EXISTING CONDITIONS PRIOR TO SUBMITTING A BID.

2.3. THIS PROJECT CONSISTS OF DEMOLITION, REMODEL, AND NEW CONSTRUCTION IN THE NOTED AREAS, VERIFY WITH OWNER IN FIELD ALL DEMOLITION WORK PRIOR TO BID.

2.4. ALL CONDUIT AND CONDUCTORS REMOVED UNDER DEMOLITION WORK SHALL NOT BE REUSED.

2.5. UNLESS NOTED OTHERWISE UNDER THE PROJECTS GENERAL CONDITIONS, AT THE COMPLETION OF THIS PROJECT, TURN OVER TO OWNER'S REPRESENTATIVE ALL REMOVED DEVICES AND/OR EQUIPMENT.

2.6. WHERE IT IS IMPOSSIBLE TO REMOVE CONDUITS AS SHOWN ON DRAWINGS (SUCH AS BELOW OR EMBEDDED IN CONCRETE FLOOR SLAB), REMOVE CONDUCTORS, CUT, CAP, AND ABANDON CONDUIT BELOW FLOOR LINE.

2.7. THE CONTRACTOR SHALL VERIFY LOCATION OF ALL EXISTING SITE UTILITIES BEFORE DIGGING TRENCHES.

2.8. VERIFY AND COORDINATE THE FOLLOWING WITH THE MECHANICAL AND CONTROLS CONTRACTOR:

a)LOCATION OF EQUIPMENT; E.G. MOTORS, HEATERS, T-STATS, CONTROL PANELS, ETC.

b)EQUIPMENT ELEC CHARACTERISTICS; E.G. VOLTAGE, PHASE, HP, AMPS, CONTROL WIRING, ETC.

2.9. CONCEAL ALL CONDUIT WORK. WHERE THIS IS IMPOSSIBLE, CONTACT OWNER AND COORDINATE IN FIELD.

2.10. COORDINATE ALL POWER OUTAGES WITH THE OWNERS REPRESENTATIVE IN ADVANCE.

2.11. RESTORE ALL SURFACES THAT WERE DAMAGED (PAINTING, PATCHING, PLASTERING, ETC.,) DUE TO THE INSTALLATION OR REMOVAL OF ELECTRICAL ITEMS.

2.12. PANEL DESIGNATIONS SHOWN ON THESE DRAWINGS ARE GIVEN FOR CLARIFICATION OF CIRCUITING ONLY AND MAY NOT CORRESPOND TO THE DESIGNATIONS FOUND IN THE FIELD.

2.13. FULLY GUARANTEE THE INSTALLATION FOR A PERIOD OF ONE YEAR FROM THE DATE OF FINAL ACCEPTANCE BY THE OWNER, AGAINST ANY IMPERFECT WORKMANSHIP AND MALFUNCTION OF EQUIPMENT. ANY WORK IDENTIFIED TO BE DEFECTIVE WITHIN THE GUARANTEE PERIOD SHALL BE PROMPTLY REPAIRED OR REPLACE AT NO ADDITIONAL COST THE THE OWNER.

2.14. FOR EQUIPMENT BEING REMOVED OR REPLACED, THE ELECTRICAL CONTRACTOR SHALL DE-ENERGIZE THE EQUIPMENT AND MAKE IT SAFE PRIOR TO REMOVAL. COMPLY WITH OSHA REQUIREMENTS FOR LOCKING OUT AND TAGGING EQUIPMENT TO PREVENT INADVERTENT RE-ENERGIZING.

3.0. SUBMITTALS:

3.1. PROVIDE A MINIMUM OF SIX (6) SETS OF SHOP DRAWINGS FOR THE FOLLOWING; LIGHTING FIXTURES, DISCONNECT SWITCHES, PANELBOARDS, STARTERS, SERVICE ENTRANCE EQUIPMENT. ALL SHOP DRAWING SUBMITTALS SHALL BE BOUND, LABELED, AND MARKED TO IDENTIFY EXACTLY WHICH ITEM SHALL BE PROVIDED. SUBMIT ALL SHOP DRAWINGS FOR REVIEW AT THE SAME TIME.

3.2. SUBMIT UTILITY COORDINATION DRAWINGS AS REQUIRED BY THE LOCAL UTILITIES.

4.0. SUBSTITUTIONS:

4.1. EQUIPMENT LISTED BY BRAND NAME OR CATALOG NUMBER SHALL BE INTERPRETED AS ESTABLISHING A STANDARD OF QUALITY. SUBSTITUTIONS WILL BE CONSIDERED IF A WRITTEN REQUEST IS SUBMITTED TO THE ARCHITECT/ENGINEER A MINIMUM OF EIGHT (8) DAYS PRIOR TO THE BID DATE. THE REQUEST SHALL INCLUDE THE FOLLOWING:

a)A STATEMENT DECLARING THAT THE EQUIPMENT PROPOSED IS EQUAL TO THAT SPECIFIED BY HAVING THE SAME PHYSICAL CHARACTERISTICS AND DIMENSIONS, AND WILL MEET THE DRAWING LAYOUT AND STRUCTURAL CONDITIONS.

b)THE SPECIFIED AND SUBMITTAL CATALOG NUMBERS OF THE EQUIPMENT UNDER CONSIDERATION.

c)AN EQUIPMENT CUT SHEET WITH DRAWING, DIMENSIONS AND SPECIFICATIONS.

d)SAMPLE MAY BE REQUIRED AT THE ENGINEERS DISCRETION.

4.2. ALL LIGHTING FIXTURES SUBMITTED FOR APPROVAL MUST HAVE THE INFORMATION AS DESCRIBED ABOVE, AS WELL AS THE FOLLOWING INFORMATION:

a)MANUFACTURE'S DATA SHOWING CATALOG NUMBERS.

b)CONSTRUCTION DETAILS.

c)PHOTOMETRIC OR ISOLUX CURVES.

d)TABLE OF COEFFICIENTS OF UTILIZATION.

e)RECOMMENDED MAINTENANCE FACTOR AND BRIGHTNESS READING.

f)FOOTCANDLE CALCULATIONS AS REQUESTED.

4.3. ANY CONFLICT ARISING FROM THE USE OF SUBSTITUTED MATERIAL SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR, WHO SHALL BEAR ALL COSTS REQUIRED TO MAKE THE EQUIPMENT COMPLY WITH THE INTENT OF THE PLANS AND SPECIFICATIONS.

4.4. NO MATERIAL OR APPARATUS SHALL BE SUBSTITUTED AFTER THE BID OPENING UNLESS APPROVED IN WRITING BY THE ENGINEER.

4.5. MANUFACTURERS SHALL NOT BE CONSIDERED APPROVED AS EQUAL UNTIL LISTED IN A FORMAL ADDENDUM. LISTING AS EQUAL DOES NOT RELIEVE THE MANUFACTURER FROM MEETING THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.

5.0. CONDUIT AND WIRE:

5.1. WHERE WIRING AND CONDUIT SIZES ARE INDICATED FOR HOMERUNS, THESE SIZES APPLY TO THE ENTIRE LENGTH FROM THE PROTECTIVE DEVICE IN THE PANEL TO THE EQUIPMENT OR LAST WIRING DEVICE.

5.2. SCHEDULE 40 PVC CONDUIT SHALL BE USED FOR ALL UNDERGROUND EXTERIOR CONDUIT, IN SLABS, BELOW SLAB ON GRADE AND IN CONCRETE OR MASONRY WALLS. ALL BENDS OVER 30 DEGREES SHALL BE MADE WITH WRAPPED INTERMEDIATE METAL CONDUIT. USE LONG SWEEP FITTINGS FOR ALL 90 DEGREE BENDS. ALL PLASTIC CONDUIT, EXCEPT THAT USED FOR COMMUNICATIONS, SHALL BE PROVIDED WITH A CODE SIZED EQUIPMENT GROUNDING CONDUCTOR. DO NOT USE PVC IN EXPOSED LOCATIONS.

5.3. ALL BELOW GRADE CONDUIT SHALL BE INSTALLED A MINIMUM OF 24 INCHES BELOW FINISHED GRADE. BELOW GRADE CONDUIT SHALL BE 3/4 INCH DIAMETER, MINIMUM.

5.4. ALL WIRING SHALL BE IN CONDUIT. RIGID OR INTERMEDIATE METALLIC CONDUIT (IMC) SHALL BE USED FOR ALL EXPOSED CONDUIT, WHERE SUBJECT TO MOISTURE, OR WHERE SUBJECT TO PHYSICAL DAMAGE.

5.5. FLEXIBLE METALLIC CONDUIT SHALL BE USED FOR ALL CONNECTIONS TO MOTORS, OR EQUIPMENT SUBJECT TO VIBRATION. LIQUID-TIGHT CONDUIT SHALL BE USED WHERE SUBJECT TO MOISTURE. BOND FLEXIBLE CONDUIT PER N.E.C. REQUIREMENTS.

5.6. INSTALL A PULL WIRE IN ALL EMPTY CONDUITS.

5.7. ALL CONDUCTORS SHALL BE COPPER. MINIMUM BRANCH CIRCUIT WIRING SHALL BE #12 AWG. OTHER SIZES AS INDICATED ON THE DRAWINGS OR AS REQUIRED BY CODE. INSULATION SHALL BE THHN/THWN FOR CONDUCTORS #6 AND SMALLER AND XHHW FOR #4 AND LARGER.

5.8. CIRCUIT NUMBERS ARE SHOWN FOR CIRCUIT IDENTIFICATION. CIRCUITING SHALL AGREE WITH NUMBERING ON THE PANEL SCHEDULE PROVIDED. BALANCE THE LOAD AS EVENLY AS POSSIBLE BETWEEN EACH PHASE LEG.

5.9. ALL SECONDARY SERVICES, FEEDERS AND BRANCH CIRCUIT CONDUCTORS SHALL BE COLOR CODED AS FOLLOWS:

208/120 VOLT	PHASE	480/277 VOLT
BLACK	A	BROWN
RED	B	ORANGE
BLUE	C	YELLOW
WHITE	NEUTRAL	GRAY
GREEN	GROUND	GREEN

5.10. CONTROL WIRES SHALL BE PURPLE OR VIOLET. ALL BRANCH CIRCUIT CONDUCTORS SHALL HAVE SOLID COLOR COMPOUND OR SOLID COLOR COATING. COORDINATE EXACT REQUIREMENTS WITH CONTROLS CONTRACTOR AND NOTIFY ENGINEER OF ANY DISCREPANCIES.

5.11. WRAP UNDERGROUND STEEL CONDUIT WITH HALF LAPPED SCOTCH #50 TAPE OR PROVIDE PVC COATED PIPE.

6.0. GROUNDING:

6.1. GROUNDING OF ELECTRICAL SERVICE AND EQUIPMENT SHALL BE PER THE APPLICABLE SECTIONS OF N.E.C. ARTICLE 250, AND AS SHOWN ON THE DRAWINGS.

6.2. PROVIDE AN INSULATED EQUIPMENT GROUNDING CONDUCTORS, IN ACCORDANCE WITH N.E.C. 250-122, IN ALL CONDUITS WITH CONDUCTORS.

7.0. NOT USED:

8.0. EQUIPMENT:

8.1. ALL ELECTRICAL COMPONENTS INSTALLED OUTDOORS, EXPOSED TO WEATHER OR IN DAMP LOCATIONS SHALL BE WEATHERPROOF, NEMA 3R.

8.2. THE SERVICE ENTRANCE ASSEMBLY AND ALL OF ITS COMPONENTS SHALL BE BRACED TO WITHSTAND A MINIMUM OF 100% OF AVAILABLE FAULT CURRENT SUPPLIED BY THE POWER COMPANY.

8.3. PROVIDE AT THE COMPLETION OF THE PROJECT NEATLY TYPED ACCURATE PANELBOARD DIRECTORIES INDICATING ALL BRANCH CIRCUITS AND SPARES. ALL SPARES SHALL BE LEFT IN THE OFF POSITION.

8.4. PROVIDE A 120 VOLT, 20 AMP, WEATHERPROOF GFCI RECEPTACLE WITHIN 25 FEET AND ACCESSIBLE TO ALL MECHANICAL EQUIPMENT.

8.5. LABEL ALL SERVICE ENTRANCE EQUIPMENT, PANELBOARDS AND MAJOR SINGLE LINE COMPONENTS WITH PERMANENTLY AFFIXED PHENOLIC LETTERING (2" MINIMUM). LABEL ALL RECEPTACLES, DEVICES, JUNCTION BOXES, DISCONNECT SWITCHES, LUMINAIRES, ETC. WITH VINYL ADHESIVE TAPE INDICATING PANEL AND CIRCUIT NUMBER.

8.6. PANELBOARDS SHALL HAVE COPPER BUS, WITH FULL NEUTRAL AND GROUND BUSSES. MINIMUM AIC RATING SHALL BE 10,000 AMPS. PANELS SHALL HAVE LOCKING DOORS WITH MATCHING KEYS. PANELS SHALL BE MANUFACTURED BY SQUARE "D", GENERAL ELECTRIC, CUTLER HAMMER OR SIEMENS. LOAD CENTERS ARE NOT ACCEPTABLE.

8.7. ALL BRANCH CIRCUIT PANEL BOXES SHALL BE MINIMUM 5-3/4 INCHES DEEP AND 20 INCHES WIDE. PROVIDE MOUNTING HARDWARE IN ALL SPACES FOR FUTURE DEVICES.

8.8. ALL SAFETY SWITCHES SHALL BE HEAVY DUTY TYPE, WITH COVER INTERLOCK AND HANDLE LOCK OFF PROVISIONS. SWITCHES SHALL BE MANUFACTURED BY SQUARE "D", GENERAL ELECTRIC, CUTLER HAMMER OR SIEMENS. RATING AND FUSING SHALL BE AS SHOWN ON THE DRAWINGS. COORDINATE FUSING FOR SWITCHES SERVING MECHANICAL EQUIPMENT WITH MANUFACTURERS RECOMMENDED FUSE SIZE.

8.9. DRY TYPE TRANSFORMERS SHALL BE 60 HZ, WITH KVA RATINGS AS NOTED ON THE DRAWINGS. TRANSFORMERS SHALL BE TOTALLY ENCLOSED, EXCEPT FOR VENTILATION OPENINGS AND BE PROVIDED WITH WEATHER HOOD SUITABLE FOR OUTDOOR INSTALLATION. TRANSFORMERS SHALL HAVE A SHEET STEEL ENCLOSURE, AND CORE AND COIL ASSEMBLY SHALL BE ISOLATED FROM THE MOUNTING FRAME WITH VIBRATION ISOLATORS. PROVIDE SIX (6), 2-1/2% TAPS, FOUR (4) BELOW AND TWO (2) ABOVE NORMAL. INSTALL TRANSFORMER A MINIMUM OF 6 INCHES FROM ADJACENT WALLS OR STRUCTURES. TRANSFORMERS SHALL BE MANUFACTURED BY SQUARE "D", SIEMENS, GENERAL ELECTRIC, OR CUTLER HAMMER.

8.10. TIME CLOCKS SHALL MEET THE REQUIREMENTS OF THE 2006 IECC. PROVIDE WITH COMBINATION 7-DAY AND SEASONAL PROGRAM SCHEDULE AND MINIMUM 4 HOUR BATTERY BACK UP. INTERMATIC MODEL #ET7011150R OR EQUAL.

9.0. WIRING DEVICES:

9.1. SWITCHES SHALL BE OF THE QUIET TYPE, SPECIFICATION GRADE, 20 AMP, 120/277 VOLT AC. HUBBELL 1221 (SINGLE POLE), 1223 (THREE-WAY), EQUAL BY LEVITON OR PASS & SEYMOUR.

9.2. RECEPTACLES, UNLESS NOTED OTHERWISE, SHALL BE DUPLEX, 120 VOLT, 20 AMP, GROUNDING TYPE, NEMA 5-20R. HUBBELL 5362, OR EQUAL BY LEVITON OR PASS & SEYMOUR.

9.3. PROVIDE ALL WIRING DEVICES WITH APPROPRIATE COVERPLATES. PROVIDE BLANK COVER PLATES FOR ALL EMPTY BOXES. COVERPLATES SHALL BE LEXAN, PLASTIC OR STAINLESS STEEL IN FINISHED AREA. GALVANIZED COVERPLATES MAY BE USED IN EQUIPMENT ROOMS.

ELECTRICAL ABBREVIATIONS AND SYMBOL SCHEDULE:

NOTE: NOT ALL SYMBOLS MAY BE USED ON THIS PROJECT. ALL MOUNTING HEIGHTS TO CENTER OF BOX, UNO. ALL DEVICES SHALL COMPLY WITH ADA REQUIREMENTS, WHERE APPLICABLE.

ABBREVIATIONS:

A	AMPERES
AC	ALTERNATING CURRENT
AF	AMPERES FRAME (RATING)
AFC	AVAILABLE FAULT CURRENT
AFG	ABOVE FINISHED GRADE
AFF	ABOVE FINISHED FLOOR
AHU	AIR HANDLING UNIT
AIC	AMPERES INTERRUPTING CAPACITY
AL	ALUMINUM
AT	AMPERES TRIP (SETTING)
AUX	AUXILIARY
BRKR	BREAKER
C	CONDUIT
CB	CIRCUIT BREAKER
CKT	CIRCUIT
COMB	COMBINATION
COMM	COMMUNICATIONS
CP	CONTROL PANEL
CPT	CONTROL POWER TRANSFORMER
CT	CURRENT TRANSFORMER
CU	COPPER
DC	DIRECT CURRENT
DISC	DISCONNECT
DP	POWER DISTRIBUTION PANEL
DWG	DRAWING
EC	ELECTRICAL CONTRACTOR
EDF	ELECTRIC DRINKING FOUNTAIN
EF	EXHAUST FAN
EG	EQUIPMENT GROUND
ELEC	ELECTRICAL – ELECTRIC
EM	EMERGENCY
EMT	ELECTRICAL METALLIC TUBING
EO	ELECTRICALLY OPERATED
F	FUSE
FA	FIRE ALARM
FAAP	FIRE ALARM ANNUNCIATE PANEL
FACP	FIRE ALARM CONTROL PANEL
FSD	FIRE SMOKE DAMPER
FDR	FEEDER
FLA	FULL LOAD AMPERES
FLEX	FLEXIBLE
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GND	GROUND
HID	HIGH INTENSITY DISCHARGE
HP	HORSE POWER
HOA	HAND-OFF-AUTO
JB	JUNCTION BOX
KV	KILOVOLTS
KVA	KILOVOLTS-AMPERES
KW	KILOWATTS
LTG	LIGHTING
MBJ	MAIN BONDING JUMPER
MC	MECHANICAL CONTRACTOR
MCA	MINIMUM CIRCUIT AMPACITY
MCC	MOTOR CONTROL CENTER
MECH	MECHANICAL
MH	MANHOLE
MISC	MISCELLANEOUS
MTD	MOUNTED
MTG	MOUNTING
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NEU	NEUTRAL
NF	NON-FUSED
NIC	NOT IN CONTRACT
NL	NIGHT LIGHT
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OL'S	OVERLOADS
P	POLE
PA	PUBLIC ADDRESS
PB	PUSH BUTTON
PH	PHASE
PNL	PANEL
PT	POTENTIAL TRANSFORMER
PWR	POWER
RECP	RECEPTACLE
RLA	RUNNING LOAD AMPERES
RSC	RIGID STEEL CONDUIT
RTU	ROOF TOP UNIT
SCHED	SCHEDULE
SES	SERVICE ENTRANCE SECTION
SS	SPECIAL SYSTEMS
SWBD	SWITCHBOARD
TMB	TELEPHONE MOUNTING BOARD
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
V	VOLTS
VP	VANDAL PROOF
W	WIRE
WG	WIRE GUARD
WH	WATER HEATER
WP	WEATHER PROOF (WHILE IN USE)

GENERAL SYMBOLS:

- RECESSED OR SURFACE JUNCTION BOX IN ACCESSIBLE LOCATION WITH FLEXIBLE CONDUIT CONNECTION.
- MOTOR, HP, VOLTAGE, & PHASE AS INDICATED MECH EQUIP SCHEDULE.
- ELECTRICAL PANELBOARD, 480/277V, 3PH, 4W, WITH GND, UNO. FLUSH/SURFACE MOUNT AT +6'-0" AFF TO TOP. STUB OUT THREE 3/4"C INTO ACCESSIBLE CEILING SPACE.
- ELECTRICAL PANELBOARD, 208/120V, 3PH, 4W WITH GND, UNO. FLUSH/SURFACE MOUNT AT +6'-0" AFF TO TOP. STUB OUT THREE 3/4"C INTO ACCESSIBLE CEILING SPACE.
- KVA — TRANSFORMER, TYPE AND RATING AS SPECIFIED ON PLAN.
- SERVICE ENTRANCE SECTION, DISTRIBUTION PANELBOARD, OR MOTOR CONTROL CENTER, AS SPECIFIED ON PLAN.
- CONDUIT CONCEALED IN FINISHED AREAS OR ABOVE CEILING SPACE.
- UNDERGROUND CONDUIT OR CONCEALED IN CONCRETE OR BELOW FLOOR AS NOTED.
- CONDUIT TURNING UP
- CONDUIT TURNING DOWN
- CONDUIT STUB OUT, AS NOTED ON PLANS
- HOME RUN TO PANELBOARD OR AS NOTED. ALL CONDUCTORS SHALL BE COPPER & HAVE CODE SIZED GROUNDING CONDUCTORS. MINIMUM BRANCH CIRCUIT WIRING SHALL BE #12 AWG. OTHER SIZES AS INDICATED ON THE DRAWINGS, ELECTRICAL SCHEDULES, OR AS REQUIRED BY CODE. INSULATION SHALL BE THHN/THWN FOR CONDUCTORS #6 AND SMALLER AND XHHW FOR #4 AND LARGER.

SINGLE LINE DIAGRAM SYMBOLS:

- LSIG — LONG-TIME/SHORT-TIME/INSTANTANEOUS/GROUND FAULT TRIP SETTINGS
- CIRCUIT BREAKER
- FUSIBLE SWITCH, SIZE AS INDICATED ON PLANS
- MOTOR STARTER, # INDICATES NEMA SIZE
- 480V DRAW-OUT CIRCUIT BREAKER
- DRAW-OUT FUSE
- COMBINATION MOTOR CONTROLLER, FUSIBLE SWITCH TYPE
- COMBINATION MOTOR CONTROLLER, CIRCUIT BREAKER TYPE
- GROUND
- METER
- GFP — GROUND FAULT PROTECTION
- CURRENT TRANSFORMER
- DPM — DIGITAL POWER METER
- DISTRIBUTION TRANSFORMER
- DELTA CONNECTION
- WYE CONNECTION WITH GROUND
- FEED THROUGH LUG CONNECTION
- ELECTRICAL PANEL BOARD, MAIN LUG ONLY
- ELECTRICAL PANEL BOARD, MAIN CIRCUIT BREAKER

CONTROLS SYMBOLS:

NOTE: PROVIDE NEMA 3R ENCLOSURE IN EXTERIOR APPLICATIONS.

- $ — SINGLE POLE TOGGLE SWITCH MTD AT +48" AFF
- $_K — SINGLE POLE KEY OPERATED SWITCH MTD AT +48" AFF
- $_M — HP RATED MANUAL MOTOR STARTER WITH SWITCH CONTROL & THERMAL OVERLOAD PROTECTION.
- MOTOR CONTROLLER. FURNISHED WITH EQUIPMENT.
- MOTOR CONTROLLER. FURNISHED BY ELECTRICAL CONTRACTOR.
- HEAVY DUTY SAFETY DISCONNECT SWITCH, 250V-30A-3P, UNO. HP RATED, REFER TO EQUIP SCHEDULE(S) FOR FUSES AND OTHER SPECIFICATIONS
- COMBINATION MOTOR STARTER/DISCONNECT SWITCH, FUSIBLE WITH 120V CONTROL TRANSFORMER, H-O-A SWITCH, AND PILOT LIGHT IN ENCLOSURE. FUSE PER EQUIPMENT MANUFACTURER'S RECOMMENDATIONS OR EQUIP SCHEDULE SPECIFICATIONS. SUBSCRIPT INDICATES STARTER SIZE.
- VFD — VARIABLE FREQUENCY DRIVE. FURNISHED BY MECHANICAL CONTRACTOR, INSTALLED BY ELECTRICAL CONTRACTOR.
- TS — TIME SWITCH
- PC — PHOTOCELL. ROOF MOUNTED, UNO

POWER SYMBOLS:

NOTE: WEATHER PROOF WHERE OUTSIDE MTD AT +72" AFG, UNO

- SPECIAL PURPOSE RECEPTACLE, 250V-400V, NEMA CONFIG & MTG HEIGHT AS SPECIFIED ON EQUIP SCHEDULE OR AS REQUIRED FOR INTENDED USE.
- DUPLEX RECEPTACLE, 20A-2P-3W, NEMA 5-20R, MTD AT +16" AFF, UNO
- DOUBLE DUPLEX RECEPTACLE, (2) 20A-2P-3W, NEMA 5-20R
- SINGLE RECEPTACLE, 30A-2P-3W, NEMA 5-30R MTD AT +16" AFF, UNO
- SINGLE, DUPLEX, OR DBL-DUPLEX RECP W/SWITCHED LEG MTD AT +16", UNO

LIGHTING SYMBOLS:

NOTE: REFER TO LIGHTING FIXTURE SCHEDULE FOR LUMINAIRE SPECIFICATIONS.
NOTE: SUBSCRIPT INDICATES LUMINAIRE TYPE.

- DOUBLE OR SINGLE ARM POLE MTD AREA LIGHT WITH CONCRETE BASE
- BOLLARD OR POST MTD AREA LIGHT
- SURFACE CEILING MTD INCANDESCENT, FLUORESCENT, OR HID FIXTURE
- SURFACE WALL MTD INCANDESCENT, FLUORESCENT, OR HID FIXTURE

GENERAL PROJECT NOTES:

A. ALL WORK TO BE PERFORMED IN ACCORDANCE WITH THE N.E.C. AND ALL APPLICABLE LOCAL CODES AND ORDINANCES.

B. ALL CONTRACTORS SHALL VERIFY LOCATION OF ALL EXISTING SITE UTILITIES BEFORE DIGGING TRENCHES.

C. THE ELECTRICAL CONTRACTOR SHALL VERIFY REQUIREMENTS FOR EQUIPMENT FURNISHED BY OTHERS TO BE CONNECTED TO THE THE ELECTRICAL SYSTEM. THE ELECTRICAL CONTRACTOR SHALL PROVIDE ALL MATERIALS NECESSARY, SUCH AS WIRE, CONDUIT, FUSE, TRANSFORMERS, ETC. FOR PROPER INSTALLATION AND ELECTRICAL OPERATION OF SUCH EQUIPMENT.

D. ELECTRICAL CONTRACTOR SHALL CONTACT THE ENGINEERS OFFICE IN WRITING WITH A REQUEST FOR INFORMATION (RFI) PRIOR TO PROCEEDING WITH ANY WORK NOT CLEARLY SHOWN IN DOCUMENTS HEREIN. ENGINEER WILL NOT ASSUME RESPONSIBILITY FOR WORK NOT AUTHORIZED TO CHANGES TO CONTRACT DOCUMENTS.

OBSERVATION SCHEDULE:

1. CONTACT THE ENGINEER 48 HOURS PRIOR TO SCHEDULING AN OBSERVATION FOR ANY INSPECTION BY THE LOCAL JURISDICTION. THE ENGINEER, OR HIS REPRESENTATIVE SHALL VERIFY COMPLIANCE WITH THESE DOCUMENTS. ANY WORK THAT DOES NOT COMPLY WITH THESE DOCUMENTS SHALL BE CORRECTED BY THE ELECTRICAL CONTRACTORS EXPENSE.

2. PUNCH WALK-THROUGH, AFTER ENERGIZING ALL EQUIPMENT.

REFERENCE SYMBOLS

- EQP / #: MECH EQUIP IDENTIFICATION. REFER TO EQUIP SCHED FOR ELECTRICAL REQUIREMENTS. EQUIPMENT TAG NUMBER
- #: FEEDER IDENTIFICATION. REFER TO FEEDER SCHED FOR CONDUCTOR DETAILS
- f#: AVAIL FAULT CURRENT IDENTIFICATION. REFER TO AFC TABLE FOR FURTHER DETAILS

SHEET INDEX

RECORD DRAWING (4/23/2012)

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ROOSEVELT IRRIGATION DISTRICT #95
WATER TREATMENT INSTALLATION
709 SOUTH 35TH AVENUE, PHOENIX, ARIZONA

Sheet Title:
ELECTRICAL SPECIFICATIONS AND SYMBOLS LIST

REVISIONS:

DATE:	12/14/2011
DRAWN BY:	CRL
CHECKED BY:	JOD
SCALE:	AS NOTED
PROJECT NO:	011175.00
SHEET	E0.0

Calculation Summary							
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min
PROPERTY LINE	Illuminance	Fc	0.11	0.3	0.0	N.A.	N.A.
SITE	Illuminance	Fc	1.13	3.6	0.1	11.30	36.00

GENERAL NOTES:

A. ALL EXTERIOR LIGHT FIXTURES TO COMPLY WITH LOCAL NIGHT SKY ORDINANCE.

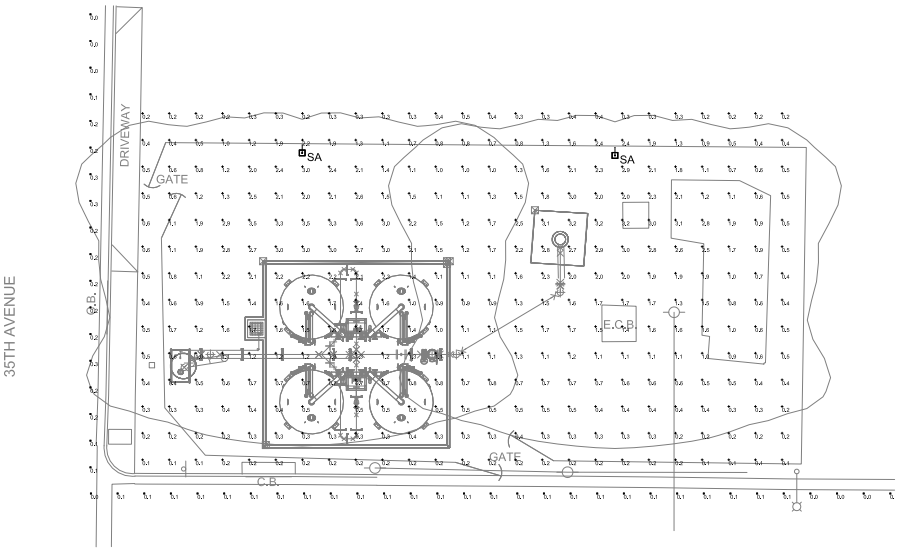
B. ALL EXTERIOR ELECTRICAL EQUIPMENT TO BE RATED FOR WEATHER-PROOF/ NEMA-3R APPLICATIONS.

C. ALL FIXTURES INSTALLED OUTDOORS SHALL BE RATED FOR DAMP/WET LOCATIONS AS REQUIRED. THE CONTRACTOR SHALL COORDINATE DAMP/WET LOCATION RATING PER NEC ARTICLE 410-4. ALL INSTALLATIONS SHALL CONFORM TO NEC ARTICLE 410, ALL SUB ARTICLES.

D. CONTRACTOR TO COORDINATE EXACT SITE LIGHTING FIXTURE LOCATIONS WITH OWNER. ALL CONFLICTS SHALL BE IMMEDIATELY REPORTED TO THE ENGINEER AND ARCHITECT.

E. ALL EXTERNAL LIGHTING SHALL BE SO LOCATED AND DESIGNED TO PREVENT LIGHTING RAYS FROM BEING DIRECTED OFF THE PROPERTY UPON WHICH THE LIGHTING IS LOCATED.

F. REFER TO LIGHTING FIXTURE SCHEDULE ON SHEET E2.0 FOR LIGHT FIXTURE TYPES AND SPECIFICATIONS.



PHOTOMETRIC SITE PLAN

1" = 10'-0"

RECORD DRAWING
(4/23/2012)

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WATER TREATMENT INSTALLATION
709 SOUTH 35TH AVENUE, PHOENIX, ARIZONA
Sheet Title: PHOTOMETRIC SITE PLAN

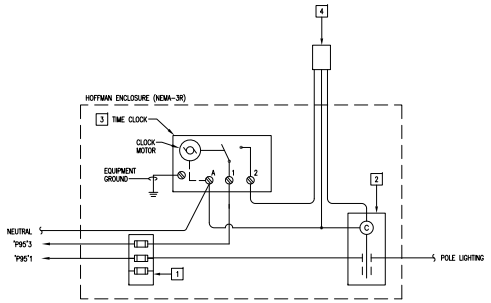
REVISIONS:

DATE:	12/14/2011
DRAWN BY:	CRL
CHECKED BY:	JOD
SCALE:	AS NOTED
PROJECT NO:	011175.00
SHEET	E0.1

Apr 24, 2012 - 11:40am
\\TRCFNP\Project Files\2011 Projects\011175.00 - RID Water Treatment\Electrical\RID-95\As-built\Electrical Drawings - 95.dwg

PANEL "P95" (NEW)			SQUARE 'D' 10KVA MINI POWER ZONE				60 AMP SECONDARY MAIN CIRCUIT BREAKER		
240/120V 1ø 3W			SURFACE MOUNTED				30A PRIMARY MAIN CIRCUIT BREAKER (25K AIC)		
USE OR AREA SERVED	CB	LOAD TYPE	LOAD PER PHASE (VA) A#	B#		LOAD TYPE	CB	USE OR AREA SERVED
SECURITY POLE LIGHTS	20 1	C	1 370			N	60	PANEL-"P95" SECONDARY MAIN
					2			
TIMECLOCK/CONTACTOR	20 1	N	3	180		N	2	
					4			
CONEX BOX LIGHTING	20 1	C	5 600			N	20	VERTECH CONTROL PANEL
			1200		6			
CONEX BOX OUTLETS	20 1	N	7	1080		N	20 1	TANK SKID SUMP PUMP
			180	864	8			
CONEX A/C	20 2	C	9 1836			N	20	CONVENIENCE RECEPTACLE
			180		10		1	
		C	11	1836		N		BUSSED SPACE
					12			
LOAD PER PHASE NON-CONTINUOUS			1380	2124	4888 VA / 120 V = 41 AMPS			
LOAD PER PHASE CONTINUOUS			2806	1836				
25% OF CONTINUOUS			702	459				
-			0	0	TOTAL KVA= 9307 VA			
TOTAL			4888	4419	10,000 A.I.C. BRANCH BREAKERS			

NOTES: 1. "C" LOAD TYPES ARE CONTINUOUS OR LARGEST MOTOR LOADS AND "N" LOAD TYPES ARE NON-CONTINUOUS.

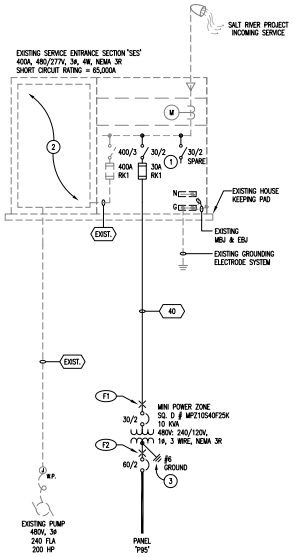


KEY NOTES:

1. FUSE BLOCK WITH 20A CURRENT LIMITING CLASS J DUAL ELEMENT TIME DELAY FUSES.
2. 2 POLE ELECTRICALLY HELD CONTACTOR, SQUARE 'D' LO20VO2 OR EQUAL WITH 30A CONTACTS, 5000A WITHSTAND RATING MINIMUM.
3. TIMECLOCK "INTERMATIC" MODEL #ET701150R OR EQUAL.
4. PHOTOCELL "INTERMATIC" #K4236 MOUNT ON ROOF FACING NORTH.

EXTERIOR LIGHTING CONTROL DIAGRAM

NO SCALE



ELECTRICAL SINGLE-LINE DIAGRAM

NO SCALE

GENERAL NOTES:

A. CONDUCTOR SIZES BASED ON THHN/XHHW-2, 90° C, 600V, INSULATED, COPPER WIRE APPLIED AT 60° C AMPACITIES SIZES UP TO #1 AWG, AND 75° C, AMPACITIES FOR SIZES #1 AWG OR LARGER.

B. NO DESIGN CHANGES MAY BE MADE TO THE SYSTEM WITHOUT THE PRIOR APPROVAL OF THE DESIGN ENGINEER AND THE ELECTRICAL INSPECTOR.

C. DASHED-SHADED LINES INDICATE EXISTING EQUIPMENT. SOLID-BOLD LINES INDICATE NEW EQUIPMENT U.N.O.

KEY NOTES:

1. PROVIDE NEW SUB-MAIN SWITCH IN EXISTING CUTLER-HAMMER SES. PROVIDE LISTED COVER PLATES AS REQUIRED TO MAINTAIN A DEAD FRONT. VERIFY NEW SWITCH REQUIREMENTS WITH CUTLER-HAMMER AND COORDINATE NEW SWITCH INSTALLATION AND POWER OUTAGES WITH POWER COMPANY.
2. EXISTING SES CONTROL CABINET WITH CONTACTORS AND REDUCED VOLTAGE STARTING CONTROLS FOR EXISTING IRRIGATION PUMP MOTOR TO REMAIN. COORDINATE WITH KELLER ELECTRICAL AND VERTECH CONTROLS FOR ANY CONTROL PROVISION OR MODIFICATION REQUIREMENTS.
3. TIE TO THE NEW SUSE SWITCH GROUNDING ELECTRODE SYSTEM PER KEY NOTE #4 BELOW.
4. PROVIDE SUSE RATED DISCONNECT. SEE GROUNDING DETAL ON THIS SHEET FOR DISCONNECT GROUNDING REQUIREMENTS..

FEEDER SCHEDULE:

SYMBOL	PARALLEL SETS	CONDUIT AND CONDUCTOR SIZE	NOTE:
40	1	3 #8, 1 #10 GND, 1"C	

LOAD CALCULATIONS:

SES, 400A, 480/277V, 3PH, 4W

NEW PANEL "P95"		x 100% =	3967 VA
EXISTING HIGH DEMAND AT 0.8 pf		x 125% =	261300 VA
		SUB TOTAL =	265267 VA
	265267 VA	AT 480V 3 PHASE =	319 AMPS

AVAILABLE FAULT CURRENT:

1. ALL VALUES ARE SYMMETRICAL, BASED ON BUSSMANN SPD CALCULATIONS AS INDICATED.
2. ALL EQUIPMENT SHALL BE FULLY RATED.
3. AFC = AVAILABLE FAULT CURRENT.

LABEL	FAULT LOCATION	TYPE OF CALCULATION	Cable	Conduit Type	Conductor Type	AFC(1) or AFC(PRI)	V or V(PRI)	V(SEC)	L	C VALUE	kVA	%Z	N	f or f1	M or M1	AFC(2) or AFC(SEC)
F1	MINI-POWER ZONE KFMR PRIMARY	AFC AT END OF A FEEDER	#8	NON-MAGNETIC	COPPER	65000	480		15	1558			1	2.6975	0.2772	18018
F2	MINI-POWER ZONE KFMR SECONDARY	AFC AT SEC. OF 1-PHASE KFMR				18018	480	240			7.5	3.3		65.6333	0.0150	539

AFC AT THE END OF A FEEDER

DEFINITIONS
AFC(1) = AFC AT THE BEGINNING OF THE FEEDER
AFC(2) = AFC AT THE END OF THE FEEDER
N = NUMBER OF CONDUCTORS IN PARALLEL PER PHASE
C = "C" VALUE AS DEFINED IN THE BUSSMANN SPD HANDBOOK
V = LINE-TO-LINE VOLTAGE
L = LENGTH OF FEEDER (IN FEET)

CALCULATIONS

$$F = \frac{1.732 \times L \times AFC(1)}{N \times C \times V}$$

$$M = \frac{1}{1+F}$$

$$AFC(2) = AFC(1) \times M$$

AFC AT THE SECONDARY OF A THREE PHASE TRANSFORMER

DEFINITIONS
AFC(PRI) = AFC AT PRIMARY TERMINALS OF TRANSFORMER
AFC(SEC) = AFC AT SECONDARY TERMINALS OF TRANSFORMER
V(PRI) = LINE-TO-LINE VOLTAGE AT TRANSFORMER PRIMARY
%Z = TRANSFORMER PERCENT IMPEDANCE
kVA = RATED KVA OF TRANSFORMER

CALCULATIONS

$$F1 = \frac{AFC(PRI) \times V(PRI) \times 1.73 \times \%Z}{100{,}000 \times kVA}$$

$$M1 = \frac{1}{1+F1}$$

$$AFC(SEC) = \frac{V\ PRIMARY}{V\ SECONDARY} \times M1 \times AFC(1)$$

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ROOSEVELT IRRIGATION DISTRICT #95
WATER TREATMENT INSTALLATION
709 SOUTH 35TH AVENUE, PHOENIX, ARIZONA

Sheet Title:
SINGLE-LINE DIAGRAM, PANELS, AND CALCULATIONS

REVISIONS:

DATE:	12/14/2011
DRAWN BY:	CRL
CHECKED BY:	JOD
SCALE:	AS NOTED
PROJECT NO:	011175.00
SHEET	E1.0

Apr 24, 2012 - 11:41am
\\TRCFNP\Project Files\2011 Projects\011175.00 - RID Water Treatment\Electrical\RID-95\As-built\Electrical Drawings - 95.dwg

LIGHTING FIXTURE SCHEDULE

MOUNTING: (MTG)
RE – RECESSED
SP – SUSPENDED
CL – CEILING SURFACE
WL – WALL
UC – UNDER CABINET
CV – COVE
PL – POLE
GR – GROUND
UN – UNIVERSAL

DOOR:
FA – FLAT ALUMINUM
FS – FLAT STEEL
RA – REGRESSED ALUMINUM
RS – REGRESSED STEEL

LAMP TYPE:
FL – FLUORESCENT
CF – COMPACT FLUORESCENT
IN – INCANDESCENT
LED – LIGHT EMITTING DIODE
HS – HIGH PRESSURE SODIUM
PSMH – PULSE START METAL HALIDE
MV – MERCURY VAPOR
LV – LOW VOLTAGE
O – OTHER (SEE DESCRIPTION)

BALLAST:
EB – ELECTRONIC BALLAST
ML – MULTI-LEVEL SWITCHING
EM – EMERGENCY BATTERY
HPF – HIGH POWER FACTOR
CWA – CONSTANT WATTAGE AUTO XFMR

LENS/LOUVER: (L/L)
A – .125" ACRYLIC
B – BLACK BAFFLE
C – CLEAR ALZAK
D – PARABOLIC
F – FRESNEL
G – TEMPERED GLASS
H – WALL WASHER
K – KSH12 .125" ACRYLIC
K19 – KSH19 .125" ACRYLIC
L – LOW IRIDESCENT SPECULAR ALUMINUM
N – NONE
O – OTHER (SEE DESCRIPTION)
P – PRISMATIC
PC – POLYCARBONATE
WG – WIRE GUARD

PROVIDE DISCONNECTING MEANS FOR FLUORESCENT LUMINAIRES THAT CAN BE SERVICED IN PLACE WHICH INCLUDES LUMINAIRES THAT UTILIZE DOUBLE ENDED LAMPS, LUMINAIRES CONTAINING A BALLAST(S) & SUPPLIED FROM MULTI-WIRE BRANCH CIRCUITS. THE DISCONNECT MEANS MUST DISCONNECT ALL SUPPLY CONDUCTORS SIMULTANEOUSLY, INCLUDING THE GROUNDED CONDUCTOR. EXCEPTIONS ARE PROVIDED FOR; HAZARDOUS LOCATIONS, EMERGENCY ILLUMINATION, CORD-&-PLUG CONNECTED LUMINAIRES, INDUSTRIAL FACILITIES, & LUMINAIRES NOT SUPPLIED BY A MULTIWIRE BRANCH CIRCUIT WHICH DOES NOT LEAVE THE ILLUMINATED SPACE IN TOTAL DARKNESS. REFER TO NEC 410.130(G) FOR FURTHER CLARIFICATION.

CATALOG NUMBER SHALL NOT BE CONSIDERED COMPLETE AND MATERIAL SHALL NOT BE ORDERED BY MANUFACTURER AND CATALOG NUMBER ONLY. THE COMPLETE DESCRIPTION AND THE SPECIFICATION SHALL BE COORDINATED WITH THE CATALOG NUMBER TO DETERMINE THE EXACT MATERIAL AND ACCESSORIES TO BE ORDERED. THE FIRST MANUFACTURER LISTED IS THE BASIS FOR DESIGN, HOWEVER ANY SUBSTITUTIONS, WHETHER LISTED WITHIN SCHEDULE BELOW OR NOT, MUST BE PRIOR APPROVED IN WRITING BY BOTH ARCHITECT AND ENGINEER.

ALL LAMPS FOR THIS PROJECT SHALL BE FURNISHED AND INSTALLED BY THE ELECTRICAL CONTRACTOR UNLESS OTHERWISE NOTED.

REFER TO SPECIFICATION FOR LAMP AND BALLAST REQUIREMENTS, SHOP DRAWING SUBMITTAL REQUIREMENTS AND ADDITIONAL INFORMATION.

ITEM	DESCRIPTION	SIZE	MTG	LAMPS			VOLTAGE	BALLAST	L/L	APPROVED MANUFACTURER / MODEL	LAMP/BALLAST
				TYPE	QTY	SIZE					VA
SA	SINGE-HEAD AREA LIGHT FIXTURE SSS POLE 15.5' W/ 2.5' BASE	15.5"x22"x6.5"	PL	PSMH	1	150W PSMH	120	CWA	P	COOPER – LUMARK (MPTR-SL-150-120-LL OR APPROVED EQUAL	185

GENERAL NOTES:

A. ALL CONDUIT ROUTING AND STUB-UP LOCATIONS ARE DIAGRAMMATIC AND SHOWN FOR REFERENCE, CLARITY, AND INTENT PURPOSES ONLY. E.C. SHALL COORDINATE ALL ROUTING AS EXISTING FIELD CONDITIONS AND NEW CONSTRUCTION PERMITS. COORDINATE ROUTING WITH NEW AND EXISTING OBSTRUCTIONS AND WITH ALL APPLICABLE TRADES. COORDINATE STUB-UP LOCATIONS WITH FINAL EQUIPMENT LOCATIONS IN FIELD.

B. ALL EXTERIOR LIGHT FIXTURES TO COMPLY WITH LOCAL NIGHT SKY ORDINANCE.

C. ALL EXTERIOR LIGHTING TO BE FED WITH #10 CU. MINIMUM U.N.O.

D. ALL EXTERIOR ELECTRICAL EQUIPMENT TO BE RATED FOR WEATHER-PROOF/ NEMA-3R APPLICATIONS.

E. ALL FIXTURES INSTALLED OUTDOORS SHALL BE RATED FOR DAMP/WET LOCATIONS AS REQUIRED. THE CONTRACTOR SHALL COORDINATE DAMP/WET LOCATION RATING PER NEC ARTICLE 410-4. ALL INSTALLATIONS SHALL CONFORM TO NEC ARTICLE 410, ALL SUB ARTICLES.

F. CONTRACTOR TO COORDINATE EXACT SITE LIGHTING FIXTURE LOCATIONS WITH OWNER. ALL CONFLICTS SHALL BE IMMEDIATELY REPORTED TO THE ENGINEER AND ARCHITECT.

G. ALL WIRING SHALL BE INSTALLED UNDER-GROUND IN PVC CONDUIT WHERE POSSIBLE. WHERE EXPOSED, PROVIDE IMC CONDUIT WITH WEATHERPROOF FLEX CONNECTIONS.

H. FIXTURE / ITEM IDENTIFIED WITH LETTER:
"X" – INDICATES DEVICE TO REMAIN.
"XR" – INDICATES DEVICE TO BE REMOVED.
"XRR" – INDICATES DEVICE TO BE REMOVED & RELOCATED.

KEY NOTES:

1. EXISTING SERVICE ENTRANCE SECTION TO REMAIN. SEE SINGLE-LINE DIAGRAM ON SHEET E1.0 FOR NEW WORK.
2. EXISTING POWER POLE WITH TRANSFORMERS AND OVER-HEAD POWER LINES TO REMAIN.
3. NEW UNI-STRUT MOUNTED MINI POWER ZONE TRANSFORMER AND PANEL-"P95'. SEE SINGLE-LINE DIAGRAM AND PANEL SCHEDULE ON SHEET E1.0.
4. CONTROL PANEL BY VERTECH. PROVIDE POWER TO CONTROL PANEL AS SHOWN. PROVIDE 3/4" CONDUITS AS INDICATED FOR POWER AND CONTROL WIRING. ALL POWER AND CONTROLS CONDUCTORS FROM CONTROL PANEL TO CONTROL EQUIPMENT SHALL BE PROVIDED BY ELECTRICAL CONTRACTOR AS DIRECTED BY CONTROLS CONTRACTOR. SEE VERTECH CONTROL DRAWINGS FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
5. PROVIDE W.P./GFCI RECEPTACLE FOR 120V, 3/4HP SUMP PUMP POWER CONNECTION AND POST MOUNTED CONTACTOR WITH NEMA-3R ENCLOSURE AND HOA FOR AUTOMATIC AND MANUAL CONTROL OF SUMP PUMP. SQUARE-D CLASS #8502-SBH1-VO2-CS, OR EQUAL. COORDINATE EXACT LOCATION AND WIRING REQUIREMENTS WITH CONTROLS CONTRACTOR AND OWNER. COORDINATE EXACT LOCATION OF RECEPTACLE WITH MECHANICAL CONTRACTOR PRIOR TO ROUGH-IN.
6. PROVIDE W.P. J-BOX AND 3/4" CONDUIT AS SHOWN WITH POWER WIRING FROM AUTOMATIC VALVE TO VERTECH CONTROL PANEL. COORDINATE EXACT ROUGH-IN LOCATION, WIRING REQUIREMENTS, CONDUIT ROUTING AND CONNECTION REQUIREMENTS WITH OWNER, MECHANICAL, AND CONTROLS CONTRACTOR. SEE SHEET M2.1 FOR VALVE LOCATION.
7. PROVIDE W.P. J-BOX AND 3/4" CONDUIT AS SHOWN WITH POWER WIRING FROM FLOW METER LOCATION TO VERTECH CONTROL PANEL. COORDINATE EXACT ROUGH-IN LOCATION, WIRING REQUIREMENTS, CONDUIT ROUTING AND CONNECTION REQUIREMENTS WITH OWNER, MECHANICAL, AND CONTROLS CONTRACTOR. SEE SHEET M2.1 FOR FLOW METER LOCATIONS.
8. PROVIDE W.P. J-BOX AND 3/4" CONDUIT AS SHOWN WITH CONTROL CABLING FROM FLOW METER LOCATION TO VERTECH CONTROL PANEL. COORDINATE EXACT ROUGH-IN LOCATION, CABLING REQUIREMENTS, CONDUIT ROUTING AND CONNECTION REQUIREMENTS WITH OWNER, MECHANICAL, AND CONTROLS CONTRACTOR. SEE SHEET M2.1 FOR FLOW METER LOCATIONS.
9. PROVIDE W.P. J-BOX AND 3/4" CONDUIT AS SHOWN WITH CONTROL CABLING FROM LOCATION OF SUMP PUMP HIGH AND LOW LEVEL SENSORS TO VERTECH CONTROL PANEL. COORDINATE EXACT ROUGH-IN LOCATION, CABLING REQUIREMENTS, CONDUIT ROUTING AND CONNECTION REQUIREMENTS WITH OWNER, MECHANICAL, AND CONTROLS CONTRACTOR.
10. PROVIDE W.P./GFCI TYPE CONVENIENCE RECEPTACLE. MOUNT AT +24"AFF ON UNI-STRUT STRUCTURE SUPPORTING MINI POWER ZONE PER KEY-NOTE #3 ABOVE.
11. PROVIDE J-BOX FOR TRANSITIONING FROM UNDER-GROUND TO ABOVE GROUND CONDUIT. COORDINATE EXACT LOCATION IN THE FIELD WITH MECHANICAL AND CONTROLS CONTRACTOR. TYPICAL OF 5.
12. CONEX BOX PROVIDED BY OWNER. SIZE AND LOCATION SHOWN ARE APPROXIMATE AND SHOWN FOR REFERENCE ONLY. PROVIDE SINGLE-POINT 120V, 20A CIRCUITS FOR OWNER LIGHTING, POWER AND A/C UNIT CONNECTIONS. COORDINATE EXACT CONNECTION POINTS AND REQUIREMENTS WITH OWNER AND NOTIFY ENGINEER OF ANY DISCREPANCIES.
13. NOT USED.
14. PROVIDE 3/4" CONDUIT AS SHOWN WITH 120V CONTROL WIRE FROM SUMP PUMP CONTROL CONTACTOR HOA SWITCH (120VAC) TO VERTECH CONTROL PANEL SUMP PUMP RELAY. COORDINATE EXACT ROUGH-IN LOCATION, CABLING REQUIREMENTS, CONDUIT ROUTING AND CONNECTION REQUIREMENTS WITH OWNER, AND CONTROLS CONTRACTOR.

RECORD DRAWING
(4/23/2012)

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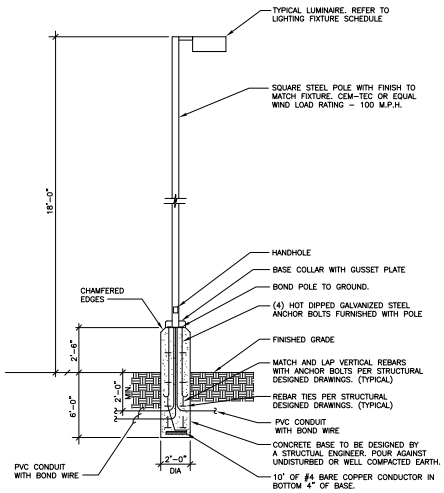
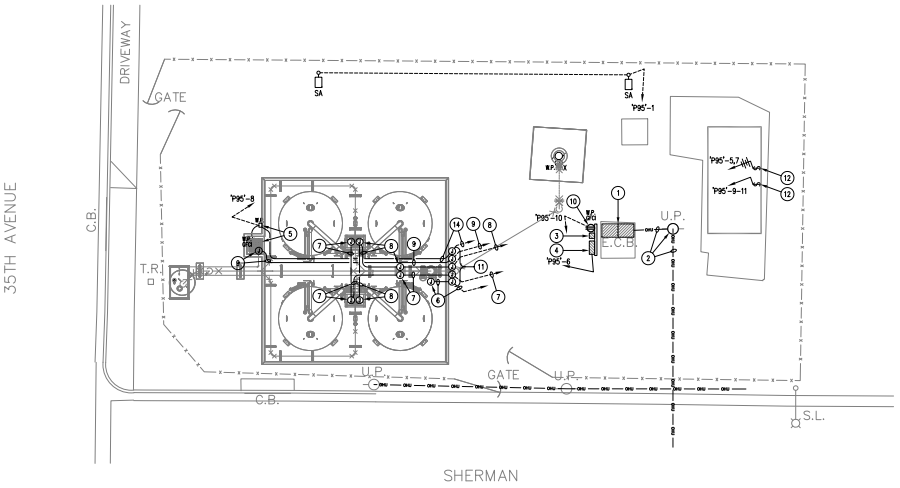


POLE MOUNTED LIGHT FIXTURE DETAIL

NO SCALE



ELECTRICAL SITE PLAN – NEW WORK

1" = 10'-0"

TAYLOR RYMAR
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60 EAST RIO SALADO PARKWAY
SUITE 402
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ROOSEVELT IRRIGATION DISTRICT #95
WATER TREATMENT INSTALLATION
709 SOUTH 35TH AVENUE, PHOENIX, ARIZONA

Sheet Title:
ELECTRICAL SITE PLAN – NEW WORK

REVISIONS:

DATE:	12/14/2011
DRAWN BY:	CRL
CHECKED BY:	JOD
SCALE:	AS NOTED
PROJECT NO:	011175.00
SHEET	E2.0

Apr 24, 2012 - 11:42am
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Spinnaker Holdings, LLC

Roosevelt Irrigation District (RID) Water Remediation
SCADA and Control Package
Well #95 Master Control Panel RID-95

Vertech Project Number P110124

January 5, 2012

WELL #95 MASTER CONTROL PANEL RID-95 - DRAWING INDEX				
Drawing Set	Drawing Name	Sheet #	Revision	Description
RID-95	P110124-RID95-01	01	1	Well #95 Master Control Panel RID-95 - Title Page & Drawing Index
	P110124-RID95-02	02	1	Well #95 Master Control Panel RID-95 - Symbols & Legends
	P110124-RID95-03	03	1	Well #95 Master Control Panel RID-95 - General Notes
	P110124-RID95-04	04	1	Well #95 Master Control Panel RID-95 - 120VAC Power Distribution
	P110124-RID95-05	05	1	Well #95 Master Control Panel RID-95 - 24VDC Power Distribution 24VDC UPS Power Distribution
	P110124-RID95-06	06	1	Well #95 Master Control Panel RID-95 - 24VDC UPS Power Distribution S7-1200 CPU 1214C Module PLC01 - 14 Pt. Discrete Input
	P110124-RID95-07	07	1	Well #95 Master Control Panel RID-95 - S7-1200 CPU 1214C Module PLC01 - 10 Pt. Relay Output & Field Interlocks
	P110124-RID95-08	08	1	Well #95 Master Control Panel RID-95 - S7-1200 CPU 1214C Module PLC02 - 8 Pt. Analog Input
	P110124-RID95-09	09	1	Well #95 Master Control Panel RID-95 - S7-1200 CPU 1214C Module PLC03 - 8 Pt. Analog Input
	P110124-RID95-10	10	1	Well #95 Master Control Panel RID-95 - Enclosure Layout
	P110124-RID95-11	11	1	Well #95 Master Control Panel RID-95 - Backplate Layout & Bill of Material
	P110124-RID95-12	12	1	Well #95 Master Control Panel RID-95 - PLC Rack 0 Layout & Bill of Material
	P110124-RID95-13	13	1	Well #95 Master Control Panel RID-95 - Terminal Strip Layout
	P110124-RID95-14	14	1	Well #95 Master Control Panel RID-95 - Engraving Schedule

P110124-RID95-01.dwg

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #95 Master Control Panel RID-95
Title Page
Drawing Index

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-95
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 01 OF 14

SYMBOLS:

SWITCHES:

PUSHBUTTON
N.O.

PUSHBUTTON
N.C.

PUSHBUTTON
MUSHROOM HEAD
N.O.

PUSHBUTTON
MUSHROOM HEAD
N.C.

SELECTOR SWITCH
2 POSITION MAINTAINED
N.O.

SELECTOR SWITCH
2 POSITION KEYED
N.O.

SELECTOR SWITCH
3 POSITION SPRING CENTER
N.O.

SELECTOR SWITCH
3 POSITION KEYED
N.C.

SELECTOR SWITCH
3 POSITION KEYED
N.O.

TEMPERATURE SWITCH
N.C.

TEMPERATURE SWITCH
N.O.

LIMIT SWITCH
N.C.

LIMIT SWITCH
HELD OPEN
N.C.

LIMIT SWITCH
N.O.

LIMIT SWITCH
HELD CLOSED
N.O.

PROXIMITY SWITCH
N.C.

PROXIMITY SWITCH
N.O.

FOOT SWITCH
MAINTAINED
N.C.

FOOT SWITCH
SPRING RETURNED
N.C.

FOOT SWITCH
MAINTAINED
N.O.

FOOT SWITCH
SPRING RETURNED
N.O.

PULL CORD
N.C.

PULL CORD
N.O.

PHOTO EYE
N.O.

PHOTO EYE
N.C.

PHOTO EYE EMITTER

SELECTOR SWITCH
3 POSITION

TIMER

KNIFE SWITCH

CONTACT
N.O.

CONTACT
N.C.

TERMINALS:

TERMINAL
LOCAL

TERMINAL
FIELD

DISTRIBUTION BLOCK
(POWER OR GROUND)

TERMINAL BANK
LOCAL

TERMINAL BANK
FIELD

TERMINAL
FIELD LOCAL


GROUND TERMINAL
DIN RAIL MOUNTED

GROUND FIELD TERMINAL
DIN RAIL MOUNTED

SHIELD TERMINAL
LOCAL

SHIELD TERMINAL
FIELD

GROUNDING:

EARTH GROUNDING

ISOLATION GROUNDING

MISCELLANEOUS:

CIRCUIT BREAKER

CIRCUIT BREAKER
3 PHASE

FUSE

RELAY COIL

MOTOR

SOLENOID

RESISTOR

MOTOR STARTER
WITH OVERLOAD

PILOT LIGHT
PUSH TO TEST

PILOT LIGHT

ALARM HORN (BELL)

ALARM HORN

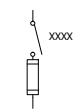
ALARM HORN (BUZZ)

ALARM BEACON

HORN LIGHT

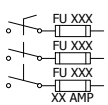
STACK LIGHT

OVERLOAD RELAY



FUSED DISCONNECT

DISCONNECT



FUSED DISCONNECT
3 PHASE

GENERAL:

(#14AWG Yellow) WIRE SIZE & COLOR

JUMPER

PLC INPUT

PLC OUTPUT

EQUIPMENT TAG

LEGENDS:

ABBREVIATIONS	
SCD	Start Command
SFW	Start Forward
SRV	Start Reverse
RNG	Running
RFW	Running Forward
RRV	Running Reverse
OVL	Overload
DFT	Drive Fault
BRK	Brake
PBL	Push Button Light
RST	Reset
STR	Starter
VFD	Variable Frequency Drive
CBR	Clutch/Brake
CTH	Clutch
PS	Power Supply
CB	Circuit Breaker
ES	EtherNet Switch
PDB	Power Distribution Block
DISC	Disconnect
RCP	Receptacle
TS	Temperature Switch
ECR	Safety Relay
ECRM	Safety Relay Master
ENT	EntherNet/IP
MP	Motor Protector
LR	Line Reactor
MSD	Motor Safety Disconnect
DS	Door Switch
EL	Enclosure Light
DB	Dynamic Break
TVSS	Transient Voltage Surge Suppressor
FU	Fuse
HMT	Hour Meter

P110124-RID95-02.dwg

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #95 Master Control Panel RID-95
Symbols & Legend

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-95
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 02 OF 14

General Notes:

1. Panel shall be manufactured to UL-508a Standards, and the required UL markings shall be affixed to the interior of the panel. The panel shall ship with a complete as-built drawing set.

2. The following chart shows the standard wire colors for various voltages in the drawing set.

Color	Abbreviation	Usage
Brown	BRN	3-Phase AC - Phase A
Orange	ORG	3-Phase AC - Phase B
Yellow	YEL	3-Phase AC - Phase C
Black	BLK	120VAC Power (Hot)
White	WHT	120VAC Neutral
Red	RED	120VAC Control
Green w/ Yellow Stripe	GRN/YEL	AC Ground
Yellow	YEL	Foreign Power
White w/ Yellow Stripe	WHT/YEL	Foreign Neutral
Purple	PUR	Temporary
Blue	BLU	24VDC Power & Control
White w/ Blue Stripe	WHT/BLU	24VDC Common (Grounded)

3. All analog signal cables shall be Belden 8760; 2-conductor #18AWG (BLK/CLR) twisted/shielded: BLK = Positive (+); CLR = Negative (-).

P110124-RID95-03.dwg

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

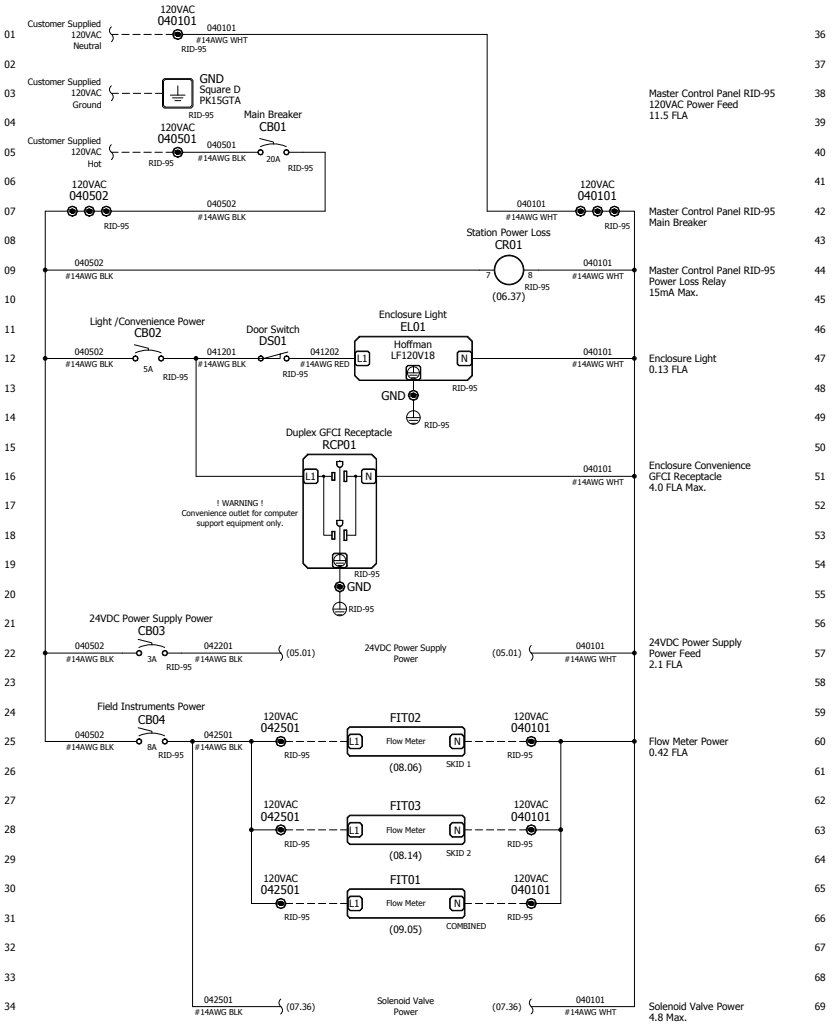
Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #95 Master Control Panel RID-95
General Notes

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-95
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 03 OF 14

120VAC Power Distribution
Master Control Panel RID-95



Notes:

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

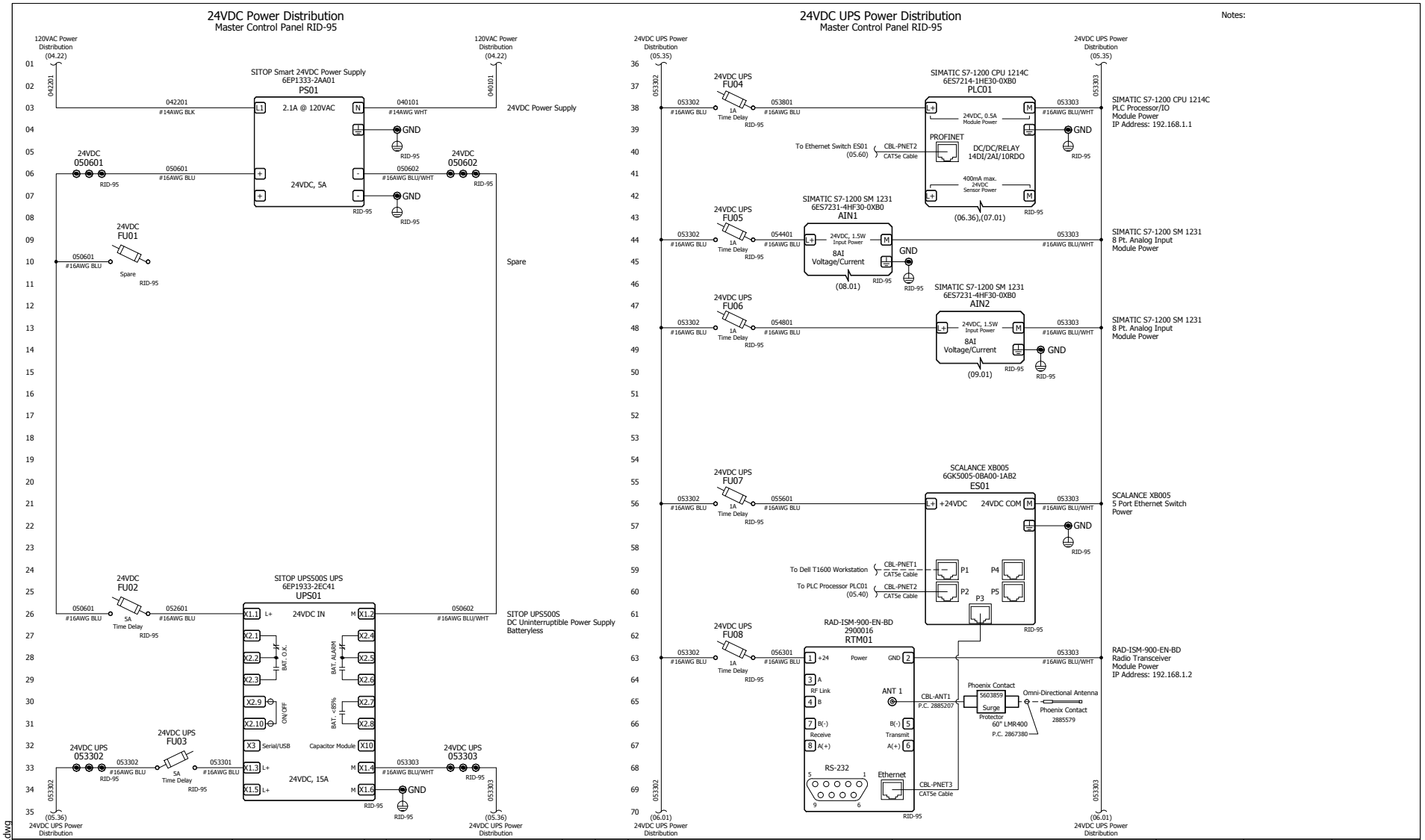
System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #95 Master Control Panel RID-95
120VAC Power Distribution

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-95
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 04 OF 14



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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

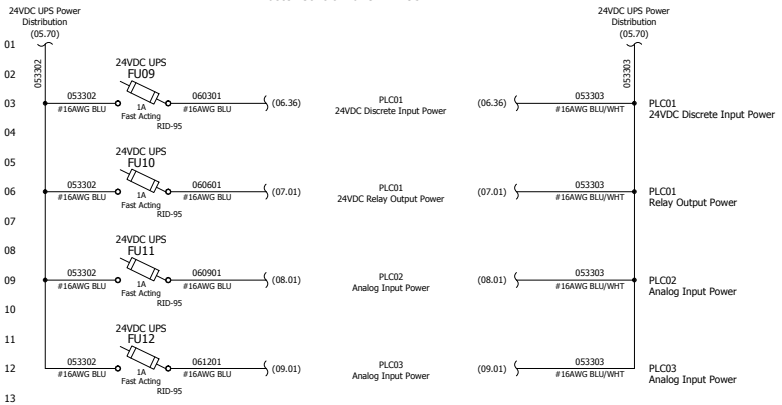
Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

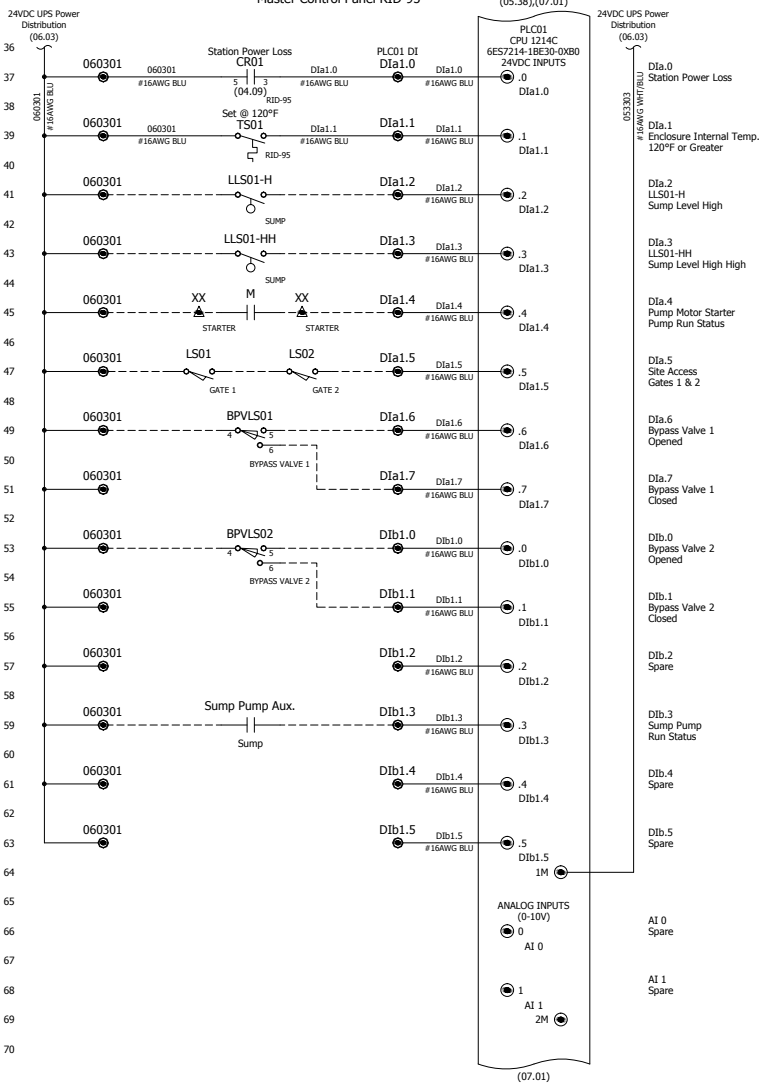
Roosevelt Irrigation District Water Remediation Well #95 Master Control Panel RID-95
24VDC Power Distribution
24VDC UPS Power Distribution

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-95
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 05 OF 14

24VDC UPS Power Distribution
Master Control Panel RID-95



S7-1200 CPU 1214C Module PLC01 - 14 Pt. Discrete Input
Master Control Panel RID-95



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P110124-RID95-06.dwg

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

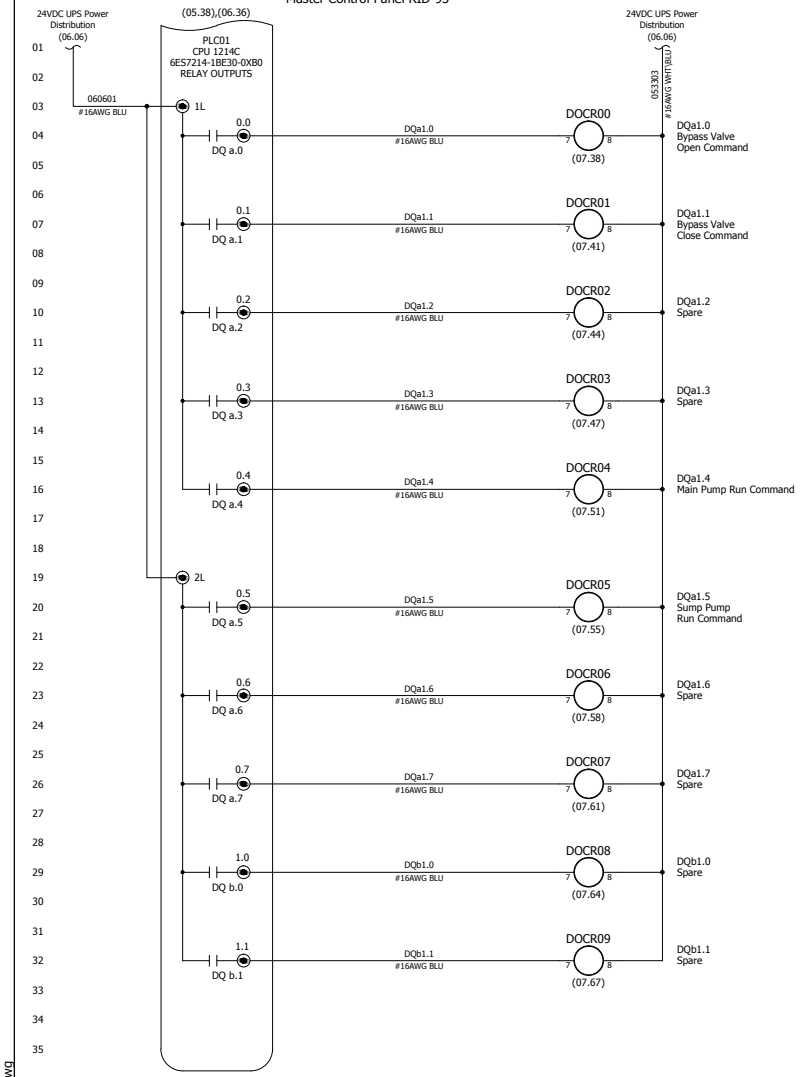
Sheet Description:

Roosevelt Irrigation District Water Remediation Well #95 Master Control Panel RID-95
24VDC UPS Power Distibution
S7-1200 CPU 1214C Module PLC01 - 14 Pt. Discrete Input

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-95
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 06 OF 14

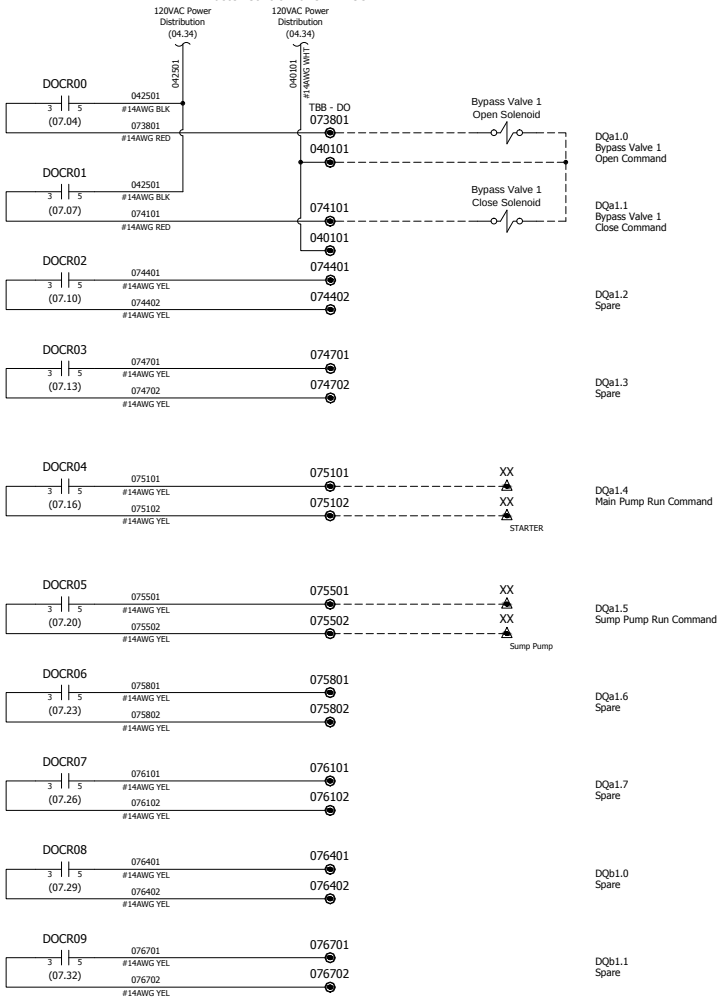
S7-1200 CPU 1214C Module PLC01 - 10 Pt. Relay Output

Master Control Panel RID-95



S7-1200 CPU 1214C Module PLC01 - Field Interlocks

Master Control Panel RID-95



Notes:

P110124-RID95-07.dwg

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

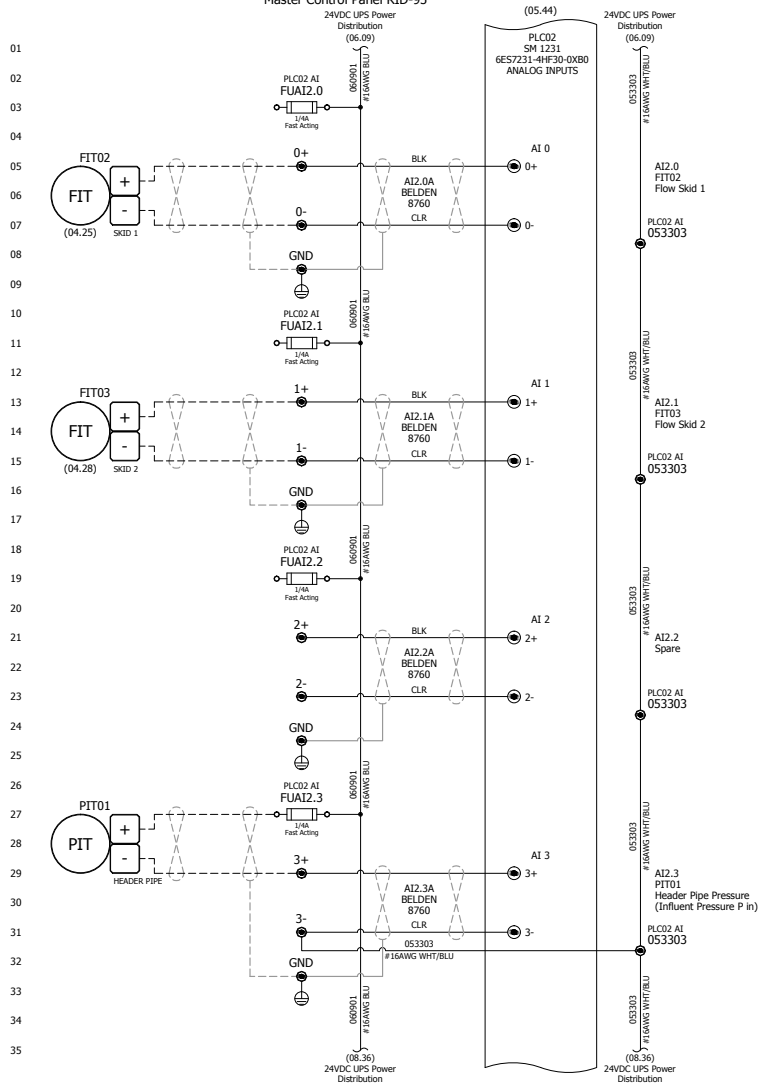
Sheet Description:

Roosevelt Irrigation District Water Remediation Well #95 Master Control Panel RID-95
S7-1200 CPU 1214C Module PLC01 - 10 Pt. Relay Output
S7-1200 CPU 1214C Module PLC01 - Field Interlocks

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-95
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 07 OF 14

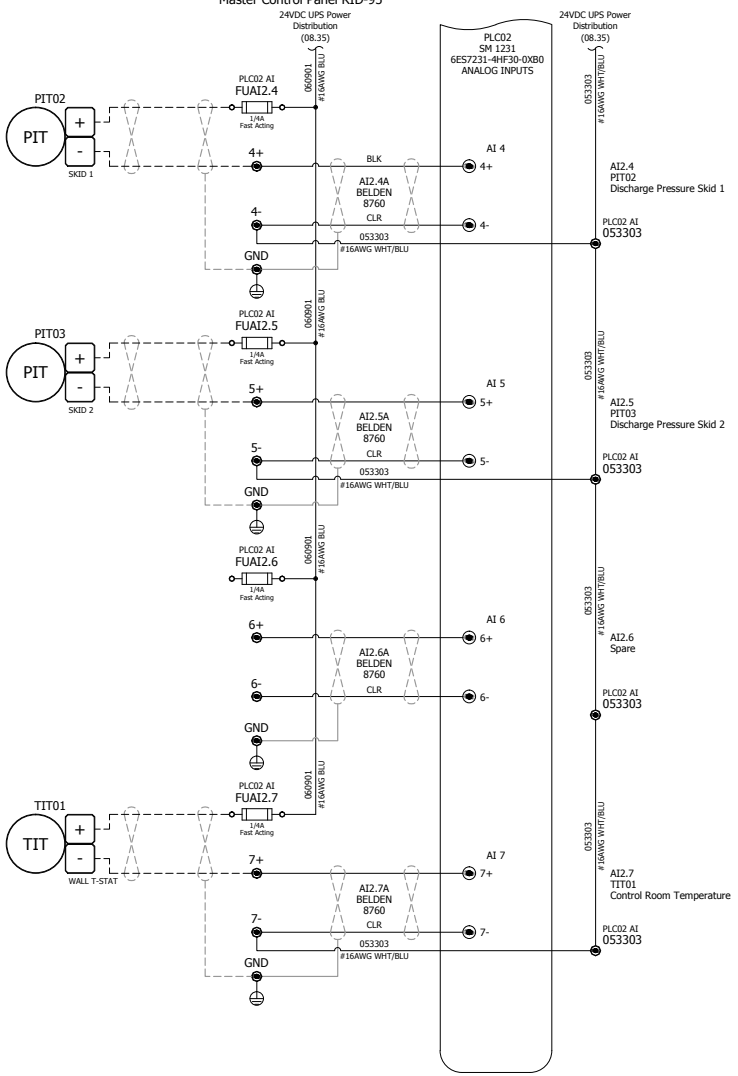
S7-1200 SM 1231 Module PLC02 - 8 Pt. Analog Input

Master Control Panel RID-95



S7-1200 SM 1231 Module PLC02 - 8 Pt. Analog Input

Master Control Panel RID-95



Notes:

P110124-RID95-08.dwg

Vertech

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

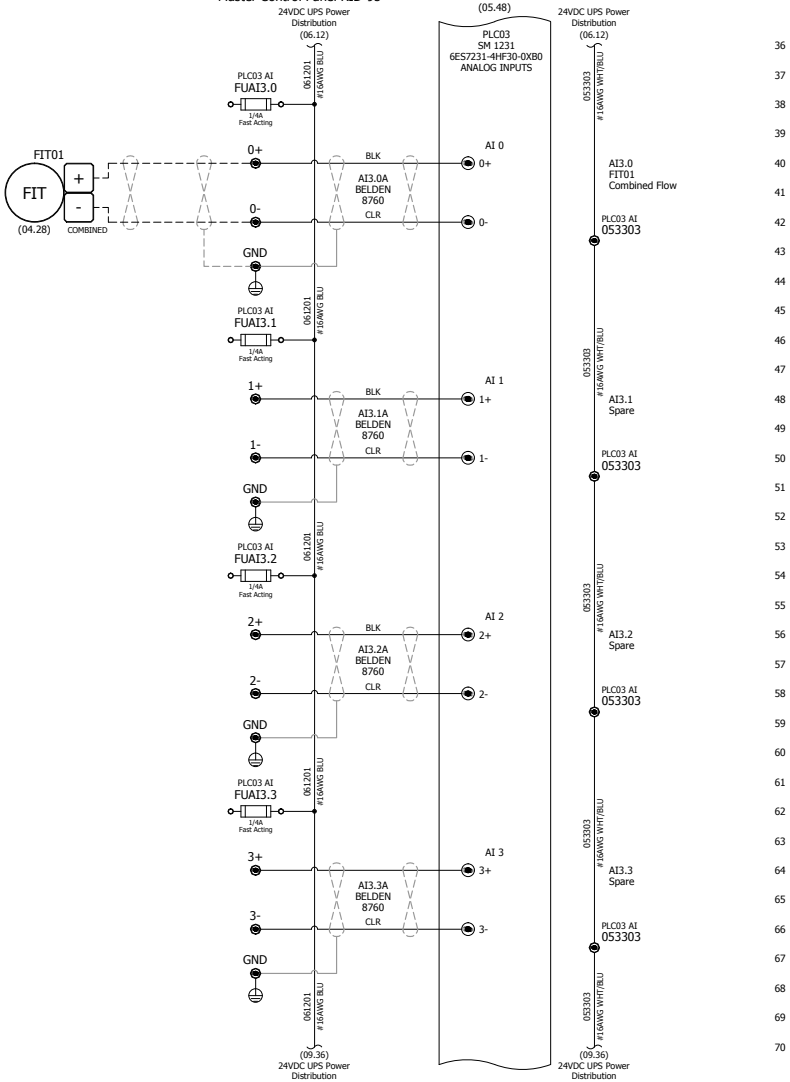
Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #95 Master Control Panel RID-95
S7-1200 SM 1231 Module PLC02 - 8 Pt. Analog Input

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-95
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 08 OF 14

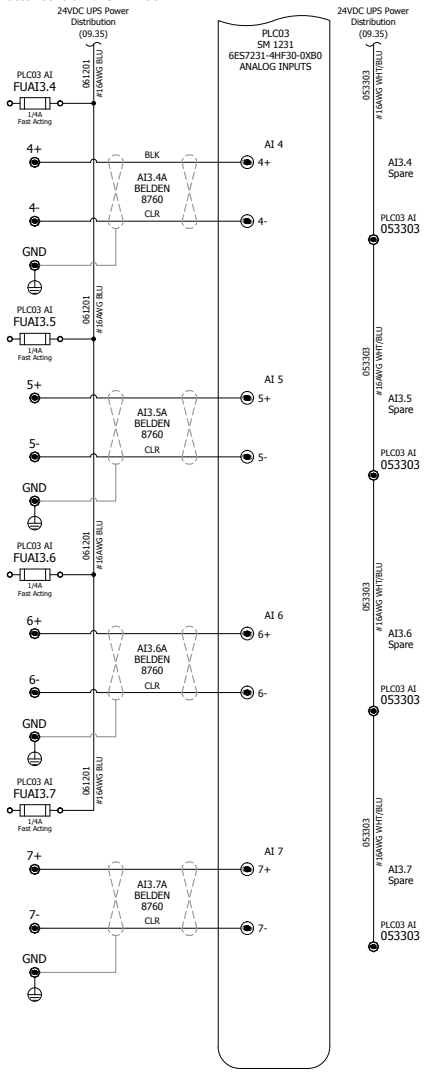
S7-1200 SM 1231 Module PLC03 - 8 Pt. Analog Input

Master Control Panel RID-95



S7-1200 SM 1231 Module PLC03 - 8 Pt. Analog Input

Master Control Panel RID-95



Notes:

P110124-RID95-09.dwg

Vertech

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

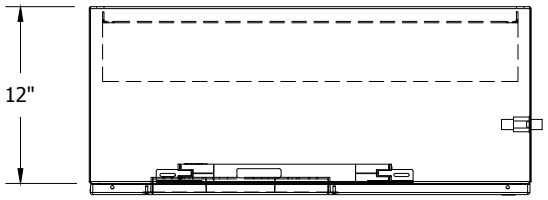
System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

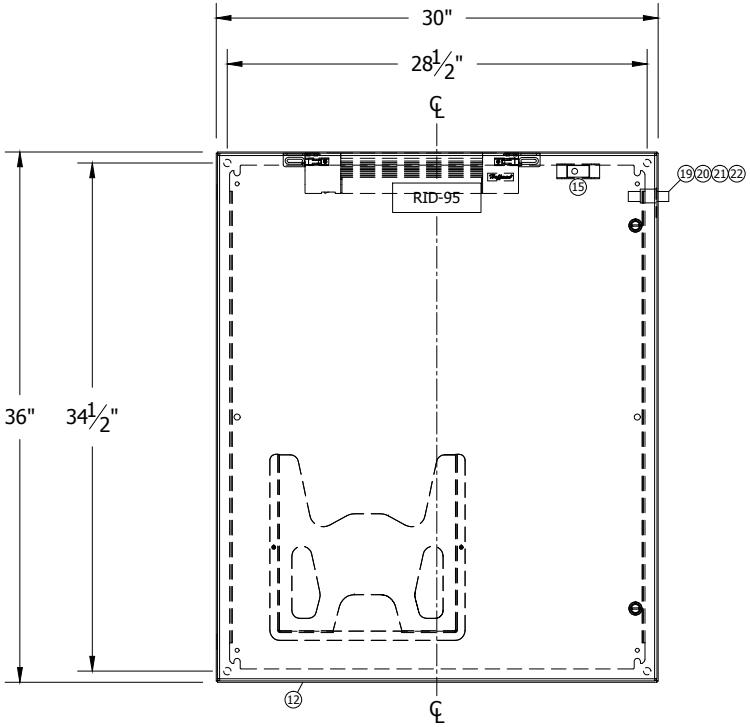
Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #95 Master Control Panel RID-95
S7-1200 SM 1231 Module PLC03 - 8 Pt. Analog Input

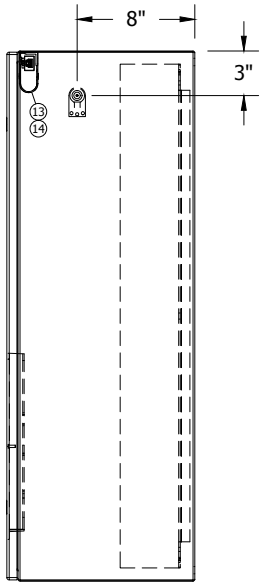
Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-95
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 09 OF 14



Enclosure Top View
Master Control Panel RID-95



Enclosure Front Elevation
Master Control Panel RID-95



Enclosure Right Side
Master Control Panel RID-95

P110124-RID95-10.dwg

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

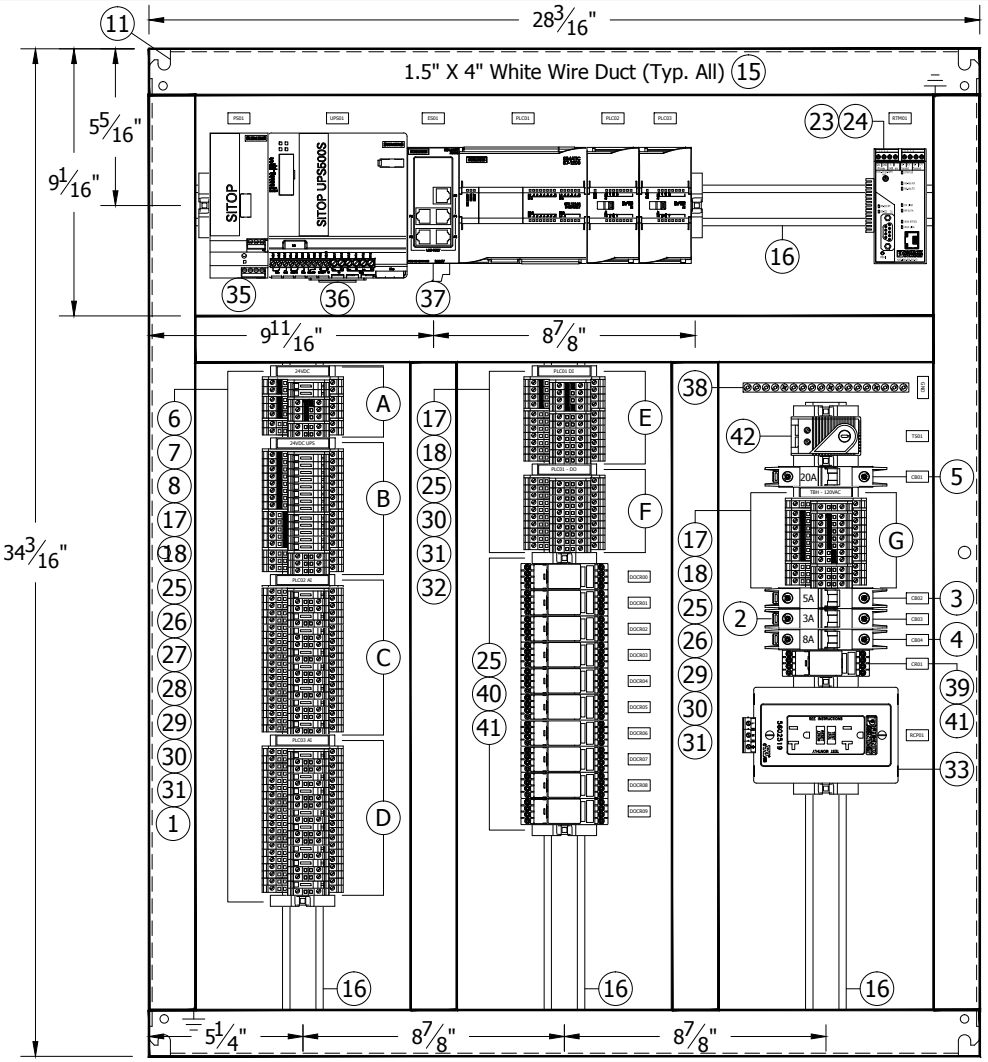
Sheet Description:

Roosevelt Irrigation District Water Remediation Well #95 Master Control Panel RID-95
Enclosure Layout

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-95
Rev: 1	**Scale:** 1-1/2" = 1'-0"	**Sheet Size:** B	**Sheet Number:** 10 OF 14

◯ WELL #95 MASTER CONTROL PANEL RID-95 - BILL OF MATERIAL

Item	Qty.	Part Number	Description	Manufacturer
1	2	GGA5	Fuse, Time Delay, 5mmx20mm, Glass Tube, 125V, 5A	Ferraz Shawmut
2	1	WMZT1C03	Circuit breaker, UL489, 1 Pole, 10KA, Trip Curve C, 3A	Eaton
3	1	WMZT1C05	Circuit breaker, UL489, 1 Pole, 10KA, Trip Curve C, 5A	Eaton
4	1	WMZT1C08	Circuit breaker, UL489, 1 Pole, 10KA, Trip Curve C, 8A	Eaton
5	1	WMZT1C20	Circuit breaker, UL489, 1 Pole, 10KA, Trip Curve C, 20A	Eaton
6	5	GGA1	Fuse, Time Delay, 5mmx20mm, Glass Tube, 125V, 1A	Ferraz Shawmut
7	16	GGM1/4	Fuse, Fast Acting, 5mmx20mm, Glass Tube, 250V, 1/4A	Ferraz Shawmut
8	4	GGM1	Fuse, Fast Acting, 5mmx20mm, Glass Tube, 250V, 1A	Ferraz Shawmut
9	1	ALFSWD	Door switch assembly for enclosure light, remote mount	Hoffman
10	1	Precision T1600	Computer Workstation, Dual Core i3-2100 3.1GHz, 4GB DDR3 RAM, 250 GB SATA HD, E2211H 22" Monitor, MS Office	Dell
11	1	CP3630	Panel, CONCEPT Line, Painted Steel, 34.2" X 28.2", fits 36" X 30" enclosure	Hoffman
12	1	CSD363012	Enclosure, CONCEPT Line, NEMA Type 4/12, Wall Mountable, ANSI 61 Grey, 36" X 30" X 12"	Hoffman
13	1	F6T5	Florescent Light Bulb, for 15" PANELITE Enclosure Light	Hoffman
14	1	LF120V15	PANELITE Line Enclosure Lighting Package, 120VAC 50/60Hz, 0.13A, 15", Manual Switch, Bulb not Included	Hoffman
15	16'	T1-1540W	Wireway Duct & Cover, 1.5" x 4" x 72", White, Rigid PVC	Iboco
16	8'	0801733	NS 35/ 7,5 PERF 2000MM, DIN rail, 35mm, 7mm height, 5 pieces 2 meters each	Phoenix Contact
17	8	1004348	KLM-A, Terminal Strip ID Tag, Fits into End Anchor	Phoenix Contact
18	A/R	1051003	ZB6:UNBEDRUCKT, Zack Terminal Marker Strips, White, Unprinted, 10 Strips of 10 Markers	Phoenix Contact
19	1	2818135	CN-UB/MP, Mounting bracket for radio antenna surge suppressor	Phoenix Contact
20	1	2818850	CN-UB-280DC-BB, Surge suppressor for antenna cable	Phoenix Contact
21	1	2867380	RAD-CAB-LMR400-60, Antenna Extension LMR400 Cable, 60ft	Phoenix Contact
22	1	2885579	RAD-ISM-900-ANT-OMNI-FG-6-N, Omnidirectional Antenna Kit, 8 dBi, Connection N (female)	Phoenix Contact
23	1	2885207	RAD-CON-MCX90-N-SS, Adapter Cable, Pigtail, 120cm	Phoenix Contact
24	1	2900016	RAD-ISM-900-EN-BD, Wireless Radio Transceiver with Ethernet, RS-232, RS-485, 900MHz	Phoenix Contact
25	16	3022218	CLIPFIX 35, End Anchor, Snap-on, for 35mm DIN Rail	Phoenix Contact
26	6	3030271	Cross Connector/Jumper for UT-4 Terminal Blocks, Red, 10 Position	Phoenix Contact
27	31	3036819	P-FU 5X20 LED 24, Fuse plug, 6.3A, 500V, 6.2mm, for 5x20mm glass fuses, black, BFI (12-30V), fits UT 2,5/4/6-TG terminal	Phoenix Contact
28	31	3044720	UTTB 4-TG, Terminal block, two-tier, top tier pluggable, screw connection, 26-10AWG, 6.2mm, grey	Phoenix Contact
29	16	3044759	UTTB 4-PE, Ground terminal block, two-tier, feed-through, screw connection, 26-10AWG, 6.2mm, green/yellow	Phoenix Contact
30	49	3044814	UTTB 4, Terminal block, two-tier, feed-through, screw connection, 26-10AWG, 36A, 800V, 6.2mm, grey	Phoenix Contact
31	14	3047293	D-UT 2,5/4-TWIN, Terminal cover, fits UT 2,5/4-MTD/TWIN terminal block, grey	Phoenix Contact
32	2	3047358	FBS-PV UT, Vertical potential bridge, to connect the upper and lower level of 2-tier terminals	Phoenix Contact
33	1	5602519	EM-DUO-120/20/GFI, Receptacle, Duplex, 20A, GFI, DIN Rail Mount	Phoenix Contact
34	1	6AV2105-0FA01-0AA0	SIMATIC WinCC Runtime Professional 2048 Powertags V11, Single License (Key on USB stick), Class A, Windows XP/7 32 bit	Siemens
35	1	6EP1332-5ba10	Power Supply, SITOP PSU 100c, 24VDC @ 4A	Siemens
36	1	6EP1933-2EC41	DC Uninterruptible Power Supply (UPS), SITOP UPS500S	Siemens
37	1	6GK5005-0BA00-1AB2	Industrial Ethernet Switch, SCALANCE XB005, Unmanaged, 5 X 10/100MBIT/S Twisted Pair RJ45, LED-Diagnosis, IP20, 24VDC	Siemens
38	1	PK15GTA	Ground Distribution Block, 15-Terminals	Square D
39	1	C7-A20X120VAC	Control relay, QRC miniature plug-in, general purpose, 120VAC coil, DPDT, 10A contacts, LED indicator	Turck
40	10	C7-A20X24VDC	Control relay, QRC miniature plug-in, general purpose, 24VDC coil, DPDT, 10A contacts, LED indicator	Turck
41	11	S7-M	Socket for miniature relays C7 and C80 series, 8-blade, DIN rail mount, 10A, 250V, replaces former socket S7-C	Turck
42	1	ATEMNO	Temperature Control Switch, 1 NO Contact, 15A Max. Resistive/2A Max. Inductive @ 120VAC, 20mA Min., 30-140°F	Hoffman



Backplate Layout
Master Control Panel RID-95

REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

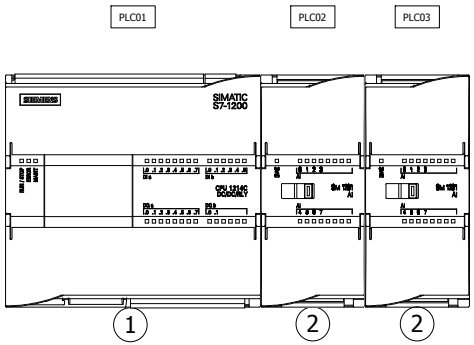
Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #95 Master Control Panel RID-95
Backplate Layout
Bill of Material

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-95
Rev: 1	**Scale:** 3" = 1'-0"	**Sheet Size:** B	**Sheet Number:** 11 OF 14

P110124-RID95-11.dwg



◯ WELL #95 MASTER CONTROL PANEL RID-95 - PLC RACK - BILL OF MATERIAL				
Item	Qty	Part Number	Description	Manufacturer
1	1	6ES7214-1HE30-0XB0	PLC Processor, SIMATIC S7-1200, CPU 1214C, DC/DC/RLY, 14 DI (24VDC), 10DO (Relay) 2A, 2AI (0-10VDC), Power: DC 24V, 50KB Memory	Siemens
2	2	6ES7231-4HF30-0XB0	Analog Input Module, SIMATIC S7-1200, SM 1231, 8 AI, +/-10V, +/-5V, +/-2.5V, OR 0-20 mA, 12 Bit + Sign or 13 Bit ADC	Siemens

P110124-RID95-12.dwg

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

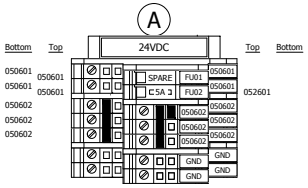
Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #95 Master Control Panel RID-95
PLC Rack 0 Layout
& Bill of Material

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-95
Rev: 1	**Scale:** 6" = 1'-0"	**Sheet Size:** B	**Sheet Number:** 12 OF 14

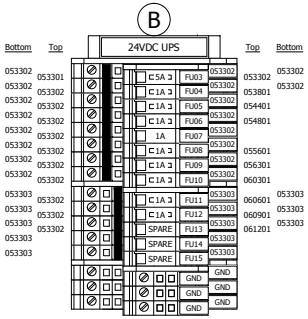
24VDC Power Distribution

Master Control Panel RID-95



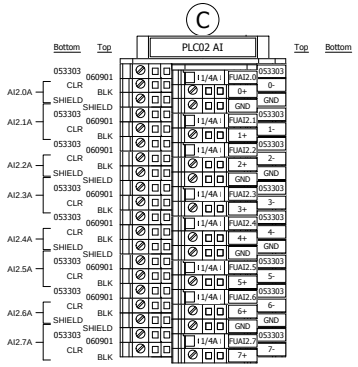
24VDC UPS Power Distribution

Master Control Panel RID-95



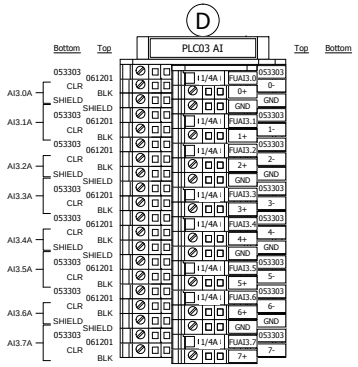
PLC02 - Analog Inputs

Master Control Panel RID-95



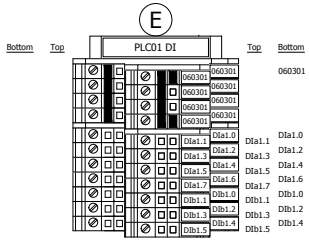
PLC03 - Analog Inputs

Master Control Panel RID-95



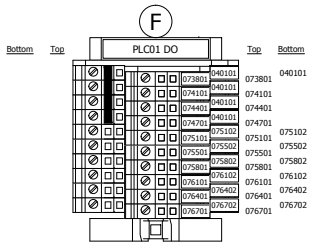
PLC01- 24VDC Discrete Inputs

Master Control Panel RID-95



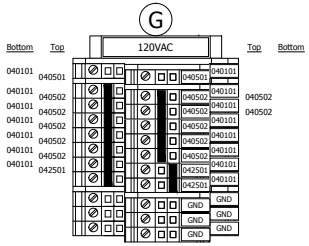
PLC01 - Relay Outputs

Master Control Panel RID-95



120VAC Power Distribution

Master Control Panel RID-95



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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

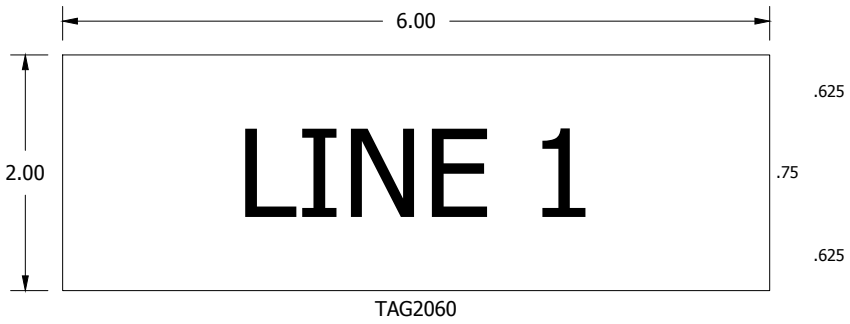
Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #95 Master Control Panel RID-95
Terminal Strip Layout

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-95
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 13 OF 14

WELL #95 MASTER CONTROL PANEL RID-95 - ENGRAVING SCHEDULE						
Tag	Type	Height	Width	Surface	Core	Text Line 1
1	TAG2060	2.0	6.0	White	Black	RID-95
2	TAG038075	0.375	0.75	White	Black	GND
3	TAG038075	0.375	0.75	White	Black	CB01
4	TAG038075	0.375	0.75	White	Black	CB02
5	TAG038075	0.375	0.75	White	Black	CB03
6	TAG038075	0.375	0.75	White	Black	CB04
7	TAG038075	0.375	0.75	White	Black	CR01
8	TAG038075	0.375	0.75	White	Black	EL01
9	TAG038075	0.375	0.75	White	Black	RCP01
10	TAG038075	0.375	0.75	White	Black	PS01
11	TAG038075	0.375	0.75	White	Black	UPS01
12	TAG038075	0.375	0.75	White	Black	PLC01
13	TAG038075	0.375	0.75	White	Black	PLC02
14	TAG038075	0.375	0.75	White	Black	PLC03
15	TAG038075	0.375	0.75	White	Black	ES01
16	TAG038075	0.375	0.75	White	Black	RTM01
17	TAG038075	0.375	0.75	White	Black	TS01
18	TAG038075	0.375	0.75	White	Black	DOCR00
19	TAG038075	0.375	0.75	White	Black	DOCR01
20	TAG038075	0.375	0.75	White	Black	DOCR02
21	TAG038075	0.375	0.75	White	Black	DOCR03
22	TAG038075	0.375	0.75	White	Black	DOCR04
23	TAG038075	0.375	0.75	White	Black	DOCR05
24	TAG038075	0.375	0.75	White	Black	DOCR06
25	TAG038075	0.375	0.75	White	Black	DOCR07
26	TAG038075	0.375	0.75	White	Black	DOCR08
27	TAG038075	0.375	0.75	White	Black	DOCR09



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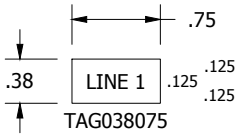

TAG038075

P110124-RID95-14.dwg

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As Built	RS	JMM
0	11/07/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #95 Master Control Panel RID-95
Engraving Schedule

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-95
Rev: 1	**Scale:** 1'-0" = 1'-0"	**Sheet Size:** B	**Sheet Number:** 14 OF 14

SYNERGY ENVIRONMENTAL, LLC

APPENDIX D

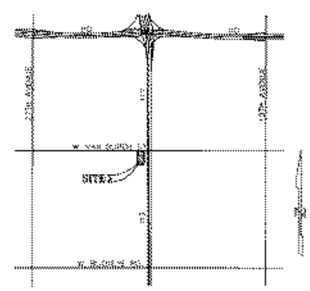
RID-114 Wellhead Treatment System Drawings

ROOSEVELT IRRIGATION DISTRICT
SITE #114 WATER TREATMENT INSTALLATION

LOCATED IN
A PORTION OF SECTION 12, T.1.N., R.2.E.,
OF THE G. & S.R.M., MARICOPA COUNTY, ARIZONA

ENGINEERS NOTES

1. MARICOPA ASSOCIATION OF GOVERNMENTS (M.A.G.) UNIFORM STANDARD SPECIFICATIONS AND DETAILS FOR PUBLIC WORKS CONSTRUCTION (LATEST EDITION INCLUDING LATEST REVISION AND CURRENT SUPPLEMENTALS THEREOF FOR THE LOCAL TOWN OR CITY) ARE INCORPORATED INTO THIS PLAN IN THEIR ENTIRETY.
2. ALL WORK REQUIRED TO COMPLETE THE CONSTRUCTION COVERED BY THIS PLAN SHALL BE IN ACCORDANCE WITH THE M.A.G. STANDARD SPECIFICATIONS AND DETAILS AND CURRENT SUPPLEMENTS THEREOF FOR THE LOCAL CITY OR TOWN UNLESS SPECIFIED OTHERWISE IN THESE PLANS OR ELSEWHERE IN THE CONTRACT DOCUMENTS. CONTRACTORS SHALL FAMILIARIZE THEMSELVES WITH ALL REQUIRED STANDARD SPECIFICATIONS, DETAILS AND SUPPLEMENTS PRIOR TO BIDDING THE WORK FOR THE CONSTRUCTION COVERED BY THIS PLAN.
3. THE CONTRACTOR IS RESPONSIBLE FOR ALL METHODS, SEQUENCING, AND SAFETY CONCERNS ASSOCIATED WITH THIS PROJECT DURING CONSTRUCTION, UNLESS SPECIFICALLY ADDRESSED OTHERWISE IN THIS PLAN OR ELSEWHERE IN THE CONTRACT.
4. THE CONTRACTOR IS TO COMPLY WITH ALL LOCAL, STATE, AND FEDERAL LAWS AND REGULATIONS APPLICABLE TO THE CONSTRUCTION COVERED BY THIS PLAN.
5. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING AND COMPLYING WITH ALL PERMITS REQUIRED TO COMPLETE ALL WORK COVERED BY THIS PLAN.
6. THE QUANTITIES AND SITE CONDITIONS DEPICTED IN THESE PLANS ARE FOR INFORMATIONAL PURPOSES ONLY AND ARE SUBJECT TO ERROR AND OMISSION. CONTRACTORS SHALL SATISFY THEMSELVES AS TO ACTUAL QUANTITIES AND SITE CONDITIONS PRIOR TO BIDDING THE WORK FOR THE CONSTRUCTION COVERED BY THIS PLAN.
7. A REASONABLE EFFORT HAS BEEN MADE TO SHOW THE LOCATIONS OF EXISTING UNDERGROUND FACILITIES AND UTILITIES IN THE CONSTRUCTION AREA. THE CONTRACTOR IS RESPONSIBLE FOR ANY DAMAGE TO UTILITIES AND/OR FACILITIES CAUSED DURING THEIR CONSTRUCTION OPERATIONS. THE CONTRACTOR SHALL CALL 48 HOURS IN ADVANCE FOR BLUE STAKE (1-800-STAKE-IT) PRIOR TO ANY EXCAVATION.
8. THE CONTRACTOR IS RESPONSIBLE FOR ALL COORDINATION OF CONSTRUCTION AFFECTING UTILITIES AND THE COORDINATION OF ANY NECESSARY UTILITY RELOCATION WORK.
9. ALL PAVING, GRADING, EXCAVATION, TRENCHING, PIPE BEDDING, CUT FILL AND BACKFILL SHALL COMPLY WITH THE RECOMMENDATIONS SET FORTH IN THE SOILS (GEOTECHNICAL) REPORT FOR THIS PROJECT IN ADDITION TO THE REFERENCED REQUIRED SPECIFICATIONS AND DETAILS. THE CONTRACTOR SHALL BE AWARE THAT CERTAIN UTILITIES REQUIRE PROPER ATTENTION AND CAREFUL PLANNING DURING SITE CONSTRUCTION. PLEASE NOTE THAT UTILITIES ON THESE PLANS MAY NOT EXHIBIT THE FULL PROTECTIVE COVER REQUIRED DURING THE SUBGRADE PREPARATION PHASE OF THE CONSTRUCTION. IN SUCH INSTANCES, THE CONTRACTOR SHALL PROVIDE ADDITIONAL PROTECTION (SUCH AS RAMPING) OR INCREASED PIPE STRENGTH TO PROVIDE THE NECESSARY PROTECTION REQUIRED TO PREVENT DAMAGE DURING THE CONSTRUCTION OF THIS PROJECT. THE CONTRACTOR SHALL HOLD THE ENGINEER HARMLESS IN ALL CASES FOR DAMAGES TO UTILITIES WHERE INADEQUATE PROTECTIVE MEASURES OCCUR.
10. THE CONTRACTOR IS TO VERIFY THE LOCATION AND THE ELEVATIONS OF ALL EXISTING UTILITIES AT POINTS OF TIE-IN PRIOR TO COMMENCING ANY NEW CONSTRUCTION. SHOULD ANY LOCATION OR ELEVATION DIFFER FROM THAT SHOWN ON THESE PLANS, THE CONTRACTOR SHALL CONTACT THE OWNER'S AGENT.
11. CONTRACTOR TO VERIFY AND COORDINATE ALL DIMENSIONS AND SITE LAYOUT WITH ARCHITECT'S FINAL SITE PLAN AND FINAL BUILDING DIMENSIONS BEFORE STARTING WORK. REPORT DISCREPANCIES TO OWNER'S AGENT.
12. COORDINATION BETWEEN ALL PARTIES IS ESSENTIAL PART OF CONTRACT.
13. CONTRACTOR IS RESPONSIBLE FOR PROJECT AND SITE CONDITIONS, AND TO WORK WITH WEATHER CONDITIONS AS THE PROJECT SITE MAY BE LOCATED IN A FLOOD PRONE AREA AND SUBJECT TO FLOODING AND ITS HAZARDS.
14. THE CONTRACTOR IS TO VERIFY THE LOCATION, ELEVATION, CONDITION, AND PAVEMENT CROSS-SLOPE OF ALL EXISTING SURFACES AT POINTS OF TIE-IN AND MATCHING, PRIOR TO COMMENCEMENT OF GRADING, PAVING, CURB AND GUTTER, OR OTHER SURFACE CONSTRUCTION. SHOULD EXISTING LOCATIONS, ELEVATIONS, CONDITION, OR PAVEMENT CROSS-SLOPE DIFFER FROM THAT SHOWN ON THESE PLANS, RESULTING IN THE DESIGN INTENT REFLECTED ON THESE PLANS NOT ABLE TO BE CONSTRUCTED, THE CONTRACTOR SHALL NOTIFY THE OWNER'S AGENT IMMEDIATELY FOR DIRECTION ON HOW TO PROCEED PRIOR TO COMMENCEMENT OF CONSTRUCTION. THE CONTRACTOR ACCEPTS RESPONSIBILITY FOR ALL COSTS ASSOCIATED WITH CORRECTIVE ACTION IF THESE PROCEDURES ARE NOT FOLLOWED.
15. CONTRACTOR IS RESPONSIBLE TO COORDINATE UTILITY CROSSINGS AT CULVERT CROSSINGS BEFORE STARTING WORK ON CULVERT. COORDINATE WITH OWNER REPRESENTATIVE. VERIFY UTILITY LINES AND/OR CONDUITS ARE IN PLACE BEFORE STARTING CULVERT WORK.
16. CONSTRUCT RETENTION BASIN AS SHOWN. CONTRACTOR TO SCARIFY BOTTOM OF BASIN TWO FEET DEEP AND NOT ALLOW COMPACTION OVER 85%.
17. THIS PROJECT REQUIRES A REGULAR ONGOING MAINTENANCE PROGRAM FOR THE DESIGNED DRAINAGE SYSTEM(S) TO PRESERVE THE DESIGN INTEGRITY AND THE ABILITY TO PERFORM ITS OPERATIONAL INTENT. FAILURE TO PROVIDE MAINTENANCE WILL JEOPARDIZE THE DRAINAGE SYSTEM(S)' PERFORMANCE AND MAY LEAD TO ITS INABILITY TO PERFORM PROPERLY AND/OR CAUSE DAMAGE ELSEWHERE IN THE PROJECT.
18. SEWER LINES DESIGNED IN PROFILE AND PUBLIC WATER LINES ARE REQUIRED TO BE ASBUILT AND THE INSTALLATION AND TESTING WITNESSED BY A PROFESSIONAL ENGINEER IN ACCORDANCE WITH ARIZONA ADMINISTRATIVE CODES R18-9-E301 "4.01 GENERAL PERMIT: SEWAGE COLLECTIONS SYSTEMS" AND R18-5-507 AND 508 "APPROVAL OF CONSTRUCTION" AND "RECORD DRAWINGS", RESPECTIVELY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY OWNER 72 HOURS IN ADVANCE WHEN THOSE SYSTEMS ARE READY TO BE WITNESSED.
19. THE WORK PRODUCT PRESENTED IS BELIEVED TO BE COMPLIANT WITH THE INTENT OF THE CURRENT AMERICANS DISABILITIES ACT (ADA) REQUIREMENTS AS INTERPRETED BY THE REVIEWING AGENCY(S). IF CONSTRUCTION OF THE PROJECT IS DELAYED, THIS WORK PRODUCT SHOULD BE UPDATED TO ACCOUNT FOR ANY RELEVANT ADA UPDATES BEFORE CONSTRUCTION BEGINS.
20. LOWEST FLOOR (LF) REFERS TO FINISH FLOOR/SLAB ELEVATION OR TOP OF BASEMENT SLAB. LF ELEVATIONS ON THE GRADING AND DRAINAGE PLANS FOR RESIDENTIAL UNITS REFLECT SLAB ON GRADE CONDITIONS AND CANNOT BE LOWERED WITHOUT AGENCY APPROVAL IN LOCATIONS WHERE "SPECIAL FLOOD HAZARD AREAS" EXIST. IN NON-FLOOD HAZARD LOCATIONS, TO ENSURE THAT ADEQUATE RESIDENTIAL LOT DRAINAGE CAN BE ACHIEVED, A PROFESSIONAL ENGINEER SHOULD BE CONSULTED IF THE LF FOR THE SLAB IS PROPOSED TO BE LOWERED, OR IF A BASEMENT IS TO BE CONSTRUCTED.



VICINITY MAP
N.T.S.

OWNER

ROOSEVELT IRRIGATION DISTRICT
103 W. BASELINE ROAD
BUCKEYE, AZ 85326
CONTACT: DONOVAN NEESE
PH: 623-386-2046

TREATMENT DESIGNER

SYNERGY ENVIRONMENTAL LLC
20645 N TATUM BLVD., SUITE 200-427
PHOENIX, AZ 85050
CONTACT: JOEL PETERSON
PH: 480-284-3585

MECHANICAL ENGINEER

TAYLOR RYMAR CORPORATION
60 E RIO SALADO PARKWAY, SUITE 1010
TEMPE, AZ 85281
CONTACT: CHRIS MARTNEY
PH: 480-951-6517
FAX: 480-951-2553

STRUCTURAL ENGINEER

PK ASSOCIATES LLC
7434 E McDONALD DR
SCOTTSDALE, ARIZONA 85250
CONTACT: STEVE SLONAKER
PH: 480-922-8554
FX: 480-922-3730

CIVIL ENGINEER

WOOD, PATEL AND ASSOCIATES
2051 W NORTHERN AVE, SUITE 100
PHOENIX, ARIZONA 85021
CONTACT: DARRELL SMITH
PH: 602-335-8500
FX: 602-335-8580

LEGEND

EXISTING	DESCRIPTION	PROPOSED
⊙	SURVEY MARKER	
	CURB & GUTTER	
— — OE — —	OVERHEAD ELECTRIC LINE	
	CONCRETE ELEVATION	C=51.58
	NATURAL GRADE	
	TOP OF CURB GUTTER ELEVATION	TC=56.17 FG=56.15
	PAVEMENT ELEVATION	
U.P.	UTILITY POLE	
S.L.	STREET LITE	
C.B.	CATCH BASIN	
	SIGN	
S.D.M.H.	STORM DRAIN MANHOLE	
I.V.B.	IRRIGATION VALVE BOX	
E.J.B.	ELECTRICAL JUNCTION BOX	
W.M.	WATER METER	

(602) 263-1100
1-800-STAKE-IT

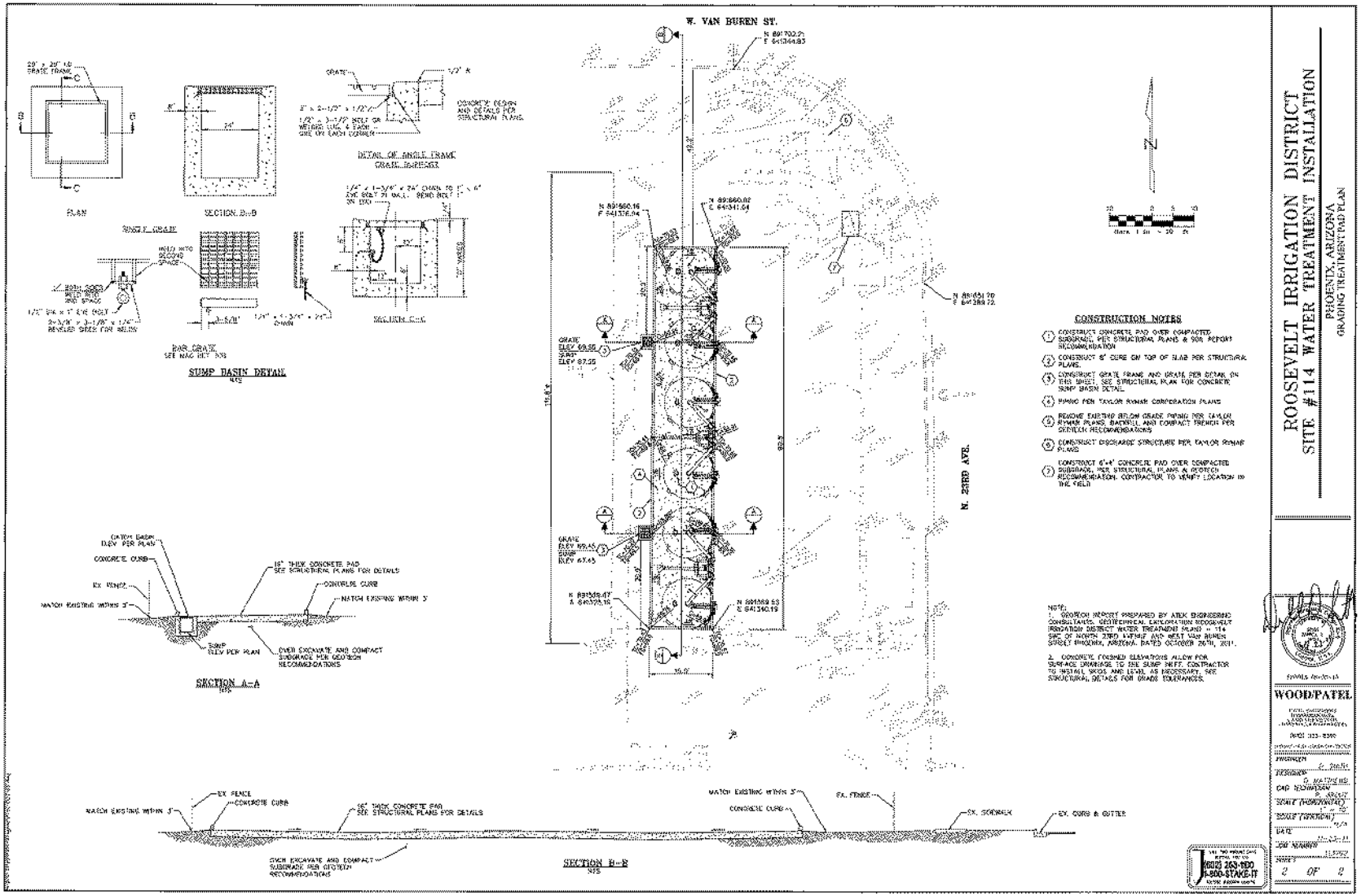
ROOSEVELT IRRIGATION DISTRICT
SITE #114 WATER TREATMENT INSTALLATION
PHOENIX, ARIZONA
GRADING TREATMENT PAD PLAN

EXPIRES 09-30-15

WOOD/PATEL

(602) 335-8500

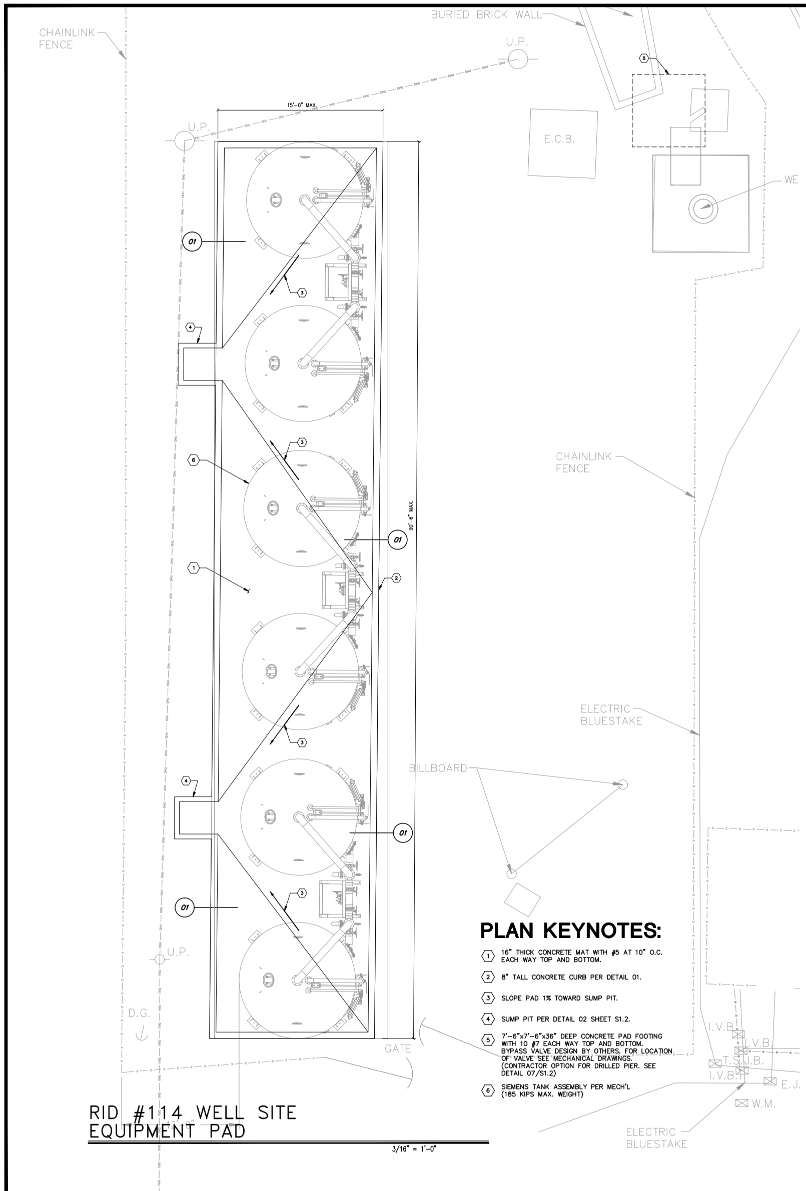
ENGINEER: D. SMITH
DESIGNER: C. MATTHEWS
CAD TECHNICIAN: D. BOOTH
SCALE (HORIZONTAL): N.T.S.
SCALE (VERTICAL): N/A
DATE: 11-25-13
JOB NUMBER: 113352
SHEET 1 OF 2



ROOSEVELT IRRIGATION DISTRICT
SITE #114 WATER TREATMENT INSTALLATION
PHOENIX, ARIZONA
GRADING TREATMENT PAD PLAN

WOOD/PATEL

DESIGNED
DRAWN
CHECKED
SCALE (HORIZONTAL)
SCALE (VERTICAL)
DATE
JOB NUMBER
SHEET 2 OF 2



RID #114 WELL SITE EQUIPMENT PAD

3/16" = 1'-0"

PLAN KEYNOTES:

1. 16" THICK CONCRETE MAT WITH #5 AT 10" O.C. EACH WAY TOP AND BOTTOM.
2. 8" TALL CONCRETE CURB PER DETAIL 01.
3. SLOPE PAD 1% TOWARD SUMP PIT.
4. SUMP PIT PER DETAIL 02 SHEET S1.2.
5. 7'-6"x7'-6"x36" DEEP CONCRETE PAD FOOTING WITH 10 #7 EACH WAY TOP AND BOTTOM. BYPASS VALVE DESIGN BY OTHERS. FOR LOCATION OF VALVE SEE MECHANICAL DRAWINGS. (CONTRACTOR OPTION FOR DRILLED PIER. SEE DETAIL 07/S1.2)
6. SIEMENS TANK ASSEMBLY PER MECH'L (185 KIPS MAX. WEIGHT)

BUILDING CODE:

2006 EDITION OF THE INTERNATIONAL BUILDING CODE, WITH CITY OF PHOENIX AMENDMENTS.

LOADS:

SIEMENS HP 1220 ADSORPTION SYSTEM = 185,000 LBS. PER SKID (2 TANKS PER SKID, 6 TANKS TOTAL THIS SITE)

WIND:

90 MPH BASIC WIND SPEED, EXPOSURE C.
I_w = 1.0.
INTERNAL PRESSURE COEFFICIENT (GCpi) = 0.18.

SEISMIC:

OCCUPANCY CATEGORY = II.
I_e = 1.0.
DESIGN CATEGORY = B.
SITE CLASS D.
S_s = 0.174, S_1 = 0.060.

FOUNDATIONS:

SOIL REPORT BY ATEK ENGINEERING CONSULTANTS; JOB NO.110059; DATED OCTOBER 26, 2011; MAT FOUNDATIONS SHALL BEAR ON 18" CONTROLLED COMPACTED FILL IN ACCORDANCE WITH THE ABOVE REPORT. BOTTOM OF FOOTING TO BE 12" MINIMUM BELOW FINISHED GRADE. THESE FOOTING DEPTHS ARE MINIMUMS AND THE CONTRACTOR SHALL COORDINATE WITH SOILS REPORT AND OTHERS TRADES TO ENSURE THESE MINIMUMS ARE SUFFICIENT FOR THE WORK. COMPACTED FILL SHALL EXTEND 5'-0" BEYOND EACH EDGE OF FOOTING. FINISHED GRADE IS DEFINED AS LOWEST ADJACENT GRADE WITHIN 5 FEET. DESIGN SOIL BEARING VALUE = 2000 PSF. FOUNDATION EXCAVATIONS SHALL BE INSPECTED BY SOILS ENGINEER PRIOR TO PLACEMENT OF CONCRETE.

CONCRETE:

MINIMUM 28 DAY STRENGTH 4,000 PSI (w/c = 0.45): (TYPE II, U.N.O.)
- 3,000 PSI MIN. BEFORE SETTING EQUIPMENT

MECHANICALLY VIBRATE ALL CONCRETE WHEN PLACED. MAXIMUM SLUMP 4 1/2" FOR CONCRETE WITHOUT PLASTICIZER. IF PLASTICIZER IS USED, A HIGHER FINAL SLUMP MAY BE ALLOWED UPON STRUCTURAL ENGINEER'S APPROVAL. CAST CLOSURE POUR AROUND COLUMNS AFTER COLUMN DEAD LOAD IS APPLIED.

REINFORCING:

ASTM A615 (Fy = 60 KSI) DEFORMED BARS FOR ALL BARS. ALL GRADE 60 REINFORCING TO BE WELDED SHALL BE ASTM A706. WELDED WIRE FABRIC PER ASTM A185, WIRE PER ASTM A82. NO TACK WELDING OF REINFORCING BARS ALLOWED WITHOUT PRIOR REVIEW OF PROCEDURE WITH THE STRUCTURAL ENGINEER. LATEST ACI CODE AND DETAILING MANUAL APPLY. CLEAR CONCRETE COVERAGES AS FOLLOWS:

CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH ------------- 3"
EXPOSED TO EARTH OR WEATHER
#6 OR LARGER ----------------------------------- 2"
#5 AND SMALLER --------------------------------- 1 1/2"
ALL OTHER PER LATEST EDITION OF ACI 318.

LAP SPLICES IN CONCRETE:

LAP SPLICES, UNLESS NOTED OTHERWISE, SHALL BE CLASS "B" TENSION LAP SPLICES PER LATEST EDITION OF ACI 318. STAGGER SPLICES A MINIMUM OF ONE LAP LENGTH.

ALL SPLICE LOCATIONS SUBJECT TO APPROVAL BY THE STRUCTURAL ENGINEER. PROVIDE BENT CORNER BARS TO MATCH AND LAP WITH HORIZONTAL BARS AT ALL CORNERS AND INTERSECTIONS PER TYPICAL DETAILS. REINFORCING BAR SPACING GIVEN ARE MAXIMUM ON CENTERS. ALL BARS PER CRSI SPECIFICATIONS AND HANDBOOK. DOWEL ALL VERTICAL REINFORCING TO FOUNDATION WITH STANDARD 90-DEGREE HOOKS UNLESS NOTED OTHERWISE. SECURELY TIE ALL BARS IN LOCATION BEFORE PLACING CONCRETE.

NOTES ON CRACKING OF CONCRETE STRUCTURES:

CRACKING IS INHERENT TO THE MATERIAL PROPERTIES OF CONCRETE CONSTRUCTION WHILE EVERY EFFORT HAS BEEN MADE TO MINIMIZE THE EFFECTS OF UNSIGHTLY CRACKING, THE PRESENCE OF CRACKS ARE NORMAL AND UNAVOIDABLE. THE DESIGN OF THE CONCRETE STRUCTURAL ITEMS HAVE BEEN ANALYZED USING A "CRACKING SECTION." THE PRESENCE OF THE CRACKING SHOULD NOT BE CONSIDERED DETRIMENTAL TO THE STRUCTURE. CRACKS LARGER THAN 5 MILS SHALL BE FILLED AND SEALED WITH AN APPROVED CRACK FILLER TO PREVENT FUTURE DETERIORATION. ALLOWANCE SHALL BE MADE IN THE CONSTRUCTION BUDGET FOR SEALING OF SUCH CRACKS. IN SOME CASE, CRACKS DO NOT APPEAR UNTIL WELL AFTER CONSTRCUTION HAS BEEN COMPLETED. IT IS THE RESPONSIBILTY OF THE OWNER TO MAINTAIN THE STRUCTURE PROPERLY OVER THE LIFE OF THE STRUCTURE. CONCRETE CRACKS, SHOULD THEY OCCUR, SHALL BE FILLED AND SEALED TO PREVENT PREMATURE DETERIORATION OF THE STRUCTURE.

SHOP DRAWINGS:

SHOP DRAWINGS SHALL BE SUBMITTED FOR ALL STRUCTURAL ITEMS IN ADDITION TO ITEMS REQUIRED BY MECHANICAL SPECIFICATIONS.

THE CONTRACTOR SHALL REVIEW ALL SHOP DRAWINGS PRIOR TO SUBMITTAL. ITEMS NOT IN ACCORDANCE WITH CONTRACT DOCUMENTS SHALL BE FLAGGED UPON HIS REVIEW.

VERIFY ALL DIMENSIONS WITH MECHANICAL AND ALL FINISHED GRADE WITH CIVIL DRAWINGS.

ANY CHANGES, SUBSTITUTIONS, OR DEVIATIONS FROM CONTRACT DOCUMENTS SHALL BE CLOUDED BY MANUFACTURER OR FABRICATOR. ANY OF THE AFOREMENTIONED WHICH ARE NOT CLOUDED OR FLAGGED BY SUBMITTING PARTIES, SHALL NOT BE CONSIDERED APPROVED AFTER ENGINEER'S REVIEW, UNLESS NOTED ACCORDINGLY.

THE ENGINEER HAS THE RIGHT TO APPROVE OR DISAPPROVE ANY CHANGES TO CONTRACT DOCUMENTS AT ANYTIME BEFORE OR AFTER SHOP DRAWING REVIEW.

THE SHOP DRAWINGS DO NOT REPLACE THE CONTRACT DOCUMENTS. ITEMS OMITTED OR SHOWN INCORRECTLY AND ARE NOT FLAGGED BY THE STRUCTURAL ENGINEER OR ARCHITECT ARE NOT TO BE CONSIDERED CHANGES TO CONTRACT DOCUMENTS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO MAKE SURE ITEMS ARE CONSTRUCTED TO CONTRACT DOCUMENTS.

THE ADEQUACY OF ENGINEERING DESIGNS AND LAYOUT PERFORMED BY OTHERS RESTS WITH THE DESIGNING OR SUBMITTING AUTHORITY.

REVIEWING IS INTENDED ONLY AS AN AID TO THE CONTRACTOR IN OBTAINING CORRECT SHOP DRAWINGS. RESPONSIBILITY FOR CORRECTNESS SHALL REST WITH THE CONTRACTOR.

EPOXY ANCHORS IN CONCRETE:

INJECTABLE ADHESIVE SHALL BE USED FOR INSTALLATION OF REINFORCING STEEL DOWELS OR THREADED ANCHOR RODS AND INSERTS INTO NEW OR EXISTING CONCRETE OR SOLID GROUTED CONCRETE MASONRY UNITS ONLY WHERE SPECIFIED ON PLANS. IF USE IS REQUESTED FOR OTHER THAN WHERE NOTED CONTACT STRUCTURAL ENGINEER THROUGH ARCHITECT FOR APPROVAL. ADHESIVE SHALL BE FURNISHED IN SIDE BY SIDE PACKS WHICH KEEP COMPONENT A AND COMPONENT B SEPARATE. USE ONLY INJECTION TOOLS AND STATIC MIXING NOZZLES RECOMENDED BY MANUFACTURER. MANUFACTURER?S INSTRUCTIONS SHALL BE FOLLOWED.

ANCHORS USED MUST HAVE I.C.C. APPROVAL AND INCLUDE HILTI HY-150 FOR MASONRY (ESR-1967), HILTI HIT-RE 500-SD FOR CONCRETE (ESR-2322) AND SIMPSON STRONG TIE SET (ESR-1772) FOR MASONRY OR EQUIVALENT. THE USE OF ANY EPOXY ANCHOR MUST BE APPROVED BY THE ENGINEER OF RECORD.

GENERAL:

ENTIRE CONTRACT DOCUMENTS SHALL BE USED TO BUILD BUILDING. SOME CRITICAL ITEMS REQUIRED BY OTHER DISCIPLINES MAY NOT BE SHOWN ON STRUCTURAL DRAWING (i.e. MECHANICAL, PLUMBING LOADS, ANS SUPPORT PLATES ETC.)

ITEMS SHOWN BY OTHER DISCIPLINES WITH REFERENCE TO STRUCTURAL DRAWING BUT NOT SHOWN ON THESE STRUCTURAL DOCUMENT SHALL BE CONSIDERED DESIGN BUILD ITEMS. CONTRACTOR SHALL SUBMIT DESIGN BY OTHERS FOR REVIEW.

THE STRUCTURAL CONSTRUCTION DOCUMENTS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE ALL MEASURES NECESSARY TO PROTECT THE STRUCTURE DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO, BRACING, SHORING FOR LOADS DUE TO CONSTRUCTION EQUIPMENT, ETC. THE STRUCTURAL ENGINEER SHALL NOT BE RESPONSIBLE FOR THE CONTRACTOR'S MEANS, METHODS, TECHNIQUES, SEQUENCES FOR PROCEDURE OF CONSTRUCTION, OR THE SAFETY PRECAUTIONS AND THE PROGRAMS INCIDENT THERETO (NOR SHALL OBSERVATION VISITS TO THE SITE INCLUDE INSPECTION OF THESE ITEMS).

WHERE REFERENCE IS MADE TO VARIOUS TEST STANDARDS FOR MATERIALS, SUCH STANDARDS SHALL BE THE LATEST EDITION AND/OR ADDENDA.

ESTABLISH AND VERIFY ALL OPENINGS AND INSERTS FOR MECHANICAL, PLUMBING AND ELECTRICAL WITH APPROPRIATE TRADES, DRAWINGS AND SUBCONTRACTORS PRIOR TO CONSTRUCTION.

OPTIONS ARE FOR CONTRACTOR'S CONVENIENCE. IF HE CHOOSES AN OPTION, CONTRACTOR SHALL BE RESPONSIBLE FOR ALL NECESSARY CHANGES AND SHALL COORDINATE ALL DETAILS.

NOTES AND DETAILS ON DRAWINGS SHALL TAKE PRECEDENCE OVER GENERAL STRUCTURAL NOTES AND TYPICAL DETAILS. WHERE NO DETAILS ARE SHOWN, CONSTRUCTION SHALL CONFORM TO SIMILAR WORK ON THE PROJECT.

ALL DIMENSIONS SHOWN (INCLUDING ELEVATIONS) ON STRUCTURAL DRAWINGS ARE TO ASSIST CONTRACTOR IN VERIFICATION. SCALING DIMENSIONS FROM DRAWINGS IS NOT PERMITTED. LOCATION OF ALL ITEMS SHALL BE DETERMINED BY DIMENSIONS OR NOTES ONLY; DO NOT USE GRAPHIC APPEARANCE TO ASSUME SPECIFIC LOCATIONS.

CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF ALL DIMENSIONS WITH MECHANICAL AND FINISHED GRADE WITH CIVIL DRAWINGS PRIOR TO START OF CONSTRUCTION. RESOLVE ANY DISCREPANCY WITH THE ARCHITECT.

TYPICAL DETAILS MAY NOT NECESSARILY BE CUT ON PLANS, BUT APPLY UNLESS NOTED OTHERWISE.

WHERE DISCREPANCIES OCCUR BETWEEN PLANS, DETAILS, GENERAL STRUCTURAL NOTES AND SPECIFICATIONS, THE GREATER REQUIREMENTS SHALL GOVERN.

ANY ENGINEERING DESIGN, PROVIDED BY OTHERS AND SUBMITTED FOR REVIEW, SHALL BEAR THE SEAL OF AN ENGINEER REGISTERED IN THE STATE OF JURISDICTION.

MISCELLANEOUS:

REFER TO MECHANICAL, ELECTRICAL, CIVIL, OR OTHER SPECIALTY ENGINEERING DRAWINGS FOR DIMENSIONS NOT SHOWN, INCLUDING BUT NOT LIMITED TO: SIZE AND LOCATION OF CURBS, EQUIPMENT HOUSEKEEPING PADS, BLOCKOUTS, FLOOR DEPRESSIONS, SUMPS, DRAINS, ANCHOR BOLTS, EMBEDDED ITEMS, ETC. CONTRACTOR SHALL VERIFY DIMENSIONS AND RESOLVE DISCREPANCIES OR CONFLICT PRIOR TO CONSTRUCTION. WHERE SECTIONS ARE INDICATED ON THE PLAN BY A NUMBER AND A DRAWING NUMBER THUS, 1/S5.01, THE INDICATED SECTION (1) IS SHOWN ON STRUCTURAL DRAWING S5.01.

FLOOR FLATNESS/LEVELNESS SHALL MEET MECHANICAL SPECIFICATIONS (1/8" MINIMUM LEVELNESS UNLESS TIGHTER REQUIREMENT IN SPECIFICATIONS) IN HEIGHT FOR ALL STRUCTURAL SYSTEMS. CONTRACTOR SHALL INCLUDE COST FOR LEVELING ALL MAT SLABS IF REQUIRED.

SPECIAL INSPECTION:

PER IBC CHAPTER 17, SPECIAL INSPECTION IS REQUIRED FOR THE FOLLOWING ITEMS:

CONCRETE: VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERRENCED STANDARD (NOTE 1)	IBC REFERENCE
1. Inspection of reinforcing steel.	–	X	ACI 318: 3.5, 7.1–7.7	1913.4
2. Inspect bolts to be installed in concrete prior to and during placement of concrete where allowable loads have been increased.	X	–	ACI 318: APPENDIX D	1912
3. Verifying use of required design mix.	–	X	ACI 318: CH. 4, 5.2–5.4	1904.2.2, 1913.2, 1913.3
4. At the time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	X	–	ASTM C 172 ASTM C 31 ACI 318: 5.6, 5.8	1913.10
5. Inspection of concrete placement for proper application techniques.	X	–	ACI 318: 5.9, 5.10	1913.6, 1913.7, 1913.8
6. Inspection for maintenance of specified curing temperature and techniques.	–	X	ACI 318: 5.11, 5.13	1913.9
7. Inspect formwork for shape, location and dimensions of the concrete member being formed.	–	X	ACI 318: 6.1.1	

NOTES:
1. TABLES TAKEN DIRECTLY FROM IBC FOR REFERENCE.

Registered Professional Engineer — Certificate No. 34635 — STEVEN C. SLONAKER — Civil (Structural) — Date 12/15/11 — ARIZONA, U.S.A.
EXPIRES: 3-31-2012

TAYLOR RYMAR CORPORATION
60 EAST RIO SALADO PARKWAY
SUITE 1010
TEMPE, AZ 85281
PH: 480.951.0517 FAX:480.951.2353
WWW.TR-CORP.COM

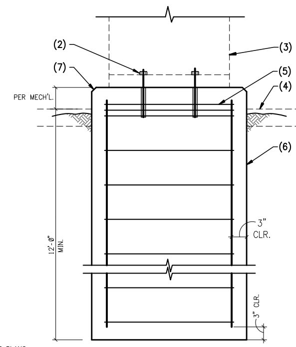
ROOSEVELT IRRIGATION DISTRICT #114 WATER TREATMENT INSTALLATION

2307 WEST VAN BUREN STREET, PHOENIX, ARIZONA

Sheet Title: GSN AND FOUNDATION PLAN

REVISIONS:

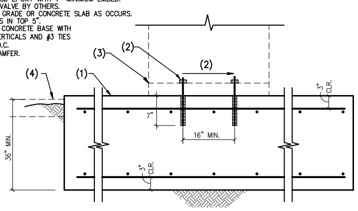
DATE: 12/15/2011
DRAWN BY: FML
CHECKED BY: RH
SCALE: AS NOTED
PROJECT NO: 11322
SHEET
S1.1



NOTES:

1. CONCRETE PAD PER PLANS.
2. PROVIDE (4) 3/4"ø EPOXY BOLTS FOR BY-PASS VALVE TO MAT CONNECTION. EPOXY WITH HILTI RE 500 SD EPOXY WITH 7" MINIMUM EMBED.
3. BYPASS VALVE BY OTHERS.
4. FINISHED GRADE OR CONCRETE SLAB AS OCCURS.
5. 3 #3 TIES IN TOP 5".
6. 36" DIA. CONCRETE BASE WITH 13 #8 VERTICALS AND #3 TIES AT 12" O.C.
7. 1/2" CHAMFER.

AT CONTRACTOR OPTION



07 *CONCRETE PAD AT BYPASS VALVE*

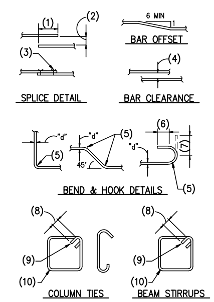
NO SCALE

	CLASS B TENSION SPLICE LENGTHS						COMP. BARS	
CONC. PSI	f'c = 2,500 PSI/ f'c = 3,000 PSI		f'c = 4,000 PSI		f'c = 5,000 PSI AND HIGHER		f'c = ALL	
BAR LOCATION	REGULAR CLASS	TOP CLASS	REGULAR CLASS	TOP CLASS	REGULAR CLASS	TOP CLASS	STD LAP	ENCLOSED W/ SPIRAL TIES
SIZE								
#3	24"	31"	19"	24"	17"	22"	12"	12"
#4	32"	41"	25"	33"	23"	29"	15"	12"
#5	39"	51"	31"	41"	28"	36"	19"	14"
#6	47"	61"	37"	49"	34"	43"	23"	17"
#7	69"	89"	54"	71"	49"	63"	26"	20"
#8	78"	102"	62"	81"	56"	72"	30"	23"
#9	88"	115"	70"	91"	63"	81"	34"	25"
#10	100"	129"	79"	102"	70"	92"	38"	29"
#11	110"	143"	87"	113"	78"	102"	42"	32"

NOTES:
1. TOP BARS ARE ANY HORIZONTAL BARS PLACED SO THAT MORE THAN 12" OF FRESH CONCRETE IS CAST IN THE MEMBER BELOW THE REINFORCEMENT.
2. UNLESS NOTED OTHERWISE, LAP SPLICES IN CONCRETE BEAMS, SLABS, AND WALLS. WILL BE CLASS B TENSION SPLICE LENGTHS. COLUMNS SHALL HAVE STANDARD COMPRESSION LAP SPLICE.
3. CONTACT STRUCTURAL ENGINEER IF CENTER TO CENTER SPACING OF REINFORCING IS LESS THAN OR EQUAL TO 3 BAR DIAMETERS, <3db OR 2db CLEAR SPACING BETWEEN BARS.
4. ALL SPLICES MUST BE FULL CONTACT.
5. SPLICES WITH #14 OR #18 BARS SHALL USE MECHANICAL COUPLERS. (THIS INCLUDES #14 OR #18 BARS TO SMALLER BARS SHOWN IN SCHEDULE).

04 *LAP SCHEDULE FOR REINFORCING STEEL*

NO SCALE

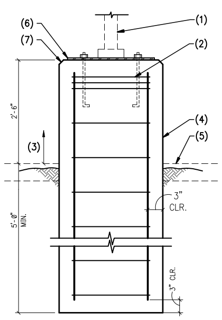


NOTES:

1. LAP - SEE G.S.N.
2. MAXIMUM 1/5 LAP BUT NOT MORE THAN 6".
3. WIRE TIES.
4. 1d (1" MINIMUM).
5. RADIUS=3d FOR BARS NOT OVER #8; 4d FOR #9, #10 AND #11 BARS; 5d FOR #14 AND #18 BARS. 5d FOR ALL GRADE 40 BARS WITH 180 DEGREE HOOK.
6. 4d (4" MINIMUM).
7. 12d (90 DEGREE HOOK).
8. 6d (4" MINIMUM).
9. 135 DEGREE BEND.
10. BEND AROUND 1 1/2" PIN FOR #3 BARS. BEND AROUND 2" PIN FOR #4 BARS. BEND AROUND 2 1/2" PIN FOR #5 BARS.

05 *TYPICAL CONCRETE REINFORCING BAR DETAILS*

NO SCALE



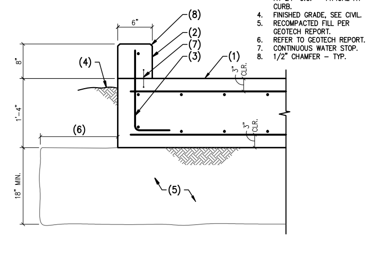
NOTES:
1. LIGHT POLE AND ANCHOR BOLTS BY OTHERS.
2. 3 #3 TIES IN TOP 5".
3. TOP OF LIGHT POLE TO BE 18'-0" ABOVE FINISHED GRADE - MAX.
4. 24" DIA. CONCRETE BASE WITH 6 #6 VERTICALS AND #3 TIES AT 12" O.C.
5. FINISHED GRADE OR CONCRETE SLAB AS OCCURS.
6. BASEPLATE AND ANCHOR BOLTS BY OTHERS.
7. 1/2" CHAMFER.

06 *TYPICAL LIGHT POLE BASE*

NO SCALE

NOTES:

1. MAT FOUNDATION PER PLAN.
2. 8" CONCRETE CURB WITH (1) #4 CONTINUOUS.
3. PROVIDE 1 #4 HOOKED DOWEL AT 24" O.C. - TYPICAL AT CURB.
4. FINISHED GRADE, SEE CIVIL.
5. RECOMPACTED FILL PER GEOTECH REPORT.
6. REFER TO GEOTECH REPORT.
7. CONTINUOUS WATER STOP.
8. 1/2" CHAMFER - TYP.

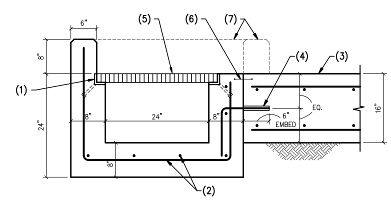


01 *CONCRETE CURB AT MAT FOOTING*

NO SCALE

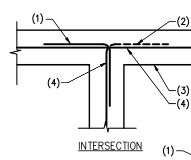
NOTES:

1. 2"x2"x1/4" CONT. GALVANIZED STEEL ANGLE WITH 1/2"ø x6" HEADED STUD AT 12" O.C.
2. #5 REINFORCING AT 10" O.C.
3. CONCRETE MAT FOUNDATION.
4. DRILL AND EPOXY #5 BENT BAR PER GSN. SPACING TO MATCH SUMP PIT REINFORCING.
5. GRATING PER CIVIL DRAWINGS.
6. CONT. WATER STOP.
7. CONCRETE CURB BEYOND.



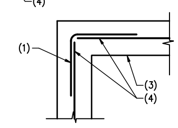
02 *SUMP PIT DETAIL*

NO SCALE



NOTES:

1. CORNER BARS SAME SIZE AND SPACING AS HORIZONTAL REINFORCING. LAP PER G.S.N. (24" MINIMUM).
2. ALTERNATE BEND.
3. CONCRETE STEM WALL OR FOOTING.
4. REINFORCING PER PLANS AND /OR G.S.N.



03 *PLAN - CORNER REINFORCING IN CONCRETE FOOTING AND/OR STEM WALL*

NO SCALE

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ROOSEVELT IRRIGATION DISTRICT #114
WATER TREATMENT INSTALLATION
2307 WEST VAN BUREN STREET, PHOENIX, ARIZONA

Sheet Title:
DETAILS

REVISIONS:

DATE:	12/15/2011
DRAWN BY:	FML
CHECKED BY:	RH
SCALE:	AS NOTED
PROJECT NO:	11322
SHEET	S1.2

ABBREVIATIONS

AC	AIR CONDITIONING UNIT
AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
AH	AIR HANDLER (SPLIT REFRIG)
AHU	AIR HANDLING UNIT
AL	ACOUSTICAL LINING
AP	ACCESS PANEL
BB	ELECTRIC BASEBOARD RADIATION
B	BOILER
BDD	BACK DRAFT DAMPER
BFC	BELOW FINISHED CEILING
BOB	BOTTOM OF BEAM
BOD	BOTTOM OF DUCT
BOP	BOTTOM OF PIPE
C	CHILLER
CD	CEILING DIFFUSER
CFM	CUBIC FEET PER MINUTE
CHWP	CHILLED WATER PUMP
CHWR	CHILLED WATER RETURN
CHWS	CHILLED WATER SUPPLY
CO	CLEAN OUT
CP	CONDENSATE PUMP
CWR	CONDENSER WATER RETURN
CWS	CONDENSER WATER SUPPLY
CT	COOLING TOWER
CU	CONDENSING UNIT
CUH	CABINET UNIT HEATER
CVB	CONSTANT VOLUME BOX
CWP	CONDENSER WATER PUMP
DB	DRY BULB
DS	DUCT SILENCER
DWP	DOMESTIC WATER PUMP
EAT	ENTERING AIR TEMPERATURE
EC	ELECTRICAL CONTRACTOR
EF	EXHAUST FAN
EJ	EXPANSION JOINT
ER	EXHAUST REGISTER
ESP	EXTERNAL STATIC PRESSURE
ET	EXPANSION TANK
EWT	ENTERING WATER TEMPERATURE
EWC	ELECTRIC WATER COOLER
FA	FREE AREA
FX	FLEXIBLE CONNECTION
FC	FAN COIL UNIT
FD	FIRE DAMPER
FLR	FLOOR
FOB	FLAT ON BOTTOM
FOT	FLAT ON TOP
FOP	FUEL OIL PUMP
FP	FIRE PUMP
FPM	FEET PER MINUTE
FTR	FINNED TUBE RADIATION
GC	GENERAL CONTRACTOR
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
HD	HAND DAMPER
HP	HEAT PUMP
HV	HEATING AND VENTILATING UNIT
HWC	HOT WATER CONVERTER
HWP	HOT WATER PUMP
HWR	HEATING HOT WATER RETURN
HWS	HEATING HOT WATER SUPPLY
HX	HEAT EXCHANGER
HZ	HERTZ
ID	INSIDE DIAMETER
LAT	LEAVING AIR TEMPERATURE
LWT	LEAVING WATER TEMPERATURE
LD	LINEAR DIFFUSER
LF	LINEAR FEET
MC	MECHANICAL CONTRACTOR
MTD	MOUNTED
MOD	MOTOR OPERATED DAMPER
MUA	MAKE-UP AIR UNIT
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
NIC	NOT IN CONTRACT
NK	NECK
OA	OUTSIDE AIR
OAI	OUTSIDE AIR INTAKE
OAT	OUTSIDE AIR TEMPERATURE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OBD	OPPOSED BLADE DAMPER
PBD	PARALLEL BLADE DAMPER
PRV	PRESSURE REDUCING VALVE
PTAC	PACKAGED TERMINAL AIR CONDITIONER
RA	RETURN AIR
RG	RETURN AIR GRILLE
RR	RETURN AIR REGISTER
RCP	REFLECTED CEILING PLAN
RHC	REHEAT COIL
RF	RETURN FAN
SA	SUPPLY AIR
SR	SUPPLY AIR REGISTER
SCG	SMOKE CONTROL GRILLE
SD	SMOKE DAMPER
SEF	SMOKE EXHAUST FAN
SF	SUPPLY FAN
SP	STATIC PRESSURE
TG	TRANSFER GRILLE
TYP	TYPICAL
UH	UNIT HEATER
UON	UNLESS OTHERWISE NOTED
VAV	VARIABLE AIR VOLUME UNIT
VD	VOLUME DAMPER
VTR	VENT THRU ROOF
WB	WET BULB
WMS	WIRE MESH SCREEN

MECHANICAL SYMBOL SCHEDULE:

NOT ALL SYMBOLS USED. ALL MOUNTING HEIGHTS TO CENTER OF BOX AND ALL DEVICES TO COMPLY WITH ADA REQUIREMENTS, WHERE APPLICABLE.

DUCTWORK SYMBOLS:

DOUBLE LINE / SINGLE LINE

- EXISTING EQUIPMENT OR DUCTWORK TO BE REMOVED.
- EXISTING DUCTWORK TO REMAIN
- 20/12 — DUCT SIZE, FIRST FIGURE IS SIDE SHOWN
- AD — ACCESS DOOR
- RADIUS ELBOW (R=1.5)
- VANED ELBOW
- BRANCH DUCT TAKE-OFF
- D / R — RISE OR DROP DIRECTION OF AIR FLOW
- FLEXIBLE CONNECTION (FXC)
- TRANSITION, RECTANGULAR TO ROUND
- DUCT SECTION, SUPPLY
- DUCT SECTION, RETURN
- DUCT SECTION, EXHAUST
- UP — CHANGE IN ELEVATION (UP), (DN)
- ROUND DUCT VERTICAL OFFSET (USING 45° ELBOWS U.N.O.)
- FLEXIBLE DUCT AND SPIN-IN
- ### — CEILING SUPPLY DIFFUSER WITH DESIGN CFM ARROWS INDICATE THROW PATTERN OTHER THAN 4-WAY
- ### — CEILING RETURN GRILL WITH DESIGN CFM
- ### — CEILING EXHAUST GRILLE WITH DESIGN CFM
- #/# ### — SIDEWALL/DUCT MOUNTED SUPPLY GRILLE W/NECKSIZE AND CFM
- #/# ### — SIDEWALL RET/EXH GRILLE W/NECKSIZE AND CFM
- UC — UNDERCUT DOOR
- DL — DOOR LOUVER (FREE AREA REQUIRED INDICATED IN SQUARE FEET)
- FD — FIRE (1 1/2 HOUR) (FD)
- MANUAL (BALANCING)
- SD — SMOKE
- CONTROL
- FS — FIRE / SMOKE (FD/SM)
- BUTTERYFLY DAMPER
- SLIDE
- DP — DIFFERENTIAL PRESSURE SENSOR
- R — RESISTANCE TEMPERATURE SENSOR
- S — "VENTILATION SYSTEM EMERGENCY SHUTOFF"
- SD — SMOKE DETECTOR
- M — MOISTURE SENSOR (RELATIVE HUMIDITY)
- D — LOW POINT DUCT DRAIN
- SP — DUCT MOUNTED STATIC PRESSURE SENSOR TRANSMITTER

PIPING SYMBOLS:

- EXISTING PIPING TO REMAIN (SERVICE AS INDICATED)
- EXISTING PIPING TO BE REMOVED (SERVICE AS INDICATED)
- NEW PIPING (SERVICE AS INDICATED)
- DIRECTION OF FLOW
- DIRECTION OF PITCH
- CWS — CONDENSER WATER SUPPLY
- CWR — CONDENSER WATER RETURN
- CHWS — CHILLED WATER SUPPLY
- CHWR — CHILLED WATER RETURN
- CGS — CHILLED GLYCOL SUPPLY
- CGR — CHILLED GLYCOL RETURN
- HWS — HEATING HOT WATER SUPPLY
- HWR — HEATING HOT WATER RETURN
- LPS — LOW PRESSURE STEAM (PSI 15)
- MPS — MEDIUM PRESSURE STEAM (PSI 30)
- HPS — HIGH PRESSURE STEAM (PSI 125)
- LPC — LOW PRESSURE CONDENSATE
- PC — PUMPED CONDENSATE
- UNION
- FLANGED CONNECTION
- REDUCER, CONCENTRIC
- REDUCER, ECCENTRIC
- TEE, TURNED DOWN
- TEE, TURNED UP
- CAP
- CONNECTION, TOP
- ELBOW, TURNED UP
- ELBOW, TURNED DOWN
- CONNECTION, BOTTOM
- "Y" STRAINER WITH BLOWDOWN
- GATE
- GLOBE
- BUTTERFLY
- CHECK
- BALL
- PNEUMATIC CYLINDER OPERATED
- S — SOLENOID OPERATED
- 3-WAY

REFERENCE SYMBOLS:

- XX / X.XX — SECTION NUMBER; SHEET WHERE SECTION IS DRAWN — BUILDING SECTION REFERENCE
- XX / X.XX — DETAIL NUMBER; SHEET WHERE DETAIL IS DRAWN — DETAIL REFERENCE
- X / X-X — EQUIPMENT IDENTITY (SEE EQUIPMENT ABBREVIATION LIST AND SCHEDULES); EQUIPMENT NUMBER; SYSTEM NUMBER (IF APPLICABLE)
- POINT OF CONNECTION

SHEET INDEX

PROJECT GENERAL NOTES - HVAC

1. ALL WORK SHALL CONFORM TO 2006 INTERNATIONAL MECHANICAL CODE, ALL STATE AND LOCAL CODES, RULES AND REGULATIONS AND ORDINANCES.
2. SUBMISSION OF PROPOSAL DIRECTLY OR INDIRECTLY IN CONNECTION WITH THIS WORK SHALL IMPLY THAT THE BIDDER HAS EXAMINED THE JOB SITE UNDER WHICH HE WILL BE OBLIGATED TO OPERATE SHOULD HE BE AWARDED THE WORK UNDER THIS CONTRACT. NO EXTRA CHARGE WILL BE ALLOWED FOR FAILURE OF ANY BIDDER TO EXAMINE THE SITE PRIOR TO BID.
3. CONTRACTOR SHALL VISIT THE SITE AND VERIFY ALL DIMENSIONS IN THE FIELD, AND SHALL ADVISE THE ARCHITECT/ENGINEER AND THE OWNER OF ANY DISCREPANCIES BEFORE PERFORMING THE WORK.
4. CONTRACTOR SHALL SECURE AND PAY ALL FEES AND PERMITS PERTAINING TO THE CONTRACT.
5. ALL EQUIPMENT SHALL BE INSTALLED IN STRICT COMPLIANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS. THE CONTRACTOR SHALL PROVIDE ALL HANGERS AND SUPPORTS REQUIRED FOR A COMPLETE INSTALLATION.
6. CONTRACTOR SHALL BE RESPONSIBLE FOR WORKMEN'S IDENTIFICATION AND BADGING, SAFETY AND FIRE PROTECTION, CONTRACTOR'S LIABILITY INSURANCE, BARRICADES, WARNING SIGNS, TRASH REMOVAL, CUTTING AND PATCHING.
7. CONTRACTOR SHALL SCHEDULE ALL SHUTDOWNS THAT AFFECT UTILITIES AND PORTIONS OF THE BUILDING THAT MUST REMAIN IN OPERATION WITH THE OWNER.
8. CONTRACTOR SHALL COORDINATE ALL WORK WITH THE OWNER AND ALL OTHER CONTRACTORS.
9. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL RIGGING, HANDLING AND PROTECTION OF MATERIALS.
10. CONTRACTOR SHALL PROVIDE LABOR TO RECEIVE, UNLOAD, STORE, PROTECT AND TRANSFER TO POINT OF INSTALLATION, OWNER FURNISHED ITEMS.
11. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CORING AS IT RELATES TO HIS WORK.

RECORD DRAWING
(04/23/12)

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ROOSEVELT IRRIGATION DISTRICT #114
WATER TREATMENT INSTALLATION

2307 WEST VAN BUREN STREET, PHOENIX, ARIZONA

Sheet Title:
MECHANICAL ABBREVIATIONS, SYMBOLS & NOTES

REVISIONS:

DATE:	12/14/2011
DRAWN BY:	RAA
CHECKED BY:	DLB
SCALE:	NONE
PROJECT NO:	011175.00
SHEET	M0.0

Apr 23, 2012 - 2:10pm
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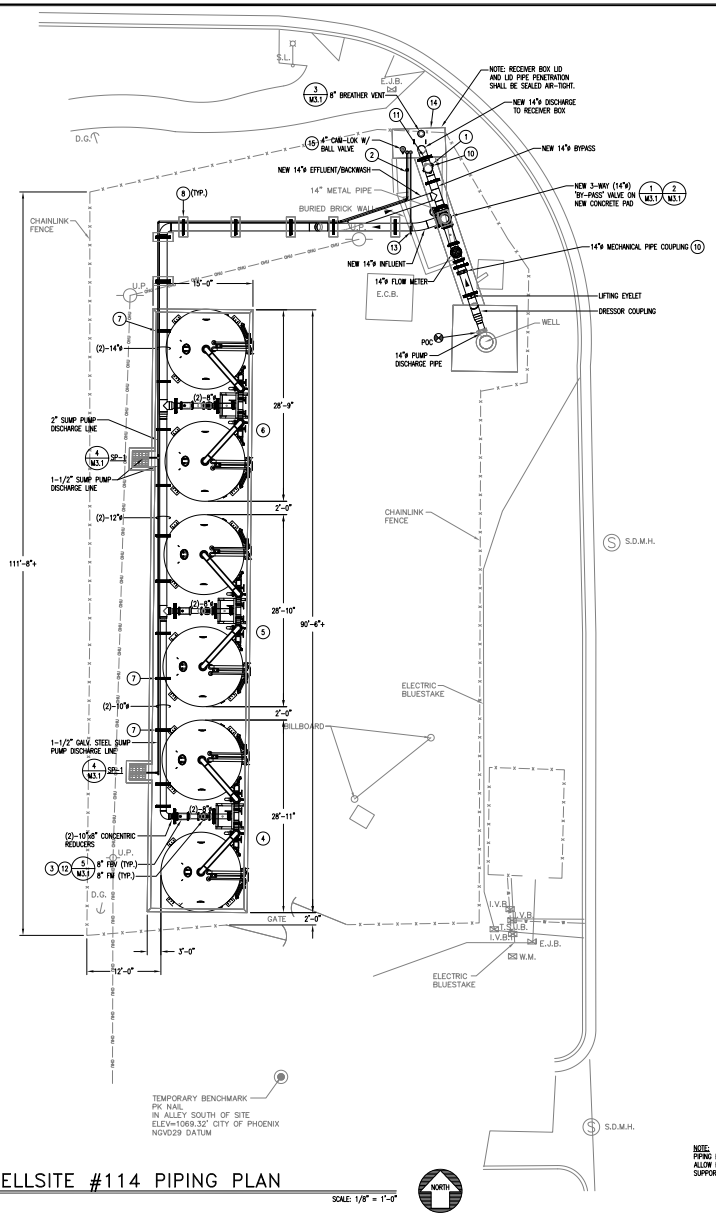

WELLSITE #114 PIPING PLAN

SCALE: 1/8" = 1'-0"

NORTH

KEY NOTES:

1. PROVIDE (1)-3/4" THREADED-O-LET SAMPLE PORT.
2. 2"ø GALV. STEEL SUMP PUMP DISCHARGE LINE.
3. PIPE LINE FLOW METERS (FLOW METERS FURNISHED BY VERTECH AND INSTALLED BY MECH. CONTR.)
4. SIEMENS MODEL HP1220 (NEW) 1000-GPM CAPACITY LOAC VESSEL SKID #3. (LEAD/LAG).
5. SIEMENS MODEL #HP1220 (NEW) 1,000-GPM CAPACITY LOAC VESSEL SKID #2 (LEAD/LAG).
6. SIEMENS MODEL #HP1220 (NEW) 1,000-GPM CAPACITY LOAC VESSEL SKID #1 (LEAD/LAG).
7. PIPE SUPPORT (TYP.) ANCHORED TO CONCRETE PAD.
8. PIPE SUPPORT (TYP.) SEE STRUCTURAL DWG. FOR CONCRETE PAD DETAILS.
9. CARBON FILTER/TANK BREATHER.
10. (1)-14"ø MECHANICAL COUPLING.
11. 1/4"x4"x4"x2"ø WELDED LIFTING EYELET.
12. FLOW BALANCE VALVE 8"ø.
13. 3/4"ø MANUAL AIR VENT BALL VALVE WITH GALV. STEEL DRAIN LINE INTO SUMP.
14. INSTALL NEW "AIR-TIGHT" 3/8" STEEL PLATE LID ON RECEIMER BOX.
    -RECEIVER BOX LID SHALL BE FURNISHED AND INSTALLED BY MECH. CONTRACTOR.
    -LID SHALL BE CLEANED AND RECEIVE FULL EPOXY PRIMER COAT AND FINISH COAT AFTER ALL WELDING AND CUTTING OPERATIONS ARE COMPLETE.
    -PROVIDE (2)-WELDED STEEL LIFTING EYELETS ON TOP OF COVER.
    -PROVIDE 1/8"x1"x1" WELDED STEEL ANGLE FRAME TO SET AND SEAL COVER AT TOP OF RECEIVER BOX. ANCHOR FRAME TO CONCRETE CURB OF RECEIVER BOX.
    -PERIMETER OF LID, AND "CUT-OUT" OPENING OF 14" DISCHARGE PIPE SHALL BE MADE AIR TIGHT BY SEALING WITH "RTV" FLEXIBLE SEALANT USE DOW CORNING #734 "ONE-PART" SOLVENT-LESS SILICONE SEALANT, OR EQUAL. APPLY SEALANT PER MANUFACTURER'S INSTRUCTIONS.
15. #DC400 MALE HOSE CAM-LOK W/ 4"ø BALL VALVE.

NOTE:
PIPING ELEVATIONS ARE APPROXIMATE. ALLOW FOR FIELD GROUTING OF VESSEL SUPPORT LEGS AND EQUIPMENT PAD SLOPE.

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ROOSEVELT IRRIGATION DISTRICT #114
WATER TREATMENT INSTALLATION
2307 WEST VAN BUREN STREET, PHOENIX, ARIZONA
Sheet Title: PIPING WELLSITE

REVISIONS:

DATE:	12/14/2011
DRAWN BY:	RAA
CHECKED BY:	DLB
SCALE:	1/8"=1'-0"
PROJECT NO:	011175.00
SHEET	M1.1

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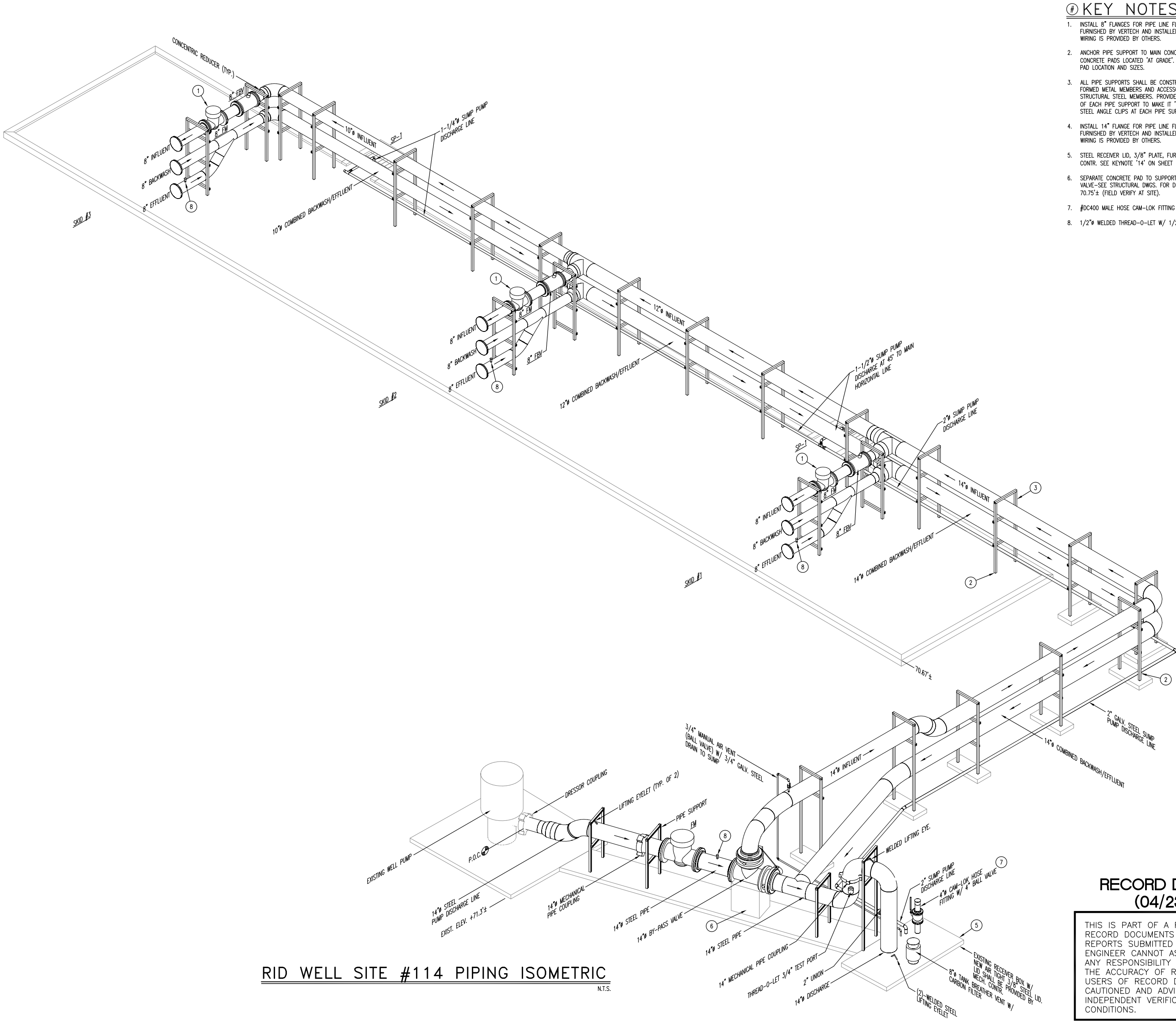

RID WELL SITE #114 PIPING ISOMETRIC

N.T.S.

⓪ KEY NOTES:

1. INSTALL 8" FLANGES FOR PIPE LINE FLOW METER. FLOW METERS ARE FURNISHED BY VERTECH AND INSTALLED BY MECH. CONTR. FLOW METER WIRING IS PROVIDED BY OTHERS.
2. ANCHOR PIPE SUPPORT TO MAIN CONCRETE EQUIPMENT PAD, OR TO CONCRETE PADS LOCATED 'AT GRADE'. REFER TO STRUCTURAL DWG'S FOR PAD LOCATION AND SIZES.
3. ALL PIPE SUPPORTS SHALL BE CONSTRUCTED WITH UNISTRUT (P1001) FORMED METAL MEMBERS AND ACCESSORY FITTINGS, OR FULL-WELDED STRUCTURAL STEEL MEMBERS. PROVIDE INTERNAL AND EXTERNAL BRACING OF EACH PIPE SUPPORT TO MAKE IT 'RIGID', INSTALL 1-1/2"x1-1/2" STEEL ANGLE CLIPS AT EACH PIPE SUPPORT TO KEEP PIPE CENTERED.
4. INSTALL 14" FLANGE FOR PIPE LINE FLOW METER. FLOW METER IS FURNISHED BY VERTECH AND INSTALLED BY MECH. CONTR. FLOW METER WIRING IS PROVIDED BY OTHERS.
5. STEEL RECEIVER LID, 3/8" PLATE, FURNISHED AND INSTALLED BY MECH. CONTR. SEE KEYNOTE '14' ON SHEET M1.1.
6. SEPARATE CONCRETE PAD TO SUPPORT/RESTRAIN 14"ø BY-PASS VALVE-SEE STRUCTURAL DWGS. FOR DETAILS. TOP OF PAD ELEV. @ 70.75'± (FIELD VERIFY AT SITE).
7. #DC400 MALE HOSE CAM-LOK FITTING W/ 4"ø BALL VALVE.
8. 1/2"ø WELDED THREAD-O-LET W/ 1/2"ø PIPE PLUG.

RECORD DRAWING (04/23/12)

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ROOSEVELT IRRIGATION DISTRICT #114 WATER TREATMENT INSTALLATION

2307 WEST VAN BUREN STREET, PHOENIX, ARIZONA

Sheet Title: RID #114 WELL SITE PIPING ISOMETRIC

REVISIONS:

DATE:	12/14/2011
DRAWN BY:	RAA
CHECKED BY:	DLB
SCALE:	NONE
PROJECT NO:	011175.00
SHEET	M2.1

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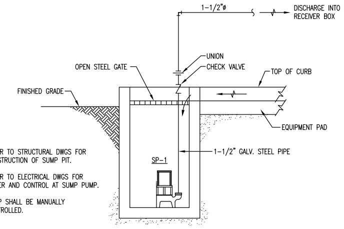
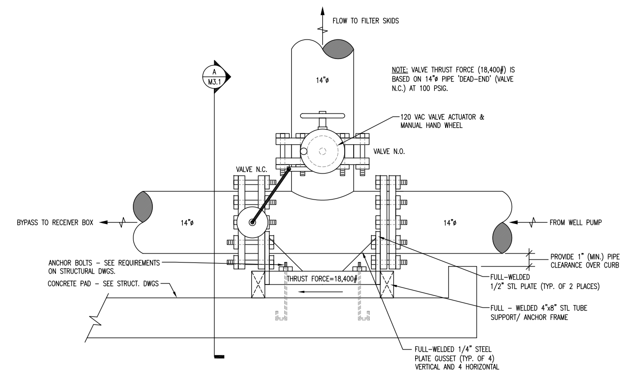


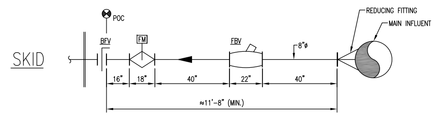
NOTES:
1. REFER TO STRUCTURAL DWGS FOR CONSTRUCTION OF SUMP PIT.
2. REFER TO ELECTRICAL DWGS FOR POWER AND CONTROL AT SUMP PUMP.
3. PUMP SHALL BE MANUALLY CONTROLLED.

4 / M3.1 **SUMP PUMP DETAIL©**
NOT TO SCALE

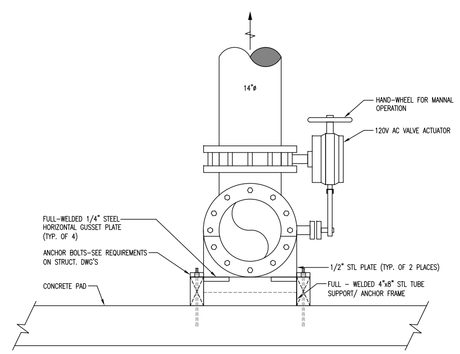


NOTE: VALVE THRUST FORCE (18,400#) IS BASED ON 14"ø PIPE 'DEAD-END' (VALVE N.C.) AT 100 PSIG.

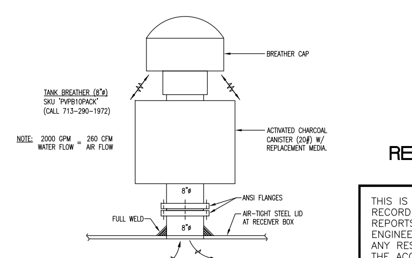
1 / M3.1 **BY-PASS VALVE DETAIL©**
NOT TO SCALE



5 / M3.1 **FLOW METER & BALANCE VALVE PLACEMENT DETAIL©**
NOT TO SCALE



2 / M3.1 **SECTION 'A'**
NOT TO SCALE



TANK BREATHER (8"ø)
SKU 'PVPB10PACK'
(CALL 713-290-1972)

NOTE: 2000 GPM WATER FLOW = 260 CFM AIR FLOW

3 / M3.1 **RECEIVER BOX BREATHER DETAIL©**
NOT TO SCALE

RECORD DRAWING (04/23/12)

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ROOSEVELT IRRIGATION DISTRICT #114
WATER TREATMENT INSTALLATION
2307 WEST VAN BUREN STREET, PHOENIX, ARIZONA

Sheet Title: MECHANICAL DETAILS

REVISIONS:

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SUMP PUMP SCHEDULE

MARK	LOCATION AND SERVICE	GPM	HEAD FEET	MOTOR HP	VOLT/PH	SINGLE OR DUPLEX	MANUFACTURER AND MODEL NUMBER	REMARKS
SP-1	EQUIPMENT PAD SUMP	50	24	3/4	115/60	SINGLE	ZOELLER MODEL N145	NOTES 1,2,3

NOTES:
1. SUMP PUMP SHALL BE FURNISHED AND INSTALLED BY PIPING CONTRACTOR.
2. SUMP PUMP SHALL BE FURNISHED WITHOUT FACTORY-INSTALLED AUTOMATIC CONTROL. MANUAL CONTROL OF PUMP OPERATION SHALL BE PROVIDED THRU MANUAL SWITCH FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR.
3. SUMP PUMP SHALL BE FACTORY EQUIPPED WITH A 20 FOOT, UL LISTED, NEOPRENE POWER CORD WITH MOLDED PLUG AND GROUND WIRE.

AUTOMATIC CONTROL VALVE SCHEDULE

MARK	LOCATION AND SERVICE	VALVE TYPE	BODY DUTY	PIPE CONNECTIONS		VALVE ACTUATOR			MANUFACTURER & MODEL #	REMARKS
				SIZE	TYPE	TYPE	ACTION	POWER IN		
CV-1	EQUIPMENT PAD-BYPASS VALVE	3-WAY (CI.TEE)	DIVERTING	14"ø	150# FLG.	ROTARY ELEC.	2-POS. ON/OFF	120V AC	VSI #3S2000SS-14/1200	NOTES 1,2,3,4,5

NOTES:
1. CONTROL VALVE/ACTUATOR SHALL BE FURNISHED AND INSTALLED BY PIPING CONTRACTOR CONTROL POWER AND CONTROL WIRING SHALL BE FURNISHED AND INSTALLED BY CONTROLS CONTRACTOR.
2. ACTUATOR ENCLOSURE SHALL BE RATED NEMA 4, WATERTIGHT.
3. PIPING CONTRACTOR SHALL REVIEW CONTROL VALVE DETAIL IN DRAWINGS, TO CONFIRM VALVE ORIENTATION AND FLOW DIRECTION, PRIOR TO ORDERING VALVE ASSEMBLY.
4. VALVE ASSEMBLY SHALL CONSIST OF A 14"ø 125# FLANGED DUCTILE-IRON TEE BODY MOUNTED WITH (2)-14"ø THREADED LUG-BODY BUTTERFLY VALVES (EPDM SEAT, 304 SS DISC, 416 SS SHAFT, PTFE BUSHINGS, 316 SS SHAFT-PINS) RATED FOR 100 PSI. ACTUATOR SHALL BE MOUNTED ON PRIMARY (N.O.) VALVE STEM AND CONNECTED TO (N.C.) VALVE STEM BY A STAINLESS STEEL LINKAGE.
5. VALVE/ ACTUATOR SUPPLIER: VSI-VALVE SOLUTIONS, INC. (SALES@VALVESOLUTIONS.COM) OR 770-740-0800.

MECHANICAL GENERAL SPECIFICATIONS

1.00 SCOPE OF WORK

1.1. THE CONTRACTOR IS RESPONSIBLE FOR ALL WORK, MATERIALS, AND LABOR TO SATISFY A COMPLETE WORKING SYSTEM WHETHER SPECIFIED OR IMPLIED.

1.2. ALL WORK IS TO BE PERFORMED IN STRICT COMPLIANCE WITH ALL CODES AND REGULATIONS GOVERNING WORK OF THIS NATURE.

1.3. THE CONTRACTOR SHALL, BEFORE SUBMITTING ANY PROPOSAL, EXAMINE THE PROPOSED SITE AND SHALL DETERMINE FOR HIMSELF THE CONDITIONS THAT MAY EFFECT THE WORK. NO ALLOWANCE SHALL BE MADE IF THE CONTRACTOR FAILS TO MAKE SUCH EXAMINATIONS.

1.4. ALL EQUIPMENT AND MATERIALS SHALL BE AS SPECIFIED OR "APPROVED EQUAL" BY THE ENGINEER.

2.00 ELECTRICAL

2.1. CONTRACTOR TO COORDINATE WITH ELECTRICAL CONTRACTOR FOR LOCATION OF WIRING FOR POWERED EQUIPMENT.

3.00 MISCELLANEOUS

3.1. DO NOT SCALE THIS DRAWING FOR EXACT DIMENSIONS. VERIFY ALL FIGURES, CONDITIONS, AND DIMENSIONS AT THE JOB SITE.

3.2. THE MECHANICAL PLANS ARE INTENDED TO BE DIAGRAMMATICAL AND ARE BASED ON ONE MANUFACTURER'S EQUIPMENT. THEY ARE NOT INTENDED TO SHOW EVERY ITEM IN ITS EXACT LOCATION, THE EXACT DIMENSIONS, OR ALL THE DETAILS OF THE EQUIPMENT. THE CONTRACTOR SHALL VERIFY THE ACTUAL DIMENSIONS OF THE EQUIPMENT PROPOSED TO ENSURE THAT THE EQUIPMENT WILL FIT IN THE AVAILABLE SPACE.

PIPE SUPPORT

1.00 PIPE SUPPORT

1.1. USE 'FORMED METAL' (UNISTRUT) COMPONENTS OR WELDED STRUCTURAL STEEL SHAPES.

1.2. ANCHOR PIPE SUPPORT INTO CONCRETE PADS WITH 5/8"ø EXPANSION BOLTS.

1.3. PAINT UNCOATED STEEL TO MATCH PIPING.

WATER PIPING

1.00 MATERIAL WATER PIPING

1.1. 2" AND SMALLER: SCH. 40 GALVANIZED STEEL WITH THREADED FITTINGS, ASTM A-120.

1.2. 2" AND LARGER: SCH. 40 BLACK STEEL WITH WELDED OR FLANGED FITTINGS, ASTM A-120.

1.3. 2" AND SMALLER UNIONS SHALL BE MALLEABLE IRON BODY FOR FERROUS PIPING, BRONZE BODY FOR COPPER PIPING, GALVANIZED FOR GALVANIZED PIPING, THREADED OR SOLDER ENDS.

1.4. 2-1/2" AND LARGER UNIONS SHALL 150# BE FORGED STEEL FLANGES FOR FERROUS PIPING.

1.5. BALL VALVES - GENERAL SHUTOFF SERVICE OF WATER:
A. 2" AND SMALLER BALL VALVES SHALL BE 150SWP, 400WOG, BRONZE TWO PIECE BODY, FULL PORT, STAINLESS STEEL BALL, TEFLON SEAT AND RINGS, LEVER HANDLE AND SOLDER OR THREADED ENDS.

1.6. BUTTERFLY VALVES - GENERAL SHUTOFF SERVICE OF WATER:
A. 2-1/2" AND LARGER BUTTERFLY VALVES SHALL BE CAST IRON BODY, BRONZE DISC, SEATS AND SEATS SHALL BE CAPABLE OF SERVICE TO 250F, LUG ENDS, EXTENDED NECK, 10 POSITION LEVER HANDLE WITH MEMORY STOP.

1.7. CHECK VALVES - GENERAL SERVICE OF WATER:
A. 2" AND SMALLER CHECK VALVES SHALL BE 150SWP, 300WOG, BRONZE BODY, SWING CHECK DISC, THREADED ENDS, SUITABLE FOR HORIZONTAL OR VERTICAL INSTALLATION.
B. 2-1/2" AND LARGER CHECK VALVES SHALL BE 125SWP, 200WOG, CAST IRON BODY, SWING CHECK DISC, BRONZE TRIM, FLANGED ENDS, SUITABLE FOR HORIZONTAL OR VERTICAL INSTALLATION.

1.8. BALANCING VALVES - GENERAL SHUTOFF AND BALANCING SERVICE OF WATER:
A. 3" AND SMALLER BALANCING VALVE SHALL BE BRONZE BODY, BRASS BALL, TFE SEAT RINGS, DIFFERENTIAL PRESSURE READOUT PORTS WITH CHECK VALVES, DRAIN/PURGE PORT,MEMORY STOP FEATURE, CALIBRATED POINTER INDICATING DEGREE OF VALVE OPENING, TIGHT SHUTOFF WITH SOLDER OR THREADED ENDS.
B. 5" PIPE SIZE AND LARGER BALANCING VALVE SHALL BE CAST IRON BODY, BRASS VANE, DIFFERENTIAL PRESSURE READOUT PORTS WITH CHECK VALVES, MEMORY STOP FEATURE, CALIBRATED POINTER WITH FLANGED ENDS. BELL & GOSSETT #CB-8F.

1.9. TEST SHALL BE PERFORMED BY CONTRACTOR AND WITNESSED BY AUTHORIZED INSPECTOR. ALL PIPING SHALL BE TESTED TO WORKING PRESSURE OF NOT LESS THAT 100 PSIG. WHERE OPERATING PRESSURES EXCEED 50 PSIG, TEST PRESSURE SHALL BE TWO TIMES THE WORKING PRESSURE. TEST DURATION SHALL BE AT LEAST 30 MINUTES.

1.10. PAINT EXPOSED PIPING (EXCEPT GALVANIZED PIPE) WITH CORROSION RESISTANT PRIMER AND FLAT ENAMEL FINISH COAT. FINISH COAT COLOR SELECTION SHALL BE BY OWNER.

1.11. WRAP DIRECT-BURIED STEEL PIPE WITH 20-MIL PVC TAPE OR CONTINUOUS SLEEVE. EXTEND PIPE WRAP TO 12" ABOVE GRADE AND SEAL WATER TIGHT.

RECORD DRAWING
(04/23/12)

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WATER TREATMENT INSTALLATION
2307 WEST VAN BUREN STREET, PHOENIX, ARIZONA

Sheet Title:
MECHANICAL SCHEDULES AND SPECIFICATIONS

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CHECKED BY:	DLB
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ELECTRICAL DRAWING SPECIFICATION

1.0 GENERAL:

1.1. ALL ELECTRICAL WORK SHALL COMPLY WITH ALL APPLICABLE CITY, COUNTY, STATE, AND SERVING ELECTRICAL UTILITY CODES, ORDINANCES, RULES, AND REGULATIONS. THE ENTIRE INSTALLATION SHALL COMPLY WITH OR SURPASS THE REQUIREMENTS OF THE ADOPTED EDITION OF THE NATIONAL ELECTRICAL CODE.

1.2. THE COMPLETE INSTALLATION SHALL BE IN ACCORDANCE WITH THE A.D.A.A.G. (AMERICANS WITH DISABILITIES ACT ACCESSIBILITY GUIDELINES).

1.3. UNLESS SPECIFICALLY NOTED, ALL MATERIAL SHALL BE NEW, OF FIRST CLASS QUALITY, SHALL BE U.L. LISTED AND LABELED, AND FREE OF DEFECTS.

1.4. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY LOSS OR DAMAGE CAUSED BY HIM OR HIS WORKMEN TO THE SITE AND EXISTING SYSTEMS DURING THE COURSE OF CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING OR REPLACING SUCH LOSS OR DAMAGE AT NO ADDITIONAL COST TO THE OWNER.

1.5. DRAWINGS ARE DIAGRAMMATIC IN NATURE AND CANNOT SHOW EVERY CONNECTION. JUNCTION BOXES, WIRE, CONDUIT, ETC. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING A COMPLETE AND FUNCTIONAL ELECTRICAL SYSTEM.

1.6. ALL EXISTING CONDUIT RUNS ARE NOT SHOWN. VERIFY EXISTING CONDUIT LOCATIONS IN FIELD.

1.7. NO DESIGN CHANGES SHALL BE MADE TO THE ELECTRICAL SYSTEM WITHOUT THE PRIOR APPROVAL OF THE ELECTRICAL ENGINEER AND THE ELECTRICAL INSPECTOR.

2.0. SCOPE OF WORK:

2.1. FURNISH ALL MATERIALS, TOOLS AND LABOR AND PAY ALL PERMITS AND FEES REQUIRED FOR THE ELECTRICAL INSTALLATION UNLESS OTHERWISE NOTED ON PLANS. ALL PERMITS AND INSPECTIONS SHALL BE PROVIDED AS REQUIRED BY THE LOCAL CODE AUTHORITY.

2.2. THE CONTRACTOR SHALL VISIT THE SITE TO DETERMINE EXISTING CONDITIONS PRIOR TO SUBMITTING A BID.

2.3. THIS PROJECT CONSISTS OF DEMOLITION, REMODEL, AND NEW CONSTRUCTION IN THE NOTED AREAS, VERIFY WITH OWNER IN FIELD ALL DEMOLITION WORK PRIOR TO BID.

2.4. ALL CONDUIT AND CONDUCTORS REMOVED UNDER DEMOLITION WORK SHALL NOT BE REUSED.

2.5. UNLESS NOTED OTHERWISE UNDER THE PROJECTS GENERAL CONDITIONS, AT THE COMPLETION OF THIS PROJECT, TURN OVER TO OWNER'S REPRESENTATIVE ALL REMOVED DEVICES AND/OR EQUIPMENT.

2.6. WHERE IT IS IMPOSSIBLE TO REMOVE CONDUITS AS SHOWN ON DRAWINGS (SUCH AS BELOW OR EMBEDDED IN CONCRETE FLOOR SLAB), REMOVE CONDUCTORS, CUT, CAP, AND ABANDON CONDUIT BELOW FLOOR LINE.

2.7. THE CONTRACTOR SHALL VERIFY LOCATION OF ALL EXISTING SITE UTILITIES BEFORE DIGGING TRENCHES.

2.8. VERIFY AND COORDINATE THE FOLLOWING WITH THE MECHANICAL AND CONTROLS CONTRACTOR:

a)LOCATION OF EQUIPMENT; E.G. MOTORS, HEATERS, T-STATS, CONTROL PANELS, ETC.

b)EQUIPMENT ELEC CHARACTERISTICS; E.G. VOLTAGE, PHASE, HP, AMPS, CONTROL WIRING, ETC.

2.9. CONCEAL ALL CONDUIT WORK. WHERE THIS IS IMPOSSIBLE, CONTACT OWNER AND COORDINATE IN FIELD.

2.10. COORDINATE ALL POWER OUTAGES WITH THE OWNERS REPRESENTATIVE IN ADVANCE.

2.11. RESTORE ALL SURFACES THAT WERE DAMAGED (PAINTING, PATCHING, PLASTERING, ETC.,) DUE TO THE INSTALLATION OR REMOVAL OF ELECTRICAL ITEMS.

2.12. PANEL DESIGNATIONS SHOWN ON THESE DRAWINGS ARE GIVEN FOR CLARIFICATION OF CIRCUITING ONLY AND MAY NOT CORRESPOND TO THE DESIGNATIONS FOUND IN THE FIELD.

2.13. FULLY GUARANTEE THE INSTALLATION FOR A PERIOD OF ONE YEAR FROM THE DATE OF FINAL ACCEPTANCE BY THE OWNER, AGAINST ANY IMPERFECT WORKMANSHIP AND MALFUNCTION OF EQUIPMENT. ANY WORK IDENTIFIED TO BE DEFECTIVE WITHIN THE GUARANTEE PERIOD SHALL BE PROMPTLY REPAIRED OR REPLACE AT NO ADDITIONAL COST THE THE OWNER.

2.14. FOR EQUIPMENT BEING REMOVED OR REPLACED, THE ELECTRICAL CONTRACTOR SHALL DE-ENERGIZE THE EQUIPMENT AND MAKE IT SAFE PRIOR TO REMOVAL. COMPLY WITH OSHA REQUIREMENTS FOR LOCKING OUT AND TAGGING EQUIPMENT TO PREVENT INADVERTENT RE-ENERGIZING.

3.0. SUBMITTALS:

3.1. PROVIDE A MINIMUM OF SIX (6) SETS OF SHOP DRAWINGS FOR THE FOLLOWING; LIGHTING FIXTURES, DISCONNECT SWITCHES, PANELBOARDS, STARTERS, SERVICE ENTRANCE EQUIPMENT. ALL SHOP DRAWING SUBMITTALS SHALL BE BOUND, LABELED, AND MARKED TO IDENTIFY EXACTLY WHICH ITEM SHALL BE PROVIDED. SUBMIT ALL SHOP DRAWINGS FOR REVIEW AT THE SAME TIME.

3.2. SUBMIT UTILITY COORDINATION DRAWINGS AS REQUIRED BY THE LOCAL UTILITIES.

4.0. SUBSTITUTIONS:

4.1. EQUIPMENT LISTED BY BRAND NAME OR CATALOG NUMBER SHALL BE INTERPRETED AS ESTABLISHING A STANDARD OF QUALITY. SUBSTITUTIONS WILL BE CONSIDERED IF A WRITTEN REQUEST IS SUBMITTED TO THE ARCHITECT/ENGINEER A MINIMUM OF EIGHT (8) DAYS PRIOR TO THE BID DATE. THE REQUEST SHALL INCLUDE THE FOLLOWING:

a)A STATEMENT DECLARING THAT THE EQUIPMENT PROPOSED IS EQUAL TO THAT SPECIFIED BY HAVING THE SAME PHYSICAL CHARACTERISTICS AND DIMENSIONS, AND WILL MEET THE DRAWING LAYOUT AND STRUCTURAL CONDITIONS.

b)THE SPECIFIED AND SUBMITTAL CATALOG NUMBERS OF THE EQUIPMENT UNDER CONSIDERATION.

c)AN EQUIPMENT CUT SHEET WITH DRAWING, DIMENSIONS AND SPECIFICATIONS.

d)SAMPLE MAY BE REQUIRED AT THE ENGINEERS DISCRETION.

4.2. ALL LIGHTING FIXTURES SUBMITTED FOR APPROVAL MUST HAVE THE INFORMATION AS DESCRIBED ABOVE, AS WELL AS THE FOLLOWING INFORMATION:

a)MANUFACTURE'S DATA SHOWING CATALOG NUMBERS.

b)CONSTRUCTION DETAILS.

c)PHOTOMETRIC OR ISOLUX CURVES.

d)TABLE OF COEFFICIENTS OF UTILIZATION.

e)RECOMMENDED MAINTENANCE FACTOR AND BRIGHTNESS READING.

f)FOOTCANDLE CALCULATIONS AS REQUESTED.

4.3. ANY CONFLICT ARISING FROM THE USE OF SUBSTITUTED MATERIAL SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR, WHO SHALL BEAR ALL COSTS REQUIRED TO MAKE THE EQUIPMENT COMPLY WITH THE INTENT OF THE PLANS AND SPECIFICATIONS.

4.4. NO MATERIAL OR APPARATUS SHALL BE SUBSTITUTED AFTER THE BID OPENING UNLESS APPROVED IN WRITING BY THE ENGINEER.

4.5. MANUFACTURERS SHALL NOT BE CONSIDERED APPROVED AS EQUAL UNTIL LISTED IN A FORMAL ADDENDUM. LISTING AS EQUAL DOES NOT RELIEVE THE MANUFACTURER FROM MEETING THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.

5.0. CONDUIT AND WIRE:

5.1. WHERE WIRING AND CONDUIT SIZES ARE INDICATED FOR HOMERUNS, THESE SIZES APPLY TO THE ENTIRE LENGTH FROM THE PROTECTIVE DEVICE IN THE PANEL TO THE EQUIPMENT OR LAST WIRING DEVICE.

5.2. SCHEDULE 40 PVC CONDUIT SHALL BE USED FOR ALL UNDERGROUND EXTERIOR CONDUIT, IN SLABS, BELOW SLAB ON GRADE AND IN CONCRETE OR MASONRY WALLS. ALL BENDS OVER 30 DEGREES SHALL BE MADE WITH WRAPPED INTERMEDIATE METAL CONDUIT. USE LONG SWEEP FITTINGS FOR ALL 90 DEGREE BENDS. ALL PLASTIC CONDUIT, EXCEPT THAT USED FOR COMMUNICATIONS, SHALL BE PROVIDED WITH A CODE SIZED EQUIPMENT GROUNDING CONDUCTOR. DO NOT USE PVC IN EXPOSED LOCATIONS.

5.3. ALL BELOW GRADE CONDUIT SHALL BE INSTALLED A MINIMUM OF 24 INCHES BELOW FINISHED GRADE. BELOW GRADE CONDUIT SHALL BE 3/4 INCH DIAMETER, MINIMUM.

5.4. ALL WIRING SHALL BE IN CONDUIT. RIGID OR INTERMEDIATE METALLIC CONDUIT (IMC) SHALL BE USED FOR ALL EXPOSED CONDUIT, WHERE SUBJECT TO MOISTURE, OR WHERE SUBJECT TO PHYSICAL DAMAGE.

5.5. FLEXIBLE METALLIC CONDUIT SHALL BE USED FOR ALL CONNECTIONS TO MOTORS, OR EQUIPMENT SUBJECT TO VIBRATION. LIQUID-TIGHT CONDUIT SHALL BE USED WHERE SUBJECT TO MOISTURE. BOND FLEXIBLE CONDUIT PER N.E.C. REQUIREMENTS.

5.6. INSTALL A PULL WIRE IN ALL EMPTY CONDUITS.

5.7. ALL CONDUCTORS SHALL BE COPPER. MINIMUM BRANCH CIRCUIT WIRING SHALL BE #12 AWG. OTHER SIZES AS INDICATED ON THE DRAWINGS OR AS REQUIRED BY CODE. INSULATION SHALL BE THHN/THWN FOR CONDUCTORS #6 AND SMALLER AND XHHW FOR #4 AND LARGER.

5.8. CIRCUIT NUMBERS ARE SHOWN FOR CIRCUIT IDENTIFICATION. CIRCUITING SHALL AGREE WITH NUMBERING ON THE PANEL SCHEDULE PROVIDED. BALANCE THE LOAD AS EVENLY AS POSSIBLE BETWEEN EACH PHASE LEG.

5.9. ALL SECONDARY SERVICES, FEEDERS AND BRANCH CIRCUIT CONDUCTORS SHALL BE COLOR CODED AS FOLLOWS:

208/120 VOLT	PHASE	480/277 VOLT
BLACK	A	BROWN
RED	B	ORANGE
BLUE	C	YELLOW
WHITE	NEUTRAL	GRAY
GREEN	GROUND	GREEN

5.10. CONTROL WIRES SHALL BE PURPLE OR VIOLET. ALL BRANCH CIRCUIT CONDUCTORS SHALL HAVE SOLID COLOR COMPOUND OR SOLID COLOR COATING. COORDINATE EXACT REQUIREMENTS WITH CONTROLS CONTRACTOR AND NOTIFY ENGINEER OF ANY DISCREPANCIES.

5.11. WRAP UNDERGROUND STEEL CONDUIT WITH HALF LAPPED SCOTCH #50 TAPE OR PROVIDE PVC COATED PIPE.

6.0. GROUNDING:

6.1. GROUNDING OF ELECTRICAL SERVICE AND EQUIPMENT SHALL BE PER THE APPLICABLE SECTIONS OF N.E.C. ARTICLE 250, AND AS SHOWN ON THE DRAWINGS.

6.2. PROVIDE AN INSULATED EQUIPMENT GROUNDING CONDUCTORS, IN ACCORDANCE WITH N.E.C. 250-122, IN ALL CONDUITS WITH CONDUCTORS.

7.0. NOT USED:

8.0. EQUIPMENT:

8.1. ALL ELECTRICAL COMPONENTS INSTALLED OUTDOORS, EXPOSED TO WEATHER OR IN DAMP LOCATIONS SHALL BE WEATHERPROOF, NEMA 3R.

8.2. THE SERVICE ENTRANCE ASSEMBLY AND ALL OF ITS COMPONENTS SHALL BE BRACED TO WITHSTAND A MINIMUM OF 100% OF AVAILABLE FAULT CURRENT SUPPLIED BY THE POWER COMPANY.

8.3. PROVIDE AT THE COMPLETION OF THE PROJECT NEATLY TYPED ACCURATE PANELBOARD DIRECTORIES INDICATING ALL BRANCH CIRCUITS AND SPARES. ALL SPARES SHALL BE LEFT IN THE OFF POSITION.

8.4. PROVIDE A 120 VOLT, 20 AMP, WEATHERPROOF GFCI RECEPTACLE WITHIN 25 FEET AND ACCESSIBLE TO ALL MECHANICAL EQUIPMENT.

8.5. LABEL ALL SERVICE ENTRANCE EQUIPMENT, PANELBOARDS AND MAJOR SINGLE LINE COMPONENTS WITH PERMANENTLY AFFIXED PHENOLIC LETTERING (2" MINIMUM). LABEL ALL RECEPTACLES, DEVICES, JUNCTION BOXES, DISCONNECT SWITCHES, LUMINAIRES, ETC. WITH VINYL ADHESIVE TAPE INDICATING PANEL AND CIRCUIT NUMBER.

8.6. PANELBOARDS SHALL HAVE COPPER BUS, WITH FULL NEUTRAL AND GROUND BUSSES. MINIMUM AIC RATING SHALL BE 10,000 AMPS. PANELS SHALL HAVE LOCKING DOORS WITH MATCHING KEYS. PANELS SHALL BE MANUFACTURED BY SQUARE "D", GENERAL ELECTRIC, CUTLER HAMMER OR SIEMENS. LOAD CENTERS ARE NOT ACCEPTABLE.

8.7. ALL BRANCH CIRCUIT PANEL BOXES SHALL BE MINIMUM 5-3/4 INCHES DEEP AND 20 INCHES WIDE. PROVIDE MOUNTING HARDWARE IN ALL SPACES FOR FUTURE DEVICES.

8.8. ALL SAFETY SWITCHES SHALL BE HEAVY DUTY TYPE, WITH COVER INTERLOCK AND HANDLE LOCK OFF PROVISIONS. SWITCHES SHALL BE MANUFACTURED BY SQUARE "D", GENERAL ELECTRIC, CUTLER HAMMER OR SIEMENS. RATING AND FUSING SHALL BE AS SHOWN ON THE DRAWINGS. COORDINATE FUSING FOR SWITCHES SERVING MECHANICAL EQUIPMENT WITH MANUFACTURERS RECOMMENDED FUSE SIZE.

8.9. DRY TYPE TRANSFORMERS SHALL BE 60 HZ, WITH KVA RATINGS AS NOTED ON THE DRAWINGS. TRANSFORMERS SHALL BE TOTALLY ENCLOSED, EXCEPT FOR VENTILATION OPENINGS AND BE PROVIDED WITH WEATHER HOOD SUITABLE FOR OUTDOOR INSTALLATION. TRANSFORMERS SHALL HAVE A SHEET STEEL ENCLOSURE, AND CORE AND COIL ASSEMBLY SHALL BE ISOLATED FROM THE MOUNTING FRAME WITH VIBRATION ISOLATORS. PROVIDE SIX (6), 2-1/2% TAPS, FOUR (4) BELOW AND TWO (2) ABOVE NORMAL. INSTALL TRANSFORMER A MINIMUM OF 6 INCHES FROM ADJACENT WALLS OR STRUCTURES. TRANSFORMERS SHALL BE MANUFACTURED BY SQUARE "D", SIEMENS, GENERAL ELECTRIC, OR CUTLER HAMMER.

8.10. TIME CLOCKS SHALL MEET THE REQUIREMENTS OF THE 2006 IECC. PROVIDE WITH COMBINATION 7-DAY AND SEASONAL PROGRAM SCHEDULE AND MINIMUM 4 HOUR BATTERY BACK UP. INTERMATIC MODEL #ET7011150R OR EQUAL.

9.0. WIRING DEVICES:

9.1. SWITCHES SHALL BE OF THE QUIET TYPE, SPECIFICATION GRADE, 20 AMP, 120/277 VOLT AC. HUBBELL 1221 (SINGLE POLE), 1223 (THREE-WAY), EQUAL BY LEVITON OR PASS & SEYMOUR.

9.2. RECEPTACLES, UNLESS NOTED OTHERWISE, SHALL BE DUPLEX, 120 VOLT, 20 AMP, GROUNDING TYPE, NEMA 5-20R. HUBBELL 5362, OR EQUAL BY LEVITON OR PASS & SEYMOUR.

9.3. PROVIDE ALL WIRING DEVICES WITH APPROPRIATE COVERPLATES. PROVIDE BLANK COVER PLATES FOR ALL EMPTY BOXES. COVERPLATES SHALL BE LEXAN, PLASTIC OR STAINLESS STEEL IN FINISHED AREA. GALVANIZED COVERPLATES MAY BE USED IN EQUIPMENT ROOMS.

ELECTRICAL ABBREVIATIONS AND SYMBOL SCHEDULE:

NOTE: NOT ALL SYMBOLS MAY BE USED ON THIS PROJECT. ALL MOUNTING HEIGHTS TO CENTER OF BOX, UNO. ALL DEVICES SHALL COMPLY WITH ADA REQUIREMENTS, WHERE APPLICABLE.

ABBREVIATIONS:

A	AMPERES
AC	ALTERNATING CURRENT
AF	AMPERES FRAME (RATING)
AFC	AVAILABLE FAULT CURRENT
AFG	ABOVE FINISHED GRADE
AFF	ABOVE FINISHED FLOOR
AHU	AIR HANDLING UNIT
AIC	AMPERES INTERRUPTING CAPACITY
AL	ALUMINUM
AT	AMPERES TRIP (SETTING)
AUX	AUXILIARY
BRKR	BREAKER
C	CONDUIT
CB	CIRCUIT BREAKER
CKT	CIRCUIT
COMB	COMBINATION
COMM	COMMUNICATIONS
CP	CONTROL PANEL
CPT	CONTROL POWER TRANSFORMER
CT	CURRENT TRANSFORMER
CU	COPPER
DC	DIRECT CURRENT
DISC	DISCONNECT
DP	POWER DISTRIBUTION PANEL
DWG	DRAWING
EC	ELECTRICAL CONTRACTOR
EDF	ELECTRIC DRINKING FOUNTAIN
EF	EXHAUST FAN
EG	EQUIPMENT GROUND
ELEC	ELECTRICAL – ELECTRIC
EM	EMERGENCY
EMT	ELECTRICAL METALLIC TUBING
EO	ELECTRICALLY OPERATED
F	FUSE
FA	FIRE ALARM
FAAP	FIRE ALARM ANNUNCIATE PANEL
FACP	FIRE ALARM CONTROL PANEL
FSD	FIRE SMOKE DAMPER
FDR	FEEDER
FLA	FULL LOAD AMPERES
FLEX	FLEXIBLE
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GND	GROUND
HID	HIGH INTENSITY DISCHARGE
HP	HORSE POWER
HOA	HAND-OFF-AUTO
JB	JUNCTION BOX
KV	KILOVOLTS
KVA	KILOVOLTS-AMPERES
KW	KILOWATTS
LTG	LIGHTING
MBJ	MAIN BONDING JUMPER
MC	MECHANICAL CONTRACTOR
MCA	MINIMUM CIRCUIT AMPACITY
MCC	MOTOR CONTROL CENTER
MECH	MECHANICAL
MH	MANHOLE
MISC	MISCELLANEOUS
MTD	MOUNTED
MTG	MOUNTING
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NEU	NEUTRAL
NF	NON-FUSED
NIC	NOT IN CONTRACT
NL	NIGHT LIGHT
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OL'S	OVERLOADS
P	POLE
PA	PUBLIC ADDRESS
PB	PUSH BUTTON
PH	PHASE
PNL	PANEL
PT	POTENTIAL TRANSFORMER
PWR	POWER
RECP	RECEPTACLE
RLA	RUNNING LOAD AMPERES
RSC	RIGID STEEL CONDUIT
RTU	ROOF TOP UNIT
SCHED	SCHEDULE
SES	SERVICE ENTRANCE SECTION
SS	SPECIAL SYSTEMS
SWBD	SWITCHBOARD
TMB	TELEPHONE MOUNTING BOARD
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
V	VOLTS
VP	VANDAL PROOF
W	WIRE
WG	WIRE GUARD
WH	WATER HEATER
WP	WEATHER PROOF (WHILE IN USE)

GENERAL SYMBOLS:

- RECESSED OR SURFACE JUNCTION BOX IN ACCESSIBLE LOCATION WITH FLEXIBLE CONDUIT CONNECTION.
- MOTOR, HP, VOLTAGE, & PHASE AS INDICATED MECH EQUIP SCHEDULE.
- ELECTRICAL PANELBOARD, 480/277V, 3PH, 4W, WITH GND, UNO. FLUSH/SURFACE MOUNT AT +6'-0" AFF TO TOP. STUB OUT THREE 3/4"C INTO ACCESSIBLE CEILING SPACE.
- ELECTRICAL PANELBOARD, 208/120V, 3PH, 4W WITH GND, UNO. FLUSH/SURFACE MOUNT AT +6'-0" AFF TO TOP. STUB OUT THREE 3/4"C INTO ACCESSIBLE CEILING SPACE.
- KVA — TRANSFORMER, TYPE AND RATING AS SPECIFIED ON PLAN.
- SERVICE ENTRANCE SECTION, DISTRIBUTION PANELBOARD, OR MOTOR CONTROL CENTER, AS SPECIFIED ON PLAN.
- CONDUIT CONCEALED IN FINISHED AREAS OR ABOVE CEILING SPACE.
- UNDERGROUND CONDUIT OR CONCEALED IN CONCRETE OR BELOW FLOOR AS NOTED.
- CONDUIT TURNING UP
- CONDUIT TURNING DOWN
- CONDUIT STUB OUT, AS NOTED ON PLANS
- HOME RUN TO PANELBOARD OR AS NOTED. ALL CONDUCTORS SHALL BE COPPER & HAVE CODE SIZED GROUNDING CONDUCTORS. MINIMUM BRANCH CIRCUIT WIRING SHALL BE #12 AWG. OTHER SIZES AS INDICATED ON THE DRAWINGS, ELECTRICAL SCHEDULES, OR AS REQUIRED BY CODE. INSULATION SHALL BE THHN/THWN FOR CONDUCTORS #6 AND SMALLER AND XHHW FOR #4 AND LARGER.

SINGLE LINE DIAGRAM SYMBOLS:

- LSIG — LONG-TIME/SHORT-TIME/INSTANTANEOUS/GROUND FAULT TRIP SETTINGS
- CIRCUIT BREAKER
- FUSIBLE SWITCH, SIZE AS INDICATED ON PLANS
- MOTOR STARTER, # INDICATES NEMA SIZE
- 480V DRAW-OUT CIRCUIT BREAKER
- DRAW-OUT FUSE
- COMBINATION MOTOR CONTROLLER, FUSIBLE SWITCH TYPE
- COMBINATION MOTOR CONTROLLER, CIRCUIT BREAKER TYPE
- GROUND
- METER
- GFP — GROUND FAULT PROTECTION
- CURRENT TRANSFORMER
- DPM — DIGITAL POWER METER
- DISTRIBUTION TRANSFORMER
- DELTA CONNECTION
- WYE CONNECTION WITH GROUND
- FEED THROUGH LUG CONNECTION
- ELECTRICAL PANEL BOARD, MAIN LUG ONLY
- ELECTRICAL PANEL BOARD, MAIN CIRCUIT BREAKER

CONTROLS SYMBOLS:

NOTE: PROVIDE NEMA 3R ENCLOSURE IN EXTERIOR APPLICATIONS.

- $ — SINGLE POLE TOGGLE SWITCH MTD AT +48" AFF
- $_K — SINGLE POLE KEY OPERATED SWITCH MTD AT +48" AFF
- $_M — HP RATED MANUAL MOTOR STARTER WITH SWITCH CONTROL & THERMAL OVERLOAD PROTECTION.
- MOTOR CONTROLLER. FURNISHED WITH EQUIPMENT.
- MOTOR CONTROLLER. FURNISHED BY ELECTRICAL CONTRACTOR.
- HEAVY DUTY SAFETY DISCONNECT SWITCH, 250V-30A-3P, UNO. HP RATED, REFER TO EQUIP SCHEDULE(S) FOR FUSES AND OTHER SPECIFICATIONS
- COMBINATION MOTOR STARTER/DISCONNECT SWITCH, FUSIBLE WITH 120V CONTROL TRANSFORMER, H/A SWITCH, AND PILOT LIGHT IN ENCLOSURE. FUSE PER EQUIPMENT MANUFACTURER'S RECOMMENDATIONS OR EQUIP SCHEDULE SPECIFICATIONS. SUBSCRIPT INDICATES STARTER SIZE.
- VFD — VARIABLE FREQUENCY DRIVE. FURNISHED BY MECHANICAL CONTRACTOR, INSTALLED BY ELECTRICAL CONTRACTOR.
- TS — TIME SWITCH
- PC — PHOTOCELL. ROOF MOUNTED, UNO

POWER SYMBOLS:

NOTE: WEATHER PROOF WHERE OUTSIDE MTD AT +72" AFG, UNO

- SPECIAL PURPOSE RECEPTACLE, 250V-400V, NEMA CONFIG & MTG HEIGHT AS SPECIFIED ON EQUIP SCHEDULE OR AS REQUIRED FOR INTENDED USE.
- DUPLEX RECEPTACLE, 20A-2P-3W, NEMA 5-20R, MTD AT +16" AFF, UNO
- DOUBLE DUPLEX RECEPTACLE, (2) 20A-2P-3W, NEMA 5-20R
- SINGLE RECEPTACLE, 30A-2P-3W, NEMA 5-30R MTD AT +16" AFF, UNO
- SINGLE, DUPLEX, OR DBL-DUPLEX RECP W/SWITCHED LEG MTD AT +16", UNO

LIGHTING SYMBOLS:

NOTE: REFER TO LIGHTING FIXTURE SCHEDULE FOR LUMINAIRE SPECIFICATIONS.
NOTE: SUBSCRIPT INDICATES LUMINAIRE TYPE.

- DOUBLE OR SINGLE ARM POLE MTD AREA LIGHT WITH CONCRETE BASE
- BOLLARD OR POST MTD AREA LIGHT
- SURFACE CEILING MTD INCANDESCENT, FLUORESCENT, OR HID FIXTURE
- SURFACE WALL MTD INCANDESCENT, FLUORESCENT, OR HID FIXTURE

GENERAL PROJECT NOTES:

A. ALL WORK TO BE PERFORMED IN ACCORDANCE WITH THE N.E.C. AND ALL APPLICABLE LOCAL CODES AND ORDINANCES.

B. ALL CONTRACTORS SHALL VERIFY LOCATION OF ALL EXISTING SITE UTILITIES BEFORE DIGGING TRENCHES.

C. THE ELECTRICAL CONTRACTOR SHALL VERIFY REQUIREMENTS FOR EQUIPMENT FURNISHED BY OTHERS TO BE CONNECTED TO THE THE ELECTRICAL SYSTEM. THE ELECTRICAL CONTRACTOR SHALL PROVIDE ALL MATERIALS NECESSARY, SUCH AS WIRE, CONDUIT, FUSE, TRANSFORMERS, ETC. FOR PROPER INSTALLATION AND ELECTRICAL OPERATION OF SUCH EQUIPMENT.

D. ELECTRICAL CONTRACTOR SHALL CONTACT THE ENGINEERS OFFICE IN WRITING WITH A REQUEST FOR INFORMATION (RFI) PRIOR TO PROCEEDING WITH ANY WORK NOT CLEARLY SHOWN IN DOCUMENTS HEREIN. ENGINEER WILL NOT ASSUME RESPONSIBILITY FOR WORK NOT AUTHORIZED TO CHANGES TO CONTRACT DOCUMENTS.

OBSERVATION SCHEDULE:

1. CONTACT THE ENGINEER 48 HOURS PRIOR TO SCHEDULING AN OBSERVATION FOR ANY INSPECTION BY THE LOCAL JURISDICTION. THE ENGINEER, OR HIS REPRESENTATIVE SHALL VERIFY COMPLIANCE WITH THESE DOCUMENTS. ANY WORK THAT DOES NOT COMPLY WITH THESE DOCUMENTS SHALL BE CORRECTED BY THE ELECTRICAL CONTRACTORS EXPENSE.

2. PUNCH WALK-THROUGH, AFTER ENERGIZING ALL EQUIPMENT.

REFERENCE SYMBOLS

- EQP / #: MECH EQUIP IDENTIFICATION. REFER TO EQUIP SCHED FOR ELECTRICAL REQUIREMENTS. EQUIPMENT TAG NUMBER
- #: FEEDER IDENTIFICATION. REFER TO FEEDER SCHED FOR CONDUCTOR DETAILS
- f#: AVAIL FAULT CURRENT IDENTIFICATION. REFER TO AFC TABLE FOR FURTHER DETAILS

SHEET INDEX

RECORD DRAWING (4/23/2012)

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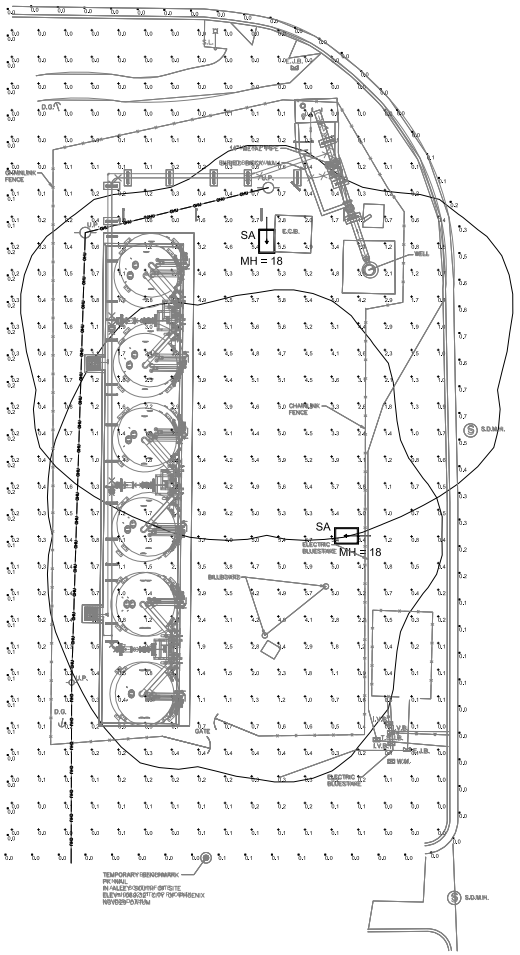
ROOSEVELT IRRIGATION DISTRICT #114
WATER TREATMENT INSTALLATION
2307 WEST VAN BUREN STREET, PHOENIX, ARIZONA

Sheet Title:
ELECTRICAL SPECIFICATIONS AND SYMBOLS LIST

REVISIONS:

DATE:	12/14/2011
DRAWN BY:	CRL
CHECKED BY:	JOD
SCALE:	AS NOTED
PROJECT NO:	011175.00
SHEET	E0.0

Calculation Summary							
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min
PROPERTY LINE	Illuminance	Fc	0.12	0.7	0.0	N.A.	N.A.
SITE	Illuminance	Fc	1.43	6.7	0.0	N.A.	N.A.



PHOTOMETRIC SITE PLAN

1" = 10'-0"

GENERAL NOTES:

A. ALL EXTERIOR LIGHT FIXTURES TO COMPLY WITH LOCAL NIGHT SKY ORDINANCE.

B. ALL EXTERIOR ELECTRICAL EQUIPMENT TO BE RATED FOR WEATHER-PROOF/ NEMA-3R APPLICATIONS.

C. ALL FIXTURES INSTALLED OUTDOORS SHALL BE RATED FOR DAMP/WET LOCATIONS AS REQUIRED. THE CONTRACTOR SHALL COORDINATE DAMP/WET LOCATION RATING PER NEC ARTICLE 410-4. ALL INSTALLATIONS SHALL CONFORM TO NEC ARTICLE 410, ALL SUB ARTICLES.

D. CONTRACTOR TO COORDINATE EXACT SITE LIGHTING FIXTURE LOCATIONS WITH OWNER. ALL CONFLICTS SHALL BE IMMEDIATELY REPORTED TO THE ENGINEER AND ARCHITECT.

E. ALL EXTERNAL LIGHTING SHALL BE SO LOCATED AND DESIGNED TO PREVENT LIGHTING RAYS FROM BEING DIRECTED OFF THE PROPERTY UPON WHICH THE LIGHTING IS LOCATED.

F. REFER TO LIGHTING FIXTURE SCHEDULE ON SHEET E2.0 FOR LIGHT FIXTURE TYPES AND SPECIFICATIONS.

RECORD DRAWING
(4/23/2012)

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ROOSEVELT IRRIGATION DISTRICT #114
WATER TREATMENT INSTALLATION
2307 WEST VAN BUREN STREET, PHOENIX, ARIZONA
Sheet Title: PHOTOMETRIC SITE PLAN

REVISIONS:

DATE:	12/14/2011
DRAWN BY:	CRL
CHECKED BY:	JOD
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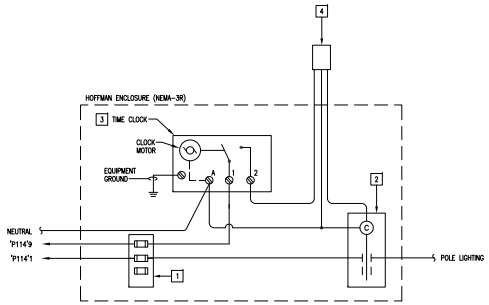
PROJECT NO:	011175.00
SHEET	E0.1

Apr 24, 2012 - 11:47am
\\TRCFNP\Project Files\2011 Projects\011175.00 - RID Water Treatment\Electrical\RID--114\As-built\Electrical Drawings - 114.dwg

PANEL "114" (NEW)			SQUARE 'D' 7.5KVA MIN POWER ZONE					40 AMP SECONDARY MAIN CIRCUIT BREAKER
240/120V 1ø 3W			SURFACE MOUNTED					20A PRIMARY MAIN CIRCUIT BREAKER (25K AIC)
USE OR AREA SERVED	CB	LOAD TYPE	LOAD PER PHASE (VA) A#	B#		LOAD TYPE	CB	USE OR AREA SERVED
SECURITY POLE LIGHTS	20 1	C	1 295			N	20 1	VERTECH CONTROL PANEL
					2			
TIMECLOCK/CONTACTOR	20 1	N	3	180		N	20 1	
				864	4			
VERTECH CONTROL PANEL	20 1	N	5 1200			N	20 1	N. TANK SKID SUMP PUMP
			864		6			
BUSSED SPACE		N	7			N	20 1	S. TANK SKID SUMP PUMP
					8			
BUSSED SPACE		N	9			N	20 1	CONVENIENCE RECEPTACLE
			180		10			
BUSSED SPACE		N	11			N		BUSSED SPACE
					12			
LOAD PER PHASE NON-CONTINUOUS			2244	1044	2613 VA / 120 V = 22 AMPS			
LOAD PER PHASE CONTINUOUS			295	0				
25% OF CONTINUOUS			74	0				
-			0	0	TOTAL KVA= 3657 VA			
TOTAL			2613	1044	10,000 A.I.C. BRANCH BREAKERS			

NOTES: 1. "C" LOAD TYPES ARE CONTINUOUS OR LARGEST MOTOR LOADS AND "N" LOAD TYPES ARE NON-CONTINUOUS.

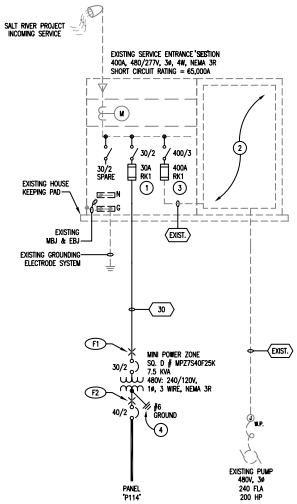


KEY NOTES:

1. FUSE BLOCK WITH 20A CURRENT LIMITING CLASS J DUAL ELEMENT TIME DELAY FUSES.
2. 2 POLE ELECTRICALLY HELD CONTACTOR, SQUARE 'D' LO20V02 OR EQUAL WITH 30A CONTACTS, 5000A WITHSTAND RATING MINIMUM.
3. TIMECLOCK "INTERMATIC" MODEL #ET70115OR OR EQUAL.
4. PHOTOCELL "INTERMATIC" #K4236 MOUNT ON ROOF FACING NORTH.

EXTERIOR LIGHTING CONTROL DIAGRAM

NO SCALE



ELECTRICAL SINGLE-LINE DIAGRAM

NO SCALE

GENERAL NOTES:

A. CONDUCTOR SIZES BASED ON THHN/XHHW-2, 90° C, 600V, INSULATED, COPPER WIRE APPLIED AT 60° C AMPACITIES SIZES UP TO #1 AWG, AND 75° C, AMPACITIES FOR SIZES #1 AWG OR LARGER.

B. NO DESIGN CHANGES MAY BE MADE TO THE SYSTEM WITHOUT THE PRIOR APPROVAL OF THE DESIGN ENGINEER AND THE ELECTRICAL INSPECTOR.

C. DASHED-SHADED LINES INDICATE EXISTING EQUIPMENT. SOLID-BOLD LINES INDICATE NEW EQUIPMENT U.N.O.

KEY NOTES:

1. PROVIDE NEW SUB-MAIN SWITCH IN EXISTING CUTLER-HAMMER SES. PROVIDE LISTED COVER PLATES AS REQUIRED TO MAINTAIN A DEAD FRONT. VERIFY NEW SWITCH REQUIREMENTS WITH CUTLER-HAMMER AND COORDINATE NEW SWITCH INSTALLATION AND POWER OUTAGES WITH POWER COMPANY.
2. EXISTING SES CONTROL CABINET WITH CONTACTORS AND REDUCED VOLTAGE STARTING CONTROLS FOR EXISTING IRRIGATION PUMP MOTOR TO REMAIN. COORDINATE WITH KELLER ELECTRICAL AND VERTECH CONTROLS FOR ANY CONTROL PROVISION OR MODIFICATION REQUIREMENTS.
3. REPLACE EXISTING 400A/3P SWITCH WITH SMALLER PROFILE SWITCH TO MAKE ROOM FOR NEW 30A/3P SWITCH. PROVIDE RETROFIT KIT WITH NEW 400/3 CUTLER-HAMMER SWITCH #FDPK365R AND CONNECTOR KIT #KPRL489X. VERIFY NEW SWITCH REQUIREMENTS WITH CUTLER-HAMMER AND COORDINATE NEW SWITCH INSTALLATION AND POWER OUTAGES WITH POWER COMPANY.
4. TIE TO EXISTING SES GROUNDING ELECTRODE SYSTEM.

FEEDER SCHEDULE:

SYMBOL	PARALLEL SETS	CONDUIT AND CONDUCTOR SIZE	NOTE:
30	1	2#10, 1 #10 GND, 3/4"C	

LOAD CALCULATIONS:

SES, 400A, 480/277V, 3PH, 4W

NEW PANEL "P114"		x 100% =	2793 VA
EXISTING HIGH DEMAND AT 0.8 pf		x 125% =	292500 VA
		SUB TOTAL =	295293 VA
295293 VA	AT 480V 3 PHASE =		355 AMPS

AVAILABLE FAULT CURRENT:

1. ALL VALUES ARE SYMMETRICAL BASED ON BUSSMANN SPD CALCULATIONS AS INDICATED.
2. ALL EQUIPMENT SHALL BE FULLY RATED.
3. AFC = AVAILABLE FAULT CURRENT.

LABEL	FAULT LOCATION	TYPE OF CALCULATION	Cable	Conduit Type	Conductor Type	AFC(1) or AFC(PRI)	V or V(PRI)	VSEC	L	C VALUE	KVA	SZ	N	f or f1	M or M1	AFC(2) or AFC(SEC)
F1	MIN-POWER ZONE KVAR PRIMARY	AFC AT END OF A FEEDER	#8	NON-MAGNETIC	COPPER	65000	480						1	2.6075	0.2772	18018
F2	MIN-POWER ZONE KVAR SECONDARY	AFC AT SEC. OF 1-PHASE XFMR				18018	480	240	15	1008	7.5	3.3		65.6333	0.0151	536

AFC AT THE END OF A FEEDER

DEFINITIONS
AFC(1) = AFC AT THE BEGINNING OF THE FEEDER
AFC(2) = AFC AT THE END OF THE FEEDER
N = NUMBER OF CONDUCTORS IN PARALLEL PER PHASE
C = "C" VALUE AS DEFINED IN THE BUSSMANN SPD HANDBOOK
V = LINE-TO-LINE VOLTAGE
L = LENGTH OF FEEDER (IN FEET)

CALCULATIONS

$$f = \frac{1.732 \times L \times AFC(1)}{N \times C \times V}$$

$$M = \frac{1}{1+f}$$

$$AFC(2) = AFC(1) \times M$$

AFC AT THE SECONDARY OF A THREE PHASE TRANSFORMER

DEFINITIONS
AFC(PRI) = AFC AT PRIMARY TERMINALS OF TRANSFORMER
AFC(SEC) = AFC AT SECONDARY TERMINALS OF TRANSFORMER
V(PRI) = LINE-TO-LINE VOLTAGE AT TRANSFORMER PRIMARY
%Z = TRANSFORMER PERCENT IMPEDANCE
KVA = RATED KVA OF TRANSFORMER

CALCULATIONS

$$f1 = \frac{AFC(PRI) \times V(PRI) \times 1.73 \times \%Z}{100,000 \times KVA}$$

$$M1 = \frac{1}{1+f1}$$

$$AFC(SEC) = \frac{V\ PRIMARY}{V\ SECONDARY} \times M1 \times AFC(1)$$

RECORD DRAWING (4/23/2012)

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ROOSEVELT IRRIGATION DISTRICT #114
WATER TREATMENT INSTALLATION
2307 WEST VAN BUREN STREET, PHOENIX, ARIZONA

Sheet Title:
SINGLE-LINE DIAGRAM, PANELS, AND CALCULATIONS

REVISIONS:

DATE:	12/14/2011
DRAWN BY:	CRL
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SCALE:	AS NOTED
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Apr 24, 2012 - 11:44am
\\TRCFNP\Project Files\2011 Projects\011175.00 - RID Water Treatment\Electrical\RID-114Va-built\Electrical Drawings - 114.dwg

LIGHTING FIXTURE SCHEDULE

MOUNTING: (M/G)
- RE – RECESSED
- SP – SUSPENDED
- CL – CEILING SURFACE
- WL – WALL
- UC – UNDER CABINET
- CV – COVE
- PL – POLE
- GR – GROUND
- UN – UNIVERSAL

LAMP TYPE:
- FL – FLUORESCENT
- CF – COMPACT FLUORESCENT
- IN – INCANDESCENT
- LED – LIGHT EMITTING DIODE
- HS – HIGH PRESSURE SODIUM
- PSMH – PULSE START METAL HALIDE
- MV – MERCURY VAPOR
- LV – LOW VOLTAGE
- O – OTHER (SEE DESCRIPTION)

LENS/LOUVER: (L/L)
- A – .125" ACRYLIC
- B – BLACK BAFFLE
- C – CLEAR ALZAK
- D – PARABOLIC
- F – FRESNEL
- G – TEMPERED GLASS
- H – WALL WASHER
- K – KSH12 .125" ACRYLIC
- K19 – KSH19 .125" ACRYLIC
- L – LOW IRIDESCENT SPECULAR ALUMINUM
- N – NONE
- O – OTHER (SEE DESCRIPTION)
- P – PRISMATIC
- PC – POLYCARBONATE
- WG – WIRE GUARD

DOOR:
- FA – FLAT ALUMINUM
- FS – FLAT STEEL
- RA – RECESSED ALUMINUM
- RS – RECESSED STEEL

BALLAST:
- EB – ELECTRONIC BALLAST
- ML – MULTI-LEVEL SWITCHING
- EM – EMERGENCY BATTERY
- HPF – HIGH POWER FACTOR
- CWA – CONSTANT WATTAGE AUTO XFMR

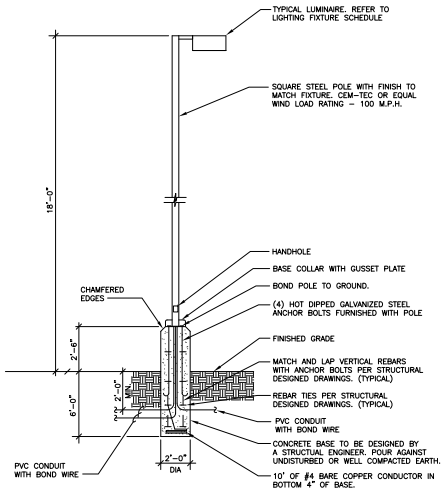
PROVIDE DISCONNECTING MEANS FOR FLUORESCENT LUMINAIRES THAT CAN BE SERVICED IN PLACE WHICH INCLUDES LUMINAIRES THAT UTILIZE DOUBLE ENDED LAMPS, LUMINAIRES CONTAINING A BALLAST(S) & SUPPLIED FROM MULTI-WIRE BRANCH CIRCUITS. THE DISCONNECT MEANS MUST DISCONNECT ALL SUPPLY CONDUCTORS SIMULTANEOUSLY, INCLUDING THE GROUNDED CONDUCTOR. EXCEPTIONS ARE PROVIDED FOR; HAZARDOUS LOCATIONS, EMERGENCY ILLUMINATION, CORD-&-PLUG CONNECTED LUMINAIRES, INDUSTRIAL FACILITIES, & LUMINAIRES NOT SUPPLIED BY A MULTIWIRE BRANCH CIRCUIT WHICH DOES NOT LEAVE THE ILLUMINATED SPACE IN TOTAL DARKNESS. REFER TO NEC 410.130(G) FOR FURTHER CLARIFICATION.

CATALOG NUMBER SHALL NOT BE CONSIDERED COMPLETE AND MATERIAL SHALL NOT BE ORDERED BY MANUFACTURER AND CATALOG NUMBER ONLY. THE COMPLETE DESCRIPTION AND THE SPECIFICATION SHALL BE COORDINATED WITH THE CATALOG NUMBER TO DETERMINE THE EXACT MATERIAL AND ACCESSORIES TO BE ORDERED. THE FIRST MANUFACTURER LISTED IS THE BASIS FOR DESIGN, HOWEVER ANY SUBSTITUTIONS, WHETHER LISTED WITHIN SCHEDULE BELOW OR NOT, MUST BE PRIOR APPROVED IN WRITING BY BOTH ARCHITECT AND ENGINEER.

ALL LAMPS FOR THIS PROJECT SHALL BE FURNISHED AND INSTALLED BY THE ELECTRICAL CONTRACTOR UNLESS OTHERWISE NOTED.

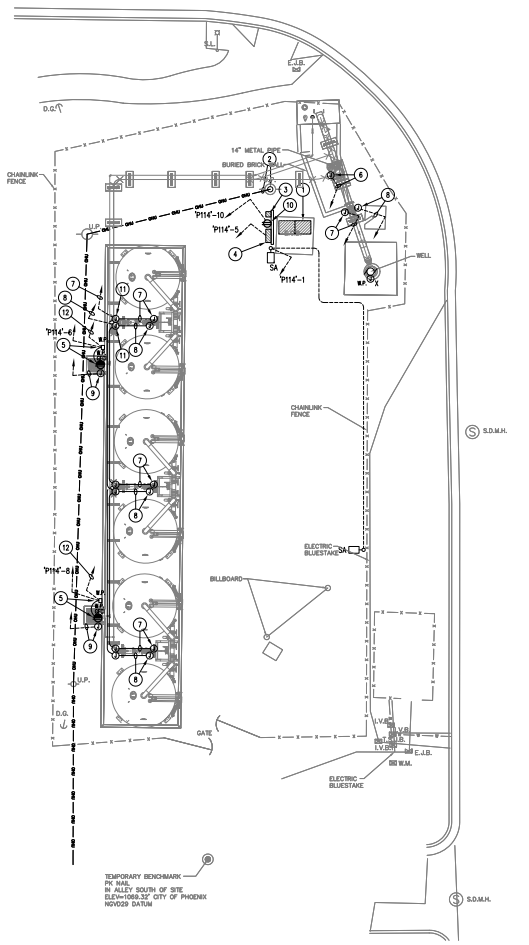
REFER TO SPECIFICATION FOR LAMP AND BALLAST REQUIREMENTS, SHOP DRAWING SUBMITTAL REQUIREMENTS AND ADDITIONAL INFORMATION.

ITEM	DESCRIPTION	SIZE	MTG	LAMPS			VOLTAGE	BALLAST	L/L	APPROVED MANUFACTURER / MODEL	LAMP/BALLAST
				TYPE	QTY	SIZE					VA
SA	SINGE-HEAD AREA LIGHT FIXTURE SSS POLE 15.5' W/ 2.5' BASE	15.5"x22"x16.5"	PL	PSMH	1	150W PSMH	120	CWA	P	COOPER – LUMARK #MPTR-SL-150-120-LL OR APPROVED EQUAL	185



POLE MOUNTED LIGHT FIXTURE DETAIL

NO SCALE



ELECTRICAL SITE PLAN – NEW WORK

1" = 10'-0"

GENERAL NOTES:

A. ALL CONDUIT ROUTING AND STUB-UP LOCATIONS ARE DIAGRAMMATIC AND SHOWN FOR REFERENCE, CLARITY, AND INTENT PURPOSES ONLY. E.C. SHALL COORDINATE ALL ROUTING AS EXISTING FIELD CONDITIONS AND NEW CONSTRUCTION PERMITS. COORDINATE ROUTING WITH NEW AND EXISTING OBSTRUCTIONS AND WITH ALL APPLICABLE TRADES. COORDINATE STUB-UP LOCATIONS WITH FINAL EQUIPMENT LOCATIONS IN FIELD.

B. ALL EXTERIOR LIGHT FIXTURES TO COMPLY WITH LOCAL NIGHT SKY ORDINANCE.

C. ALL EXTERIOR LIGHTING TO BE FED WITH #10 CU. MINIMUM U.N.O.

D. ALL EXTERIOR ELECTRICAL EQUIPMENT TO BE RATED FOR WEATHER-PROOF/ NEMA-3R APPLICATIONS.

E. ALL FIXTURES INSTALLED OUTDOORS SHALL BE RATED FOR DAMP/WET LOCATIONS AS REQUIRED. THE CONTRACTOR SHALL COORDINATE DAMP/WET LOCATION RATING PER NEC ARTICLE 410-4. ALL INSTALLATIONS SHALL CONFORM TO NEC ARTICLE 410, ALL SUB ARTICLES.

F. CONTRACTOR TO COORDINATE EXACT SITE LIGHTING FIXTURE LOCATIONS WITH OWNER. ALL CONFLICTS SHALL BE IMMEDIATELY REPORTED TO THE ENGINEER AND ARCHITECT.

G. ALL WIRING SHALL BE INSTALLED UNDER-GROUND IN PVC CONDUIT WHERE POSSIBLE. WHERE EXPOSED, PROVIDE IMC CONDUIT WITH WEATHERPROOF FLEX CONNECTIONS.

H. FIXTURE / ITEM IDENTIFIED WITH LETTER:
- "X" – INDICATES DEVICE TO REMAIN.
- "XR" – INDICATES DEVICE TO BE REMOVED.
- "XRR" – INDICATES DEVICE TO BE REMOVED & RELOCATED.

KEY NOTES:

1. EXISTING SERVICE ENTRANCE SECTION TO REMAIN. SEE SINGLE-LINE DIAGRAM ON SHEET E1.0 FOR NEW WORK.
2. EXISTING POWER POLE WITH TRANSFORMERS AND OVER-HEAD POWER LINES TO REMAIN.
3. NEW UNI-STRUT MOUNTED MINI POWER ZONE TRANSFORMER AND PANEL-"P89". SEE SINGLE-LINE DIAGRAM AND PANEL SCHEDULE ON SHEET E1.0.
4. CONTROL PANEL BY VERTECH. PROVIDE POWER TO CONTROL PANEL AS SHOWN. PROVIDE 3/4" CONDUITS AS INDICATED FOR POWER AND CONTROL WIRING. ALL POWER AND CONTROLS CONDUCTORS FROM CONTROL PANEL TO CONTROL EQUIPMENT SHALL BE PROVIDED BY ELECTRICAL CONTRACTOR AS DIRECTED BY CONTROLS CONTRACTOR. SEE VERTECH CONTROL DRAWINGS FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
5. PROVIDE W.P./GFCI RECEPTACLE FOR 120V, 3/4HP SUMP PUMP POWER CONNECTION AND POST MOUNTED CONTACTOR WITH NEMA-3R ENCLOSURE AND HOA FOR AUTOMATIC AND MANUAL CONTROL OF SUMP PUMP. SQUARE-D CLASS 8502-SBH1-V02-CS, OR EQUAL. COORDINATE EXACT LOCATION AND WIRING REQUIREMENTS WITH CONTROLS CONTRACTOR AND OWNER. COORDINATE EXACT LOCATION OF RECEPTACLE WITH MECHANICAL CONTRACTOR PRIOR TO ROUGH-IN.
6. PROVIDE W.P. J-BOX AND 3/4" CONDUIT AS SHOWN WITH POWER WIRING FROM AUTOMATIC VALVE TO VERTECH CONTROL PANEL. COORDINATE EXACT ROUGH-IN LOCATION, WIRING REQUIREMENTS, CONDUIT ROUTING AND CONNECTION REQUIREMENTS WITH OWNER, MECHANICAL, AND CONTROLS CONTRACTOR. SEE SHEET M2.1 FOR VALVE LOCATION.
7. PROVIDE W.P. J-BOX AND 3/4" CONDUIT AS SHOWN WITH POWER WIRING FROM FLOW METER LOCATION TO VERTECH CONTROL PANEL. COORDINATE EXACT ROUGH-IN LOCATION, WIRING REQUIREMENTS, CONDUIT ROUTING AND CONNECTION REQUIREMENTS WITH OWNER, MECHANICAL, AND CONTROLS CONTRACTOR. SEE SHEET M2.1 FOR FLOW METER LOCATIONS.
8. PROVIDE W.P. J-BOX AND 3/4" CONDUIT AS SHOWN WITH CONTROL CABLING FROM FLOW METER LOCATION TO VERTECH CONTROL PANEL. COORDINATE EXACT ROUGH-IN LOCATION, CABLING REQUIREMENTS, CONDUIT ROUTING AND CONNECTION REQUIREMENTS WITH OWNER, MECHANICAL, AND CONTROLS CONTRACTOR. SEE SHEET M2.1 FOR FLOW METER LOCATIONS.
9. PROVIDE W.P. J-BOX AND 3/4" CONDUIT AS SHOWN WITH CONTROL CABLING FROM LOCATION OF SUMP PUMP HIGH AND LOW LEVEL SENSORS TO VERTECH CONTROL PANEL. COORDINATE EXACT ROUGH-IN LOCATION, CABLING REQUIREMENTS, CONDUIT ROUTING AND CONNECTION REQUIREMENTS WITH OWNER, MECHANICAL, AND CONTROLS CONTRACTOR.
10. PROVIDE W.P./GFCI TYPE CONVENIENCE RECEPTACLE. MOUNT AT +24"AFF ON UNI-STRUT STRUCTURE SUPPORTING MINI POWER ZONE PER KEY-NOTE #3 ABOVE.
11. PROVIDE J-BOX FOR TRANSITIONING FROM UNDER-GROUND TO ABOVE GROUND CONDUIT. COORDINATE EXACT LOCATION IN THE FIELD WITH MECHANICAL AND CONTROLS CONTRACTOR.
12. PROVIDE 3/4" CONDUIT AS SHOWN WITH 120V CONTROL WIRE FROM SUMP PUMP CONTROL CONTACTOR HOA SWITCH (120VAC) TO VERTECH CONTROL PANEL SUMP PUMP RELAY. COORDINATE EXACT ROUGH-IN LOCATION, CABLING REQUIREMENTS, CONDUIT ROUTING AND CONNECTION REQUIREMENTS WITH OWNER, AND CONTROLS CONTRACTOR.

RECORD DRAWING
(4/23/2012)

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ROOSEVELT IRRIGATION DISTRICT #114
WATER TREATMENT INSTALLATION
2307 WEST VAN BUREN STREET, PHOENIX, ARIZONA

Sheet Title:
ELECTRICAL SITE PLAN – NEW WORK

REVISIONS:

DATE:	12/14/2011
DRAWN BY:	CRL
CHECKED BY:	JOD
SCALE:	AS NOTED
PROJECT NO:	011175.00
SHEET	E2.0

Apr 24, 2012 – 11:45am
\\TRCFNP\Project Files\2011 Projects\011175.00 – RID Water Treatment\Electrical\RID-114As-built\Electrical Drawings – 114.dwg

Spinnaker Holdings, LLC

Roosevelt Irrigation District (RID) Water Remediation
SCADA and Control Package
Well #114 RTU Control Panel RID-114

Vertech Project Number P110124

January 5, 2012

WELL #114 RTU CONTROL PANEL RID-114 - DRAWING INDEX				
Drawing Set	Drawing Name	Sheet #	Revision	Description
RID-114	P110124-RID114-01	01	1	Well #114 RTU Control Panel RID-114 - Title Page & Drawing Index
	P110124-RID114-02	02	1	Well #114 RTU Control Panel RID-114 - Symbols & Legends
	P110124-RID114-03	03	1	Well #114 RTU Control Panel RID-114 - General Notes
	P110124-RID114-04	04	1	Well #114 RTU Control Panel RID-114 - 120VAC Power Distribution
	P110124-RID114-05	05	1	Well #114 RTU Control Panel RID-114 - 24VDC Power Distribution 24VDC UPS Power Distribution
	P110124-RID114-06	06	1	Well #114 RTU Control Panel RID-114 - 24VDC UPS Power Distribution S7-1200 CPU 1214C Module PLC01 - 14 Pt. Discrete Input
	P110124-RID114-07	07	1	Well #114 RTU Control Panel RID-114 - S7-1200 CPU 1214C Module PLC01 - 10 Pt. Relay Output & Field Interlocks
	P110124-RID114-08	08	1	Well #114 RTU Control Panel RID-114 - S7-1200 CPU 1214C Module PLC02 - 8 Pt. Analog Input
	P110124-RID114-09	09	1	Well #114 RTU Control Panel RID-114 - S7-1200 CPU 1214C Module PLC03 - 8 Pt. Analog Input
	P110124-RID114-10	10	1	Well #114 RTU Control Panel RID-114 - Enclosure Layout
	P110124-RID114-11	11	1	Well #114 RTU Control Panel RID-114 - Backplate Layout & Bill of Material
	P110124-RID114-12	12	1	Well #114 RTU Control Panel RID-114 - PLC Rack 0 Layout & Bill of Material
	P110124-RID114-13	13	1	Well #114 RTU Control Panel RID-114 - Terminal Strip Layout
	P110124-RID114-14	14	1	Well #114 RTU Control Panel RID-114 - Engraving Schedule

P110124-RID114-01.dwg

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1	01/05/12	As-Built	RS	JMM
0	11/08/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

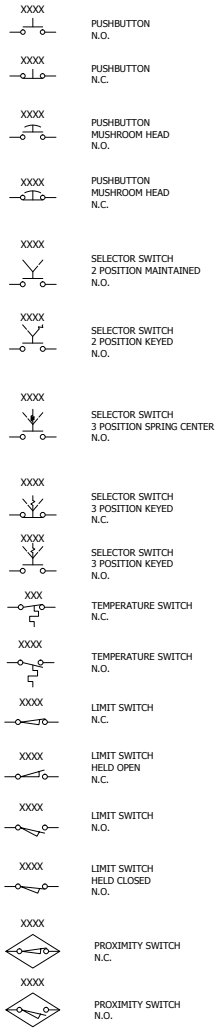
Sheet Description:

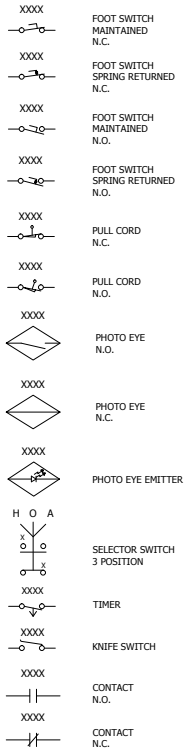
Roosevelt Irrigation District Water Remediation
Well #114 RTU Control Panel RID-114
Title Page
Drawing Index

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-114
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 01 OF 14

SYMBOLS:

SWITCHES:





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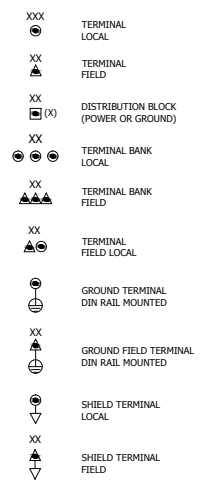

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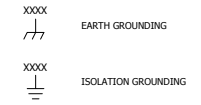

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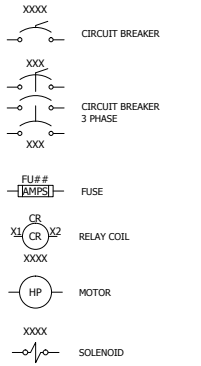

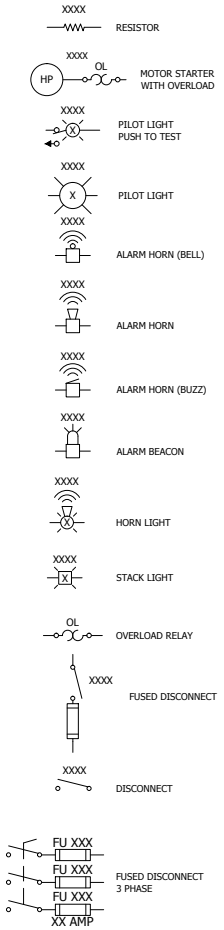

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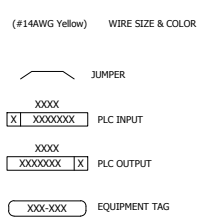

LEGENDS:

ABBREVIATIONS	
SCD	Start Command
SFW	Start Forward
SRV	Start Reverse
RNG	Running
RFW	Running Forward
RRV	Running Reverse
OVL	Overload
DFT	Drive Fault
BRK	Brake
PBL	Push Button Light
RST	Reset
STR	Starter
VFD	Variable Frequency Drive
CBR	Clutch/Brake
CTH	Clutch
PS	Power Supply
CB	Circuit Breaker
ES	EtherNet Switch
PDB	Power Distribution Block
DISC	Disconnect
RCP	Receptacle
TS	Temperature Switch
ECR	Safety Relay
ECRM	Safety Relay Master
ENT	EntherNet/IP
MP	Motor Protector
LR	Line Reactor
MSD	Motor Safety Disconnect
DS	Door Switch
EL	Enclosure Light
DB	Dynamic Break
TVSS	Transient Voltage Surge Suppressor
FU	Fuse
HMT	Hour Meter

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System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #114 RTU Control Panel RID-114
Symbols & Legend

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-114
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 02 OF 14

General Notes:

1. Panel shall be manufactured to UL-508a Standards, and the required UL markings shall be affixed to the interior of the panel. The panel shall ship with a complete as-built drawing set.

2. The following chart shows the standard wire colors for various voltages in the drawing set.

Color	Abbreviation	Usage
Brown	BRN	3-Phase AC - Phase A
Orange	ORG	3-Phase AC - Phase B
Yellow	YEL	3-Phase AC - Phase C
Black	BLK	120VAC Power (Hot)
White	WHT	120VAC Neutral
Red	RED	120VAC Control
Green w/ Yellow Stripe	GRN/YEL	AC Ground
Yellow	YEL	Foreign Power
White w/ Yellow Stripe	WHT/YEL	Foreign Neutral
Purple	PUR	Temporary
Blue	BLU	24VDC Power & Control
White w/ Blue Stripe	WHT/BLU	24VDC Common (Grounded)

3. All analog signal cables shall be Belden 8760; 2-conductor #18AWG (BLK/CLR) twisted/shielded: BLK = Positive (+); CLR = Negative (-).

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System Designed For:

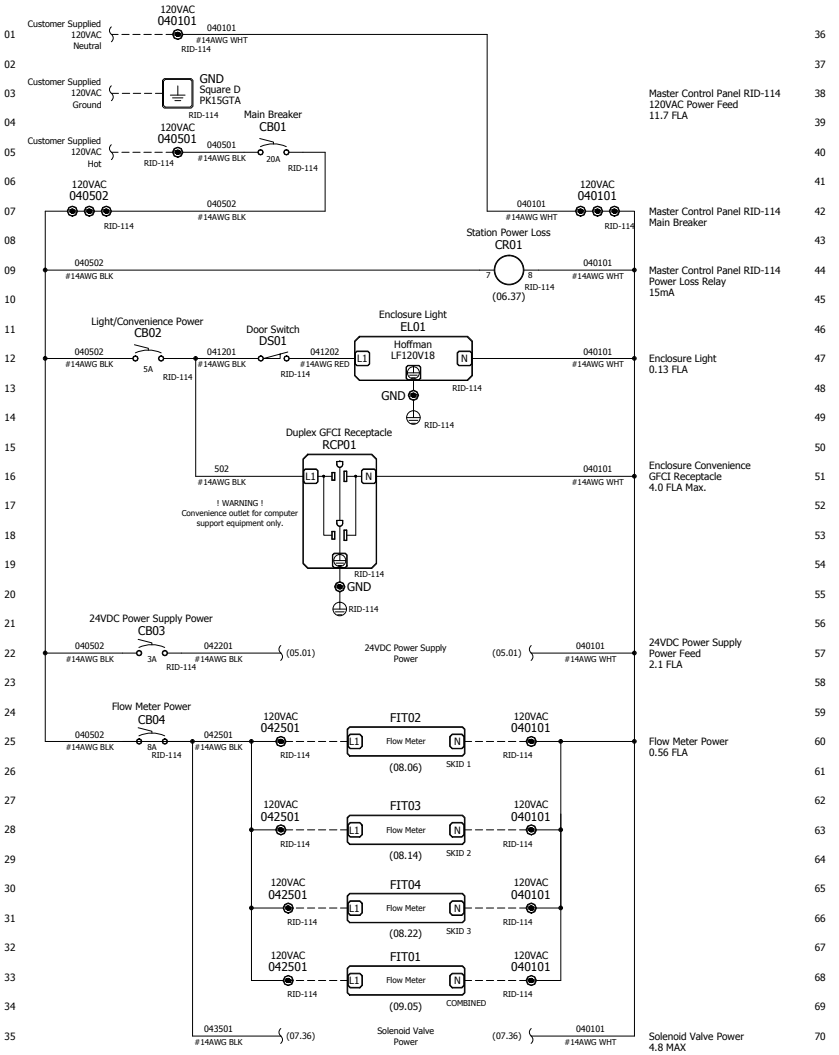
Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #114 RTU Control Panel RID-114
General Notes

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-114
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 03 OF 14

120VAC Power Distribution
RTU Control Panel RID-114



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A	11/03/11	Issue For Submittal	RS	MAS

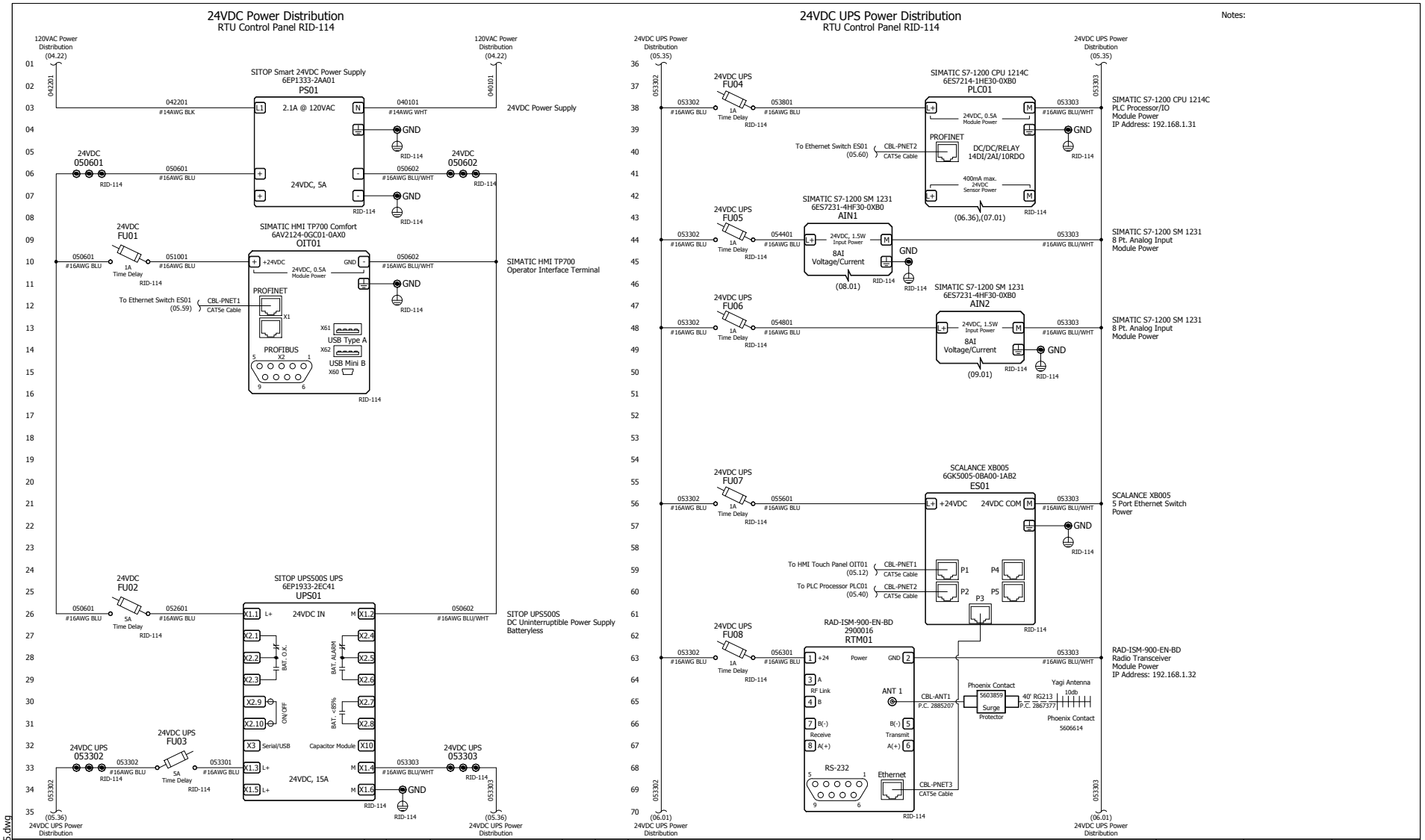
System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #114 RTU Control Panel RID-114
120VAC Power Distribution

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-114
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 04 OF 14



REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/08/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

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System Designed For:

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150 Pecan St.
Denison, TX 75020-2700

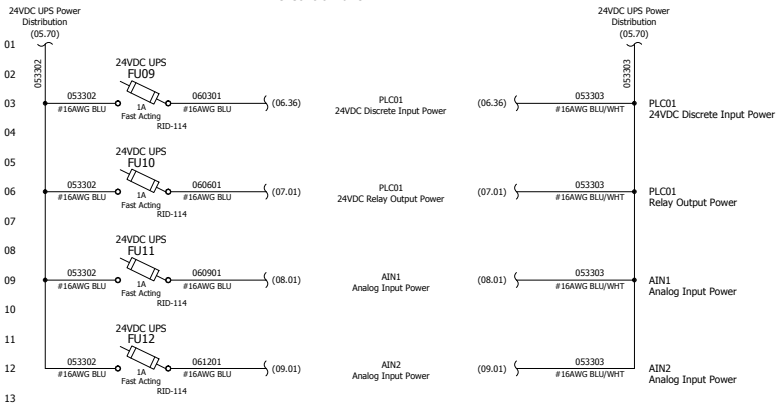
Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #114 RTU Control Panel RID-114
24VDC Power Distribution
24VDC UPS Power Distribution

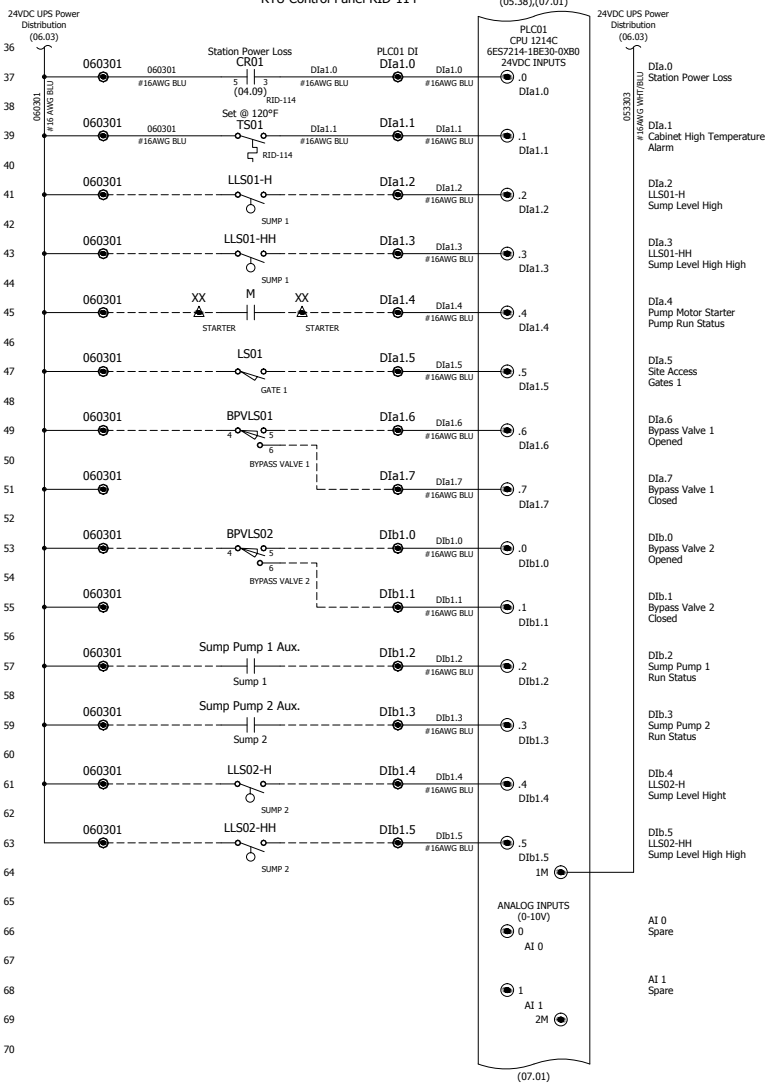
Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-114
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 05 OF 14

P110124-RID114-05.dwg

24VDC UPS Power Distribution
RTU Control Panel RID-114



S7-1200 CPU 1214C Module PLC01 - 14 Pt. Discrete Input
RTU Control Panel RID-114



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A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

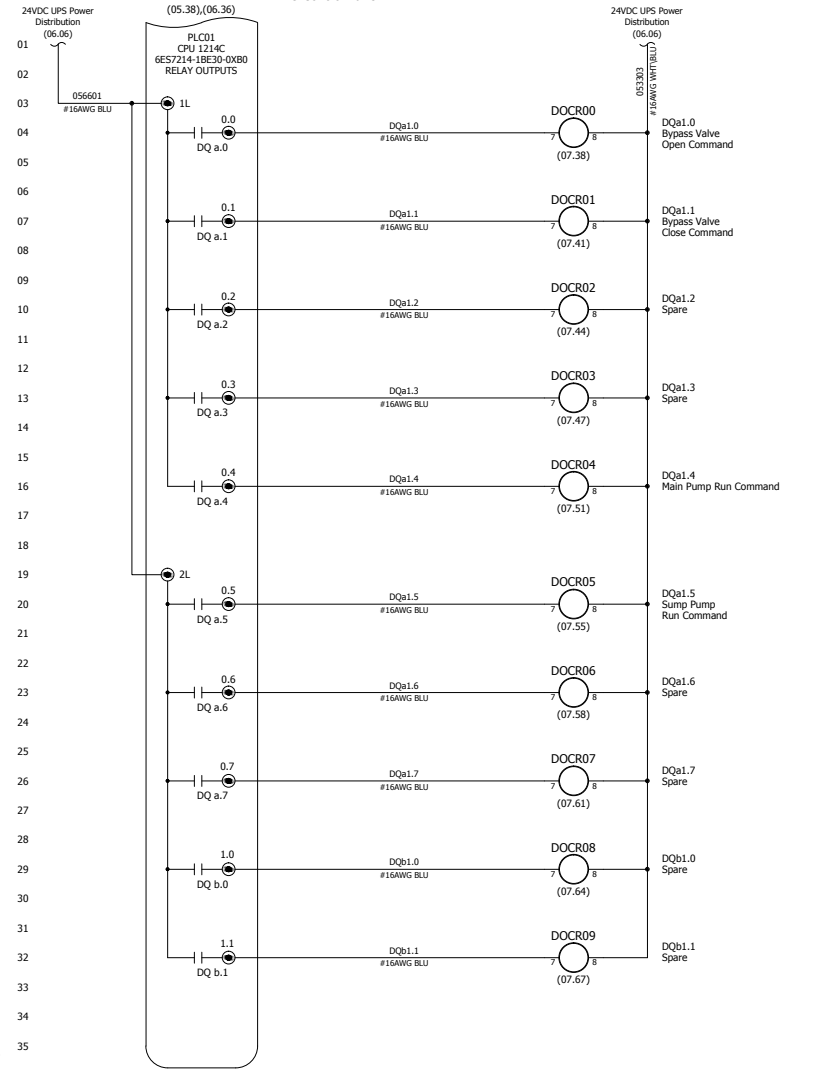
Sheet Description:

Roosevelt Irrigation District Water Remediation Well #114 RTU Control Panel RID-114
24VDC UPS Power Distibution
S7-1200 CPU 1214C Module PLC01 - 14 Pt. Discrete Input

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-114
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 06 OF 14

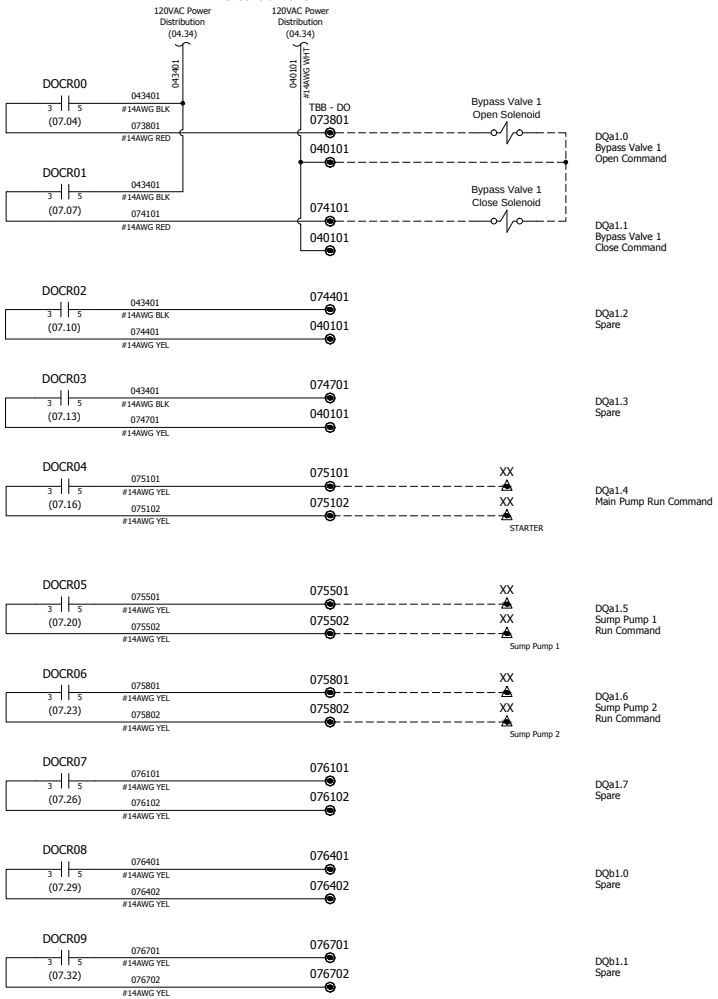
S7-1200 CPU 1214C Module PLC01 - 10 Pt. Relay Output

RTU Control Panel RID-114



S7-1200 CPU 1214C Module PLC01 - Field Interlocks

RTU Control Panel RID-114



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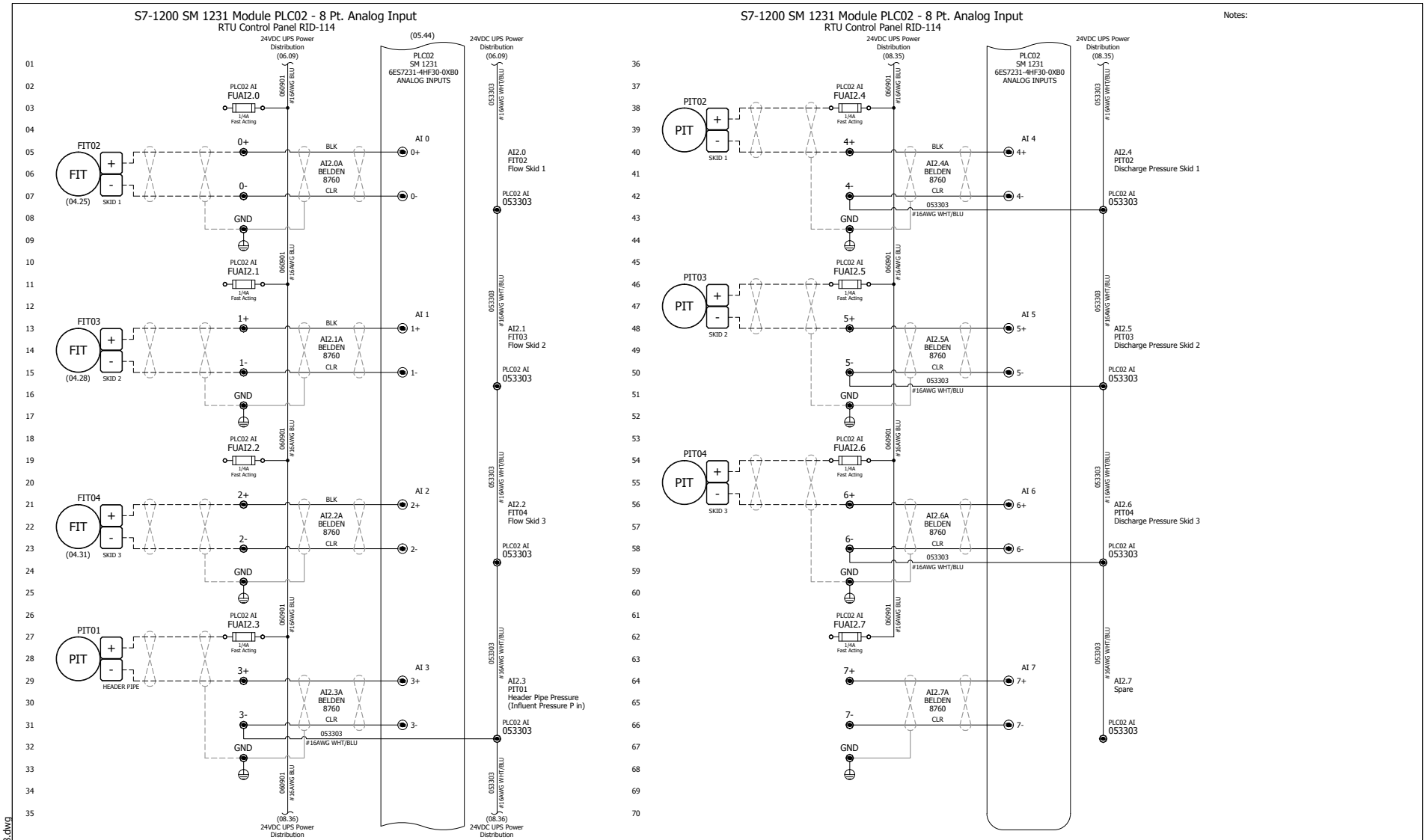
System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation Well #114 RTU Control Panel RID-114
S7-1200 CPU 1214C Module PLC01 - 10 Pt. Relay Output
S7-1200 CPU 1214C Module PLC01 - Field Interlocks

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-114
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 07 OF 14



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A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

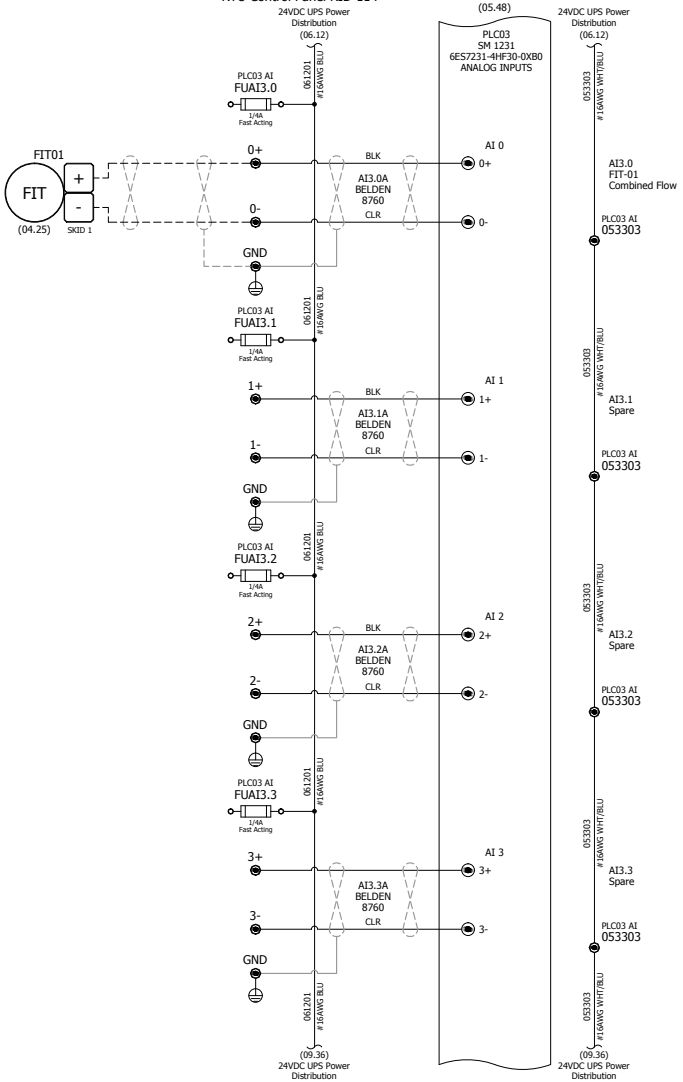
Sheet Description:

Roosevelt Irrigation District Water Remediation Well #114 RTU Control Panel RID-114
S7-1200 SM 1231 Module PLC02 - 8 Pt. Analog Input

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-114
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 08 OF 14

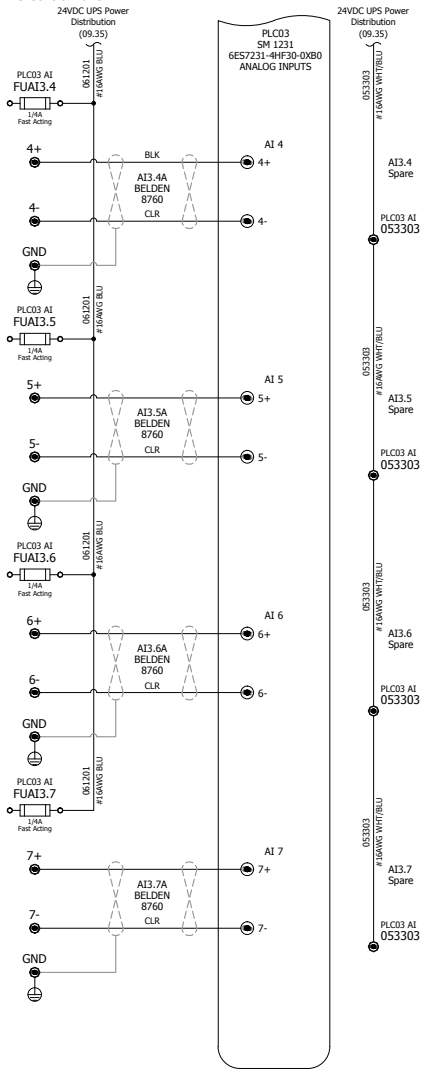
S7-1200 SM 1231 Module PLC03 - 8 Pt. Analog Input

RTU Control Panel RID-114



S7-1200 SM 1231 Module PLC03 - 8 Pt. Analog Input

RTU Control Panel RID-114



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1	01/05/12	As-Built	RS	JMM
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A	11/03/11	Issue For Submittal	RS	MAS

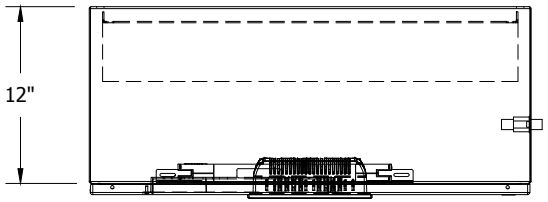
System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

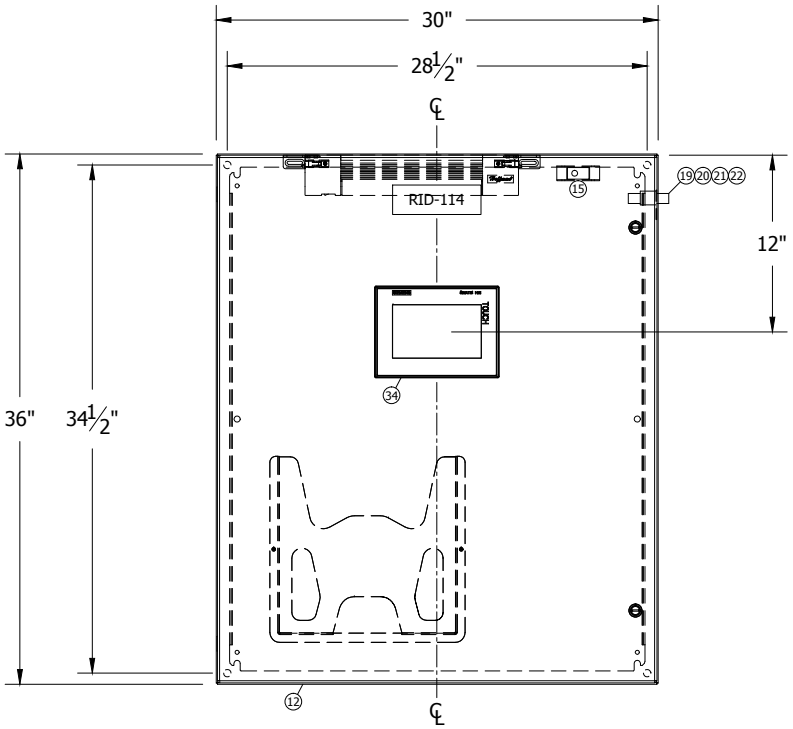
Sheet Description:

Roosevelt Irrigation District Water Remediation Well #114 RTU Control Panel RID-114
S7-1200 SM 1231 Module PLC03 - 8 Pt. Analog Input

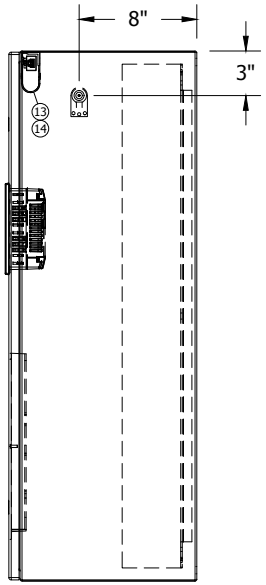
Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-114
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 09 OF 14



Enclosure Top View
RTU Control Panel RID-114



Enclosure Front Elevation
RTU Control Panel RID-114



Enclosure Right Side
RTU Control Panel RID-114

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0	11/08/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

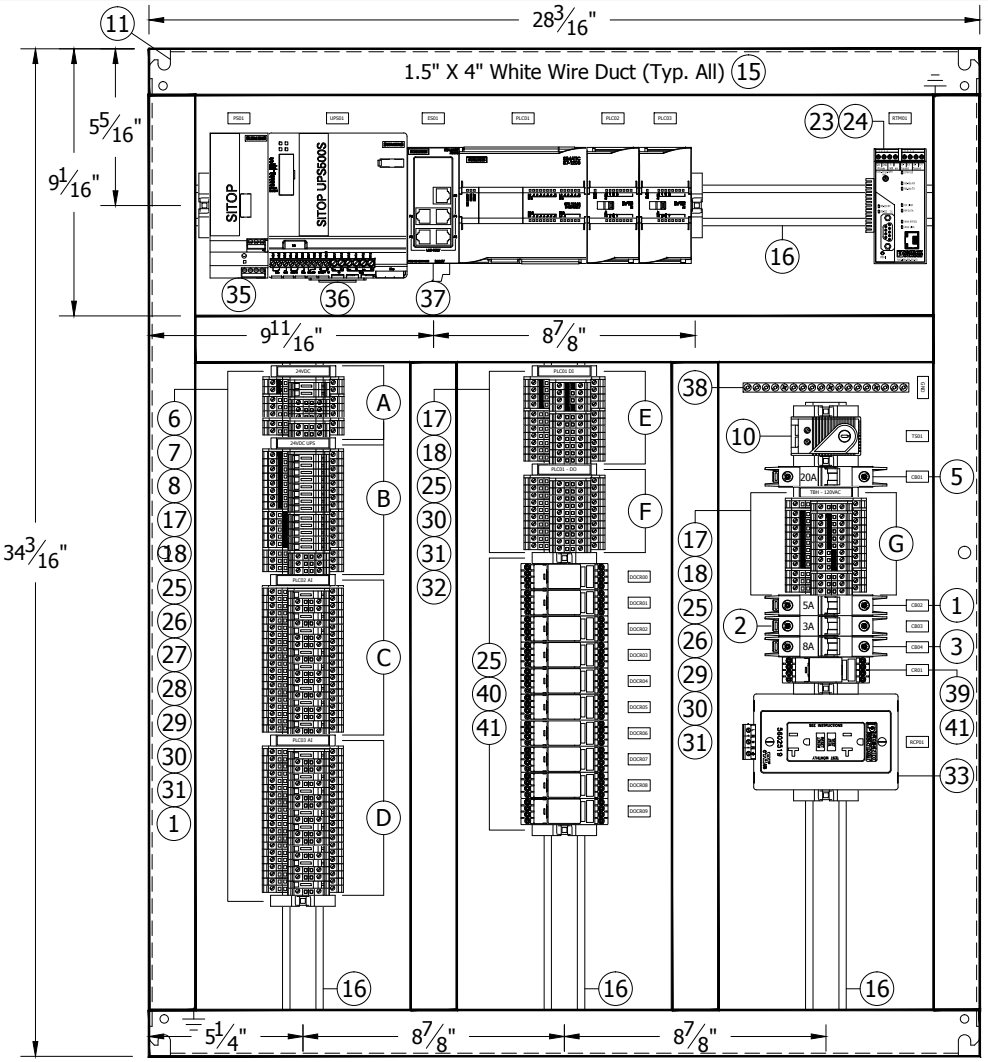
Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #114 RTU Control Panel RID-114
Enclosure Layout

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-114
Rev: 1	**Scale:** 1-1/2" = 1'-0"	**Sheet Size:** B	**Sheet Number:** 10 OF 14

WELL #114 RTU CONTROL PANEL RID-114 - BILL OF MATERIAL

Item	Qty.	Part Number	Description	Manufacturer
1	2	GGA5	Fuse, Time Delay, 5mmx20mm, Glass Tube, 125V, 5A	Ferraz Shawmut
2	1	WMZT1C03	Circuit breaker, UL489, 1 Pole, Trip Curve C, 3A	Eaton
3	1	WMZT1C05	Circuit breaker, UL489, 1 Pole, Trip Curve C, 5A	Eaton
4	1	WMZT1C08	Circuit breaker, UL489, 1 Pole, Trip Curve C, 8A	Eaton
5	1	WMZT1C20	Circuit breaker, UL489, 1 Pole, Trip Curve C, 20A	Eaton
6	6	GGA1	Fuse, Time Delay, 5mmx20mm, Glass Tube, 125V, 1A	Ferraz Shawmut
7	16	GGM1/4	Fuse, Fast Acting, 5mmx20mm, Glass Tube, 250V, 1/4A	Ferraz Shawmut
8	4	GGM1	Fuse, Fast Acting, 5mmx20mm, Glass Tube, 250V, 1A	Ferraz Shawmut
9	1	ALFSWD	Door switch assembly for enclosure light, remote mount	Hoffman
10	1	ATEMNO	Temperature Control Switch, 1 NO Contact, 15A Max. Resistive/2A Max. Inductive @ 120VAC, 20mA Min., 30-140°F	Hoffman
11	1	CP3630	Panel, CONCEPT Line, Painted Steel, 34.2" X 28.2", fits 36" X 30" enclosure	Hoffman
12	1	CSD363012	Enclosure, CONCEPT Line, NEMA Type 4/12, Wall Mountable, ANSI 61 Grey, 36" X 30" X 12"	Hoffman
13	1	F6T5	Florescent Light Bulb, for 15" PANELITE Enclosure Light	Hoffman
14	1	LF120V15	PANELITE Line Enclosure Lighting Package, 120VAC 50/60Hz, 0.13A, 15", Manual Switch, Bulb not Included	Hoffman
15	16'	T1-1540W	Wireway Duct & Cover, 1.5" x 4" x 72", White, Rigid PVC	Iboco
16	8'	0801733	NS 35/ 7,5 PERF 2000MM, DIN rail, 35mm, 7mm height, 5 pieces 2 meters each	Phoenix Contact
17	8	1004348	KLM-A, Terminal Strip ID Tag, Fits into End Anchor	Phoenix Contact
18	A/R	1051003	ZB6:UNBEDRUCKT, Zack Terminal Marker Strips, White, Unprinted, 10 Strips of 10 Markers	Phoenix Contact
19	1	2818135	CN-UB/MP, Mounting bracket for radio antenna surge suppressor	Phoenix Contact
20	1	2818850	CN-UB-280DC-BB, Surge suppressor for antenna cable	Phoenix Contact
21	1	2867377	RAD-CAB-RG213-40, Antenna Extension Coaxial Cable, 40ft	Phoenix Contact
22	1	5606614	Yagi Antenna Kit, 10dBi	Phoenix Contact
23	1	2885207	RAD-CON-MCX90-N-SS, Adapter Cable, Pigtail, 120cm	Phoenix Contact
24	1	2900016	RAD-ISM-900-EN-BD, Wireless Radio Transceiver with Ethernet, RS-232, RS-485, 900MHz	Phoenix Contact
25	17	3022218	CLIPFIX 35, End Anchor, Snap-on, for 35mm DIN Rail	Phoenix Contact
26	6	3030271	Cross Connector/Jumper for UT-4 Terminal Blocks, Red, 10 Position	Phoenix Contact
27	31	3036819	P-FU 5X20 LED 24, Fuse plug, 6.3A, 500V, 6.2mm, for 5x20mm glass fuses, black, BFI (12-30V), fits UT 2,5/4/6-TG terminal	Phoenix Contact
28	31	3044720	UTTB 4-TG, Terminal block, two-tier, top tier pluggable, screw connection, 26-10AWG, 6.2mm, grey	Phoenix Contact
29	16	3044759	UTTB 4-PE, Ground terminal block, two-tier, feed-through, screw connection, 26-10AWG, 6.2mm, green/yellow	Phoenix Contact
30	49	3044814	UTTB 4, Terminal block, two-tier, feed-through, screw connection, 26-10AWG, 36A, 800V, 6.2mm, grey	Phoenix Contact
31	14	3047293	D-UT 2,5/4-TWIN, Terminal cover, fits UT 2,5/4-MTD/TWIN terminal block, grey	Phoenix Contact
32	2	3047358	FBS-PV UT, Vertical potential bridge, to connect the upper and lower level of 2-tier terminals	Phoenix Contact
33	1	5602519	EM-DUO-120/20/GFI, Receptacle, Duplex, 20A, GFI, DIN Rail Mount	Phoenix Contact
34	1	6AV2124-0GC01-0AX0	Operator Interface Terminal (OIT), SIMATIC TP700 Comfort Touch Panel, Windows CE 6.0, 7" Display, 12MB Memory	Siemens
35	1	6EP1332-5BA10	Power Supply, SITOP PSU 100C, 24VDC @ 4A	Siemens
36	1	6EP1933-2EC41	DC Uninterruptible Power Supply (UPS), SITOP UPS500S	Siemens
37	1	6GK5005-0BA00-1AB2	Industrial Ethernet Switch, SCALANCE XB005, Unmanaged, 5 X 10/100MBIT/S Twisted Pair RJ45, LED-Diagnosis, IP20, 24VDC	Siemens
38	1	PK15GTA	Ground Distribution Block, 15-Terminals	Square D
39	1	C7-A20X120VAC	Control relay, QRC miniature plug-in, general purpose, 120VAC coil, DPDT, 10A contacts, LED indicator	Turck
40	10	C7-A20X24VDC	Control relay, QRC miniature plug-in, general purpose, 24VDC coil, DPDT, 10A contacts, LED indicator	Turck
41	11	S7-M	Socket for miniature relays C7 and C80 series, 8-blade, DIN rail mount, 10A, 250V, replaces former socket S7-C	Turck



Backplate Layout
RTU Control Panel RID-114

P110124-RID114-11.dwg

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/08/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

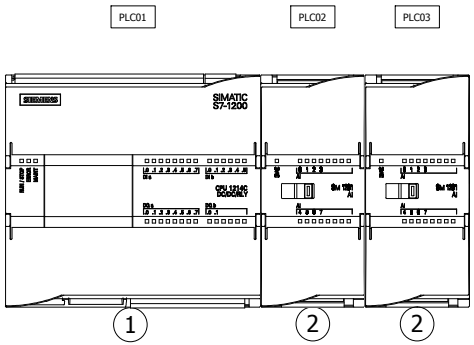
System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #114 RTU Control Panel RID-114
Backplate Layout
Bill of Material

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-114
Rev: 1	**Scale:** 3" = 1'-0"	**Sheet Size:** B	**Sheet Number:** 11 OF 14



◯ WELL #114 RTU CONTROL PANEL RID-114 - PLC RACK - BILL OF MATERIAL				
Item	Qty	Part Number	Description	Manufacturer
1	1	6ES7214-1HE30-0XB0	PLC Processor, SIMATIC S7-1200, CPU 1214C, DC/DC/RLY, 14 DI (24VDC), 10DO (Relay) 2A, 2AI (0-10VDC), Power: DC 24V, 50KB Memory	Siemens
2	2	6ES7231-4HF30-0XB0	Analog Input Module, SIMATIC S7-1200, SM 1231, 8 AI, +/-10V, +/-5V, +/-2.5V, OR 0-20 mA, 12 Bit + Sign or 13 Bit ADC	Siemens

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/08/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

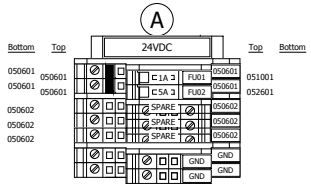
Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #114 RTU Control Panel RID-114
PLC Rack 0 Layout
& Bill of Material

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-114
Rev: 1	**Scale:** 6" = 1'-0"	**Sheet Size:** B	**Sheet Number:** 12 OF 14

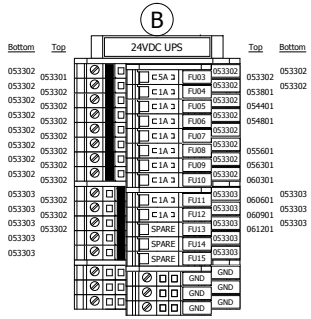
24VDC Power Distribution

RTU Control Panel RID-114



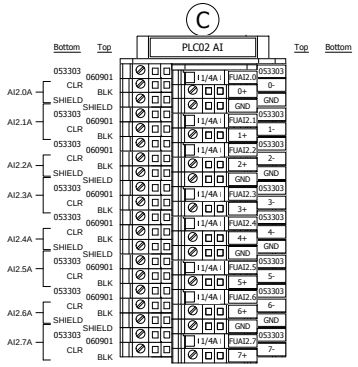
24VDC UPS Power Distribution

RTU Control Panel RID-114



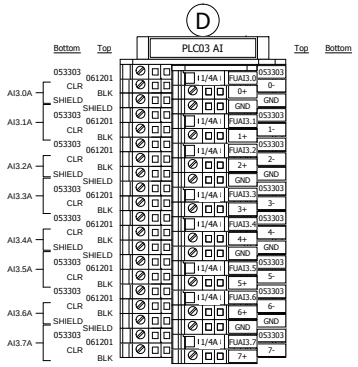
PLC02 - Analog Inputs

RTU Control Panel RID-114



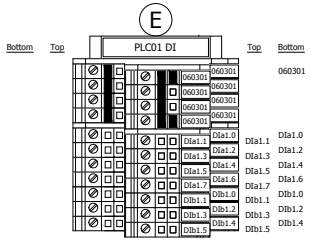
PLC03 - Analog Inputs

RTU Control Panel RID-114



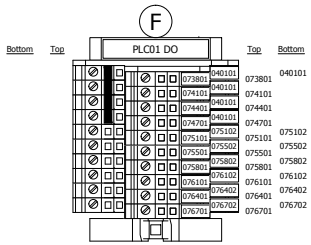
PLC01- 24VDC Discrete Inputs

RTU Control Panel RID-114



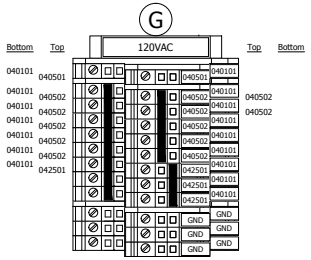
PLC01 - Relay Outputs

RTU Control Panel RID-114



120VAC Power Distribution

RTU Control Panel RID-114



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REV	DATE	DESCRIPTION	ENG	DSN
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0	11/08/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

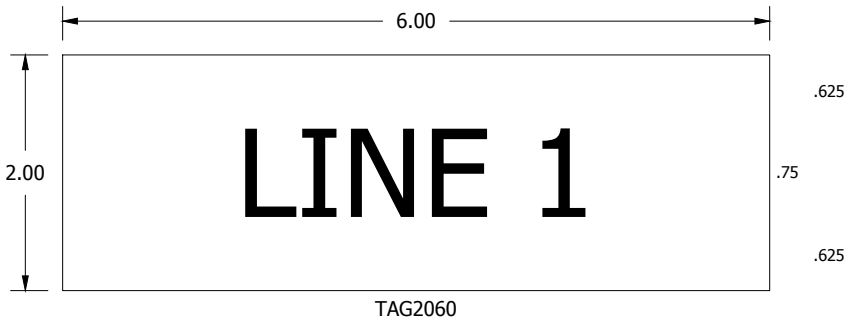
Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #114 RTU Control Panel RID-114
Terminal Strip Layout

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-114
Rev: 1	**Scale:** NTS	**Sheet Size:** B	**Sheet Number:** 13 OF 14

WELL #89 RTU CONTROL PANEL RID-89 - ENGRAVING SCHEDULE						
Tag	Type	Height	Width	Surface	Core	Text Line 1
1	TAG2060	2.0	6.0	White	Black	RID-114
2	TAG038075	0.375	0.75	White	Black	GND
3	TAG038075	0.375	0.75	White	Black	CB01
4	TAG038075	0.375	0.75	White	Black	CB02
5	TAG038075	0.375	0.75	White	Black	CB03
6	TAG038075	0.375	0.75	White	Black	CB04
7	TAG038075	0.375	0.75	White	Black	
8	TAG038075	0.375	0.75	White	Black	
9	TAG038075	0.375	0.75	White	Black	CR01
10	TAG038075	0.375	0.75	White	Black	EL01
11	TAG038075	0.375	0.75	White	Black	RCP01
12	TAG038075	0.375	0.75	White	Black	PS01
13	TAG038075	0.375	0.75	White	Black	OIT01
14	TAG038075	0.375	0.75	White	Black	UPS01
15	TAG038075	0.375	0.75	White	Black	PLC01
16	TAG038075	0.375	0.75	White	Black	PLC02
17	TAG038075	0.375	0.75	White	Black	PLC03
18	TAG038075	0.375	0.75	White	Black	ES01
19	TAG038075	0.375	0.75	White	Black	RTM01
20	TAG038075	0.375	0.75	White	Black	TS01
21	TAG038075	0.375	0.75	White	Black	DOCR00
22	TAG038075	0.375	0.75	White	Black	DOCR01
23	TAG038075	0.375	0.75	White	Black	DOCR02
24	TAG038075	0.375	0.75	White	Black	DOCR03
25	TAG038075	0.375	0.75	White	Black	DOCR04
26	TAG038075	0.375	0.75	White	Black	DOCR05
27	TAG038075	0.375	0.75	White	Black	DOCR06
28	TAG038075	0.375	0.75	White	Black	DOCR07
29	TAG038075	0.375	0.75	White	Black	DOCR08
30	TAG038075	0.375	0.75	White	Black	DOCR09



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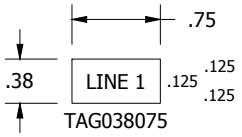

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REV	DATE	DESCRIPTION	ENG	DSN
1	01/05/12	As-Built	RS	JMM
0	11/08/11	Issue For Construction	RS	MAS
A	11/03/11	Issue For Submittal	RS	MAS

System Designed For:

Spinnaker Holdings, LLC
150 Pecan St.
Denison, TX 75020-2700

Sheet Description:

Roosevelt Irrigation District Water Remediation
Well #114 RTU Control Panel RID-114
Engraving Schedule

Engineer: R. Smith		**Client Job ID:** DW100340	**Vertech Job ID:** P110124
Designer: M. Szymanski		**Creation Date:** 10/12/2011	**Drawing Set:** RID-114
Rev: 1	**Scale:** 1'-0" = 1'-0"	**Sheet Size:** B	**Sheet Number:** 14 OF 14

SYNERGY ENVIRONMENTAL, LLC

APPENDIX E

Siemens Operation & Maintenance Manual

OPERATION & MAINTENANCE MANUAL

FOR

HP1220
GRANULAR ACTIVATED CARBON
ADSORPTION SYSTEM

SIEMENS

Spinnaker Holdings
Roosevelt Irrigation District
Well Site 95
Phoenix, AZ

BY

Siemens Industry Inc.

December 2011

Water Technologies

HP® Series Liquid Phase Adsorption Systems (ASME code)

SIEMENS

APPLICATIONS

The HP® Series Adsorption Systems are designed to remove dissolved organic contaminants from water. These systems are cost effectively used in applications including:

- Groundwater remediation
- Wastewater filtration
- Tank rinse water treatment
- Pilot testing
- Underground storage tank clean up
- Leachate treatment
- Dechlorination
- Spill cleanup
- Food grade
- Drinking water

INSTALLATION, STARTUP AND OPERATION

The HP® 810, HP® 1020 and HP® 1220 systems are shipped as separate components—two adsorbers and a piping skid module. The piping module allows the adsorbers to operate in series or parallel configurations. The systems require minimal field assembly and site connections.

Siemens can provide a total service package that includes utilizing OSHA trained personnel providing on-site carbon changeouts, packaging and transportation of spent carbon for recycling at our RCRA permitted reactivation facilities, where the contaminants are thermally destroyed.

We can provide instructions on sampling the spent carbon and completion of our spent carbon profile form. Spent carbon acceptance testing can be performed at our certified laboratory.

When requested, a certificate of reactivation will be issued.

BENEFITS AND DESIGN FEATURES:

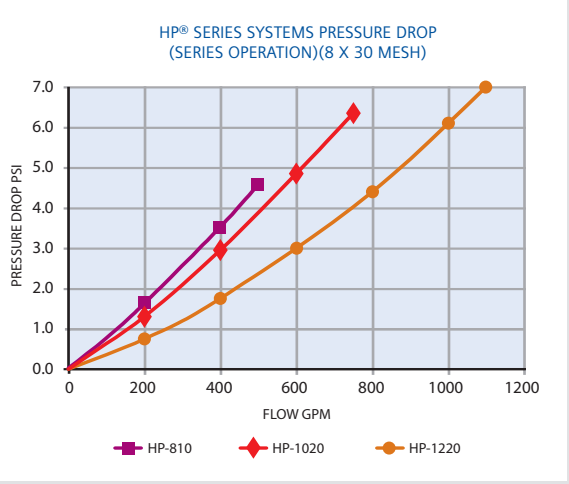
- ASME code section VIII (stamped), carbon steel vessel.
- SSPC-SP5 surface preparation, NSF 6-approved Plasite vinyl ester lining; rust preventative epoxy/urethane exterior.
- Uniform, continuous internal lining flange to flange (HP® 1020/1220 Systems).
- Proprietary vertical 316 stainless steel externally removable septa nozzles (HP® 1020/1220 Systems) allows maintenance of underdrain without vessel entry.
- Modular design for easy handling and installation.
- Internal spray nozzle ensures complete removal of all spent carbon.
- Schedule 40 carbon steel pipe, supplied with cast iron gear/wheel operated butterfly valves with EPDM seats.
- Carbon slurry piping made from schedule 10 304 stainless steel.
- In-bed water sample collection ports —25-50-75% bed depths.
- Top and side manway allows for easy internal inspection.

SPECIFICATIONS/TYPICAL PROPERTIES			
	HP® 810SYS	**HP® 1020SYS**	**HP® 1220SYS**
Dimensions (each adsorber)	96″ x 84″	120″ x 96″	144″ x 60″
Overall Height	15′ 5″	17′ 10″	15′ 4″
System Length	22′ 8″	22′ 2″	27′ 10″
System Width	10′	12′	13′ 8″
Process Piping	6″	8″	8″
Flanged Inlet/Outlet (150# ANSI)	6″	8″	8″
Carbon Fill/Discharge	4″	4″	4″
Flanged Backwash/Vent	6″	8″	8″
Manway (dia., side shell location)	20″	20″	20″
Manway (top)	14″ x 18″	14″ x 18″	14″ x 18″
Utility Water/Air (hose connection)1	2″	2″	2″
Interior Coating	Vinyl Ester	Vinyl Ester	Vinyl Ester
Exterior Coating	Urethane	Urethane	Urethane
Empty Vessel Weight (lbs.)	15,500	38,500	45,000
Carbon Weight/Vessel (lbs.)	10,000	20,000	20,000
Operating Weight (lbs.)	85,000	170,000	185,000
Design Pressure (PSIG) @ 150°F	125	125	125
Max. Flow (GPM) Series/Parallel	500/1,000	750/1,500	1,100/2,200
Backwash Rate (GPM) (8 x 30 mesh @ 55°F)	450	710	1,000

(1) Kamlock type
For detailed specifications or dimensional information or drawings, contact your local Siemens sales representative.

Safety Note: Wet activated carbon readily adsorbs atmospheric oxygen. Dangerously low oxygen levels may exist in closed vessels or poorly ventilated storage areas. Workers should follow all applicable state and federal safety guidelines for entering oxygen depleted areas.

Siemens makes no warranties as to completeness of information. Users are responsible for evaluating individual product suitability for specific applications. Siemens assumes no liability whatsoever for any special, indirect or consequential damages arising from the sale, resale or misuse of its products. All information presented herein is believed reliable and in accordance with accepted engineering practice.



Siemens
Water Technologies

Environmental Services
2430 Rose Place
Roseville, MN 55113
800.525.0658 phone

information.water@siemens.com
WS-HP-DS-1206

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

1.0 INTRODUCTION

This manual covers a general description of the equipment and operating procedures for a HP1220 High Pressure Carbon Adsorption Systems. The Carbon Systems are designed to provide many years of trouble free service. To achieve this, the Carbon System equipment must be properly handled and installed to obtain the desired results. Failure to do so can cause premature equipment malfunctions and/or undesirable System performance.

Siemens Industry Inc. shall deliver the Carbon System equipment and install the ACNS activated carbon. Unknown situations or conditions not covered in this manual are the responsibility of the Purchaser.

Section 1.4 provides helpful information for the receiving, unloading, handling and installation of the Carbon System equipment.

1.1 GLOSSARY

Adsorber - A vessel designed to hold activated carbon.

Backwash - Performed prior to placing system on-line to cleanse the carbon bed of fines entrapped air and stratify bed depth. Also used during normal operations to remove particulate build up.

Backflush - Performed during normal operations to remove entrapped air from the carbon bed.

Bulk Transport Trailer - Hopper type trailer used to transport carbon, slurry in fresh carbon, and remove spent carbon from adsorbers.

Carbon Rinse - Plant water used to rinse from the interior surface of the adsorber during carbon change-out.

GAC - Granular Activated Carbon.

Heel - Any spent carbon not removed from an adsorber before adding fresh carbon.

Lead Adsorber - The first bed of carbon through which a process or a waste stream is passed. (Also called Primary Adsorber.)

Polishing Adsorber - The second or last bed of carbon through which a process or a waste stream is passed. (Also called Secondary Adsorber.)

Pneumatic Port – The air and water connection for service and wash-down of vessel.

Pressure Port - The air and water connection for service and wash-down of vessel.

Rupture Disk - A relief disk to prevent over pressurization of a vessel.

Reactivated Carbon - Previously used carbon that has been thermally reactivated.

Spent Carbon - Carbon that has adsorbed the maximum amount of organic material.

Underdrain - Device designed to permit an evenly distributed flow of water but retain carbon in vessel.

Utility Port - The air and water connection for service and wash-down of vessel.

Vent - A line from each adsorber with automatic vacuum/air release valve (APCO).

Water Cushion - The water added to an adsorber before charging it with carbon to protect under drain and lining.

1.2 IMPORTANT MESSAGES AND WARNINGS

This Manual should be in the possession of the personnel who operate and maintain the Carbon System. The purpose of this manual is for instruction and to advise operators and maintenance personnel. This manual will remain a valuable resource for the safe, economical, efficient operation and maintenance of the Carbon System.

Failure to properly follow instructions, failure to take notice of warnings, and failure to take proper precautions and preventive measures may be dangerous and could cause serious injury, equipment damage, and environmental problems.

Mechanical modifications or substitutions of parts on equipment that may affect structural or operational safety shall not be made without prior manufacturer's approval or engineer's advice. Modifications other than those approved may defeat protective features originally designed into the equipment and its controls; and therefore, shall not be made.

Unauthorized personnel should be kept away from this equipment at all times. Only qualified personnel who have been properly instructed in this equipment's proper operation and maintenance requirements and in its potential hazards shall be allowed to operate and maintain it.

IMPORTANT

Siemens Industry Inc. makes no warranty of any kind with regard to the material contained in this manual, including, but not limited to, implied warranties or fitness for a particular purpose. Siemens Industry Inc. shall not be liable for errors contained herein or for incidental or consequential damages in connection with the performance or use of this material.

This manual contains certain proprietary criteria, ideas and designs as an instrument or professional service and shall not be reprinted in whole or in part without expressed written authorization from Siemens Industry Inc..

1.3 RECEIVING

Immediately upon receipt and prior to removal from the truck trailer, railcar or shipping container, inspect the Carbon System equipment for damage. Claiming any damage that may have occurred in transit should be filed promptly with the delivering carrier. The unloading operation should be delayed until the carrier's representative has completed his inspection of the damaged equipment, otherwise a damage claim may not be honored. The inspection should include as a minimum:

1. External surface damage.
2. Damage such as broken nozzles, valves, pipes, underdrain, etc.
3. Equipment damage at contact points.
4. Unpacking and inspection of all packaged equipment and accessories.
5. Internal lining.

1.4 UNLOADING AND HANDLING

When unloading and handling the Carbon System equipment, extreme care should be taken as not to damage it.

Regardless of the type of equipment being handled, certain precautionary measures must be implemented such as:

1. Insure the lifting equipment can withstand the total intended load.
2. Always use lifting eyes and brackets.
3. Never position the lifting equipment where damage to the equipment load may occur.
4. When using a forklift, make sure the forks are long enough to extend past the intended load. This prevents accidental punctures on the underside of the equipment crates, boxes and skids that may damage the equipment itself.
5. Use spreader bars.
6. Do not slide, drag or push equipment across surfaces. Always lift to move into position.
7. Do not roll, drop or throw equipment or accessories.
8. Lifting cables and/or straps must not be attached to, or permitted to come in contact with nozzles, flanges, gussets, pipes, shafts, painted surfaces, or any other accessory that may be damaged by contact.
9. When equipment is being lifted, proper rigging practices should be observed and a guide- line should be attached to prevent impact damage caused by swinging into contact with other object.
10. Never set on or roll over an equipment fitting and never use a fitting as a lifting point.
11. Prevent tools, hooks, etc. from striking the Carbon System equipment.

1.5 ASSEMBLY INSTRUCTIONS

The Carbon System has been shipped pre-assembled to the greatest extent possible. The attached drawing shows the system after assembly. The piping module skid and vessel skids have drilled holes for placement and mounting. The site foundation should be level, but most importantly flat. Check to see if any bolts that may have come loose during shipment, if so, tighten them. The internal nozzles have been shipped installed. Be sure to use proper flange tightening procedures when assembling the piping.

Each Carbon System should be assembled in the following order:

1. Mark the foundation with guide-lines in order to place the vessels in a straight line.
2. Locate the vessels spaced as shown on drawing.
3. Place the piping module appropriately between the face piping connections.
4. If alignment is off, make sure the vessels and piping module are level and in the correct positions. Some shimming of the vessels and piping module may be required.
5. Bolt Tank A to the piping module (bolt loosely until system is fully assembled).
6. Bolt Tank B to the piping module (bolt loosely until system is fully assembled).
7. If alignment is acceptable, tighten all the bolts.
8. Secure the vessels and piping module to the foundation.
9. Assembly is complete.

2.0 EQUIPMENT DESCRIPTION

2.1 GENERAL DESCRIPTION

Well site 95 includes (2) HP1220 System. Each HP1220 Carbon System consists of (2) two carbon adsorber vessels, face piping, and piping module with support skid. Each piping module comes complete with influent, effluent, backwash, air vent line, carbon fill, carbon removal, compressed air, and sampling connections.

The carbon steel adsorbers are vertical cylindrical pressure vessels with elliptical tops and bottoms manufactured for a maximum operating pressure of 125 PSIG. The adsorbers are designed for down flow operation with a specially designed underdrain collection system to maximize the utilization of carbon as well as allow for efficient and rapid removal of the spent carbon. Three sample valves are used for sampling treated water at various levels through the adsorber.

The adsorbers are designed with sufficient free board volume to allow for full fluidization during back washing of the carbon bed during start up and in the event an unacceptable pressure drop develops across the bed due to any filterable solids entering the vessels.

The process and utility piping to operate the system are mounted on the adsorbers and piping module. The piping options include valving to operate the adsorbers in parallel or series (lead/lag) flow configuration. Each adsorber has its own carbon fill, discharge and vent lines. The process piping is equipped with pressure gauges and sample ports at the inlet and outlet of each adsorber. Compressed air connections are provided for use during carbon transfer.

2.2 PROCESS DESCRIPTION

Each Carbon System is designed to remove dissolved organic compounds from contaminated feed water using granular activated carbon. The feed water to be treated will be pumped by the client at a controlled rate through the adsorbers in a series or parallel configuration.

Each adsorber shall contain 20,000 lbs. of granular activated carbon, which will provide sufficient contact time at the design flow rate to remove the organics in the feed water.

Feed water enters the adsorber from the top and flows down through the carbon bed. The treated water is collected in the underdrain system and discharged through the effluent piping.

When the System is piped in the series configuration, and the lead adsorber becomes saturated (exhausted) it's taken off-line for replacement of the spent carbon. The feed water is directed to the second adsorber, allowing the system to remain in service. The lead adsorber is then pressurized up to 30 psig with air. With the addition of utility water, the spent carbon is pneumatically displaced as slurry to a bulk transport trailer. The dewatered spent carbon is reactivated.

To refill the adsorber with fresh carbon, the carbon in the trailer is slurried, using clean water, pressurized up to 15 psig and then transferred to the empty adsorber.

Once the fresh carbon is placed in the vessel, it must be soaked and backwashed before the appropriate valves will be opened, placing the vessel with the fresh carbon in the secondary position, if operated in series configuration.

2.3 DESIGN AND OPERATING CONDITIONS

EACH VESSEL:

Vessel Diameter	144”
Side Shell Height	60”
Overall Height (Approx.)	…15’10”
Working Pressure	125 psi @ 150 °F
Manway:	
Flanged at side shell	… .20”
Elliptical type at head	...14” x 18”
Vessel Volume	7520 gal.
Vessel Carbon Capacity	20,000 lbs.
Carbon Bed Volume-Typical	678 Ft^3
Maximum Flow Rate Typical	1000 GPM
Design Criteria	ASME
Code Stamping	YES
Material	Carbon Steel
Supports	Wide Flange Legs
Lifting	Lifting Lugs
Seismic	CBC 2007
Interior Surface Prep	SSPC-SP5
Interior Surface Coating	Plasite 4110 35 mil dft min
Exterior Surface Primer	Epoxy 4 mil min dft
Exterior Surface Coating	Urethane 3mil min dft
Standard Color	Carboline #9225-Cashew

UNDERDRAINS:

External ring header	Carbon Steel
Septa Screens	8 ea-316L Stainless Steel V-Wire Screens 4 ½” Dia x 10”

VALVE ASSEMBLY AND PIPING:

Piping:	
Process Piping	8” Schedule 40 Carbon Steel
GAC Transfer Piping	4” Sch 10 304L Stainless Steel
Valves:	
Process	8” Butterfly, Cast Iron Body w/SS Disk, Gear Operator
GAC Transfer	4” Fanged 316 Stainless Steel Full Port Ball Valve
Vent/Wash	2” Bronze Ball Valve
Sample Ports (3)	1/2” Bronze Ball Valve

SYSTEM WEIGHT:

System Shipping weight	45,000 lb
System Carbon Weight	20,000 lb
System Operating Weight	185,000 lb

2.4 GENERAL PROCESS COMMENTS

OPERATIONAL CHANGES

Optimum operation of the system is obtained if changes to the system occur slowly. Rapid changes in flow will cause upsets to the adsorbers, which could adversely affect the operation. Valves should be turned slowly at all times to prevent hydraulic shock.

3.0 START-UP

3.1 SAFETY

Any piece of equipment can be dangerous if operated improperly. Safety is ultimately the responsibility of those operating and maintaining the equipment. All personnel operating and maintaining the Carbon System and its proper implementation must be familiar with all of the Carbon System components, and observe all OSHA, federal, state and local safety codes and requirements. The personnel should also be active participants in an approved plant-wide health and safety program.

Failure to properly follow instructions and failure to take proper safety precautions is dangerous and can cause serious personal injury, needless equipment damage, and unnecessary environmental harm. Mechanical modifications and/or substitutions of parts on equipment that will affect structural, operational, or environmental safety should not be made. Modifications may defeat protective features originally designed into the equipment and control; and therefore, should not be made.

The following is a partial list of precautions to follow but in no case is the list exhaustive nor is it intended to be. Operators and maintenance personnel should expand on this list after first reviewing the entire Carbon System and its operation with the appropriate health and safety authorities.

- Keep areas clean. A clean work area is a much safer area.
- Keep all equipment guards in place. If removed to service the equipment, make sure the guards are replaced properly.
- Wear eye and face protection around rotating and pumping equipment and whenever working around or handling chemicals. Be especially cautions for splash when disconnecting piping, valves and fittings.
- Wear ear protection if necessary.
- Wear proper apparel. Do not wear loose clothing, or jewelry, which could be caught in machinery.
- Wear a proper respirator around chemicals and in areas where vapors and/or gases may be present.
- Non-skid footwear is recommended and always wear protective gloves when feasible.
- Remove adjusting screws or wrenches. Form a habit of checking to see that all tools are removed from equipment.
- Make sure all personnel are familiar with OSHA approved Material Safety Data

Sheets for all hazardous materials they may come in contact with.

STAY ALERT

WATCH WHAT YOU ARE DOING

USE COMMON SENSE

DO NOT PERFORM OPERATION OR MAINTENANCE FUNCTIONS WHEN YOU ARE TIRED OR GROGGY

DO NOT ATTEMPT TO SERVICE OR OPERATE MACHINERY YOU ARE NOT FULLY FAMILIAR WITH

DO NOT TAKE CHANCES

ASK FOR ASSISTANCE IF IN DOUBT

DO NOT TRY TO DO IT ALONE

THINK BEFORE YOU ACT AND BE CAREFUL

3.2 OXYGEN DEMAND CREATED BY ACTIVATED CARBON IN CONFINED VESSELS

Research efforts have confirmed that wet granular activated carbon confined in large vessels creates an oxygen demand, which is hazardous to human health and can cause death unless proper safety precautions are observed.

Studies conducted have shown that low oxygen content exists in vessels containing wet carbon. Laboratory experiments conducted since that time also have revealed that commercial activated carbons in a wet or moist condition will lower the oxygen content of an isolated space. Preliminary indications of this research are:

1. The phenomenon occurs with wet activated carbon of all common types.

2. The rate of oxygen uptake naturally varies with the degree of exposure of the wet carbon to the air. Thus, it is relatively rapid in a drained bed.

3. There is some indication of a limit to carbon's capacity for oxygen, but until more is known, it would be prudent to assume that all carbon (fresh, used, reactivated) will also exhibit this characteristic. Similarly, although these tests were run with water, it should be assumed that the phenomenon will occur in other liquid and vapor systems.

NOTE:

ALL CONFINED SPACES, INCLUDING THOSE CONTAINING ACTIVATED CARBON, SHOULD BE PRESUMED TO BE HAZARDOUS. APPROPRIATE SAFETY MEASURES SHOULD ALWAYS BE TAKEN BEFORE ENTERING, AS WELL AS WHEN WORKERS ARE IN A CONFINED SPACE. OSHA REGULATIONS APPLICABLE TO RESPIRATORY PROTECTION IN OXYGEN-DEFICIENT ATMOSPHERES SHOULD BE STRICTLY FOLLOWED.

3.3 DISINFECTING THE ADSORBERS PRIOR TO FILLING WITH ACTIVATED CARBON

For drinking water applications the adsorbers must be disinfected prior to filling the adsorbers with activated carbon. Refer to section 8 for equipment disinfection procedure.

3.4 FILLING THE ADSORBERS

BULK BAGS

When filling the adsorbers with Bulk Bags the following steps are to be followed:

1. Remove the manway cover in adsorber head (top).
2. Open Vent Valve.
3. Make certain all remaining valves are closed.
4. Fill each adsorber to approximately half capacity with water.
5. Carefully empty the bulk bags into the adsorbers. After emptying eight bags of carbon, check the water level. If carbon is above the water level, add more water as necessary. Carbon should always be placed into the adsorber with a water cushion.
6. After all carbon has been loaded, fill the vessel with water and reinstall the manway cover.
7. With the carbon bed totally covered with water, let carbon bed soak approximately 24 hours to totally dissipate air from the carbon **with vent line open**.

SLURRY

Carbon is transferred into the vessels from a bulk pneumatic trailer as slurry through the carbon slurry inlet transfer lines on the vessels. The vessels must have a water cushion before carbon is transferred. The trailer must be filled with water prior to beginning the transfer sequence. The bulk pneumatic trailer is then pressurized to 15 psig. Slowly fully open the appropriate carbon slurry inlet line. While transferring the carbon, the vent lines shall be fully open. All other valves should be in the closed position. The carbon must be soaked for approximately 24 hours **with the vent line open** to totally dissipate air from the carbon bed.

3.5 INITIAL BACKWASH

The adsorbers should be backwashed after soaking and prior to being placed in service, to remove carbon fines, entrapped air and to fully stratify the carbon bed. To backwash the adsorption tank, the procedure is described below.

The Purchaser is responsible for performing the initial backwash and providing an ample water supply. The water should be **clean** water (free of solids and organics) and the flow rate should be high enough to achieve approximately 25% bed expansion. The backwash flow rate is dependent upon carbon type, mesh size and water temperature. Siemens Industry Inc. ACNS granular activated carbon will be used in this application. Backwash rates can range from 1000-1100 GPM typical depending upon the temperature of the backwash water. Refer to the ACNS Carbon Data Sheet in Section 8.0 for proper backwash rates.

EACH ADSORBER SHOULD BE BACKWASHED SEPARATELY. (Refer to HP1220 SYSTEM FLOW DIAGRAM on page 15 and 3-TIER MANIFOLD VALVE SEQUENCE CHART on page 16 of this manual).

At the start of backwash all valves in the adsorption system are closed. To initiate backwash, refur to the valve chart. Open the valves in the sequence the water flows.

1. Engage backwash water supply.

2. Final open the backwash discharge valve to adjust backwash flow rate. Backwash ACNS activated carbon up flow at about 1100 gpm for approximately 10-15 minutes or until the water leaving the vessel is clear of carbon fines. (Flow rate may vary depending on water temperature. Refer to Data Sheet on ACNS in Section 8 of this manual).

3. Slowly close all valve in reverse order

Repete the process for each vessel with fresh carbon.

4. The system is now ready to be put on-line.

NOTE: PROVISIONS SHOULD BE MADE TO PROPERLY DISPOSE OF THE BACKWASH WATER.

3.6 PLACING THE SYSTEM IN OPERATION

Refer to HP1220 SYSTEM FLOW DIAGRAM on page 15 and 3-TIER MANIFOLD VALVE SEQUENCE CHART on page 16 of this manual.

START-UP PROCEDURE FOR SYSTEM OPERATION IN PARALLEL

Initially, all valves in the adsorption system are closed. The feed to the adsorption system is provided by the user's feed pump. The pump must be started and brought up to approximately ½ of the operating flow rate prior to placing the lead carbon adsorber in operation. When this has been accomplished, the pump discharge valve is slowly opened. The pump is then brought up to full flow. The second adsorber is then placed into operation so that the valves are configured for parallel operation. For normal operation through the adsorbers, the valve sequencing is as follows:

With feed pump connected to influent line and all valves closed bring the pump up to 50% flow:

Use the valves sequence chart and open valves slowly. Sequence valves as the water flows. First on vessel then the system mate..

1. Air will vent from the first adsorber through the vent valve.

2. Once a vessel is full of water, slowly continue.

3. Slowly bring the feed pump up to 100% flow.

4. Air within the adsorber should vent through the Vent Valve on the second vessel.

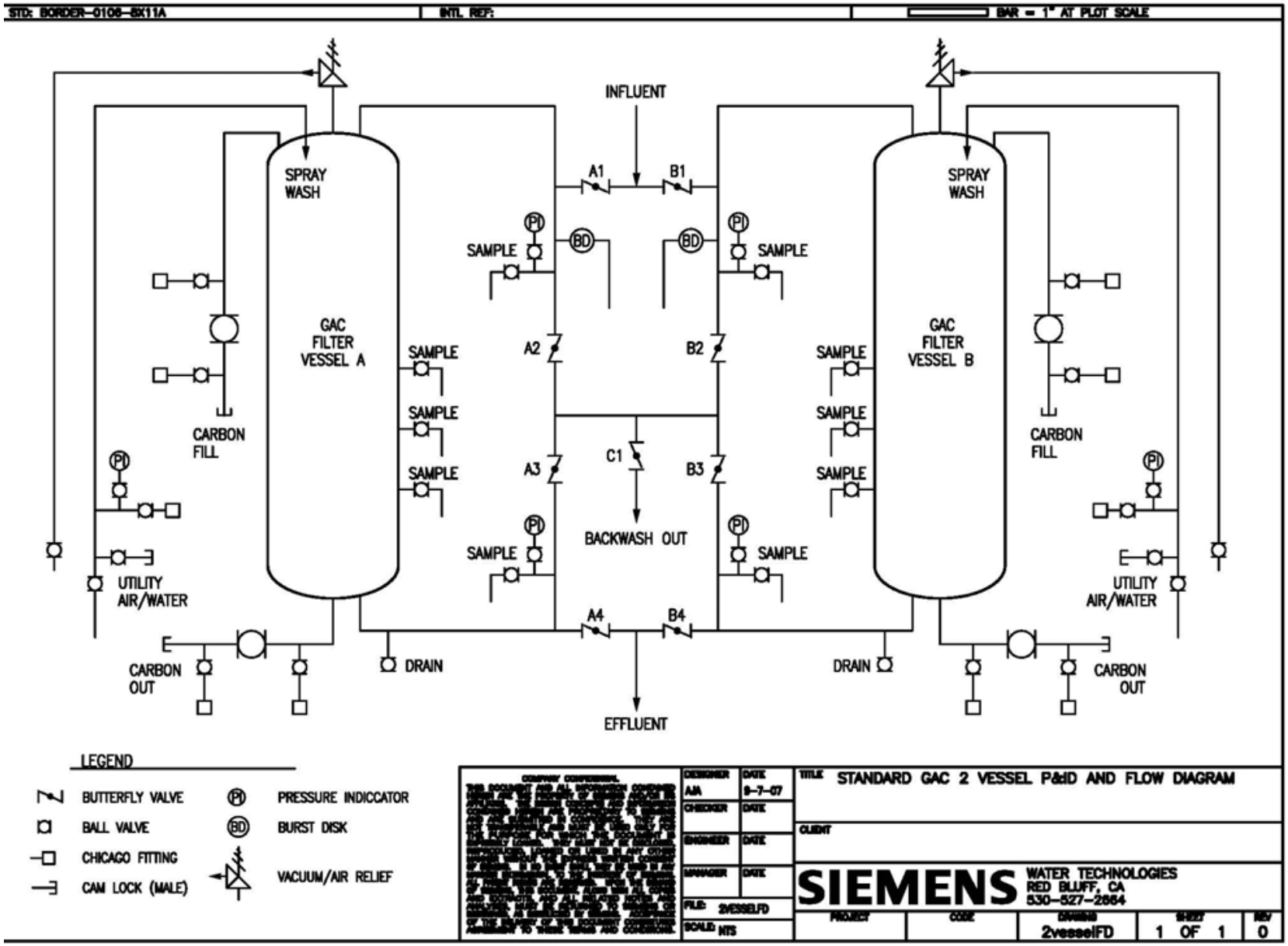
5. Once the vessel is full of water, slowly open valves to direct flow.

START-UP PROCEDURE FOR SYSTEM OPERATION IN SERIES

The same procedure is performed for starting up the system for series operation except that the pump can be ramped up to 100% flow when placing the first adsorber online and the valves are configured for series operation per the **3-TIER MANIFOLD VALVE SEQUENCE CHART on page 16 of this manual.**

Normal operation requires no further changes until breakthrough occurs. When this happens, call **Siemens Industry Inc.** Customer Service to schedule a changeout. Refer to Section 6.4 for contact and phone number.

When particulate builds up on the carbon it becomes necessary to backwash the units. Refer to Section 3.7 for Backwash Procedure.


STD: BORDER-0108-8X11A
INTL REF:
BAR = 1" AT PLOT SCALE
INFLUENT
SPRAY WASH
SPRAY WASH
A1
B1
SAMPLE
SAMPLE
BD
BD
GAC FILTER VESSEL A
GAC FILTER VESSEL B
SAMPLE
SAMPLE
SAMPLE
SAMPLE
SAMPLE
SAMPLE
A2
B2
A3
C1
B3
CARBON FILL
CARBON FILL
UTILITY AIR/WATER
UTILITY AIR/WATER
SAMPLE
SAMPLE
BACKWASH OUT
A4
B4
DRAIN
DRAIN
CARBON OUT
CARBON OUT
EFFLUENT
LEGEND
BUTTERFLY VALVE
BALL VALVE
CHICAGO FITTING
CAM LOCK (MALE)
PRESSURE INDICCATOR
BURST DISK
VACUUM/AIR RELIEF
COMPANY CONFIDENTIAL
DESIGNER AJA DATE 9-7-07
CHECKER DATE
ENGINEER DATE
MANAGER DATE
FILE: 2VESSELFD
SCALE: NTS
TITLE STANDARD GAC 2 VESSEL P&ID AND FLOW DIAGRAM
CLIENT
SIEMENS
WATER TECHNOLOGIES
RED BLUFF, CA
530-527-2664
PROJECT
CODE
DRAWING 2vesselFD
SHEET 1 OF 1
REV 0

3-TIER SYSTEM MANIFOLD

VALVE SEQUENCE CHART

VALVE SEQUENCE CHART: 3-TIER SYSTEM MANIFOLD	O – OPEN			X – CLOSED					
OPERATION	VALVE NUMBER								
	A1	A2	A3	A4	B1	B2	B3	B4	C1
SERVICE: SERIES 'A' TO 'B'	O	X	O	X	X	O	X	O	X
SERVICE: SERIES 'B' TO 'A'	X	O	X	O	O	X	O	X	X
SERVICE: 'A' ONLY	O	X	X	O	X	X	X	X	X
SERVICE: 'B' ONLY	X	X	X	X	O	X	X	O	X
SERVICE: PARALLEL 'A' AND 'B'	O	X	X	O	O	X	X	O	X
BACKWASH: 'A' ONLY	X	O	X	O	X	X	X	X	O
BACKWASH: 'B' ONLY	X	X	X	X	X	O	X	O	O
BACKWASH 'A' FROM SERVICE 'B' [1]	X	O	X	O	O	X	X	O	O
BACKWASH 'B' FROM SERVICE 'A' [1]	O	X	X	O	X	O	X	O	O
BACKWASH: PARALLEL 'A' AND 'B'	X	O	X	O	X	O	X	O	O

[1] REQUIRES VALVE BY OTHERS ON EFFLUENT WATER PIPE TO BE CLOSED.

3.7 BACKWASH

If the pressure drop across an adsorber becomes too high (doubling clean bed pressure drop), backwashing may be necessary. Generally, the cause of high-pressure drop is solids depositing in the carbon bed. This can not only lead to high pressure drop, but can cause channeling in the carbon bed and lead to premature breakthrough of organic contaminants.

It is the Purchaser's responsibility to backwash an adsorber and to provide ample water for backwashing. The water should be **clean** water (free of solids and organics) and the flow rate should be high enough to achieve approximately 25% bed expansion.

Backwashing with water containing solids is highly discouraged. If the solids are smaller than the slot opening size of the septa, they will be introduced into the carbon bed via the underdrain septa screens. If the solids are larger than the slot opening size of the septa, then there is a strong possibility that these solids may become trapped in the septa slots resulting in lugging. Plugging of the septa slots will decrease the open area for flow resulting in a high pressure drop. These solids may become so tightly wedged in the septa openings that the only remedy for their removal is to remove the septa screens and either clean them or replace them.

Backwashing with water containing organics is also highly discouraged. Normal operation for organic removal is down flow. In down flow operation, the mass transfer zone (volume of carbon in the bed where organics are being removed) moves down through the bed. The volume of carbon above the mass transfer zone is spent and the volume of carbon below the mass transfer zone is available for adsorption. If the bed is backwashed with water containing organics, then organics are adsorbed below the mass transfer zone. When the bed is placed in normal down flow operating mode, those organics will desorb and premature breakthrough may occur.

The backwash flow rate is dependent upon carbon type, mesh size and water temperature. Siemens Industry Inc. ACNS cocnut based granular activated carbon will be used in this application. Backwash rates can range from 1000-1100 gpm depending upon the temperature of the backwash water. Refer to ACNS Carbon Data Sheet attached for backwash rate.

EACH ADSORBER SHOULD BE BACKWASHED SEPARATELY.

1. Isolate the vessel to be backwashed from the process stream.

2. To initiate backwash, follow the valve sequence chart and the backwash procedure in Section 3.5 above.

3. Backwash for 10 - 15 minutes until backwash water is clear. Make sure backwash valves are open for entire cycle.

4. If pressure drop is still unacceptable, repeat backwash or call **Siemens Industry Inc.** Customer Service. Refer to Section 6.4 for contact and phone number.

NOTE: PROVISIONS SHOULD BE MADE TO PROPERLY DISPOSE OF THE BACKWASH WATER.

3.8 SPENT CARBON REMOVAL

When the activated carbon becomes saturated (exhausted), the system it is taken off-line for replacement of the spent carbon. The first adsorber is then pressurized up to 30 psig with 100 cfm air compressor. With the addition of utility water (100 gpm minimum), the spent carbon is pneumatically displaced as slurry to a bulk transport trailer by slowly opening the slurry outlet valve. To remove 20,000 pounds of carbon approximately 5,000 gallons of water is required to keep the spent GAC in slurry to facilitate removal. This will prevent a line clogging. The procedure is repeated for the second adsorber.

To refill the adsorber with fresh carbon see **Section 3.4**.

4.0 TROUBLESHOOTING

The following tables list malfunctions, probable causes, and in most cases, possible corrective action to take for the problem at hand. By no means is this list complete. It is intended only as a guide for the maintenance personnel to help them in properly identifying and isolating equipment malfunctions. If in doubt as to the actual cause of a malfunction, consult the factory or nearest equipment representative for assistance.

ADSORPTION SYSTEM:

MALFUNCTION	**PROBLEM CAUSE**	**CORRECTION ACTION**
High pressure drop across adsorber	Bed not flooded Bed air bound	Check to see that the air release valve is operating. Make sure there is a constant flow before valve closes.
	Feed pump pressure too high	Throttle feed pump
	Improper valving	Check valve sequence (see Valve Sequence Chart in Section 3.6). Check for obstructions in transfer lines.
	Particulate build-up on carbon bed	Backwash per Section 3.7
Leaking flange	Loose bolts	Tighten bolts
Discharge Water From the Backwash/Vent Outlet Line	Broken Rupture Disk	Replace Rupture Disk

MALFUNCTION	**PROBLEM CAUSE**	**CORRECTION ACTION**
Leaking Pressure Relief Valve	Leaking or broken Relief Valve	Check to see is carbon has collected on the valve seat. Replace Relief Valve
Carbon in the effluent	Internal mechanical failure	To confirm, open effluent sample valve. Collect 1 qt. Effluent sample to check for carbon. If the test confirms internal failure, call **Siemens Industry Inc.. Refer to Section 6.4 for contacts and phone number.**
Premature breakthrough	Change of influent concentrations	Confirm by checking influent and effluent samples before changing carbon
	Siphoning air in	Check Air Release/Vacuum Relief Valve for correct operation
	Background TOC Colloids	Change carbon
Sudden high contamination level in effluent	Check heel due to improper carbon change-out	**Call Siemens Industry Inc.. Refer to Section 6.4 for contacts and phone number.**
Frozen lines, broken gauges and valves	Cold weather	Insulate piping and or heat trace process. **Call Siemens Industry Inc.. Refer to Section 6.4 for contacts and phone number.**
System bacteria infections	Disinfect System	See Appendix A – Disinfection Procedures and/or Tech Note 11 – Activated Carbon Disinfection.

5.0 SYSTEM MONITORING

It is responsibility of the Purchaser to monitor the Carbon System during operation. Spent carbon must be properly profiled according to all applicable regulations prior to reactivation.

The following is a suggested format for an operating log. This list is meant as a suggestion only and is by no means complete. Record each day the following items for each individual Carbon System Vessel:

1. Record all equipment maintenance, calibrations, system cleaning, repairing and any parts replacement.

2. Record any unusual occurrences, shutdowns, breakdowns, etc.

3. Record the date and time when each item is logged.

4. Record the pressure drop across the system daily to indicate if any foreign objects have entered the Carbon System.

6.0 GENERAL CARBON SYSTEM INFORMATION

6.1 TEMPORARY SHUTDOWNS:

For shutdown or intermittent operation, the Carbon System should remain completely full of water and the inlet and outlet should be sealed either by a valve or a cap. Prior to restarting the unit, the Carbon System should be backwashed using two to three bed volumes of water. Failure to backwash may result in a temporary presence of contaminated water at the outlet of the adsorber.

6.2 EXTENDED SHUTDOWNS:

If the Carbon System is shutdown for an extended period of time, the following procedure should be followed to reduce potential degradation of bed life.

Backwash the vessels using two - three bed volumes of water. Drain the Carbon System of all water. There should be no free standing water left in the vessel. All valves, manways, and vents shall be tightly sealed for the duration of the shutdown to eliminate any supply of oxygen that would promote biological growth. Prior to re-commissioning the units, follow the start-up instructions included.

6.3 EMERGENCY PROCEDURES

In the event something should occur to cause a shutdown of an adsorber, the operation shall be switched over to the other adsorber and steps shall be taken immediately to remedy the situation.

If a major leak or failure occurs which would cause the Carbon System to be inoperative, then the feed to the system should be shut down immediately. If repairs are beyond the scope of the plant operators, the customer service department at Siemens Industry Inc. should be contacted immediately.

6.4 Siemens Industry Inc. CONTACTS - HOW TO OBTAIN HELP AND INFORMATION

Red Bluff, CA	**530-527-2664**
Gulf Coast Region	**800-659-1723**
Louisiana	**225-744-3153**
Western Region	**800-659-1771**
Mid-Atlantic Region	**800-659-1717**
Midwest Region	**708-345-7290**
Northwest Region	**800-659-1718**
Southeast Region	**225-744-3153**
New England Region	**800-659-1717**

7.0 MAINTENANCE

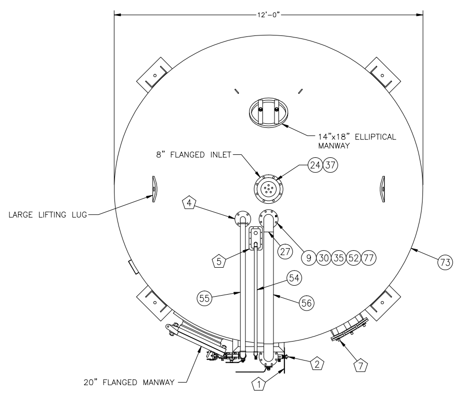
7.1 MINOR MAINTENANCE

Minor maintenance is that maintenance to be performed by the plant to ensure continuous and effective operation. This maintenance includes visual check of pressure gauges, rupture disks, and adjustments to valves and regulators, tightening flanges and connections to eliminate leakage, backwashing, etc. During scheduled change-out services vessel internal parts should be inspected (underdrain screens, vessel lining, nozzles, etc.) to ensure they are in good working condition.

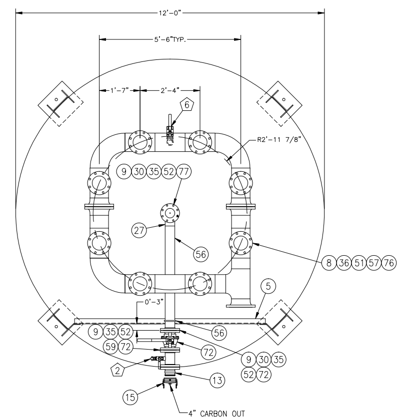
7.2 MAJOR MAINTENANCE

Major maintenance is that effort needed to repair or replace equipment in order to continue system operation. The need for major maintenance would result from a major malfunction causing the system to be inoperative. Major maintenance also refers to system design changes and/or maintenance requiring downtime. Siemens Industry Inc. can be contacted when any major maintenance is called for.

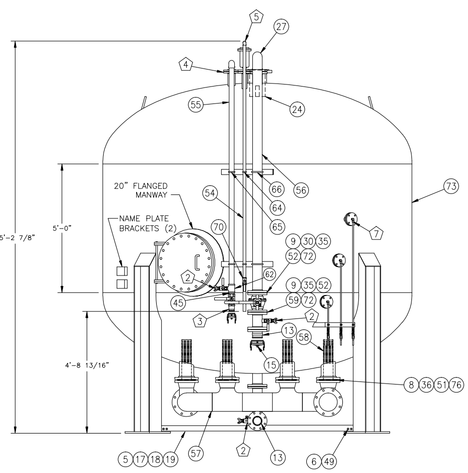
8.0 SPECIFICATION SHEETS



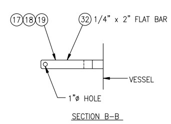
PLAN VIEW



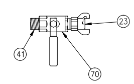
8" RING HEADER



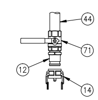
ELEVATION



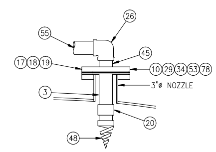
1 LADDER TIE OFF
(1 REQUIRED)



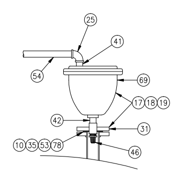
2 1" PNEUMATIC PORT
(3 REQUIRED)



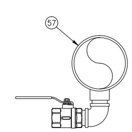
3 2" UTILITY PORT
(1 REQUIRED)



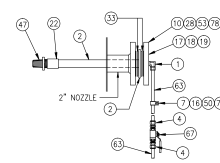
4 2" PVC NOZZLE (180°)
(1 REQUIRED)



5 APCO 143C
(1 REQUIRED)



6 2" DRAIN
(1 REQUIRED)
SEE SUBASSEMBLY DWG



7 SAMPLE PORT
(3 REQUIRED)

SCHEDULED MATERIALS

TAG	DESCRIPTION	QTY	PART NUMBER
1	ADAPTER 90 BRS 1/2IN COMP X 1/2IN MPT 769L	3	ESM3012
2	ADAPTER SAMPLE PORT 304SS	3	ESM2015
3	ADAPTER SPRAY NOZZLE 304 SS	1	ESM2016
4	ADAPTER STR BRS 1/2IN COMP X 1/2IN MPT 768L	6	ESM3011
5	ANGLE 2 1/2IN X 2 1/2IN X 3/8IN A36 CS	7.5	ESA2.5X2.5X3/8
6	BOLT 1/2 IN X 1-1/2 IN HOT DIPPED GALV GRADE A325	4	ESBOLT1/2X1-1/2A
7	BOLT 1/4 IN X 1 IN HOT DIPPED GALV GRADE A325	3	ESBOLT1/4X1A
8	BOLT 3/4 IN X 4 IN HOT DIPPED GALV GRADE A325	64	ESBOLT3/4X4A
9	BOLT 5/8 IN X 3 IN 304 STAINLESS STEEL	64	ESBOLT5/8X3S
10	BOLT 5/8 IN X 3 IN HOT DIPPED GALV GRADE A325	4	ESBOLT-5/8X3A
11	BOLT 5/8IN X 3-1/2IN HOT DIPPED GALV. A325	16	ESBOLT5/8X3-1/2A
12	CAMLOCK 2IN ALUM MALE X MPT	1	ESC1003A
13	CAMLOCK 4IN ALUM MALE X FLANGE	2	ESC1010
14	CAP 2IN ALUM CAMLOCK DUST	1	ESC1014
15	CAP 4IN ALUM CAMLOCK DUST	2	ESC1016
16	CLAMP 1/2IN SS TUBING W RUBBER	3	ESM3042
17	COATING EXTERIOR CARBOTHANE 133 VOC TAN 9225	.5	ES5007-133T
18	COATING PRIMER CARBOGUARD 888 GREY PART A 0700 1 GAL	.25	ES5003-888
19	COATING PRIMER CARBOGUARD 888 PART B 0908 1 GAL	.25	ES5003-888C
20	COUPLING 2IN 304SS CLASS 150 FULL NPT	1	ES7025
21			
22	COUPLING 3/4IN 304SS CLASS 150 FULL NPT	3	ES7031
23	COUPLING CHICAGO 1IN MPT MI AM12	3	ESC1020
24	DIFFUSER 8IN SS	1	ESS1008
25	ELBOW 1IN SCH40 GALV THRD	2	ES8010
26	ELBOW 2IN SCH40 GALV THD	2	ES8013
27	ELBOW 4IN 304SS L/R SCH10	3	ES2048
28	FLANGE 2IN X 1/2IN CS 150LB NPT	3	ES2004
29	FLANGE 3IN X 2IN CS 150LB NPT	1	ES2103
30	FLANGE 4IN 304SS 150LB SO	4	ES2015
31	FLANGE AIRPOT 2IN WITH 1IN COUPLING	1	ES2225
32	FLAT BAR 1/4IN X 2IN A36 CS	1	ESFB1/4X2
33	GASKET 2IN RED RUBBER RING 1/8 THK	7	ESR1002
34	GASKET 3IN RED RUBBER RING 1/8 THK	2	ESR1003
35	GASKET 4IN RED RUBBER RING 1/8 THK	8	ESR1004
36	GASKET 6IN RED RUBBER RING 1/8 THK	16	ESR1005
37	GASKET 8IN RED RUBBER RING 1/8 THK	1	ESR1006
38			
39	IDTAGS NAMEPLATES FOR VESSELS .029 TH SS 5 1/2INX3 1/2IN	1	ESC1034
40			
41	NIPPLE 1IN X CLOSE 316SS SCH40	4	ESN1003
42	NIPPLE 1IN X CLOSE 316SS SCH80	1	ESN1007
43	NIPPLE 2IN GALV X 12IN LONG NPT SCH40	1	ESN1010
44			
45	NIPPLE 2IN X CLOSE 316SS SCH40	2	ESN1005
46	NOZZLE 1IN POLYPROPYLENE X MNPT N8	1	ESS1011
47	NOZZLE 3/4IN MNPT POLYPROPYLENE ORTHOS MODEL N5	3	ESS1002
48	NOZZLE SPRAY 2HHSJPVC1701400	1	ESM3031
49	NUT 1/2 IN HOT DIPPED GALV HEAVY HEX (REFERENCE ONLY)	4	N/A
50	NUT 1/4 IN HOT DIPPED GALV HEAVY HEX (REFERENCE ONLY)	3	N/A
51	NUT 3/4 IN HOT DIPPED GALV HEAVY HEX (REFERENCE ONLY)	64	N/A
52	NUT 5/8 IN 304SS HEAVY HEX	64	ESNUT5/8S
53	NUT 5/8 IN HOT DIPPED GALV HEAVY HEX (REFERENCE ONLY)	20	N/A
54	PIPE 1IN GALV SCH40	14.5'	ESP1GALS40
55	PIPE 2IN GALV SCH40	13.5'	ESP2GALS40
56	PIPE 4IN 304SS SCH10	17.5'	ESP4304S10
57	RINGHEADER ASSEMBLY 8IN CS SCH40 SIDE OUTLET	1	RH1003BASS
58	SEPTA 4 1/2IN OD .015 SLOT	8	ESM3037
59	SPOOL ASSEMBLY CARBON IN AND OUT	2	ESCARBONSP
60			
61			
62	TEE 2IN X 2IN X 1IN SCH40 GALV NPT	1	ES8011
63	TUBING 1/2IN 316SS 0.035 WALL	9	EST1/2316X.035
64	UBOLT 1IN 304 STAINLESS STEEL W/4 NUTS	2	ESU1001SS304
65	UBOLT 2IN HOT DIP GALV	2	ESU1003
66	UBOLT 4IN 304 SS	3	ESU1007SS304
67	VALVE 1/2IN BRNZ BALL VALVE	3	ES1002
68			
69	VALVE 1IN APCO PRESS AIR/VAC VENT 10PSI MIN - 300PSI MAX	1	ESM3032
70	VALVE 1IN BRASS BALL LEAD FREE NSF	4	ES1004
71	VALVE 2IN BRASS BALL LEAD FREE NSF	1	ES1005
72	VALVE 4IN 316SS FULL PORT BALL VALVE	2	ES1013
73	VESSEL 12 FT 20K LB HP 125PSI BARE TANK W/COATING	1	HP1220CTI
74	WASHER 1/4 IN HOT DIPPED GALV FLAT	3	ESWASH1/4F
75	WASHER 1/4 IN HOT DIPPED GALV SPLIT LOCK	3	ESWASH1/4SL
76	WASHER FLAT 3/4 IN HOT DIPPED GALV SAE	128	ESWASH3/4HDSAE
77	WASHER FLAT 5/8 IN 304 STAINLESS STEEL SAE	16	ESWASH5/8FS
78	WASHER FLAT 5/8 IN HOT DIPPED GALV SAE	40	ESWASH5/8HDSAE

*LEFT VESSEL SHOWN
(RIGHT VESSEL MIRRORED)

REV	DESCRIPTION	DATE	DWN	CHKD	APVD	ECN

D: BORDER-0106-24X36D1

INTL REF:

BAR = 1" AT PLOT SCALE

DESIGNER	DATE
AJA	11-16-10
CHECKER	DATE
ENGINEER	DATE
MANAGER	DATE

FILE:

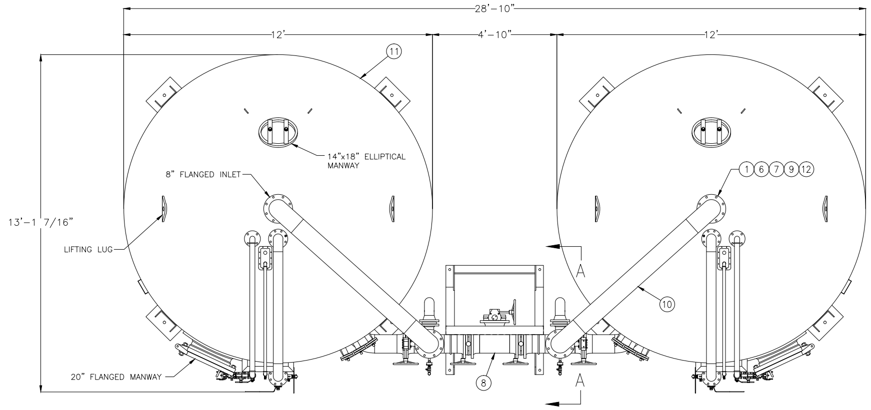
SCALE: 1/2" = 1'

TITLE HP1220 SINGLE TANK
HP1220ST
ASSEMBLY

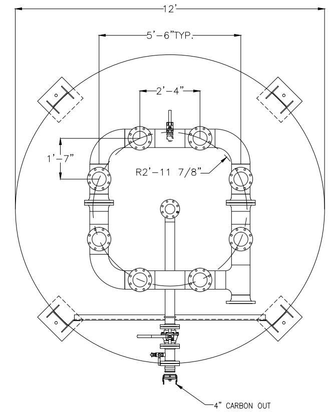
CLIENT

SIEMENS Water Technologies
RED BLUFF, CA

PROJECT	CODE	DRAWING	SHEET
		HP1220ST-0	1 OF 1



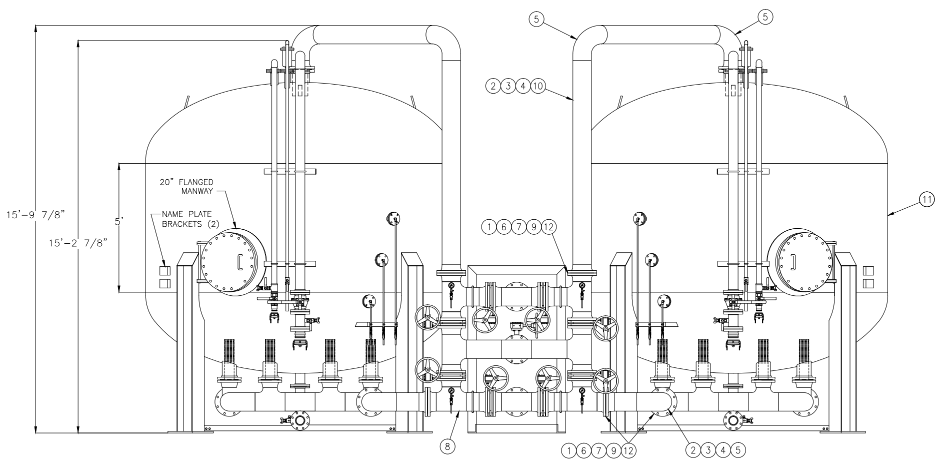
PLAN VIEW



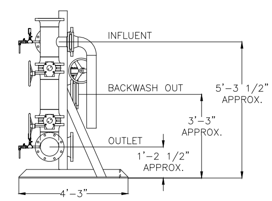
8" RING HEADER

SCHEDULED MATERIALS

TAG	DESCRIPTION	QTY	PART NUMBER
1	BOLT 3/4 IN X 4 IN HOT DIPPED GALV GRADE A325	64	ESBOLT3/4X4A
2	COATING EXTERIOR CARBOTHANE 133 VOC TAN 9225	2	ES5007-133T
3	COATING PRIMER CARBOGUARD 888 GREY PART A 0700 1 GAL	1	ES5003-888
4	COATING PRIMER CARBOGUARD 888 PART B 0908 1 GAL	1	ES5003-888C
5	ELBOW 8IN CS L/R SCH40	6	ES2058-I
6	FLANGE 8IN CS 150LB ANSI W/N	8	ES2024-I
7	GASKET 8IN RED RUBBER RING 1/8 THK	8	ESR1006
8	MANIFOLD 8IN CS SCH40 ASSEMBLY	1	MAN1004ASS-I
9	PROTECTOR FOR 8IN 150LB FLANGE SNAP-ON	18	ES08PTR
10	PIPE 8IN CS SCH40	29.5'	ESP8CSS40-I
11	VESSEL 12 FT 20K LB HP 125PSI SINGLE TANK	2	HP1220STSYS-I
12	WASHER FLAT 3/4 IN HOT DIPPED GALV SAE	128	ESWASH3/4HDSAE



ELEVATION



8 VIEW A-A

NOTES:

1. THIS DRAWING IS TO SHOW PIPING AND EQUIPMENT FOR CUSTOMER APPROVAL.
2. ALL BUTTERFLY VALVES ARE DUCTILE IRON WITH STAINLESS TRIM, STAINLESS STEEL DISK.
3. PROVIDE 316 STAINLESS STEEL SEPTA UNDER DRAIN SCREENS.
4. VESSELS SHALL BE 125 PSI, ASME CODE.
5. FINISH INTERIOR WITH PLASITE 4110, PREPARE AND APPLY STRICTLY IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS TO MEET NSF STD 61 REQUIREMENTS.
6. PIPING MATERIALS SHALL MEET: CS PIPE ASTM A-53 GRADE B (ERW); CS FITTINGS SA-234, ASME B16.9; SS THREADED FITTINGS ASTM A-351; SS PIPE ASTM A-312; SS BW FITTINGS ASTM A-403; MI THREADED FITTINGS ASME B-16.3.
7. FINISH EXTERIOR WITH CARBOGAURD 133 URTHANE COLOR TO BE USF DESERT SAND OVER CARBOLINE 888 RUST PREVENTATIVE EPOXY PRIMER APPLIED PER MFG. RECOMMENDATIONS.
8. SYSTEM ESTIMATED SHIPPING WEIGHT: 40,000 LBS.
9. GROUTING BY OTHERS IF REQUIRED.
10. ± 1" TOLERANCE ON CONNECTION DIMENSIONS.

REV	DESCRIPTION	DATE	DWN	CHKD	APVD	ECN

STD: BORDER-0106-24X36D1

INTL REF:

BAR = 1" AT PLOT SCALE

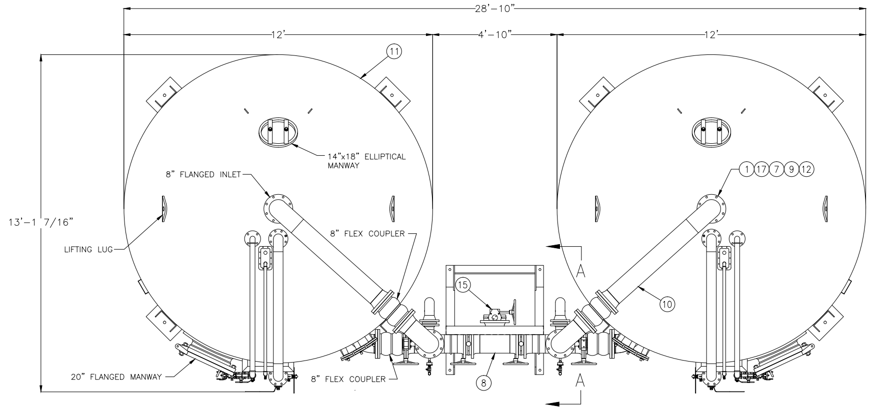
DESIGNER: CAR	DATE: 9-15-11
CHECKER	DATE
ENGINEER	DATE
MANAGER	DATE
FILE:	
SCALE: 1/2" = 1'	

TITLE HP1220 SYSTEM 12 FT 20K LB HP 125PSI ASSEMBL
HP1220SYS
ASSEMBLY

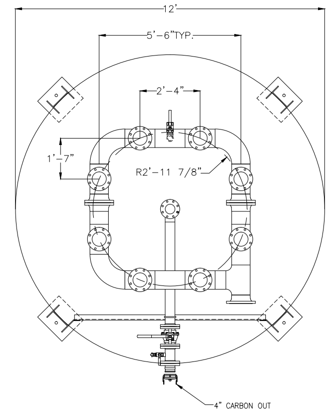
CLIENT SPINNAKER HOLDINGS, LLT.
ROOSEVELT IRRIGATION DISTRICT _ PHOENIX, AZ.

SIEMENS Water Technologies
RED BLUFF, CA

PROJECT	CODE	DRAWING	SHEET
		HP1220SYS-0	1 OF 1

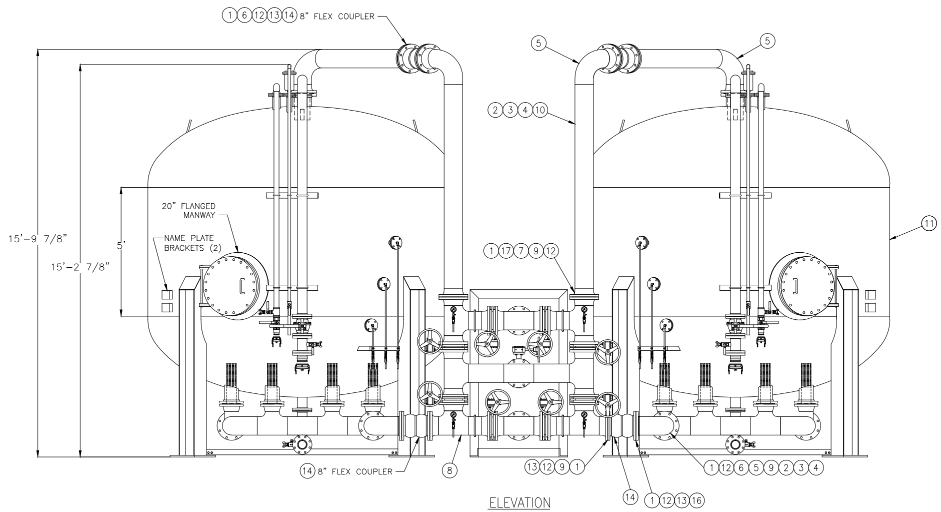


PLAN VIEW

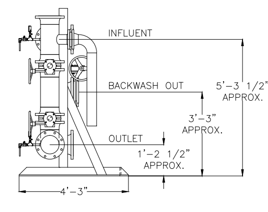


8" RING HEADER

TAG	DESCRIPTION	QTY	PART NUMBER
1	BOLT 3/4 IN X 4 IN HOT DIPPED GALV GRADE A325	80	ESBOLT3/4X4A
2	COATING EXTERIOR CARBOTHANE 133 VOC TAN 9225	2	ES5007-133T
3	COATING PRIMER CARBOGUARD 888 GREY PART A 0700 1 GAL	1	ES5003-888
4	COATING PRIMER CARBOGUARD 888 PART B 0908 1 GAL	1	ES5003-888C
5	ELBOW 8IN CS L/R SCH40	6	ES2058-I
6	FLANGE 8IN CS 150LB ANSI W/N	6	ES2024-I
7	GASKET 8IN RED RUBBER RING 1/8 THK	8	ESR1006
8	MANIFOLD 8IN CS SCH40 ASSEMBLY	1	MAN1004ASS-I
9	PROTECTOR FOR 8IN 150LB FLANGE SNAP-ON	22	ES08PTR
10	PIPE 8IN CS SCH40	29.5'	ESP8CSS40-I
11	VESSEL 12 FT 20K LB HP 125PSI SINGLE TANK	2	HP1220STSYS-I
12	WASHER FLAT 3/4 IN HOT DIPPED GALV SAE	224	ESWASH3/4HDSAE
13	BOLT 3/4 IN X 4-1/2 IN HOT DIPPED GALV GRADE A325	80	ESBOLT3/4X4-1/2
14	COUPLING FLEX 8IN FLANGED 13IN LONG PROCO TWIN SPHERE 242	4	W2T531394
15	VALVE 8IN 316SS DISK WFR BFLY CAST IRON BODY BUNA N SEAL GO	1	ES1028S
16	FLANGE 8IN CS 150LB ANSI S/O	2	W2T381836
17	FLANGE 8IN CS 150LB ANSI VAN STONE	4	W2TFLNGE



ELEVATION



VIEW A-A

NOTES:

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6. PIPING MATERIALS SHALL MEET: CS PIPE ASTM A-53 GRADE B (ERW); CS FITTINGS SA-234, ASME B16.9; SS THREADED FITTINGS ASTM A-351; SS PIPE ASTM A-312; SS BW FITTINGS ASTM A-403; MI THREADED FITTINGS ASME B-16.3.
7. FINISH EXTERIOR WITH CARBOGAURD 133 URTHANE COLOR TO BE USF DESERT SAND OVER CARBOLINE 888 RUST PREVENTATIVE EPOXY PRIMER APPLIED PER MFG. RECOMMENDATIONS.
8. SYSTEM ESTIMATED SHIPPING WEIGHT: 40,000 LBS.
9. GROUTING BY OTHERS IF REQUIRED.
10. ± 1" TOLERANCE ON CONNECTION DIMENSIONS.

STD: BORDER-0106-24X36D1 | INTL REF: | BAR = 1" AT PLOT SCALE

REV	DESCRIPTION	DATE	DWN	CHKD	APVD	ECN

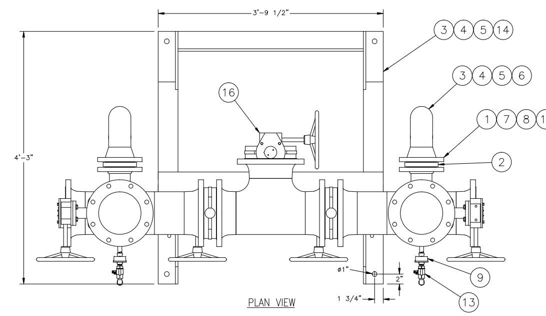
DESIGNER: CAR — DATE: 9-15-11
CHECKER — DATE
ENGINEER — DATE
MANAGER — DATE
FILE:
SCALE: 1/2" = 1'

TITLE: HP1220FX SYSTEM 12 FT 20K LB HP 125PSI ASSEM

CLIENT: SPINNAKER HOLDINGS, LLC.
ROOSEVELT IRRIGATION DISTRICT _ PHOENIX, AZ.

SIEMENS Water Technologies
RED BLUFF, CA

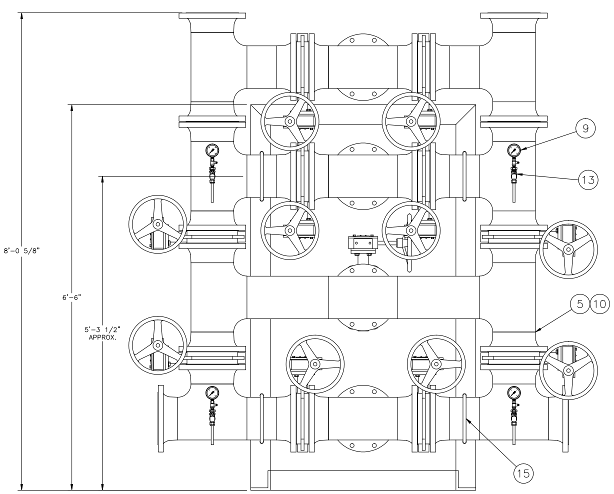
PROJECT	CODE	DRAWING	SHEET
		HP1220FXSYS-0	1 OF 1



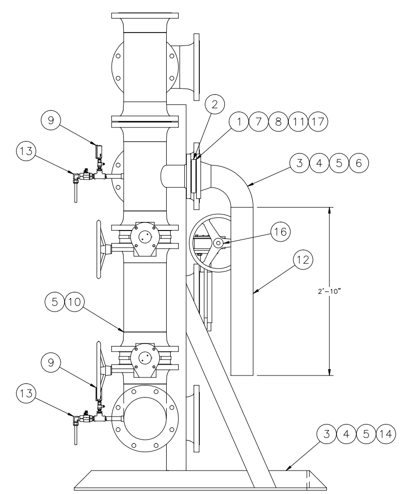
PLAN VIEW

SCHEDULED MATERIALS

TAG	DESCRIPTION	QTY	PART NUMBER
1	BOLT 5/8 IN X 4 IN HOT DIPPED GALV GRADE 5	16	ESBOLT5/8X4
2	BURST DISK 4IN ZK MONO 125PSI	2	ESM3030
3	COATING PRIMER CARBOGUARD 888 GREY PART A 0700 1 GAL	1	ES5003-888
4	COATING PRIMER CARBOGUARD 888 PART B 0908 1 GAL	1	ES5003-888C
5	COATING EXTERIOR CARBOTHANE 133 VOC TAN 9225	2	ES5007-133T
6	ELBOW 4IN CS L/R SCH40 90 DEG WELD	2	ES2046
7	FLANGE 4IN CS 150LB W/N	2	ES2014
8	GASKET 4IN RED RUBBER RING 1/8 THK	4	ESR1004
9	GAUGE WIKKA 232.53 1/4IN L X 2 1/2IN D 160PSI	4	ESM3040
10	MANIFOLD 8IN CS SCH40 4 TIER WELDMENT	1	MAN1004A
11	NUT 5/8 IN HOT DIPPED GALV HEAVY HEX	16	ESNUT5/8
12	PIPE 4IN CS SCH40 PIPE	6'	ESP4CSS40
13	PORT, SAMPLE 1/2IN WITH 90DEG ADAPTER	4	SP90ADAP
14	STAND MANIFOLD 8 IN	1	MAN1004ST
15	UBOLT 8IN HOT DIP GALV	4	ESU1011
16	VALVE 8IN 316SS DISK WFR BFLY CAST IRON BODY W/ BUNA	1	ES1028S
17	WASHER FLAT 5/8 IN HOT DIPPED GALV SAE	32	ESWASH5/8HDSAE



FRONT VIEW



SIDE VIEW

STD: BORDER-0106-24X36D1

INTL REF:

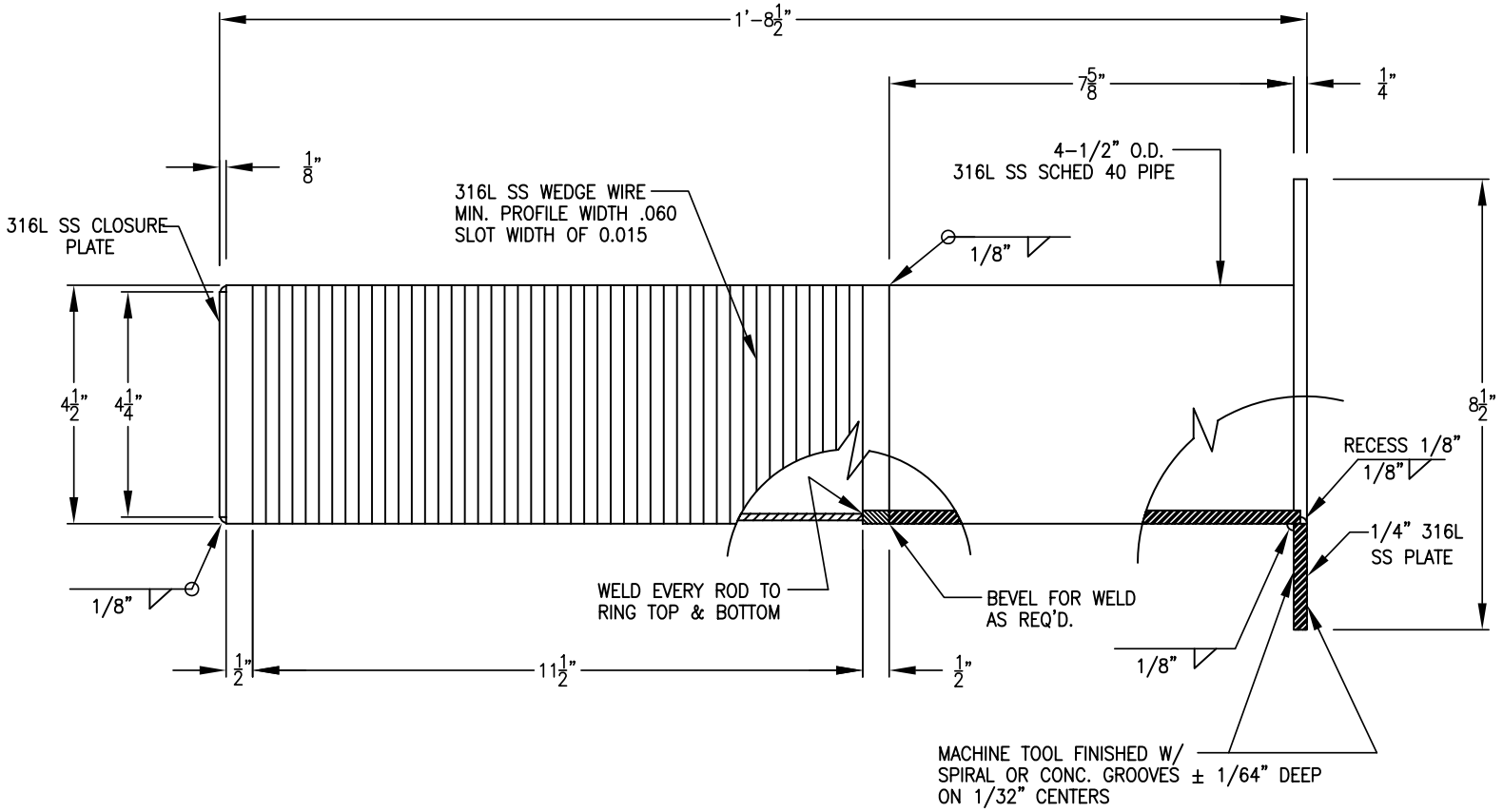
BAR = 1" AT PLOT SCALE

REV	DESCRIPTION	DATE	DWN	CHKD	APVD	ECN

DESIGNER AJA	DATE 6-4-08	TITLE MANIFOLD 8IN CS SCH40 4 TIER ASSEMBLY GENERAL ASSEMBLY MAN1004ASS
CHECKER	DATE	CLIENT
ENGINEER LLR	DATE	SIEMENS Water Technologies RED BLUFF, CA
MANAGER NRD	DATE	
FILE:		
SCALE: 1:10		

PROJECT	CODE	DRAWING	SHEET
		MAN1004AASS-0	1 OF 1

STD: BORDER-0106-8X11A	INTL REF:	BAR = 1" AT PLOT SCALE



DESIGNER	AJA	DATE 6-31-08
CHECKER		DATE
ENGINEER		DATE
MANAGER		DATE
FILE:		
SCALE:	1:3	

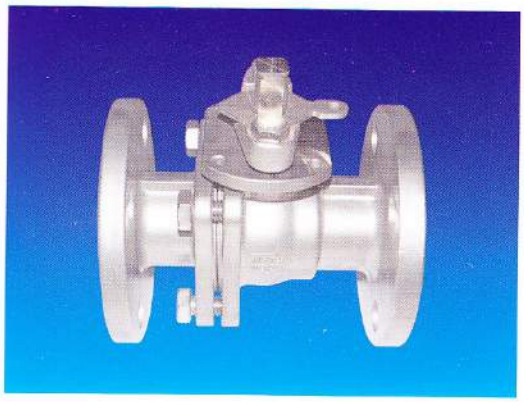
TITLE: SEPTA 4 1/2IN OD .015 SLOT
ESM3037

CLIENT

SIEMENS Water Technologies
RED BLUFF, CA

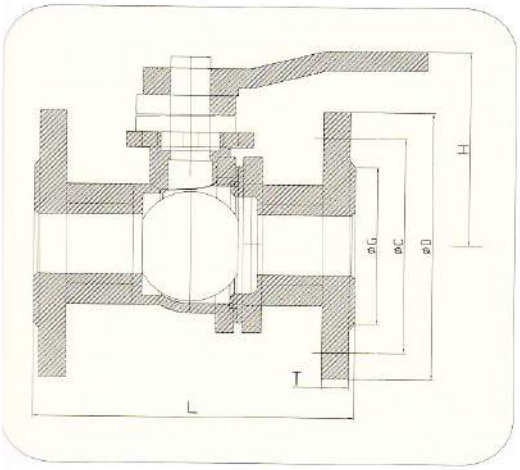
PROJECT	CODE	DRAWING	SHEET	REV
		ESM3037.DWG	1 OF 1	1

Material: 316 / 304



METERIALS LIST

PART NAME	304	316
BODY	SCS13	SCS14
BONNET	SCS13	SCS14
BALL	SS304	SS316
STEM	SS304	SS316
SEAT	PTFE	PTFE
GASKET	PTFE	PTFE
GLAND	SS304	SS316
GLAND PACKING	PTFE	PTFE
BONNET BOLT/NUT	ASTM 194-B8	
GLAND BOLT		
STOPER	SS304	SS304
SPRING WASHER	SS41	SS41
HANDLE	WCB	WCB



TWO-PIECE BALL VALVE
JIS 10K FLANGE END

APPLICATIONS

- FACE TO FACE DIMENSIONS : JIS B2002
- END FLANGE DIMENSIONS : JIS B2239
- DESIGN : ANSI B16.34
- BLOW-OUT PROOF STEM/FULL PORT
- LEVER OPERATED OR GEAR OPERATED
- WITH ISO 5211 MOUNTING PAD
- MATERIAL : CAST IRON/FC20
  CARBON STEEL/SCPH2/WCB
  STAINLESS STEEL 304/SCS13
  STAINLESS STEEL 304/SCS14

SHELL (BY WATER)		450PSI
		32KG/CM^2
SEAT	BY WATER	300PSI
		21KG/CM^2
	BY AIR	80PSI
		6KG/CM^2

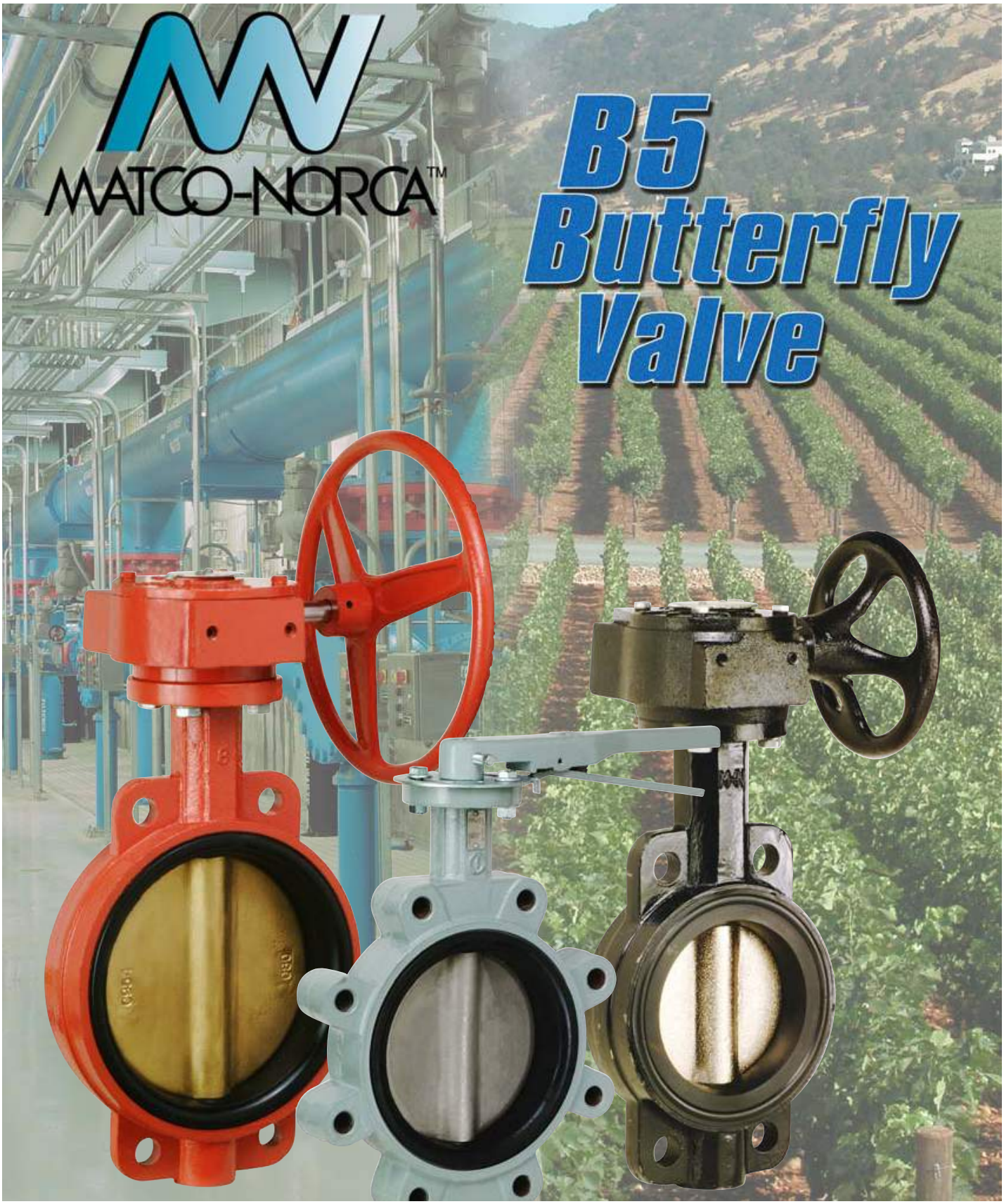
DIMENSIONS

Unit: mm

SIZE		L	H	D	C	G	ISO-5211	T	
								FC	SCS
1/2"	15.0	110.0	85.0	95.0	70.0	52.0	F04	16	11
3/4"	20.0	120.0	90.0	100.0	75.0	58.0	F04	18	14
1"	25.0	130.0	100.0	125.0	90.0	70.0	F04	18	14
11/4"	32.0	140.0	105.0	135.0	100.0	80.0	F05	20	16
11/2"	40.0	165.0	110.0	140.0	105.0	85.0	F07	20	16
2"	50.0	180.0	120.0	155.0	120.0	100.0	F07	20	16
21/2"	65.0	190.0	160.0	175.0	140.0	120.0	F07	22	18

MATCO-NORCA™

B5 Butterfly Valve



Available In Wafer Style

DUCTILE IRON DISC
BLACK BODY - BUNA-N SEAT
B5-RLO - Lever Handle
B5-RWG - Gear Handle

B5-RLO

B5-RWG

B5-RLO with 48" extension option

ALUMINUM BRONZE DISC
ORANGE BODY - BUNA-N SEAT
B5-RLOAB - Lever Handle
B5-RWGAB - Gear Handle

B5-RLOAB

B5-RWGAB

B5-RLOSE

STAINLESS STEEL DISC
GRAY BODY - EPDM SEAT
B5-RLOSE - Lever Handle
B5-RWGSE - Gear Handle

And Lug Style

Aluminum Bronze Disc
Orange Body - Buna-N Seat
B5-LGLAB - Lever Handle
B5-LGGAB - Gear Handle

B5-LGLAB

Stainless Steel Disc
Gray Body - EPDM Seat
B5-LGLSE - Lever Handle
B5-LGGSE - Gear Handle

B5-LGLSE

B5-LGLS

B5-LGGS

Stainless Steel Disc
Red Body - Buna-N Seat
B5-LGLS - Lever Handle
B5-LGGS - Gear Handle

B5-LGL

B5-LGG

Ductile Iron Disc
Black Body - Buna-N Seat
B5-LGL - Lever Handle
B5-LGG - Gear Handle

MATCO-NORCA™

Description

The Matco-Norca B5 Series Butterfly Valve is the newest addition to our family of high quality Iron Valves. Offered in Wafer style and Lug style, these valves are available with Ductile Iron, Aluminum-Bronze or 316 Grade Stainless Steel discs. These valves are in stock with both BUNA-N and EPDM liners. Viton liners are available upon request.

The new B5 design incorporates a one-piece stem with an important new feature. The disc is broached to accept the milled square stem which allows the disc to float, providing substantially improved torque values.

The B5 is available with lever operators and worm gear operators and features a bubble tight shut-off. The lug configuration is suitable for dead-end service. All Matco-Norca Butterfly Valves can be modified with extensions and various actuators.

Features

- *200WOG for 2" - 12", 150WOG for 14" - 24"*
- *Teflon Graphite Stem Bushing for positive stem alignment.*
- *Stem includes a snap ring to prevent inadvertent stem removal.*
- *Unique Stem to Disc design.*
- *All valves are epoxy coated.*
- *Torque Values up to 33% less than other valve designs.*
- *Precision disc machining provides bubble-tight shutoff.*
- *Top and bottom alignment holes.*
- *Ten Position lock lever handles are ideal for on-off and throttling applications.*

Applications

The Matco-Norca B5 Series Butterfly Valves are suitable for many applications. The B5 is well suited for:

- *Agricultural and Turf Irrigation*
- *Water Distribution*
- *Waste Water Treatment*
- *Industrial Applications Including Chemical, Pulp & Paper and a Wide Array of General Industrial Mediums.*
- *Valves with BUNA-N Liners are suitable for oil and gas applications.*
- *Valves with EPDM Liners are suitable for high temperature water and air applications: 250°F.*

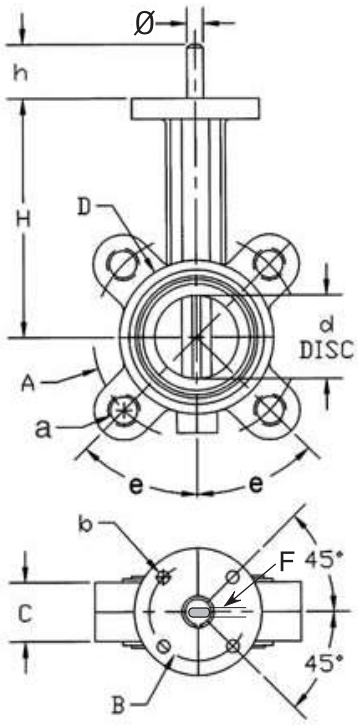
B5 Butterfly Valve

Design, Dimensions & Material Specifications

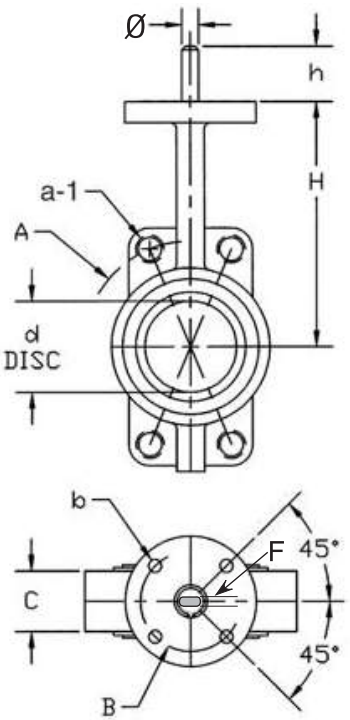
Torque Chart

2" - 12": Inch Pounds @ 200 PSI Line Pressure		14" - 24"": Inch Pounds @ 150 PSI Line Pressure	
Size	**Torque**	**Size**	**Torque**
2"	50	14"	2500
2.5"	50	16"	3000
3"	250	18"	3000
4"	250	24"	4250
5"	500		
6"	600		
8"	1000		
10"	1800		
12"	2000		

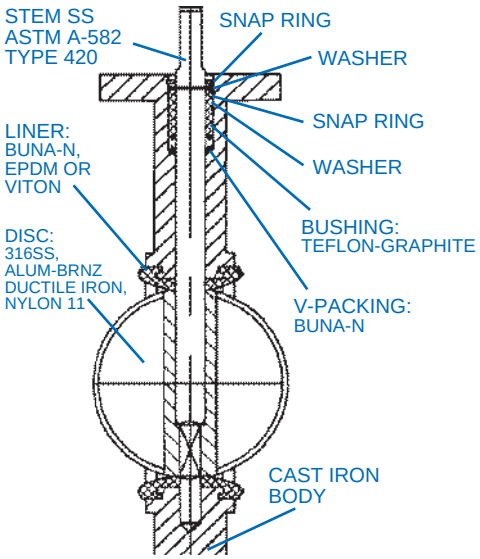
Lug Style



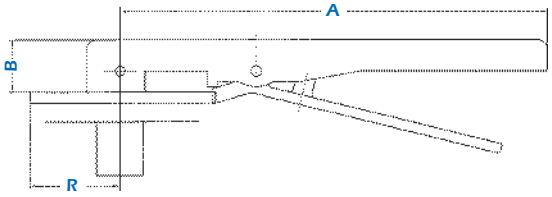
Wafer Style



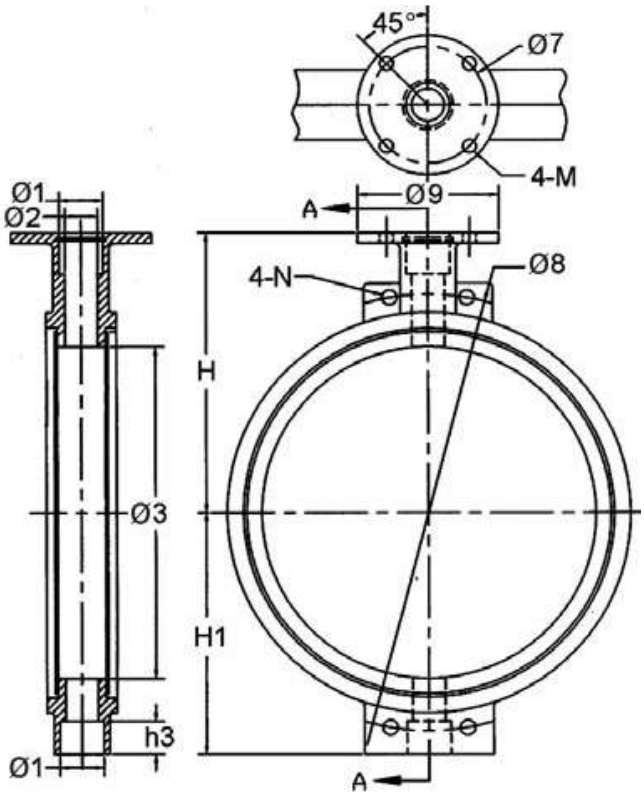
Size	H	d+.05	D	A	a	a-1	B	b	c	h	Stem Ø	F (flat)	e
2"	5.50	2.05	3.54	4.75	5/8"-4	11/16"	2.25	.284	1.625	1.25	.564	.375	45°
2.5"	6.00	2.52	4.02	5.50	5/8"-4	11/16"	2.25	.284	1.750	1.25	.564	.375	45°
3"	6.25	3.09	4.69	6.00	5/8"-4	11/16"	2.25	.284	1.750	1.25	.564	.375	45°
4"	7.00	4.09	5.91	7.50	5/8"-4	11/16"	2.75	.406	2.000	1.25	.627	.438	22.5°
5"	7.50	4.85	6.81	8.50	3/4" - 8	13/16"	2.75	.406	2.125	1.25	.752	.500	22.5°
6"	8.02	5.98	7.99	9.50	3/4" - 8	13/16"	2.75	.406	2.125	1.25	.752	.500	22.5°
8"	9.50	7.97	10.23	11.75	3/4" - 8	13/16"	3.50	.472	2.500	1.25	.880	.625	22.5°
10"	10.75	9.86	12.64	14.25	7/8" - 12	15/16"	3.50	.472	2.500	2.00	1.130	.846	15°
12"	12.25	11.87	14.57	17.00	7/8" - 12	15/16"	4.25	.472	3.000	2.00	1.130	.846	15°



Overall Dimensions of Handle Operators



Valve Size	A	B	R	Stem Size
2" - 3"	9.58	1.18	2.13	9/16"
4"	9.58	1.18	2.13	5/8"
5" - 6"	10.5	1.18	2.13	3/4"
8"	13.38	1.25	2.13	7/8"
10" - 12"	13.38	1.25	2.13	1-1/8"

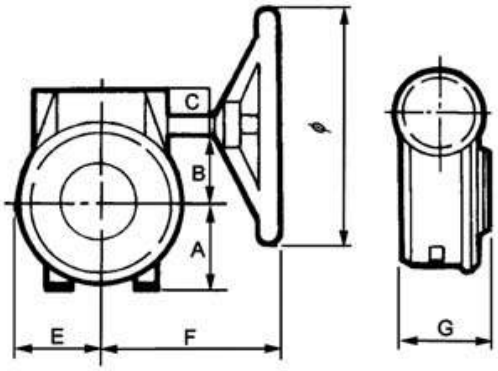


MODELS:	RLO/RWG LGL/LGG	RLOAB/RWG-AB LGLAB/LGG-AB	RLOS/RWGS LGLS/LGGS	RLOSE/RWGSE LGLSE/LGGSE
Body	Cast Iron	Cast Iron	Cast Iron	Cast Iron
Disc	Ductile Iron	Aluminum-Bronze	SS 316	SS 316
Seat	Buna-N *	Buna-N *	Buna-N *	EPDM
Stem	420 Stainless	420 Stainless	420 Stainless	420 Stainless
O-ring	Buna-N	Buna-N	Buna-N	EPDM
Bushing	Teflon-Graphite	Teflon-Graphite	Teflon-Graphite	Teflon-Graphite
Body Color	Black	Black	Red	Gray
Snap ring	Stainless	Stainless	Stainless	Stainless
Lever	Ductile Iron	Ductile Iron	Ductile Iron	Ductile Iron
Gear	Cast Iron	Cast Iron	Cast Iron	Cast Iron

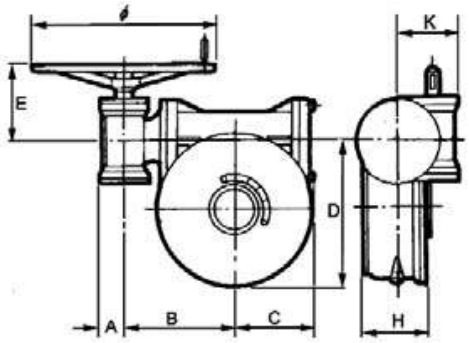
*VITON & Nylon 11 Available on Special Order

Size	Ø1	Ø2	Ø3	Ø7	Ø8	Ø9	h3	H	H1	M	N
14"	1.88	1.37	14.25	5.0	18.75	6	1.45	12.00	10.38	.56	1.06
16"	2.25	1.62	16.38	5.0	21.25	6	1.45	13.00	11.62	.56	1.06
18"	2.62	1.87	18.38	6.5	22.75	8	1.53	14.50	12.75	.81	1.19
20"	2.75	2.12	20.50	6.5	25.00	8	1.24	15.88	14.00	.81	1.19
24"	2.75	2.12	24.96	6.5	29.50	8	1.24	22.25	16.14	.81	1.38

Overall Dimensions of Worm Gear Operators



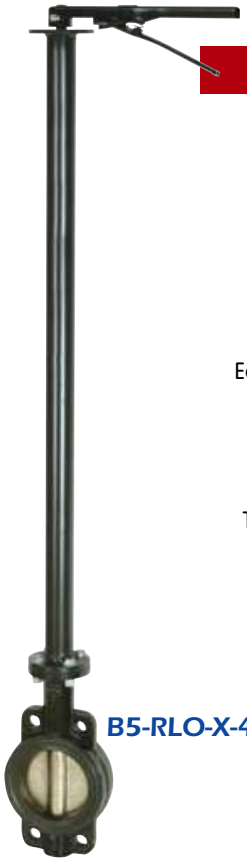
Overall Dimensions of 2 Stage Worm Gear Operators



Valve Size	A	B	C	E	F	G	Ø
2" - 6"	1.97	1.65	1.22	2.07	5.81	2.95	5.91
8" - 10"	3.15	2.83	1.54	2.95	9.06	3.35	11.81
12" - 14"	3.19	2.83	1.57	3.19	9.02	3.39	11.81
16" - 20"	5.12	4.72	3.54	5.12	11.81	4.86	11.81

Coefficient Of Volume CV.

Valve Size Inches	Stem Diameter Inches	Free Area ft²	Diameter in Inches	Coefficient of Volume Cv (GPM AT 1P) Disc Opening in Degrees 10	20	30	40	50	60	70	80	90	Nom. Pipe Area ft²
2	.564	.0098	1.34	.119	7.17	13.46	22.44	34.00	49	57	62	62	.022
2.5	.564	.0174	1.79	.815	11.21	28.68	44.68	65.28	87	106	118	123	.034
3	.564	.0310	2.39	.267	16.14	41.30	64.35	94.20	135.3	172	208	239	.049
4	.627	.0512	3.07	.476	28.70	73.42	114.4	167.5	240.6	314	384	438	.087
5	.752	.0814	3.86	.744	44.84	114.7	178.7	261.7	375.9	503	654	817	.136
6	.752	.123	4.75	1.07	64.57	165.2	257.4	376.8	541.3	744	995	1320	.196
8	.880	.265	6.97	1.90	114.8	293.7	457.6	669.9	962.3	1367	1775	3019	.349
10	1.130	.379	8.34	2.98	179.4	458.9	714.9	1047	1504	2124	2924	3978	.545
12	1.130	.643	10.86	4.28	258.3	660.8	1030	1507	2165	3099	4458	6818	.785
14	1.250	.689	11.25	5.54	333.7	853.8	1330	1947	2798	3668	5182	7256	.939
16	1.312	.934	13.37	7.17	432.2	1106	1723	2522	3623	4857	6985	10683	1.23
18	1.500	1.260	15.20	9.13	550.6	1409	2195	3213	4616	6216	9063	13867	1.55
20	1.625	1.569	16.96	11.32	682.0	1745	2719	3980	5718	7740	11284	17193	1.93
24	2.000	2.418	21.06	16.26	980.1	2508	3907	5720	8217	11454	16803	26449	2.92



B5-RLO-X-48D

B5 Extension Kits

For Use In Underground Installations

B5 Extensions feature one piece inner stem construction, solid outside housing with full face flanges with BUNA gaskets for water tight seal. The extensions accommodate 10 position levers or gear operators. The extension kits include all necessary hardware for proper mounting to the valve.

Available Lengths

B5 extensions are available in the following lengths: 24", 36", 48", 60", 72".

Extension - Valve Diameter Designation

Each letter below corresponds to the valve size for which you are ordering an extension.

A	B	C	D	E	F	G	H	I
2"-3"	4"	5"-6"	8"	10"	12"	14"	16"	18"

Example:

To order a 48" Extension for an 8" Butterfly valve,the correct product number would be:

Valve Part # — **B5-X48-D** — Nominal Valve Size

Designates Extension

Extension Length

Corporate Headquarters
P.O. Box 27 Route 22
Brewster, NY 10509
LOCAL:
Tel: 845-278-7570
Fax: 845-278-9056
TOLL FREE:
Tel: 800-431-2082
Fax: 800-640-2252
E-MAIL: mail@matco-norca.com

Central Region
1150 Silber Road
Houston, TX 77055
LOCAL:
Tel: 713-680-2888
Fax: 713-680-2999
TOLL FREE:
Tel: 800-935-5456
Fax: 800-683-4247

Western Region
5593 Fresca Drive
La Palma, CA 90623
LOCAL:
Tel: 714-522-1889
Fax: 714-522-3828
TOLL FREE:
Tel: 866-532-8306
Fax: 866-532-8307

www.matco-norca.com

product data carboline®

Carboguard® 888

Selection & Specification Data

Generic Type
Epoxy Polyamide

Description
Low-temperature and rapid curing primer/finish with an extended recoat window. Provides excellent corrosion resistance as a primer, intermediate or finish on steel substrates. Self-priming on steel, galvanized steel and concrete, 888 offers user-friendly characteristics which facilitate application in a wide range of environmental conditions.

Features
- Low temperature cure characteristics
- Rapid handling for in-shop applications
- One-year recoat window
- Low yellowing compared to other epoxies
- VOC compliant to current AIM regulations
- Meets the requirements of:
  Class "A" slip coefficient and creep testing criteria for use on faying surfaces.

Color
Red (0500); Gray (0700); White (0800); Yellow (0600)

Finish
Satin

Primers
Self-priming. May be applied over organic and inorganic zinc primers, epoxies and others as recommended. A mist coat may be required to minimize bubbling over zinc rich primers.

Topcoats
Acrylics, Epoxies, Polyurethanes

Dry Film Thickness
3.0-5.0 mils (75-125 microns) per coat
Do not exceed 10 mils in a single coat.

Solids Content
By Volume: 63% ± 2%
*Tested in accordance with ASTM D2697

Theoretical Coverage Rate
1,011 mil ft^2 (25.0 m^2/l at 25 microns)
Allow for loss in mixing and application

VOC Values
As supplied: 2.7 lbs./gal (330 g/l)
Thinned:
19 oz/gal w/ #15: 3.3 lbs./gal (403 g/l)
19 oz/gal w/ #33: 3.3 lbs./gal (403 g/l)
These are nominal values and may vary slightly with color.

Dry Temp. Resistance
Continuous: 200°F (93°C)
Non-Continuous: 250°F (121°C)
Discoloration and loss of gloss is observed above 200°F (93°C).

Limitations
Epoxies lose gloss, discolor and eventually chalk in sunlight exposure.

Substrates & Surface Preparation

General
Surfaces must be clean and dry. Employ adequate methods to remove dirt, dust, oil and all other contaminants that could interfere with adhesion of the coating.

Steel
SSPC-SP6
Surface Profile: 1.5-3.0 mils (38-75 microns)

Galvanized Steel
SSPC-SP7
Consult your Carboline Sales Representative for specific recommendations.

Concrete
Concrete must be cured 28 days at 75°F (24°C) and 50% relative humidity or equivalent. Laitance, form oils, curing agents and hardeners should be removed by suitable method before coating application.

Performance Data

Test Method	System	Results	Report #
ASTM D4541 Adhesion	Blasted Steel 2 cts. 888	1167 psi (Elcometer)	L40-172
ASTM D4060 Abrasion	Blasted Steel 1 ct. 888	138 mg. loss after 1000 cycles, CS17 wheel, 1000 gm. load	03216
ASTM D4213 Scrub Resistance	Blasted Steel 1 ct. 888	Erosion rate: .0039 microliters after 100 cycles w/ Abrasive scrub medium	03403
ASTM B117 Salt Fog	Blasted Steel With organic zinc primer 2 cts. 888	No effect on plane, rust in scribe, less than 1/32" (0.7mm) undercutting at scribe after 7000 hours	03289
ASTM D2247 Humidity Test	Blasted Steel 2 cts. 888	No blistering, no rusting; color change less than 2 DE (CieLab units) after 8000 hours	03290
ASTM A-490 Slip Coefficient	Blasted Steel 1 ct. 888	Meets requirements for Class "A" rating	03315
ASTM D5894 QUV/ Prohesion	Blasted Steel 1 ct. 888	No rusting, blistering or chalking on plane; rust in scribe; less than 1/8" undercutting at scribe after 1000 hours	03435
Midwest Weathering	Blasted Steel 2 cts. 888	No effect on plane area, except #6 slight chalking after 1 year outdoor exposure at 45° angle.	L40-172
ASTM D1653 Water Vapor Transmission	2 cts. 888	WVP of 0.6 US perms. Method B – Wet cup; Condition C – R.H. 0%, Temperature 73.1°F	03468

Test reports and additional data available upon written request.

Application Equipment

Listed below are general equipment guidelines for the application of this product. Job site conditions may require modifications to these guidelines to achieve the desired results.

General Guidelines:

Spray Application (General) The following spray equipment has been found suitable and is available from manufacturers such as Binks, DeVilbiss and Graco.

Conventional Spray Pressure pot equipped with dual regulators, 3/8" I.D. minimum material hose, .070" I.D. fluid tip and appropriate air cap.

Airless Spray

Pump Ratio:	30:1 (min.)*
GPM Output:	3.0 (min.)
Material Hose:	3/8" I.D. (min.)
Tip Size:	.017-.021"
Output PSI:	2100-2300
Filter Size:	60 mesh

*Teflon packings are recommended and available from the pump manufacturer.

Brush & Roller (General) Multiple coats may be required to obtain desired appearance, recommended dry film thickness and adequate hiding. Avoid excessive re-brushing or re-rolling. For best results, tie-in within 10 minutes at 75°F (24°C).

Brush Use a medium bristle brush.

Roller Use a short-nap synthetic roller cover with phenolic core.

Mixing & Thinning

Mixing Power mix separately, then combine and power mix. At material temperatures below 75°F sweat-in the mixed material for 30 minutes. DO NOT MIX PARTIAL KITS.

Ratio 1:1 Ratio (A to B)

Thinning May be thinned up to 19 oz/gal (15%) with Thinner #15 or Thinner #33. Use of thinners other than those supplied or recommended by Carboline may adversely affect product performance and void product warranty, whether expressed or implied.

Carboline Thinner #236E may also be used to thin this product to minimize HAP and VOC emissions. Consult Carboline Technical Service for guidance.

Pot Life 4 Hours at 75°F (24°C)
Pot life ends when coating loses body and begins to sag. Pot life times will be less at higher temperatures.

Cleanup & Safety

Cleanup Use Thinner #2 or Acetone. In case of spillage, absorb and dispose of in accordance with local applicable regulations.

Safety Read and follow all caution statements on this product data sheet and on the MSDS for this product. Employ normal workmanlike safety precautions. Hypersensitive persons should wear protective clothing, gloves and use protective cream on face, hands and all exposed areas.

Ventilation When used in enclosed areas and thinned, thorough air circulation must be used during and after application until the coating is cured. The ventilation system should be capable of preventing the solvent vapor concentration from reaching the lower explosion limit for the solvents used. User should test and monitor exposure levels to insure all personnel are below guidelines. If not sure or if not able to monitor levels, use MSHA/NIOSH approved respirator.

Application Conditions

Condition	Material	Surface	Ambient	Humidity
Normal	60°-85°F (16°-29°C)	65°-85°F (18°-29°C)	60°-90°F (16°-32°C)	0-65%
Minimum	50°F (10°C)	35°F (2°C)	35°F (2°C)	0%
Maximum	90°F (32°C)	135°F (57°C)	120°F (49°C)	85%

Industry standards are for the substrate temperatures to be 5°F (3°C) above the dew point. It is recommended to maintain this restriction during the initial curing times (see Dry to Recoat schedule). Condensation due to substrate temperatures below the dew point can cause flash rusting on prepared steel and interfere with proper adhesion to the substrate. Special application techniques may be required above or below normal application conditions.

Curing Schedule

Surface Temp. & 50% Relative Humidity	Dry to Handle	Dry to Recoat / Topcoat	Final Cure
35°F (2°C)	16 Hours	18 Hours	3 Days
50°F (10°C)	9 Hours	8 Hours	2 Days
75°F (24°C)	3 Hours	4 Hours	24 Hours
90°F (32°C)	1.5 Hour	2 Hours	12 Hours

These times are based on a 3.0-5.0 mil (75-125 micron) dry film thickness and consistent ambient conditions as stated. In practice, it may be difficult to maintain consistent curing temperatures which may and will affect the dry times as stated. Should the curing temperatures deviate during the curing cycle it is recommended to follow the dry times as stated for the lower ambient temperature reached. Higher film thickness, insufficient ventilation or cooler temperatures will require longer cure times and could result in solvent entrapment and premature failure. Excessive humidity or condensation on the surface during curing can interfere with the cure, can cause discoloration and may result in a surface blush or haze. Any haze or blush must be removed by water washing before recoating. **Maximum recoat time is one year without special surface preparation.** "Loose" chalk must be removed in accordance with good painting practice. **Specific topcoat products can be used in a much shorter re-coat interval. Consult Carboline for recommendations and test results.** If the maximum recoat time has been exceeded, the surface must be abraded by sweep blasting or sanding prior to the application of additional coats. Carboguard 888 applied below 40°F (4°C) may temporarily soften for several hours, after temperatures rise to 60°F (16°C). This is a normal condition and will not affect performance.

Packaging, Handling & Storage

Shipping Weight (Approximate) 2 Gallon Kit: 29 lbs (13 kg); 10 Gallon Kit: 137 lbs (62 kg)

Flash Point (Setaflash)
Part A: 54°F (12°C)
Part B: 56°F (13°C)

Storage (General) Store Indoors.

Storage Temperature & Humidity 40° -110°F (4°-43°C)
0-100% Relative Humidity

Shelf Life Part A & B: Min. 36 months at 75°F (24°C)

***Shelf Life: (actual stated shelf life) when kept at recommended storage conditions and in original unopened containers.**

carboline®
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314/644-1000 314/644-4617 (fax) www.carboline.com
An RPM Company

September 2008 replaces September 2005

Carbothane 133 VOC

carboline® MARINE/OFFSHORE COATINGS product data

Selection & Specification Data

Generic Type	Aliphatic Acrylic Polyurethane
Description	High solids, high build, satin finish that provides a tough attractive finish while exhibiting outstanding performance properties. Demonstrates extremely good resistance to abrasion, corrosion and chemical exposure when applied over recommended Carboline primers and/or intermediate coats.
Features	▪ Outstanding performance properties in virtually all industrial markets ▪ High build; suitable for many two-coat systems ▪ High solids formulation allows for improved edge protection ▪ Suitable for application direct to inorganic and organic zinc primers ▪ VOC compliant to current AIM regulations
Color *	Refer to Carboline Color Guide. Certain colors require multiple coats to hide.
Finish	Satin
Primers	Refer to *Substrates & Surface Preparation*
Topcoats	Carbothane® Clear Coats when required
Dry Film Thickness	3.0-5.0 mils (75-125 microns) per coat
Solids Content	By Volume: 72% ± 2%
Theoretical Coverage Rate	1155 mil ft^2 (28.3 m^2/l at 25 microns) Allow for loss in mixing and application
VOC Values	As supplied: 1.31 lbs/gal (157 g/l)
Dry Temp. Resistance	Continuous: 200°F (93°C) Non-Continuous: 250°F (121°C) Discoloration and loss of gloss is observed above 200°F (93°C).

* The alignment of aluminum flakes in aluminum-filled finishes is very dependent on application conditions and techniques. Care must be taken to keep conditions as constant as possible to reduce variations in final appearance. It is also advisable to work from a single batch of material since variations can occur from batch to batch. For more information consult Carboline Technical Service Department.

Substrates & Surface Preparation

General	Surfaces must be clean and dry. Employ adequate methods to remove dirt, dust, oil and all other contaminants that could interfere with adhesion of the coating. **For all surfaces**, prime with specific Carboline primers as recommended by your Carboline sales representative.
Steel	SSPC-SP6 with a 1.5-2.5 mil (37.5-62.5 microns) surface profile for maximum protection. SSPC-SP2 or SP3 as minimum requirement.
Previously Painted Surfaces	Lightly sand or abrade to roughen surface and degloss the surface. Existing paint must attain a minimum 3B rating in accordance with ASTM D3359 "X-Scribe" adhesion test.

Application Equipment

Listed below are general equipment guidelines for the application of this product. Job site conditions may require modifications to these guidelines to achieve the desired results.
General Guidelines:

Spray Application (General) This is a high solids coating and may require adjustments in spray techniques. Wet film thickness is easily and quickly achieved. The following spray equipment has been found suitable and is available from manufacturers such as Binks, DeVilbiss and Graco.

Conventional Spray Pressure pot equipped with dual regulators, 3/8" I.D. minimum material hose, .070" I.D. fluid tip and appropriate air cap.

Airless Spray

Pump Ratio:	30:1 (min.)*
GPM Output:	3.0 (min.)
Material Hose:	3/8" I.D. (min.)
Tip Size:	.015-.017"
Output PSI:	2100-2400
Filter Size:	60 mesh

*Teflon packings are recommended and available from the pump manufacturer.

Brush & Roller (General) Multiple coats may be required to obtain desired appearance, recommended dry film thickness and adequate hiding. Avoid excessive re-brushing or re-rolling. For best results, tie-in within 10 minutes at 75°F.

Brush Recommended for touch-up only. Use a medium, natural bristle brush.

Roller Use a medium-nap mohair roller cover with phenolic core.

Mixing & Thinning

Mixing Power mix separately Part A, then combine and power mix. DO NOT MIX PARTIAL KITS.

Ratio 5:1 Ratio (A to B)

Thinning

Spray:	Up to 19 oz/gal (13%) w/ #2
Brush:	Up to 18 oz/gal (13%) w/ #215
Roller:	Up to 18 oz/gal (13%) w/ #215

Use of thinners other than those supplied or recommended by Carboline may adversely affect product performance and void product warranty, whether expressed or implied.

Pot Life 6 Hours at 75°F (24°C) and less at higher temperatures. Pot life ends when coating becomes too viscous to use. MOISTURE CONTAMINATION WILL SHORTEN POT LIFE AND CAUSE GELLATION.

Cleanup & Safety

Cleanup Use Thinner #2 or Acetone. In case of spillage, absorb and dispose of in accordance with local applicable regulations.

Safety Read and follow all caution statements on this product data sheet and on the MSDS for this product. Employ normal workmanlike safety precautions. Hypersensitive persons should wear protective clothing, gloves and use protective cream on face, hands and all exposed areas.

Ventilation When used in enclosed areas, thorough air circulation must be used during and after application until the coating is cured. The ventilation system should be capable of preventing the solvent vapor concentration from reaching the lower explosion limit for the solvents used. User should test and monitor exposure levels to insure all personnel are below guidelines. If not sure or if not able to monitor levels, use MSHA/NIOSH approved supplied air respirator.

Caution This product contains flammable solvents. Keep away from sparks and open flames. All electrical equipment and installations should be made and grounded in accordance with the National Electric Code. In areas where explosion hazards exist, workmen should be required to use non-ferrous tools and wear conductive and non-sparking shoes.

Application Conditions

Condition	Material	Surface	Ambient	Humidity
Normal	60°-85°F (16°-29°C)	60°-85°F (16°-29°C)	60°-85°F (16°-29°C)	40-60%
Minimum	50°F (10°C)	35°F (2°C)	35°F (2°C)	0%
Maximum	100°F (38°C)	120°F (49°C)	95°F (35°C)	80%

Industry standards are for substrate temperatures to be 5°F (3°C) above the dew point. Caution: This Product is moisture sensitive in the liquid stage and until fully cured. Protect from heavy humidity, dew and direct moisture contact until fully cured. Application and/or curing in humidities above maximum, or exposure to moisture from rain or dew may result in a loss of gloss and/or microbubbling of the product.

Curing Schedule

Surface Temp. & 50% Relative Humidity	Dry to Handle	Dry to Recoat	Final Cure
35°F (2°C)	36 Hours	36 Hours	14 Days
50°F (10°C)	16 Hours	16 Hours	10 Days
75°F (24°C)	8 Hours	8 Hours	7 Days
90°F (32°C)	4 Hours	4 Hours	5 Days

These times are based on a 4.0 mil (100 micron) dry film thickness. Higher film thickness, insufficient ventilation or cooler temperatures will require longer cure times and could result in solvent entrapment and premature failure.

Packaging, Handling & Storage

	1.2 Gallon Kit	6 Gallon Kit
Shipping Weight (Approximate)	17 lbs (8 kg)	**80 lbs (36 kg)**

Flash Point (Setaflash) 71°F (22°C)

Storage (General) Store Indoors.

Storage Temperature & Humidity 40° - 110°F (4°-43°C)
0-80% Relative Humidity

Shelf Life Part A: Min. 36 months at 75°F (24°C)
Part B (Urethane Converter 811): Min. 24 months at 75°F (24°C)

***Shelf Life: (actual stated shelf life) when kept at recommended storage conditions and in original unopened containers.**

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An RPM Company

August 2006 - Marine

product data carboline®

PLASITE 4110

NSF Certified

NSF/ANSI 61

TYPE
PLASITE 4110 is a vinyl ester resin combined with special curing system and inert flake pigment to provide outstanding chemical and physical properties. Specially formulated for excellent abrasion resistance. PLASITE 4110 meets the FDA requirements for 21 CFR, 175.300 and 177.2420.

INTENDED USE
As a high chemical abrasion-resistant thick film for tank lining service and as a maintenance coating for severe exposure.

NSF REQUIREMENTS
PLASITE 4110 is certified to NSF/ANSI Standard 61 for cold potable water when the following requirements are met:

- The tank is 3,000 gallons/11,100 liters or larger.
- PLASITE Thinner #20, up to maximum of 10% by volume, may be used for thinning purposes.
- The coating must be applied in 2 to 3 coats to a maximum DFT of 45 mils/1125 microns.
- Prior to placing the lining in service, it must be force cured at 200°F/93°C metal temperature for 4 hours.

TEMPERATURE RESISTANCE
Dry tests 380°F/193°C continuous; limited short excursions to 460°F/238°C acceptable. Wet temperature resistance depends upon concentration and reagent exposure.

COLOR Charcoal gray

FILM THICKNESS
2 to 3 multi-pass spray coats will produce the 35 to 45 mils/875 to 1125 microns dry film thickness recommended for immersion service. Consult Carboline Technical Service Department for any deviation to this film thickness. Refer to APPLICATION section.

VOC CONTENT (Determined Theoretically)

Coating as Supplied		Thinned 5% by Volume with PLASITE Thinner #20	
Lbs./Gal.	**g/L**	**Lbs./Gal.**	**g/L**
0.50 ± 2%	60 ± 2%	0.78 ± 2%	93 ± 2%

COVERAGE
PLASITE 4110 will cover approximately 960 mil ft.^{2}/gal. or 86.4 sq. m. per 25 microns/gal. This is a coverage obtained from field use on small jobs and includes loss in can, spray loss, small amount of shrinkage, etc. Application by conventional spray equipment may affect coverage.

RECOATING TIME
May be recoated after initial 10 hour cure. Following coating must be applied within 30 days. Each following coat should be diluted approximately 2 to 10% with PLASITE Thinner #20.

Note: Previously applied coating exposed to an accumulation of 24 hours of sunlight or surface temperatures in excess of 130°F may result in intercoat disbondment. An applied coating film must be topcoated before an accumulation of 24 hours exposure has occurred or special procedures (such as shading with tarps) must be used.

THINNERS
Use PLASITE Thinner #20. 2 to 10% thinning may be needed to adjust coating for higher temperatures and various application conditions. Topcoating of previously coated films will require the addition of 2 to 10% thinner. Consult Carboline laboratory for unusual thinning requirements. See RECOATING TIME SECTION.
CLEANUP THINNER: Thinner #71

PRIMERS
For steel surfaces, coating is considered to be a "self-priming" system. Do not apply PLASITE 4110 directly to concrete. See reference to fillers and sealers in CONCRETE section.

PHYSICAL SPECIFICATIONS

Pigments: Inert fillers and flake.

Pot Life: 1 1/2 to 3 hours in one gallon cans and 1 1/2 to 2 hours in five gallon cans at 70 to 90°F/21-32°C MATERIAL temperature. MATERIAL temperatures in excess of 90°F will significantly reduce pot life. CAUTION! Do not attempt to extend pot life by mixing newly catalyzed coating into coating near the end of its pot life.

Shelf Life: Approximately 4 months at 75°F/24°C. Cooler storage temperatures will increase shelf life. Storage at higher temperatures can result in substantially shorter shelf life.

Film Density: 79.1 lbs./ft^3 0.26384 lbs./ft^2 at 40 mils.

Elongation: 1.7% using Method ASTM D638.

Shipping Weight: 12 lbs. per gallon kit.

Abrasion Resistance: 11 milligrams average loss per 1000 cycles Taber CS-17 Wheel, 1000 gram weight.

Surface Hardness: Konig Pendulum Hardness of 134 seconds (Glass Standard = 250 seconds); ASTM Method D4366-84.

Thermal Shock: Unaffected by minus 70°F to plus 200°F in 5 cycles, or 40 to 380°F in 10 cycles.

CHEMICAL RESISTANCE
Superior chemical resistance to organic and inorganic acids, oxidizing agents and salts.

CURING
Curing Time: 10 days at 70°F/21°C or 7 days at 90°F/32°C. Although coating may be applied at substrate temperatures as low as 60°F/16°C, the substrate temperature must be raised to at least 70°F/21°C within 12 hours and held until coating surface is tack-free (approximately 10 hours) to avoid possible loss of cure. A minimum of 70°F/21°C surface temperature is required to obtain polymerization of this coating.

Force Curing
Listed below are a few curing schedules that may be used for time and work planning. Prior to raising the metal to the force curing temperature, it is necessary that an air dry time of 2 to 5 hours at temperatures from 70°F/21°C to 100°/38°C be allowed. After the air dry time has elapsed, the temperature should be raised in increments of approximately 30°F/17°C every 30 minutes until the desired force curing metal temperatures are reached. Any moisture from condensation of any source will kill the cure on freshly applied coating before it reaches a "non-tacky" stage. A force cure at 200°F/93°C metal temperature for 4 hours is necessary to comply with NSF Standard 61 requirements.

METAL TEMPERATURE	CURING TIME	METAL TEMPERATURE	CURING TIME
110°F/43°C	72 Hrs	160°F/71°C	4 ½ Hrs
120°F/49°C	36 Hrs	170°F/77°C	3 ½ Hrs
130°F/54°C	18 Hrs	180°F/82°C	2 ½ Hrs
140°F/60°C	10 Hrs	190°F/88°C	2 Hrs
150°F/66°C	6 Hrs	200°F/93°C	1 ¾ Hrs

PACKAGING

1 gallon unit:
1 one gallon can of Part A
1 one gallon can of Part B
1 small container of Part C
1 small container of Part D

5 gallon unit:
1 six gallon partially filled pail of Part A
1 five gallon pail of Part B
1 small container of Part C
1 small container of Part D

PLASITE 4110

NSF Certified

SURFACE PREPARATION

Steel High Temperature & Immersion

All sharp edges shall be ground to produce a radius and all imperfections, such as, skip welds, delaminations, scabs, slivers and slag shall be corrected prior to abrasive blasting. Skip welds should be welded solid. Degrease surface prior to sandblasting. Organic solvents, alkaline solutions, steam, hot water with detergents or other systems that will completely remove dirt, oil, grease, etc. shall be used. Used tanks may require additional decontamination

The surface shall be blasted to SSPC SP-5/NACE No. 1 white metal blast grade using a Venturi blast nozzle with 100 psi/7 bars. Reference Joint Surface Preparation Std. SSPC SP-5/NACE 1, White Metal Blast Cleaning. A blast profile depth or "tooth" in the metal shall be a minimum of 4 mils as determined by comparing Carboline's 4000 Series Blast Comparator, using adequate light and magnification. Comparator panel available by request to Carboline Technical Service. The blast media used shall be properly graded, clean, sharp angular abrasive similar to Humble abrasive flint S7 (6 to 30 mesh), steel grit (HG25), or BLACK BEAUTY® BB1040 to produce the required blast depth.

Remove all traces of grit and dust, as well as, embedded abrasives with a vacuum cleaner and/or by brushing. Care should be taken to avoid contaminating surface with fingerprints or from detrimental material on the workers' clothes or atmospheric contamination.

The surface temperature shall be maintained at a minimum of 5°F/3°C above the dew point to prevent oxidation of the surface. The coating shall be applied within the same day that the surface has been prepared. Visible oxidation or condensation is not allowed.

Severe Corrosive Environments – Splash & Fume

Surface preparation is the same in the foregoing with the exception that NACE No. 2 or SSPC-SP10 near white metal blast may be used providing the blast profile depth as described above is achieved.

Concrete

All concrete requires abrasive blasting to remove laitance and to provide a hard, firm, clean and fully-cured concrete surface for coating. All concrete surfaces are required to be filled and sealed prior to application of PLASITE 4110. Contact Carboline for recommendations.

APPLICATION

Mixing ***(Note: this is a 4-component material)***

Mix Part B into Part A using a mechanical high speed agitator, making sure all Part B is completely mixed with Part A. Maintain a good vortex while mixing un a smooth liquid, free of any unmixed particles of pigment, is obtained (approximately 15-30 minutes). After the pigments and liquid are thoroughly mixed, add the entire amount of the measured liquid promoter (Part D). Mix completely. (no color streaking or residue of part D should remain on the container sidewalls). Allow to cool if material temperature increases, then add Part C and necessary amount of Plasite Thinner #20. Mix an additional three t five minutes.

WARNING! The promoter (Part D) and the catalyst (Part C) must be separately mixed into the coating (Parts A&B). Any contact of unmixed Part C with Part D may lead to a fire or an explosion!

Continuous mixing during use is required. Part A, Part B and Part D may be premixed up to 72 hours prior to adding Part C. Operator should wear face mask during high speed mixing of the coating components. Avoid breathing dust.

Spray

Conventional atomizing spray system shall be equal to: Binks Model 2001 Gun with 59ASS Fluid Nozzle — 251 Air Cap, 559SS Needle. Heavy-duty trigger spring recommended. Pot pressure of approximately 50 psi/3.5 bars. Atomizing pressure of approximately 60 psi/4.1 bars. (Use standard production type pressure pot with air motor drive agitator.)

Note: Application by conventional spray equipment may affect maximum film building capabilities and coverage rates.

Applicators may prefer to apply additional coats to achieve the 40 mil/1000 microns nominal DFT. Airless spray system requires a large capacity pump with a capacity of 3 g.p.m./11.1 l.p.m. similar or equal to: Graco Bulldog with 0.025" or larger fluid nozzle; 12 in/30 cm minimum spray width is recommended. Use liquid pressure of approximately 1800 to 2200 psi/124-152 bars. All screens should be removed from pump and gun. A 3/8 in/9 mm diameter fluid line is recommended. CONTINUOUS MIXING DURING USE IS REQUIRED.

Note: Conventional spray equipment is preferred. Expect higher wear rates to airless spray equipment lower units and spray tips.

A minimum surface temperature of 70°F/21°C is required to obtain polymerization of the coating system. Coating can be applied at a surface temperature as low as 60°F/16°C but polymerization will be inhibited.

Succeeding coats cannot be applied without damaging the system until the surface temperature rises sufficiently to obtain partial polymerization. This will require raising to the minimum surface temperature of 70°F/21°C within 12 hours of application. Refer to CURING section. When surface temperatures are over 100°F/38°C, consult Carboline Technical Service for special instructions.

The mixed coating shall be applied utilizing a multi-pass spray system. Apply horizontal and vertical passes with 50% overlap. Special precautions are required at overlaps and welds to eliminate excessive film build. Spray gun should be perpendicular to surface at all times, approximately 14 in/36 cm from surface.

For non-NSF applications, coating may be overcoated after initial "set" which will occur normally in 3 to 6 hours at 70°F/21°C with proper ventilation. Initial "set" time will decrease as surface temperature increases. Refer to RECOATING TIME section.

When physical contact (foot traffic, scaffolding, etc.) with the previously applied coating, or for NSF applications is needed, a minimum of 10 hours at 70°F/21°C substrate and air temperature with ventilation is required before proceeding. Previously applied coats must have reached a "non-tacky" state before being exposed to physical contact. This condition will occur in less time as surface temperature increases. Overcoating shall be performed as soon as possible to prevent contamination.

Brush

Brush application is not recommended, but may be used for repairs or touch-up. Continuous mixing during use is required.

LINING REPAIR

Clean damaged area, removing all contaminants and loose coating.

Abrasive blast substrate to original specification where coating has been exposed to environment and where oxidation is evident. Feather the original coating not less than 2 in/5 cm from damaged area.

If new coating is physically damaged and has not been in service, repair as shown above. For repairing holidays, sand surface and brush apply proper thickness of coating. Apply coating by brush or spray. Do not apply by brush on areas larger than 1 sq. ft./.093 sq.m.

Warning: Contamination of previously exposed coating film may be detrimental to adhesion of the repair and may affect life expectancy.

INSPECTION

Degree of surface preparation shall conform to appropriate specifications as outlined in SURFACE PREPARATION section.

Metal temperature shall be recorded at least every 4 hours and before application of coating. Humidity (wet bulb reading) shall be taken to ensure that metal temperature is at least 5°F/3°C higher than wet bulb temperature. Dry bulb temperatures shall be recorded at the same time to ensure curing.

For immersion service, a pinhole-free film is essential and testing with Tinker & Rasor Model AP-W or Stearns Model 14/20 or equivalent is required on final film. Use 3000 to 3500 volts. Allow a minimum cure of 48 hours at 70°F/21°C or 36 hours at 90°F/32°C before holiday testing. Dry film thickness shall be a nominal 40 mils/1000 microns with acceptable minimum at 35 mils/875 microns and maximum at 45 mils/1125 microns. Refer to Plasite Bulletin PA-3, Section 3, for inspection requirements.

SAFETY

READ THIS NOTICE

SAFETY AND MISCELLANEOUS EQUIPMENT

For tank lining work and enclosed spaces, it is recommended that the operator provide himself with clean coveralls and rubber soled shoes and observe good personal hygiene. Certain personnel may be sensitive to various types of resins which may cause dermatitis.

THE SOLVENT IN THIS COATING IS FLAMMABLE AND CARE AS DEMANDED BY GOOD PRACTICE, OSHA, STATE AND LOCAL SAFETY CODES, ETC. MUST BE FOLLOWED CLOSELY. Keep away from heat, sparks and open flame and use necessary safety equipment such as air mask, explosion-proof electrical equipment, non-sparking tools and ladders, etc. Avoid contact with skin and breathing of vapor or spray mist. When working in tanks, rooms and other enclosed spaces, adequate ventilation must be provided. Refer to Plasite Bulletin PA-3. Keep out of the reach of children.

The catalyst (Part C) is relatively stable at room temperatures but must be protected from contamination, heat, fire and contact with promoter (in Part D). The catalyst (Part C) is classified by the Interstate Commerce Commission as an "oxidizing material." All shipping containers bear a yellow caution label. The catalyst is highly irritating if it gets into the eyes. Immediately rinse eyes thoroughly with water and get medical attention. The catalyst also can be a skin irritant and should be removed with large quantities of soap and water. Since this is an oxidizing material, it should not be allowed to accumulate or remain in soaked rags or clothing.

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An RPM Company

April 2006 replaces January 2006

PROCO™

SERIES 240/242

molded expansion joints

PROCO Series 240 and Series 242 Non-Metallic Expansion Joints are designed for tough demanding industrial applications as found in: Air Conditioning-Heating and Ventilating Systems, Chemical-Petrochemical and Industrial Process Piping Systems, Power Generating Systems, Marine Services, Pulp & Paper Systems, Water-Waste-water-Sewage and Pollution Control Systems. Installed next to mechanical equipment or between the anchor points of a piping system, specify the PROCO Series 240 or 242 to: (1) Absorb Pipe/Movement/Stress, (2) Reduce System Noise, (3) Isolate Vibration, (4) Compensate Alignment/Offset, (5) Eliminate Electrolysis, (6) Protect Against Start-Up/Surge Forces. Our history in the manufacturing of expansion joint products dates back to 1930. When you need an engineered rubber solution to a piping system problem, call PROCO.

Spherical Shapes-Stronger-More Efficient. Featuring an engineered molded style single or twin sphere designed bellows, the PROCO Series 240 and Series 242 are inherently stronger than the conventional hand-built Spool Type arch. Internal pressure within a sphere is exerted in all directions, distributing forces evenly over a larger area The spherical design "flowing-arch" reduces turbulence, sediment buildup, thrust area and the effects of thrust on the piping system equipment when compared to the "high-arch" design of hand-built standard products.

Greater Movements Are Available with the PROCO Series 240 and Series 242 when compared to the movements of conventional hand-built products. Axial compression, elongation, deflection and angular movements in the system are more readily absorbed by spherical types. These products are more forgiving and can be compressed or extended to install in non-standard openings, caused by equipment shifting or settling (Pre-compressing/extending the expansion joints for installation, may result in reduced pressure, vacuum and movement capabilities of the expansion joints. See Tables 2 and 3.)

Easy Installation With Alignable Metallic Flanges. The floating metallic flanges freely rotate on the bellows, compensating for mating flange misalignment, thus speeding up installation time (see Figures 1, 2, 3 & 4). Gaskets are also not required with the Series 240 or Series 242, provided the expansion joints are mated against a flat face flange as required in the installation instructions.

Less System Strain With Thin Wall Design. Manufactured by high pressure molding of elastomer and high-tensile fabric reinforcement, the Series 240 and Series 242 have a thinner wall section and lighter weight when compared to conventional hand-built products. Lower spring forces are therefore required, reducing piping/flange/equipment stress-strain-damage. PROCO Styles 240-C and 240-A are acceptable for use with plastic piping systems where even lower deflection forces are required.

Specifications Met. The PROCO Series 240 and Series 242 are designed to meet or exceed the pressure, movement and dimensional rating of the Spool Type arch as shown in the Rubber Expansion Joint Division, Fluid Sealing Association "Technical Handbook - Sixth Edition" Tables IV & V.

Absorbs Vibration-Noise-Shock. The PROCO quiet operating Series 240 and Series 242 are a replacement for "sound transmitting" metallic expansion joints. Sound loses energy traveling axially through the elastomer bellows. Water hammer pumping impulses and water-borne noises are cushioned and absorbed by the molded lightweight thin-wall structure. Install the Series 240 or Series 242 in a system to enable isolated equipment to move freely on its vibration mountings; or to reduce vibration transmission when the piping section beyond the expansion joint is anchored or sufficiently rigid.

Flange Materials/Drilling. All PROCO Spherical 240 and 242 connectors are furnished complete with plated carbon steel flanges for corrosion protection. Series 240 and 242 Neoprene connectors — 12" and below — are tapped to ANSI 125/150# drilling. All other connectors come with standard drilled holes to the ANSI 125/150# standards (see Table 7 and Figures 3 & 4). Stainless steel flanges and other drilling standards such as: ANSI 250/300#, BS-10, DIN NP-10 and DIN NP-16 are also available from stock and are listed on Table 7. JIS-5K and JIS-10K are also available upon request.

Chemical Service Capability At Minimal Cost. Expensive, exotic metal expansion joints for chemical service can be replaced with the PROCO Series 240 or Series 242. Molded with low cost chemical resistant elastomers such as Neoprene, Nitrile, Hypalon®, EPDM and Chlorobutyl insures an expansion joint is compatible with the fluid being pumped or piped. (See Table 1 below). Use the PROCO "Chemical/Rubber Guide" to specify an elastomer recommendation compatible for your requirement.

Wide Service Range With Low Cost. Engineered to operate up to 300 PSIG and 265°F, the PROCO Series 240 and Series 242 can be specified for a wide range of piping requirements. Compared to conventional hand-built Spool Type arch, you will invest less money when specifying the mass-produced, consistent high quality, molded single or twin sphere expansion joints.

Large Inventories Mean Same-Day Shipment. PROCO maintains the largest inventory of spherical expansion joints in the Americas. Every size listed is in stock in several elastomers and comes with a choice of drilling patterns. Shipment is based on customer need. PROCO can ship same day as order placement. In fact, when it comes to rubber expansion joints, **if PROCO doesn't have your requirement…nobody does!**

Information • Ordering • Pricing • Delivery. Day or night, weekends and holidays … the PROCO phones are monitored 24 hours around the clock. When you have a question, you can call us.

Toll-Free Phone	800 / 344-3246 USA/CANADA
International Calls	209 / 943-6088
Fax	209 / 943-0242
E-mail	sales@procoproducts.com
Website	www.procoproducts.com

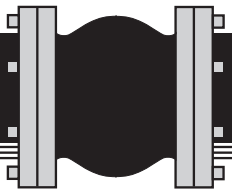
Weekday office hours are 5:30 a.m. to 5:15 p.m. (Pacific Time)

Table 1: Available Styles • Materials

For Specific Elastomer Recommendations, See: **PROCO™ "Chemical To Elastomer Guide"**

240-A	240-C	240-AV, D, E, M	242-A, B, C	PROCO™ Material Code [1]	Cover Elastomer [2]	Tube Elastomer	Maximum Operating Temp. °F	Identifying Color Band/Label
		X	X	/BB	Chlorobutyl	Chlorobutyl	250°	Black
	X	X	X	/EE	EPDM	EPDM	250°	Red
	X			/EE-9	EPDM	EPDM	265°	Red
	X			/ET-9 [3]	EPDM	Teflon®	265°	Red
	X			/HH	Hypalon®	Hypalon®	230°	Green
		X	X	/NH	Neoprene	Hypalon®	230°	Green
	X			/NJ	Neoprene	FDA-Nitrile	230°	White
		X	X	/NN	Neoprene	Neoprene	230°	Blue
X	X	X	X	/NP	Neoprene	Nitrile	230°	Yellow
X	X			/NT [3]	Neoprene	Teflon®	230°	

NOTES: Hypalon® is a registered trademark of DuPont Dow Elastomers. Teflon® is a registered trademark of the DuPont Company.
1. All elastomers include nylon reinforcing, except EE-9 which is steel cord.
All materials meet or exceed the Rubber Expansion Joint Division, Fluid Sealing Association-REJ Division requirements for Standard Class I and II. EE-9 also meets Special Class II. For more information see The FSA Technical Handbook, Table 1.
Materials NN, NP and NH meet all requirements of U.S.C.G.



Protecting Piping And Equipment Systems From Stress/Motion

Series 240 Single Sphere Expansion Joints

Table 2: Sizes • Movements • Pressures • Flange Standards • Weights

NOMINAL PIPE Size I.D.	Neutral Length	PROCO Style Number [1]	240 Movement Capability: From Neutral Position [2]					Pressure [4]		Standard Flange Bolting Dimensions					Weight in lbs [8]	
			Axial Compression Inches	Axial Extension Inches	Lateral Deflection Inches	Angular Deflection Degrees	Thrust [3] Factor	Positive [5] PSIG	Vacuum [6] Inches of Hg	Flange O.D. Inches	Bolt Circle Inches	Number of Holes	Size of Holes Inches	Bolt Hole [7] Thread	Exp. Joint & Flanges	Control Unit Set (2 Rod)
1	**6.00**	**240-AV**	0.500	0.375	0.500	37	4.43	225	26	4.25	3.13	4	0.500	1/2-13 UNC	3.8	3.3
1.25	3.74	240-D	0.312	0.188	0.312	17	6.34	235	26	4.63	3.5	4	0.500	—	4.6	3.3
	5.00	240-C	1.063	1.250	1.188	45		225	21				0.500	—	5.0	
	5.00	240-E	.500	0.375	0.500	31		225	26				0.500		5.0	
	6.00	**240-AV**	.500	0.375	0.500	31		225	26				0.500	1/2-13 UNC	5.0	
1.5	3.74	240-D	0.375	0.188	0.312	14	6.49	225	26	5.0	3.88	4	0.500	—	5.4	4.6
	4.00	240-M	0.375	0.188	0.312	14		225	26				0.500	—	5.5	
	5.00	240-C	1.063	1.250	1.188	45		235	18				0.500	—	5.1	
	5.00	240-E	0.500	0.375	0.500	27		225	26				0.500		6.0	
	6.00	**240-AV**	0.500	0.375	0.500	27		225	26				0.500	1/2-13 UNC	6.1	
2	4.00	240-M	0.375	0.188	0.312	11	7.07	225	26	6.0	4.75	4	0.625	—	8.3	6.3
	4.13	240-D	0.375	0.188	0.312	11		225	26				0.625	—	8.5	6.3
	5.00	240-C	1.063	1.250	1.188	45		235	18				0.625	—	7.1	6.3
	5.00	240-E	0.375	0.375	0.500	20		225	26				0.625	—	8.5	6.3
	6.00	240-A	1.188	1.188	1.188	45		235	18				0.625	—	7.1	6.3
	6.00	240-HW	0.500	0.375	0.500	20		300	26				0.625	—	11.0	7.6
	6.00	**240-AV**	0.500	0.375	0.500	20		225	26				0.625	5/8-11 UNC	12.3	7.6
2.5	4.00	240-M	0.375	1.188	0.375	8	11.05	225	26	7.0	5.5	4	0.625	—	12.0	7.6
	4.53	240-D	0.500	0.250	0.375	11		225	26				0.625	—	12.3	
	5.00	240-C	1.063	1.250	1.188	45		235	18				0.625	—	10.6	
	5.00	240-E	0.500	0.375	0.500	17		225	26				0.625	—	12.0	
	6.00	240-A	1.188	1.188	1.188	43		235	18				0.625	—	12.0	
	6.00	**240-AV**	0.500	0.375	0.500	17		225	26				0.625	5/8-11 UNC	12.3	
3	5.00	240-C	1.063	1.250	1.188	40	13.36	235	15	7.5	6.0	4	0.625	—	13.3	8.3
	5.00	240-E	0.500	0.375	0.500	14		225	26				0.625	—	14.0	8.3
	5.14	240-D	0.500	0.375	0.500	14		225	26				0.625	—	14.0	8.3
	6.00	240-A	1.188	1.188	1.188	38		235	15				0.625	—	13.8	8.3
	6.00	240-HW	0.500	0.375	0.500	14		300	26				0.625	—	17.5	8.3
	6.00	**240-AV**	0.500	0.375	0.500	14		225	26				0.625	5/8-11 UNC	14.0	8.3
	8.00	**240-AV**	0.500	0.375	0.500	14		225	26				0.625	5/8-11 UNC	15.0	8.7
3.5	**6.00**	**240-AV**	0.500	0.375	0.500	12	18.67	225	26	8.5	7.0	8	0.625	5/8-11 UNC	17.6	7.4
4	5.00	240-C	1.063	1.250	1.188	32	22.69	235	15	9.0	7.5	8	0.625	—	16.5	7.4
	5.00	240-E	0.750	0.500	0.500	14		225	26				0.625	—	17.0	7.4
	5.32	240-D	0.750	0.500	0.500	14		225	26				0.625	—	17.1	7.4
	6.00	240-A	1.188	1.188	1.188	30		235	15				0.625	—	17.5	7.4
	6.00	240-HW	0.750	0.500	0.500	14		300	26				0.625	—	26.0	7.4
	6.00	**240-AV**	0.750	0.500	0.500	14		225	26				0.625	5/8-11 UNC	18.3	7.4
	8.00	**240-AV**	0.750	0.500	0.500	14		225	26				0.625	5/8-11 UNC	19.3	7.8
5	5.00	240-C	1.063	1.250	1.188	27	30.02	235	10	10.0	8.5	8	0.750	—	20.3	8.3
	5.00	240-E	0.750	0.500	0.500	11		225	26				0.750	—	22.0	8.3
	6.00	240-A	1.188	1.188	1.188	25		235	10				0.750	—	21.8	8.3
	6.00	**240-AV**	0.750	0.500	0.500	11		225	26				0.750	3/4-10 UNC	22.8	8.3
	6.69	240-D	0.750	0.500	0.500	11		225	10				0.750	—	23.6	8.5
	8.00	**240-AV**	0.750	0.500	0.500	11		225	26				0.750	3/4-10 UNC	25.0	10.8
6	5.00	240-C	1.063	1.250	1.188	23	41.28	225	8	11.0	9.5	8	0.750	—	22.6	10.4
	5.00	240-E	0.750	0.500	0.500	9		225	26				0.750	—	26.0	10.4
	6.00	240-A	1.188	1.188	1.188	21		235	10				0.750	—	24.0	10.4
	6.00	240-HW	0.750	0.500	0.500	9		300	26				0.750	—	39.0	10.4
	6.00	**240-AV**	0.750	0.500	0.500	9		225	26				0.750	3/4-10 UNC	26.8	10.4
	7.09	240-D	0.750	0.500	0.500	9		225	26				0.750	—	29.0	10.6
	8.00	**240-AV**	0.750	0.500	0.500	9		225	26				0.750	3/4-10 UNC	29.1	10.8
8	5.00	240-C	1.063	1.188	1.188	17	63.62	235	8	13.5	11.75	8	0.750	—	35.5	13.4
	5.00	240-E	0.750	0.500	0.500	7		225	26				0.750	—	40.0	13.4
	6.00	240-A	1.188	1.188	1.188	16		235	8				0.750	—	38.5	13.4
	6.00	240-HW	0.750	0.500	0.500	7		300	26				0.750	—	70.0	13.4
	6.00	**240-AV**	0.750	0.500	0.500	7		225	26				0.750	3/4-10 UNC	40.6	13.4
	8.07	240-D	1.000	0.563	0.875	8		225	26				0.750	—	41.3	14.0
10	5.00	240-C	1.063	1.188	1.188	14	103.87	235	6	16.0	14.25	12	0.875	—	49.3	21.0
	5.00	240-E	1.000	0.625	0.750	7		225	26				0.875	—	56.0	21.0
	8.00	240-A	1.188	1.188	1.188	13		235	6				0.875		53.6	21.3
	8.00	**240-AV**	1.000	0.625	0.750	7		225	26				0.875	7/8-9 UNC	56.6	21.3
	9.00	**240-AV**	1.000	0.625	0.750	7		225	26				0.875	7/8-9 UNC	57.0	22.0
	8.00	240-HW	1.000	0.625	0.750	7		275	26				0.875	—	56.0	22.0
	9.45	240-D	1.000	0.625	0.875	7		225	26				0.875	—	58.5	22.0
	10.00	**240-AV**	1.000	0.625	0.750	7		225	26				0.875	7/8-9 UNC	60.5	26.5
12	5.00	240-C	1.063	1.250	1.188	12	137.89	235	6	19.0	17.0	12	0.875	—	73.4	26.5
	5.00	240-E	1.000	0.625	0.750	6		225	26				0.875	—	74.0	26.5
	8.00	240-A	1.188	1.188	1.188	11		235	6				0.875	—	80.0	27.0
	8.00	240-HW	1.000	0.625	0.750	6		275	26				0.875	—	100.0	27.0
	8.00	**240-AV**	1.000	0.625	0.750	6		225	26				0.875	7/8-9 UNC	83.0	27.0
	9.00	**240-AV**	1.000	0.625	0.750	6		225	26				0.875	7/8-9 UNC	88.0	27.0
	10.24	240-D	1.000	0.625	0.875	6		225	26				0.875	—	89.0	28.0
14	8.00	240-HW	1.000	0.625	0.750	5	182.65	200	26	21.0	18.75	12	1.000	—	162.0	28.0
	8.00	**240-AV**	1.000	0.625	0.750			150	26				1.000	—	115.0	28.0
	9.00	240-M	1.000	0.625	0.750			150	26				1.000	—	117.0	29.0
	10.43	240-D	1.000	0.625	0.875			150	26				1.000	—	120.0	29.0
16	8.00	240-C	1.000	1.063	1.188	8	240.53	145	6	23.5	21.25	16	1.000	—	136.0	26.8
	8.00	240-HW	1.000	0.625	0.750	4		175	26				1.000	—	186.0	26.8
	8.00	**240-AV**	1.000	0.625	0.750	4		125	26				1.000	—	165.0	26.8
	9.00	240-M	1.000	0.625	0.750	4		125	26				1.000	—	168.0	27.0
	10.43	240-D	1.000	0.625	0.975	4		125	26				1.000	—	170.0	27.0
18	8.00	240-HW	1.000	0.625	0.750	4	298.65	175	26	25.0	22.75	16	1.125	—	209.0	31.4
	8.00	**240-AV**	1.000	0.625	0.750			125	26				1.125	—	168.0	31.4
	9.00	240-M	1.000	0.625	0.750			125	26				1.125	—	169.0	33.1
	10.43	240-D	1.000	0.625	0.875			125	26				1.125	—	170.0	33.1
20	8.00	240-C	1.000	1.063	1.188	6	363.05	145	6	27.5	25.00	20	1.125	—	154.0	32.4
	8.00	240-HW	1.000	0.625	0.750	3		175	26				1.125	—	234.0	32.4
	8.00	**240-AV**	1.000	0.625	0.750	3		125	26				1.125	—	170.0	32.4
	9.00	240-M	1.000	0.625	0.750	3		125	26				1.125	—	173.0	34.1
	10.43	240-D	1.000	0.625	0.875	3		125	26				1.125	—	175.0	34.1
22	**10.00**	**240-AV**	1.000	0.625	0.750	3	433.74	115	26	27.5	25.0	20	1.125	—	210.0	34.5
24	8.00	240-C	1.000	1.063	1.188	5	510.70	145	6	32.5	29.5	20	1.250	—	214.0	44.0
	10.00	**240-AV**	1.000	0.625	0.750	3		110	26				1.250	—	255.0	45.5
	10.00	240-HW	1.000	0.625	0.750	3		160	26				1.250	—	297.0	45.5
	10.47	240-D	1.000	0.625	0.875	3		110	26				1.250	—	265.0	46.0
26	**10.00**	**240-AV**	1.000	0.625	0.750	3	593.96	110	26	34.25	31.75	24	1.375	—	270.0	46.5
30	**10.00**	**240-AV**	1.000	0.625	0.750	2	779.31	110	26	38.75	36.0	28	1.375	—	295.0	57.0

Standard PROCO Style 240-AV Expansion Joints shown in Bold Type are considered Standards and inventoried in large quantities.

NOTES:
1. "HW" denotes Heavy Weight Construction.
2. Movements stated are non-concurrent.
3. To determine End Thrust: Multiply Thrust Factor by Operating Pressure of System. This is End Thrust in pounds.
4. Pressure rating is based on 170°F operating temperature. The pressure rating is reduced slightly at
6. Vacuum rating is based on neutral installed length, without external load. Products should not be installed "extended" on vacuum applications.
7. Style 240-AV/NN (Neoprene elastomer only) expansion joints 1.0" I.D. – 12.0" I.D. come with tapped holes in lieu of drilled holes.

Series 242 Twin Sphere Expansion Joints

Table 3: Sizes • Movements • Pressures • Flange Standards • Weights

NOMINAL PIPE Size I.D.	Neutral Length	PROCO Style Number [1]	242 Movement Capability: From Neutral Position [2]					Pressure [4]		Standard Flange Bolting Dimensions					Weight in lbs [8]	
			Axial Compression Inches	Axial Extension Inches	Lateral Deflection Inches	Angular Deflection Degrees	Thrust [3] Factor	Positive [5] PSIG	Vacuum [6] Inches of Hg	Flange O.D. Inches	Bolt Circle Inches	Number of Holes	Size of Holes Inches	Bolt Hole [7] Thread	Exp. Joint & Flanges	Control Unit Set (2 Rod)
1	10.00	242-C	2.000	1.188	1.750	45	4.43	225	26	4.25	3.13	4	0.500	—	5.2	3.6
1.25	**7.0** 7.0 10.00	**242-A** 242-HA 242-C	2.000	1.188	1.750	45	6.34	225 300 225	26	4.63	3.5	4	0.500 0.500 0.500	1/2-13 UNC — —	5.3 6.5 6.2	3.5 3.5 3.6
1.5	6.00 6.00 **7.00** 7.00 10.00	242-B 242-HB **242-A** 242-HA 242-C	2.000	1.188	1.750	45	6.49	225 300 225 300 225	26	5.0	3.88	4	0.500 0.500 0.500 0.500 0.500	— — 1/2-11 UNC — —	6.1 7.6 6.8 8.3 7.7	4.6 4.6 4.8 4.8 5.1
2	6.00 6.00 **7.00** 7.00 10.00	242-B 242-HB **242-A** 242-HA 242-C	2.000	1.188	1.750	45	7.07	225 300 225 300 235	26	6.0	4.75	4	0.625 0.625 0.625 0.625 0.625	— — 5/8-11 UNC — —	9.0 10.5 9.0 10.5 10.2	6.6 6.6 7.0 7.0 7.3
2.5	6.00 6.00 **7.00** 7.00 10.00	242-B 242-HB **242-A** 242-HA 242-C	2.000	1.188	1.750	43	11.05	225 300 225 300 225	26	7.0	5.5	4	0.625 0.625 0.625 0.625 0.625	— — 5/8-11 UNC — —	12.9 15.3 13.3 15.8 14.5	7.6 7.6 8.0 8.0 8.4
3	**7.00** 7.00 9.00 10.00 12.00	**242-A** 242-HA 242-B 242-C 242-C	2.000	1.188	1.750	38	13.36	225 300 225 225 300	26	7.5	6.0	4	0.625 0.625 0.625 0.625 0.625	5/8-11 UNC — — — —	14.3 18.2 15.2 15.8 16.0	8.6 8.6 9.0 9.1 9.9
3.5	10.00	242-C	2.000	1.188	1.750	34	18.67	225	26	8.5	7.0	8	0.625	—	20.6	8.1
4	**9.00** 9.00 10.00 12.00	**242-A** 242-HA 242-C 242-C	2.000	1.375	1.562	34	22.69	225 300 225 225	26	9.0	7.5	8	0.625 0.750 0.750 0.750	5/8-11 UNC — — 3/4-10 UNC	20.3 26.4 21.3 22.0	8.0 8.0 8.2 8.2
5	**9.00** 9.00 10.00 12.00	**242-A** 242-HA 242-C 242-C	2.000	1.375	1.562	29	30.02	225 300 225 225	26	10.0	8.5	8	0.750 0.750 0.750 0.750	— — — —	24.5 31.4 25.5 26.0	8.3 8.3 9.1 9.1
6	**9.00** 9.00 10.00 12.00 14.00	**242-A** 242-HA 242-C 242-C 242-C	2.000	1.375	1.562	25	41.28	225 300 225 225 225	26	11.0	9.5	8	0.750 0.750 0.750 0.750 0.750	3/4-10 UNC — — — —	29.5 38.6 30.5 31.0 32.0	11.7 11.7 11.9 12.0 12.0
8	9.00 9.00 10.00 12.00 **13.00** 13.00 14.00	242-B 242-HB 242-C 242-C **242-A** 242-HA 242-C	2.375	1.375	1.375	19	63.62	225 300 225 225 225 300 225	26	13.5	11.75	8	0.750 0.750 0.750 0.750 0.750 0.750 0.750	— — — — 3/4-10 UNC — —	42.3 55.4 43.4 44.0 43.8 57.5 46.0	14.5 14.5 15.0 15.2 15.4 15.4 16.0
10	12.00 12.00 **13.00** 13.00 14.00	242-B 242-HB **242-A** 242-HA 242-C	2.375	1.375	1.375	15	103.87	225 275 225 275 225	26	16.0	14.25	12	0.875 0.875 0.875 0.875 0.875	— — 7/8-9 UNC — —	64.1 86.5 65.5 88.4 66.7	23.5 23.5 24.5 24.5 24.5
12	12.00 12.00 **13.00** 13.00 14.00	242-B 242-HB **242-A** 242-HA 242-C	2.375	1.375	1.375	13	137.89	225 275 225 275 225	26	19.0	17.00	12	0.875 0.875 0.875 0.875 0.875	— — 7/8-9 UNC — —	94.0 110.0 95.0 110.0 99.1	30.0 30.0 31.0 31.0 31.0
14	12.00 **13.75** 13.75	242-C **242-A** 242-HA	1.750	1.118	1.118	9	182.65	150 150 200	26	19.0	18.75	12	1.000 1.000 1.000	— — —	110.0 112.0 144.0	30.5 32.0 32.0
16	12.00 12.00 **13.75** 13.75	242-C 242-HC **242-A** 242-HA	1.750	1.118	1.118	8	240.53	125 175 125 175	26	23.5	21.25	16	1.000 1.000 1.000 1.000	— — — —	124.0 160.0 132.0 170.2	28.8 28.8 30.8 30.8
18	12.00 **13.75** 13.75	242-C **242-A** 242-HA	1.750	1.118	1.118	7	298.65	125 125 175	26	25.0	22.75	16	1.125 1.125 1.125	— — —	138.0 146.0 181.2	35.1 36.1 36.1
20	12.00 **13.75** 13.75	242-C **242-A** 242-HA	1.750	1.118	1.118	7	363.05	125 125 175	26	27.5	25.0	20	1.125 1.125 1.125	— — —	172.0 182.0 182.0	35.0 35.5 35.5
22	12.00	242-C	1.750	1.118	1.118	6	433.74	115	26	29.5	27.25	20	1.125	—	181.0	35.5
24	12.00 **13.75** 13.75	242-C **242-A** 242-HA	1.750	1.118	1.118	5	510.70	110 110 160	26	32.5	29.5	20	1.125 — 1.125	— — —	190.0 220.0 266.2	47.0 48.0 48.0
26	12.00	242-C	1.750	1.118	1.118	5	593.96	110	26	34.25	31.75	24	1.125	—	243.0	52.0
30	12.00	242-C	1.750	1.118	1.118	4	779.31	110	26	38.75	36.0	28	1.125	—	270.0	62.0

Standard PROCO Style 242-A Expansion Joints shown in Bold Type are considered Standards and inventoried in large quantities.

NOTES:
1. "HA", "HB", and "HC" denote Heavy Weight Construction.
2. Movements stated are non-concurrent.
3. To determine End Thrust: Multiply Thrust Factor by Operating Pressure of System. This is End Thrust in pounds.
4. Pressure rating is based on 170°F operating temperature. The pressure rating is reduced slightly at higher temperatures.
5. Pressures shown are maximum "operating pressure." Test pressure is 1.5 times "operating pressure." Burst pressure is approximately 4 times "operating pressure."
6. Vacuum rating is based on neutral installed length, without external load. Products should not be installed "extended" on vacuum applications.
7. Style 240-AV/NN (Neoprene elastomer only) expansion joints 1.25" I.D. – 12.0" I.D. come with tapped holes in lieu of drilled holes.
8. All expansion joints are furnished complete with flanges. Control units are required on applications where movements could exceed rated capabilities.

Installation Note:
Install at the neutral length dimension as shown in Tables 2 & 3.Make sure the mating flanges are **FLAT-FACE TYPE.** When attaching beaded end flanged expansion joints to raised face flanges, the use of ring gaskets are required to prevent metal flange faces from cutting rubber bead during installation. ***Care must be taken when pushing the joint into the breech between the mating flanges so as not to roll the leading edge of the joint out of its flange groove.***

Precompression Note:
Joint must be precompressed approximately 1/8" to 3/16" in order to obtain a correct installed face-to-face dimension.

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control units

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Table 4: Control Units/Unanchored

Control Units must be installed when pressures (test • design • surge • operating) exceed rating below:

Pipe Size	Series 240 P.S.I.G.	Series 242 P.S.I.G.
1" thru 4"	180	135
5" thru 10"	135	135
12" thru 14"	90	90
16" thru 24"	45	45
26" thru 30"	35	35

Table 5: Control Units

Control Rod Plate O.D. [1] (in)	Control Rod Plate Thickness (in)	Rod Diameter [2] (in)	Nominal Pipe Size (in)	Maximum Surge or Test Pressure of System/PSIG [3] Number of Rods Required: 2	3	4
8.375	0.375	0.625	1	949	—	—
8.750	0.375	0.625	1.25	830	—	—
9.125	0.375	0.625	1.5	510	—	—
10.125	0.375	0.625	2	661	—	—
11.125	0.375	1.000	2.5	529	—	—
11.625	0.375	1.000	3	441	—	—
12.625	0.375	1.000	3.5	365	547	729
13.125	0.375	1.000	4	311	467	622
14.125	0.500	1.000	5	235	353	470
15.125	0.500	1.000	6	186	278	371
19.125	0.500	1.000	8	163	244	326
21.625	0.750	1.000	10	163	244	325
24.625	0.750	1.000	12	160	240	320
26.625	0.750	1.000	14	112	167	223
30.125	0.750	1.250	16	113	170	227
31.625	0.750	1.250	18	94	141	187
34.125	0.750	1.250	20	79	118	158
36.125	1.000	1.250	22	85	128	171
38.625	1.000	1.250	24	74	110	147
40.825	1.000	1.250	26	62	93	124
44.125	1.250	1.500	28	65	98	130
46.375	1.250	1.500	30	70	105	141

NOTES:
1. Control Rod Plate O.D. installed dimension is based on a **maximum** O.D. PROCO would supply. (See Figures 3 & 4)
2. Control Rod diameter is based on a **maximum** diameter PROCO would use to design a Control Rod.
3. Rod pressure ratings are based on metal conforming to F.S.A. standards and dimensions.

Table 6: Special Construction Pressures

Pipe Size	Series 240 & 242 Heavyweight P.S.I.G.
1" thru 8"	300
10" thru 12"	275
14"	200
16" thru 20"	175
22" thru 30"	160

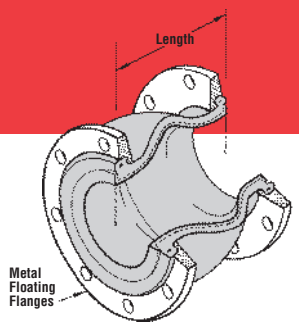


Figure 1.
Style 240
Single Sphere Connector

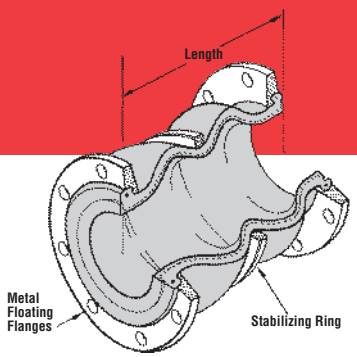
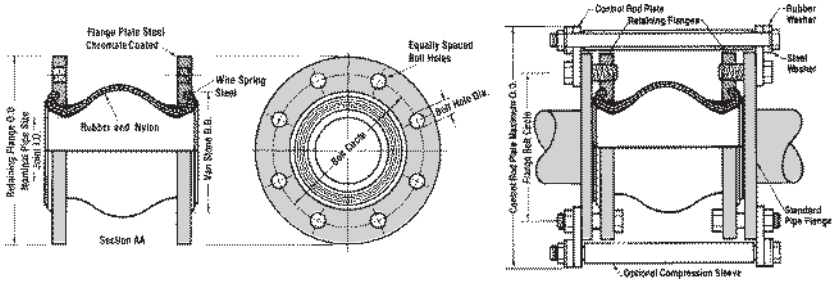


Figure 2.
Style 242
Twin Sphere Connector

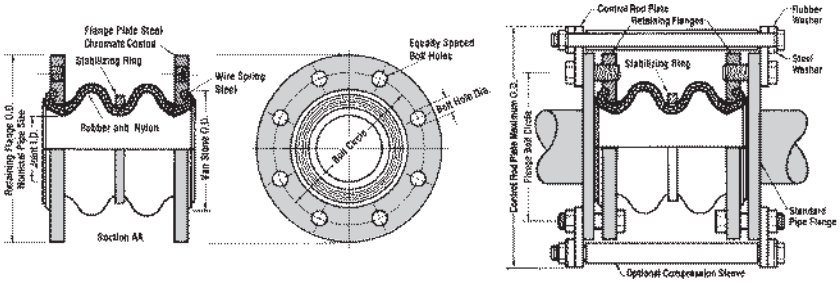
Style 240 Single Sphere Connector

Figure 3.



Style 242 Twin Sphere Connector

Figure 4.



Control Rod/Unit Applications. Control unit assemblies are designed to absorb static pressure thrust developed at the expansion joint. When used in this manner, control unit assemblies are an additional safety factor, minimizing possible failure of the expansion joint or damage to equipment. (See Tables 4 & 5).

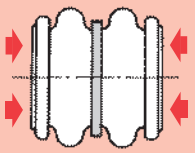
1. **Anchored Systems:** Control unit assemblies are not required in piping systems that are anchored on both sides of the expansion joint, provided piping movements are within the rated movements as shown in Tables 2 & 3.
2. **Unanchored Systems:** Control unit assemblies are always required in unanchored systems. Additionally, control unit assemblies must be used when maximum pressure exceeds the limits shown in Table 4 & 5, or the movement exceeds the rated movements as shown in Tables 2 & 3.
3. **Spring-Mounted Equipment:** Control unit assemblies are always recommended for spring-mounted equipment. Additionally, control unit assemblies must be used when maximum pressure exceeds the limits shown in Tables 4 & 5, or the movement exceeds the rated movements as shown in Tables 2 & 3.

Special Applications. Certain Style 240 (Single Sphere) and 242 (Twin Sphere) expansion joints are available in High-Pressure Designs. For specific pressures, see Table 6. Style designations are listed as 240-HW (sizes stocked in Table 2) and 242-HA, 242-HB & 242-HC (sizes stocked in Table 3.) The High-Pressure Design is recommended when the connector is to be installed into ANSI 250/300# piping systems.

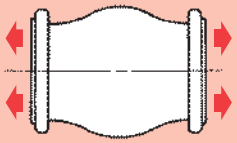
drilling for series 240 and series 242 expansion joints

Table 7: Flange Drilling

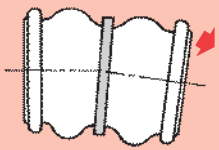
NOMINAL PIPE SIZE Inch/ mm	American 125/150# Conforms to ANSI B16.1 and B16.5						American 250/300# Conforms to ANSI B16.1 and B16.5					British Standard 10:1962 Conforms to BS 10 Table E					Metric Series Conforms to I.S.O. 2084-1974 Table NP10 Holes to I.S.O. /R-273					Metric Series Conforms to I.S.O. 2084-1974 Table NP16 Holes to I.S.O. /R-273				
	Flange Thickness	Flange O.D.	Bolt Circle	No. of Holes	Drilled Hole Size	Threaded Hole Size	Flange Thickness	Flange O.D.	Bolt Circle	No. of Holes	Hole Size	Flange Thickness	Flange O.D.	Bolt Circle	No. of Holes	Hole Size	Flange Thickness	Flange O.D.	Bolt Circle	No. of Holes	Hole Size	Flange Thickness	Flange O.D.	Bolt Circle	No. of Holes	Hole Size
1 25	0.55 14.0	4.25 108.0	3.13 79.4	4 4	0.62 15.9	1/2 - 13 UNC	0.63 16.0	4.88 124.0	3.5 88.9	4 4	0.75 19.1	0.59 15.0	4.5 114.0	3.25 82.6	4 4	0.62 15.9	0.63 16.0	4.53 115.0	3.35 85.0	4 4	0.55 14.0	0.63 16.0	4.53 115.0	3.35 85.0	4 4	0.55 14.0
1.25 32	0.55 14.0	4.63 118.0	3.5 88.9	4 4	0.62 15.9	1/2 - 13 UNC	0.63 16.0	5.25 133.0	3.88 98.4	4 4	0.75 19.1	0.59 15.0	4.75 121.0	3.44 87.3	4 4	0.62 15.9	0.63 16.0	5.51 140.0	3.94 85.0	4 4	0.71 18.0	0.63 16.0	5.51 140.0	3.94 100.0	4 4	0.71 18.0
1.5 40	0.55 14.0	5.0 127.0	3.88 98.4	4 4	0.62 15.9	1/2 - 13 UNC	0.63 16.0	6.12 156.0	4.50 114.3	4 4	0.88 22.2	0.59 15.0	5.25 133.0	3.88 98.4	4 4	0.62 15.9	0.63 16.0	5.91 150.0	4.33 110.0	4 4	0.71 18.0	0.63 16.0	5.91 150.0	4.33 110.0	4 4	0.71 18.0
2 50	0.63 16.0	6.0 152.0	4.75 120.7	4 4	0.75 19.1	5/8 - 11 UNC	0.71 18.0	6.50 165.0	5.00 127.0	8 8	0.75 19.1	0.63 16.0	6.0 152.01	4.5 114.3	4 4	0.75 19.1	0.71 18.0	6.50 165.0	4.92 125.0	4 4	0.71 18.0	0.71 18.0	6.50 165.0	4.92 125.0	4 4	0.71 18.0
2.5 65	0.71 18.0	7.0 178.0	5.5 139.7	4 4	0.75 19.1	5/8 - 11 UNC	0.71 18.0	7.5 191.0	5.88 149.2	8 8	0.88 22.2	0.71 18.0	6.5 165.0	5.0 127.0	4 4	0.75 19.1	0.71 18.0	7.25 185.0	5.71 145.0	4 4	0.71 18.0	0.71 18.0	7.28 185.0	5.71 145.0	4 4	0.71 18.0
3 80	0.71 18.0	7.5 191.0	6.0 152.4	4 4	0.75 19.1	5/8 - 11 UNC	0.79 20.0	8.25 210.0	6.62 168.2	8 8	0.88 22.2	0.71 18.0	7.25 184.0	5.75 146.1	4 4	0.75 19.1	0.79 20.0	7.87 200.0	6.3 160.0	8 8	0.71 18.0	0.79 20.0	7.87 200.0	6.30 160.0	8 8	0.71 18.0
3.5 90	0.71 18.0	8.5 216.0	7.0 177.8	8 8	0.75 19.1	5/8 - 11 UNC	0.79 20.0	9.0 229.0	7.25 184.2	8 8	0.88 22.2	0.71 18.0	8.0 203.0	6.5 165.1	8 8	0.75 19.1	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —
4 100	0.71 18.0	9.0 229.0	7.5 190.5	8 8	0.75 19.1	5/8 - 11 UNC	0.79 20.0	10.0 254.0	7.88 200.0	8 8	0.88 22.2	0.71 18.0	8.5 216.0	7.0 177.8	8 8	0.75 19.1	0.79 20.0	8.66 220.0	7.09 180.0	8 8	0.71 18.0	0.79 20.0	8.66 220.0	7.09 180.0	8 8	0.71 18.0
5 125	0.79 20.0	10.0 254.0	8.5 215.9	8 8	0.88 22.2	3/4 - 10 UNC	0.87 22.0	11.0 279.0	9.25 235.0	8 8	0.88 22.2	0.79 20.0	10.0 254.0	8.25 209.6	8 8	0.75 19.1	0.87 22.0	9.84 250.0	8.27 210.0	8 8	0.71 18.0	0.87 22.0	9.84 250.0	8.27 210.0	8 8	0.71 18.0
6 150	0.87 22.0	11.0 279.0	9.5 241.3	8 8	0.88 22.2	3/4 - 10 UNC	0.87 22.2	12.5 318.0	10.62 269.9	12 12	0.88 22.2	0.87 22.2	11.0 279.0	9.25 235.0	8 8	0.88 22.2	0.87 22.0	11.22 285.0	9.45 240.0	8 8	0.87 22.0	0.87 22.0	11.22 285.0	9.45 240.0	8 8	0.87 22.0
8 200	0.87 22.0	13.5 343.0	11.75 298.5	8 8	0.88 22.2	3/4 - 10 UNC	0.95 24.0	15.0 381.0	13.0 330.2	12 12	1.00 25.4	0.87 22.2	13.25 337.0	11.5 292.1	8 8	0.88 22.2	0.87 22.0	13.39 340.0	11.61 295.0	8 8	0.87 22.0	0.87 22.0	13.39 340.0	11.61 295.0	12 12	0.87 22.0
10 250	0.95 24.0	16.0 406.0	14.25 362.0	12 12	1.00 25.4	7/8 - 9 UNC	1.02 26.0	17.5 445.0	15.25 387.4	16 16	1.13 28.6	0.95 24.0	116.0 406.0	14.0 355.6	12 12	0.88 22.2	1.02 26.0	15.55 395.0	13.78 350.0	12 12	0.87 22.0	1.02 26.0	15.94 405.0	13.98 355.0	12 12	1.02 26.0
12 300	0.95 24.0	19.0 483.0	17.0 431.8	12 12	1.00 25.4	7/8 - 9 UNC	1.02 26.0	20.5 521.0	17.75 450.9	16 16	1.25 31.8	0.95 24.0	18.0 457.0	16.0 406.4	12 12	1.00 25.4	1.02 26.0	17.52 445.0	15.75 400.0	12 12	0.87 22.0	1.02 26.0	18.11 460.0	16.14 410.0	12 12	1.02 26.0
14 350	1.02 26.0	21.0 533.0	18.75 476.3	12 12	1.13 28.6	1 - 8 UNC	1.10 28.0	23.0 584.0	20.25 514.4	20 20	1.25 31.8	1.02 26.0	20.75 527.0	18.5 469.9	12 12	1.00 25.4	1.10 28.0	19.88 505.0	18.11 460.0	16 16	0.87 22.0	1.10 28.0	20.47 520.0	18.50 470.0	16 16	1.02 26.0
16 400	1.10 28.0	23.5 597.0	21.25 539.8	16 16	1.13 28.6	1 - 8 UNC	1.18 30.0	25.5 648.0	22.5 571.5	20 20	1.38 34.9	1.10 28.0	22.75 578.0	20.5 520.7	12 12	1.00 25.4	1.18 30.0	22.24 565.0	20.28 515.0	16 16	1.02 26.0	1.18 30.0	22.83 580.0	20.67 525.0	16 16	1.18 30.0
18 450	1.18 30.0	25.0 635.0	22.75 577.9	16 16	1.25 31.8	1 1/8 - 7 UNC	1.18 30.0	28.0 711.0	24.75 628.7	24 24	1.38 34.9	1.18 30.0	25.25 641.0	23.0 584.2	16 16	1.00 25.4	1.18 30.0	24.21 615.0	22.24 565.0	20 20	1.02 26.0	1.18 30.0	25.20 640.0	23.03 585.0	20 20	1.18 30.0
20 500	1.18 30.0	27.5 699.0	25.0 635.0	20 20	1.25 31.8	1 1/8 - 7 UNC	1.18 30.0	30.5 775.0	27.0 685.8	24 24	1.38 34.9	1.18 30.0	27.75 705.0	25.25 641.4	16 16	1.00 25.4	1.18 30.0	26.38 670.0	24.41 620.0	20 20	1.02 26.0	1.18 30.0	28.15 715.0	25.59 650.0	20 20	1.30 33.0
22 550	1.18 30.0	29.5 749.0	27.25 692.2	20 20	1.38 34.9	1 1/4 - 7 UNC	1.18 30.0	33.0 838.0	29.5 743.0	24 24	1.38 34.9	1.18 30.0	30.0 762.0	27.5 698.5	16 16	1.13 28.6	1.18 30.0	28.74 730.0	26.57 675.0	20 20	1.18 30.0	1.18 30.0	30.51 775.0	27.95 710.0	20 20	1.30 33.0
24 600	1.18 30.000	32.06 813.0	29.5 749.3	20 20	1.38 34.9	1 1/4 - 7 UNC	1.18 30.0	36.0 914.0	32.0 812.8	24 24	1.62 41.3	1.18 30.0	32.5 826.0	29.75 755.7	16 16	1.25 31.8	1.18 30.0	30.71 780.0	28.54 725.0	20 20	1.18 30.0	1.18 30.0	33.07 840.0	30.31 770.0	20 20	1.42 36.0
26 650	1.26 32.0	34.25 870.0	31.75 806.5	24 24	1.38 34.9	1 1/4 - 7 UNC	1.26 32.0	38.25 972.0	34.5 876.0	28 28	1.75 44.5	— —	— —	— —	— —	— —	1.26 32.0	32.87 835.0	30.71 780.0	24 24	1.18 30.0	1.26 32.0	33.86 860.0	31.10 790.0	24 24	1.42 36.0
30 750	1.26 32.0	38.75 984.0	36.0 914.4	28 28	1.38 34.9	1 1/4 - 7 UNC	1.26 32.0	43.0 1092.0	39.25 997.0	28 28	2.00 50.8	1.26 32.0	39.25 997.0	36.5 927.1	20 20	1.38 34.9	1.26 32.0	37.99 965.0	35.43 900.0	24 24	1.30 33.0	1.26 32.0	38.19 970.0	35.43 900.0	24 24	1.42 36.0



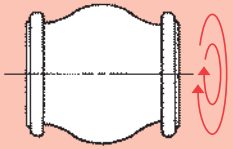
Axial Compression



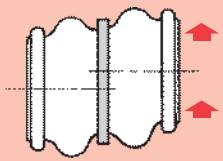
Axial Elongation



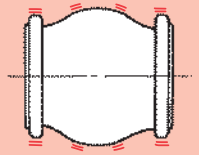
Angular Movement
Bending About the Centerline



Torsional Movement
Rotation About the Centerline (twist)



Lateral Movement
Shear or Perpendicular to Centerline



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SpiralJet® Spray Nozzles, Standard and Extra Large Free Passage Spray

Spiraljet Spray Nozzles
2-HHSJ-PVC-170-1400

Features and Benefits

- Solid cone-shaped spray pattern with round impact area.
- Maximum liquid throughput for a given pipe size.
- Maximum free passage design minimizes clogging on HHSJX.
- Compact size enables easy installation or retrofit on most pipe systems.

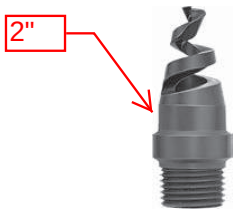
HHSJ

Threaded/hex
Brass or 316 Stainless Steel
1/4" to 2" NPT or BSPT (M)

HHSJ

Threaded/flats
Cast 316 Stainless Steel
1/4" to 4" NPT or BSPT (M)

HHSJ



Threaded/round
PVC or Teflon®
1/4" to 4" NPT or BSPT (M)

HHSJX

Threaded/hex
Brass
3/8" to 2" NPT or BSPT (M)

HHSJX

Threaded/flats
Cast 316 Stainless Steel
3/8" to 2" NPT or BSPT (M)

HHSJX

Threaded/round
PVC or Polypropylene
3/8" to 2" NPT or BSPT (M)

Optimization Tips

• See page B2 for optimization tips.

Applications

- Aerating
- Chemical processing
- Fire suppression/prevention
- Gas scrubbing, cooling
- Washing/rinsing

See Also

- Accessories
  - Adjustable ball fittings
  - Check valves
  - Pressure gauges
  - Pressure regulators
  - Pressure relief valves
  - Solenoid valves
  - Split-eyelet connectors
  - Strainers

SpiralJet® Spray Nozzles, Standard and Extra Large Free Passage Spray

Performance Data

HHSJ

*At the stated pressure in psi.

Inlet Conn. (in.)	Spray Angle at 10 psi (°)					Capacity Size	Orifice Dia. Nom. (in.)	Max. Free Passage Dia. (in.)	Capacity (gallons per minute)*				
	60	90	120	150	170				10	20	40	100	400
1/4	●	●	●			07	.094	.094	.70	.99	1.4	2.2	4.4
	●	●	●	●	●	13	.125	.125	1.3	1.8	2.6	4.1	8.2
	●	●	●	●	●	20	.156	.125	2.0	2.8	4.0	6.3	12.6
3/8	●					07	.094	.094	.70	.99	1.4	2.2	4.4
	●					13	.125	.125	1.3	1.8	2.6	4.1	8.2
	●					20	.156	.125	2.0	2.8	4.0	6.3	12.6
	●	●	●	●	●	30	.188	.125	3.0	4.2	6.0	9.5	19.0
	●	●	●	●	●	40	.219	.125	4.0	5.7	8.0	12.6	25
	●	●	●	●	●	53	.250	.125	5.3	7.5	10.6	16.8	34
	●	●	●	●	●	82	.313	.125	8.2	11.6	16.4	26	52
1/2	●	●	●	●	●	120	.375	.188	12.0	17.0	24	38	76
	●	●	●	●	●	164	.438	.188	16.4	23	33	52	104
					●	210	.500	.188	21	30	42	66	133
3/4	●	●	●	●	●	210	.500	.188	21	30	42	66	133
1	●	●	●	●	●	340	.625	.250	34	48	68	108	215
	●	●	●	●	●	470	.750	.250	47	66	94	149	297
1-1/2	●	●	●	●	●	640	.875	.313	64	91	128	202	405
	●	●	●	●	●	820	1.000	.313	82	116	164	259	519
	●	●	●	●	●	960	1.125	.313	96	136	192	304	607
2	●	●	●	●	●	1400	1.375	.438	140	198	280	443	885
	●	●	●	●	●	1780	1.500	.438	178	252	356	563	1126
3	●	●	●			2560	1.750	.563	256	362	512	810	1619
	●	●	●			3360	2.000	.563	336	475	672	1063	2125
4	●	●	●			5250	2.500	.625	525	742	1050	1660	3320

HHSJX

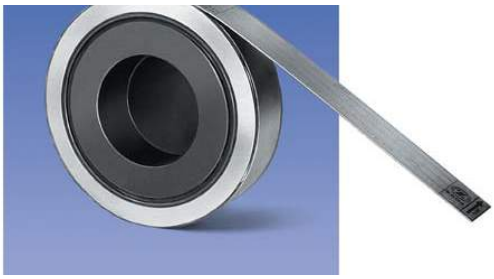
*At the stated pressure in psi.

Inlet Conn. (in.)	Spray Angle at 10 psi (°)		Capacity Size	Orifice Dia. Nom. (in.)	Max. Free Passage Dia. (in.)	Capacity (gallons per minute)*				
	90	120				10	20	40	100	400
3/8	●	●	30	.188	.188	3.0	4.2	6.0	9.5	19.0
	●	●	40	.219	.219	4.0	5.7	8.0	12.6	25
	●	●	53	.250	.250	5.3	7.5	10.6	16.8	34
	●	●	82	.313	.313	8.2	11.6	16.4	26	52
1/2	●	●	120	.375	.375	12.0	17.0	24	38	76
	●	●	164	.438	.438	16.4	23	33	52	104
3/4	●	●	210	.500	.500	21	30	42	66	133
1	●	●	340	.625	.625	34	48	68	108	215
	●	●	470	.750	.750	47	66	94	149	297
1-1/2	●	●	640	.875	.875	64	91	128	202	405
	●	●	820	1.000	1.000	82	116	164	259	519
	●	●	960	1.125	1.125	96	136	192	304	607
2	●	●	1400	1.375	1.375	140	198	280	443	885
	●	●	1780	1.500	1.500	178	252	356	563	1126

Maximum Free Passage Diameter is the maximum diameter as listed of foreign matter that can pass through the nozzle without clogging.

MONO Type

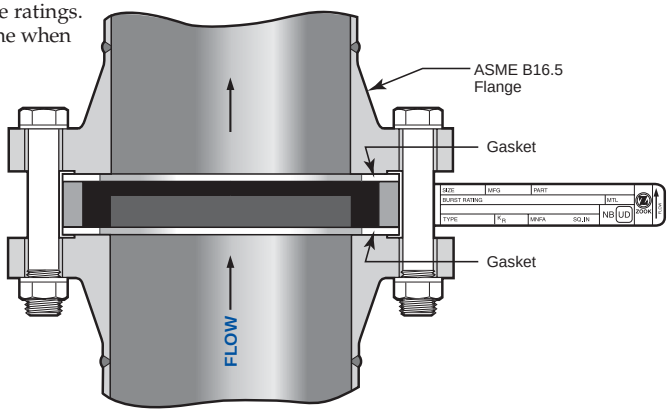
the best choice for low and intermediate burst ratings



- Sizes 1/2″ thru 24″ diameters
- Designed to fit ASME B16.5 Class 150 flanges (Higher ratings to fit Class 300 flanges are furnished in the INVERTED and DUPLEX Type Disks)
- Burst ratings 0.25 to 150 psig
- 0% manufacturing range
- Operating pressures to 90% of the disk's marked burst pressure (Contact ZOOK for operating ratio for burst pressures below 40 psig)
- Temperature ratings –290°F to +700°F (–179°C to +371°C). Maximum temperature rating without insulation is 430°F (221°C) or 700°F (371°C) with insulation. Contact ZOOK for higher temperature ratings. The specified temperature shall be at the disk location at the time when the disk is expected to rupture
- Counterbored side of the disk contacts the process media
- Vacuum supports are available for ratings below 25 psig
- May be configured to withstand high back pressure generated in closed piping systems – request Bak-Pressure™ bulletin
- Stocked MONO Disks, ready for immediate shipment
  Sizes: 1″, 1-1/2″, 2″, 3″, 4″, 6″, 8″ to fit ASME B16.5 Class 150 flanges
  Burst Ratings: 10, 15, 20, 25, 30, 40, 50, 75, 100, 125, 150 psig @ 72°F (22°C)

Note: Sizes 6″ and 8″ with burst ratings 125 and 150 psig @ 72°F (22°C) are stocked in INVERTED type

- ASME UD marking available



Certified Flow Resistance Factor (K_{rgl})

Support Style	K_{rgl}
MONO – no support	0.26
MONO – with bar	2.40
MONO – with cross	5.40
MONO – with ring	6.44
MONO – with plate	15.70

Required Vacuum Support Style for Full Vacuum Service

Size	Burst Rating	Support Style
1″	below 25 psig	MONO – with ring
1-1/2″	below 25 psig	MONO – with bar
2″ - 14″	9 to 25 psig	MONO – with bar
2″ - 14″	5 to below 9 psig	MONO – with cross
2″ - 14″	below 5 psig	MONO – with plate

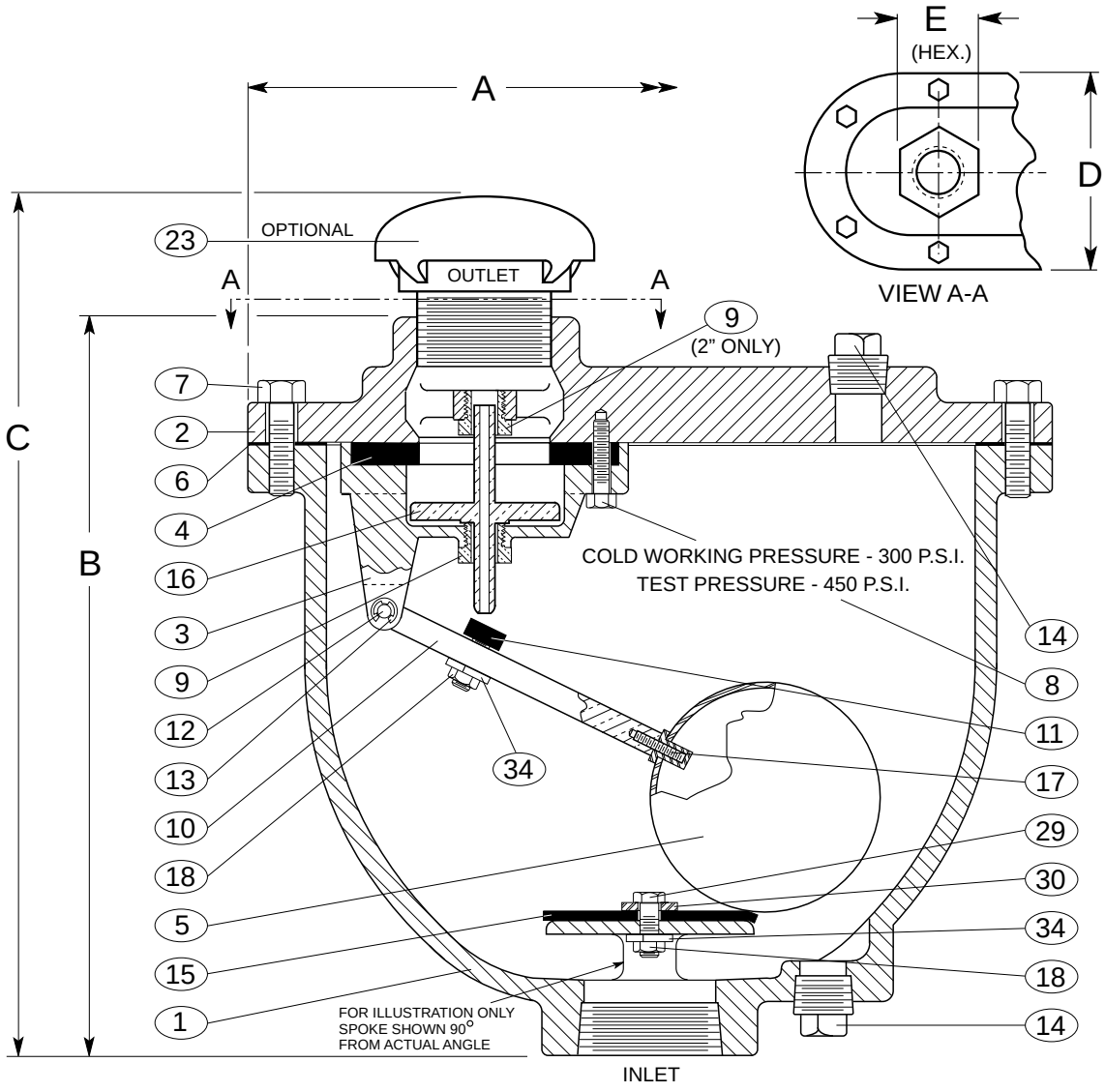
Contact ZOOK for sizes 16″ and larger

Specifications – ASME B16.5 Class 150

Nominal Disk Sizes	Minimum net flow area (MNFA) Sq. inches					Disk Dimensions				Burst Ratings psig	
	Full Bore	Vacuum support style				Diameter		Thickness*			
		Ring	Bar	Cross	Plate	I.D.	O.D.	Standard Disk	Insulated Unit	Min.	Max.
1/2″	0.30	N/A	N/A	N/A	N/A	0.622″	1-3/4″	5/8″	1-3/4″	25	150
3/4″	0.53	N/A	N/A	N/A	N/A	0.824″	2-1/8″	5/8″	1-3/4″	25	150
1″	0.78	0.44	0.60	0.47	0.32	1″	2-1/2″	7/8″	2-1/4″	10	150
1-1/2″	1.76	N/A	1.34	1.05	0.72	1-1/2″	3-1/4″	7/8″	2-1/4″	7	150
2″	3.14	N/A	2.39	1.86	1.30	2″	4″	7/8″	2-1/4″	3	150
3″	7.06	N/A	5.56	4.31	2.95	3″	5-1/4″	7/8″	2-1/4″	2	150
4″	12.56	N/A	10.56	8.81	5.47	4″	6-3/4″	7/8″	2-1/4″	1.5	150
6″	28.27	N/A	22.27	17.27	12.05	6″	8-5/8″	7/8″	2-1/4″	1	100
8″	50.02	N/A	40.26	31.82	21.14	8″	10-7/8″	1-1/8″	2-3/4″	0.50	100
10″	78.53	N/A	63.53	50.78	32.66	10″	13-1/4″	1-1/2″	3-3/8″	0.25	100
12″	113.09	N/A	89.09	69.09	47.24	12″	16″	2″	4-3/8″	0.25	75
14″	137.88	N/A	108.06	83.31	58.07	13-1/4″	17-5/8″	2-1/4″	4-7/8″	0.25	50
16″	182.65	N/A	144.52	112.65	84.49	15-1/4″	20-1/8″	2-1/2″	5-3/8″	0.25	50
18″	233.70	N/A	181.95	153.70	104.31	17-1/4″	21-1/2″	2-3/4″	5-7/8″	0.25	50
20″	291.03	N/A	233.28	184.53	122.49	19-1/4″	23-3/4″	3″	6-3/8″	0.25	40
24″	424.55	N/A	354.80	294.05	190.61	23-1/4″	28-1/8″	3″	6-3/8″	0.25	25

*Standard disk thickness does not include gaskets.
Insulated unit thickness includes all gaskets

Note: Maximum pressure rating of ASME B16.5 Class 150 flanges is 290 psig @ 100°F (38°C).
The maximum pressure rating is lower at higher temperatures.
Reference ASME/ANSI B16.5



1	BODY	5	FLOAT	9	BUSHING	13	RETAINING RING	18	LOCK NUT
2	COVER	6	GASKET	10	FLOAT ARM	14	PIPE PLUG	23	SCREENED HOOD
3	BAFFLE	7	COVER BOLTS	11	ORIFICE BUTTON	15	CUSHION	29	CUSHION RETAINER
4	SEAT	8	RETAINING SCREWS	12	PIVOT PIN	16	PLUG	30	WASHER
						17	FLOAT RETAINER	34	LOCK WASHER

SEE DRAWING NO. VM-201C-M FOR STANDARD MATERIALS OF CONSTRUCTION.

VALVE SIZE	MODEL NO.*	A	B	C	D	E	INLET SIZE	OUTLET SIZE	ORIFICE SIZE
1"	201C.2	11 3/8"	10 1/2"	12 5/8"	6 3/8"	2"	1" N.P.T.	1" N.P.T.	5/64"
2"	202C.2	14"	13"	15 7/8"	8 1/4"	3 1/4"	2" N.P.T.	2" N.P.T.	3/32"

*Add "H" to Model No. for optional screened hood SPK-1H.

Revised 1-9-06

COMBINATION AIR VALVE (SINGLE BODY TYPE)

DATE 2-2-69

VAL-MATIC® VALVE AND MANUFACTURING CORP.

DRWG. NO. VM-201C

COMBINATION AIR VALVES (SINGLE BODY TYPE)

MODEL NOS. 201C.2 - 202C.2 - 203C.2 - 204C.2

STANDARD MATERIALS OF CONSTRUCTION

PART NO.	PART NAME	MATERIAL
1	BODY	CAST IRON ASTM A126, CLASS B
2	COVER	CAST IRON ASTM A126, CLASS B
3	BAFFLE	CAST IRON ASTM A126, CLASS B
4	SEAT	BUNA-N
5	FLOAT	STAINLESS STEEL T316, ASTM A240
6	GASKET	COMPRESSED NON-ASBESTOS FIBER
7	COVER BOLT	ALLOY STEEL SAE, GRADE 5
8	RETAINING SCREWS	STAINLESS STEEL T316, ASTM F593
9	GUIDE BUSHING	STAINLESS STEEL T316, ASTM A240
10	FLOAT ARM	STAINLESS STEEL T316, ASTM A240
11	ORIFICE BUTTON	STAINLESS STEEL & BUNA-N
12	PIVOT PIN	STAINLESS STEEL T316, ASTM A276
13	RETAINING RING	STAINLESS STEEL PH 15-7 MO
14	PIPE PLUG	STEEL
15	CUSHION	BUNA-N
16	PLUG	STAINLESS STEEL T316, ASTM A276
17	FLOAT RETAINER	STAINLESS STEEL T316, ASTM F880
18	LOCK NUT	STAINLESS STEEL T316, ASTM F594
29	CUSHION RETAINER	STAINLESS STEEL T316, ASTM F593
30	WASHER	STAINLESS STEEL T316, ASTM A240
34	LOCK WASHER	STAINLESS STEEL T316, ASTM A240

NOTE: ALL SPECIFICATIONS AS LAST REVISED.

Revised 1-29-03

MATERIALS OF CONSTRUCTION

DATE 2/2/69

VAL-MATIC® VALVE AND MANUFACTURING CORP.

DRWG. NO. VM-201C-M

For Commercial and Industrial Applications

Job Name _____ Contractor _____

Job Location _____ Approval _____

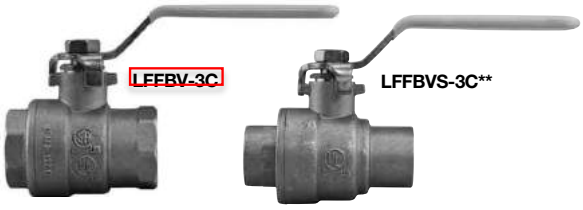
Engineer _____ Contractor's P.O. No. _____

Approval _____ Representative _____

LEAD FREE*

Series LFFBV-3C, LFFBVS-3C

2-Piece, Full Port, Lead Free* Brass Ball Valves



Sizes: ¼" – 4" (8 – 100mm)

Series LFFBV-3C 2-piece, full port, Lead Free* brass ball valves are used in commercial and industrial applications for a full range of liquids and gases. They feature a bottom-loaded blowout proof stem, virgin PTFE seats, thrust washer, and adjustable stem packing gland, stem packing nut, chrome plated Lead Free* brass ball, brass adapter, and steel handle. The Series LFFBV-3C, LFFBVS-3C features Lead Free* construction to comply with Lead Free* installation requirements.

Features

- Lead Free* brass body and adapter
- Certified to NSF/ANSI standard 61/8
- CSA approved threaded valves only ¼" – 3" (15 – 80mm)
- UL/FM approved threaded valves ½" – 2" (15 – 50mm)
- UL Listed solder valves ½" – 2" (15 – 50mm)
- Fluorocarbon elastomer stem O-ring prevents stem leaks
- Adjustable stem packing gland
- PTFE stem packing seal, thrust washer, and seats
- Bottom loaded blowout proof stem
- Machined chrome plated Lead Free* brass ball
- Valves comply to MSS-SP-110 standard

Models

LFFBV-3C: ¼" – 4" (8 – 100mm) with threaded connections

LFFBVS-3C: ½" – 3" (15 – 80mm) with solder connections

Pressure – Temperature

Temperature Range: -40ºF to 400ºF (-40ºC to 204ºC)

Pressure Ratings

LFFBV-3C : ¼" – 2" (8 – 50mm)
600psi (41 bar) WOG, non-shock
150psi (10.3 bar) WSP

2½" – 4" (65 – 100mm)
400psi (27.5 bar) WOG, non-shock
125psi (8.6 bar) WSP

LFFBVS-3C : ½" – 2" (15 – 50mm)
600psi (41 bar) WOG, non-shock
150psi (10.3 bar) WSP

2½" – 3" (65 – 80mm)
400psi (27.5 bar) WOG, non-shock
125psi (8.6 bar) WSP

**This valve is designed to be soft soldered into lines without disassembly, using a low temperature solder to 420°F (216°C). Higher temperature solders may damage the seat material.

NOTE: Apply heat with the flame directed **AWAY** from the center of the valve body. Excessive heat can harm the seats. After soldering, the packing nut may have to be tightened.

Approvals

¼" – 4" (8 - 100mm) LFFBV-3C
Certified to NSF/ANSI standard 61/8*

½" – 3" (15 – 80mm) LFFBVS-3C
Certified to NSF/ANSI standard 61/8*
*Domestic cold water at 73ºF (23ºC)

½" – 2" (15 – 50mm) LFFBV-3C UL/FM approved

½" – 2" (15 – 50mm) LFFBVS-3C UL Listed

Gas Approvals (Threaded Valves Only)

½" – 2" (15 – 50mm) ASME B16.33, CSA

½ psig, 5psig, and 125psig (14, 34 and 862 kPa)
@ -40ºF to 125ºF (-40ºC to 52ºC)

2½" – 3" (65 – 80mm)

ASME B16.38, CSA

½ psig, 5psig, and 125psig (14, 34 and 862 kPa)
@ -40ºF to 125ºF (-40ºC to 52ºC)

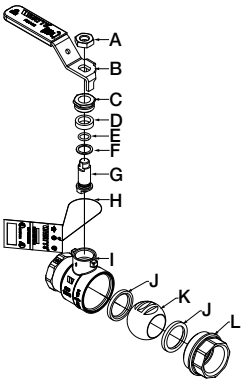
Specifications

Approved valves shall be 2-piece full port design constructed using Lead Free* brass body and end adapter. Lead Free* ball valves shall comply with state codes and standards, where applicable, requiring reduced lead content. Seats and stem packing shall be virgin PTFE. Stem shall be bottom loaded, blowout proof design with fluorocarbon elastomer O-ring to prevent stem leaks. Valve shall have chrome plated Lead Free* brass ball and adjustable packing gland. Threaded valves ½" – 3" shall be CSA approved to ½, 5, and 125psig (14, 34 and 862 kPa), UL/FM approved and certified to NSF/ANSI standard 61/8. Solder valves to be UL listed and certified to NSF/ANSI standard 61/8. Valve sizes ¼" – 2" shall be rated to 600psi (41 bar) WOG non-shock and 150psi (10.3 bar) WSP. Valve sizes 2½" – 4" threaded, shall be rated to 400psi (27.5 bar) WOG non-shock and 125psi (8.6 bar) WSP. Valve sizes 2½" – 3" solder shall be rated to 400psi (27.5 bar) WOG non-shock and 125psi (8.6 bar) WSP. Valve shall be a Watts Series LFFBV-3C (threaded) or LFFBVS-3C (solder).

***The wetted surface of this product contacted by consumable water contains less than one quarter of one percent (0.25%) of lead by weight.**

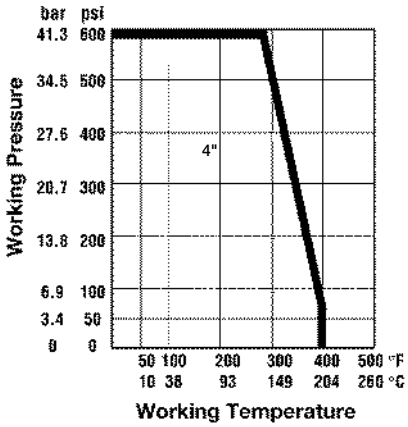
WATTS®

Materials



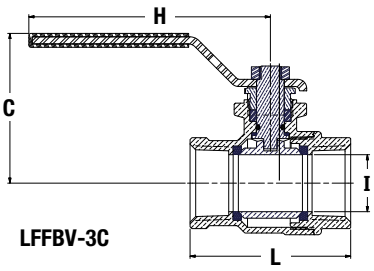
A.	Handle Nut	Zinc plated carbon steel
B.	Handle Assembly	Zinc plated carbon steel with vinyl insulator
C.	Packing Nut	Lead Free* brass
D.	Stem Packing	Virgin PTFE
E.	O-ring	Fluorocarbon elastomer (FKM)
F.	Thrust Washer	Virgin PTFE
G.	Stem	Machined Lead Free* brass
H.	Tag	Cardboard, Mylar coated both sides
I.	Body	Forged Lead Free* brass
J.	Seats	Virgin PTFE
K.	Ball	Chrome plated Lead Free* brass
L.	Adapter	Forged Lead Free* brass

Temperature – Pressure

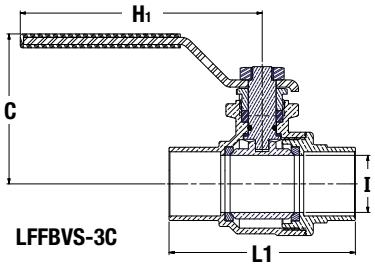


*See applicable note on reverse side for solder end valves with regards to pressure/temperature rating.

Dimensions – Weights



LFFBV-3C



LFFBVS-3C

SIZE (DN)		DIMENSIONS												WEIGHT	
		C		H		H1		I		L		L1			
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	lbs.	kg.
¼	8	1 13/16	46	3 7/16	87	-	-	½	12.9	1¾	45	-	-	0.4	0.2
⅜	10	1 13/16	46	3 7/16	87	-	-	½	12.9	1¾	45	-	-	0.4	0.2
½	15	1 13/16	46	3 7/16	87	3 7/16	87	½	12.9	1 15/16	50	2 1/16	52	0.4	0.2
¾	20	2¼	57	4	101	4	101	¾	19.2	2 5/16	59	2 11/16	68	0.8	0.3
1	25	2⅝	67	4¼	108	4¼	108	1	25.5	2 13/16	72	3¼	83	1.2	0.5
1¼	32	2 13/16	71	4¼	108	4¼	108	1¼	31.9	3 3/16	81	3 11/16	94	1.8	0.8
1½	40	3 3/16	80	5¼	134	5 5/16	135	1¼	38.0	3½	88	4¼	108	2.6	1.2
2	50	3½	89	6	153	6	153	2	50.9	4⅛	105	5 5/16	135	3.7	1.7
2½	65	4 1/16	104	7⅜	187	7⅜	188	2½	63.6	5 5/16	134	6¼	158	7.1	3.2
3	80	4½	114	7¾	197	7¾	197	3	76.3	6 1/16	154	7⅜	185	11.3	4.7
4	100	5⅜	136	9⅝	245	-	-	4	101.6	7 1/16	189	-	-	17.7	8.0

Bourdon Tube Pressure Gauges
Stainless Steel Series
Type 232.53 - Dry Case
Type 233.53 - Liquid-filled Case

Pressure Measurement

Wika Pressure Gauge
232.53

WIKA Datasheet 23X.53

Applications

- With liquid filled case for applications with high dynamic pressure pulsations or vibration
- Suitable for corrosive environments and gaseous or liquid media that will not obstruct the pressure system
- Process industry: chemical/petrochemical, power stations, mining, on and offshore, environmental technology, mechanical engineering and plant construction

Special features

- Excellent load-cycle stability and shock resistance
- All stainless steel construction
- Positive pressure ranges to 15,000 psi

Bourdon Tube Pressure Gauge Model 232.53

Standard Features

Design
ASME B40.100 & EN 837-1

Sizes
2”, 2½” & 4” (50, 63 and 100 mm)

Accuracy class
2” & 2½”: ± 2/1/2% of span (ASME B40.100 Grade A)
4”: ± 1.0% of span (ASME B40.100 Grade 1A)

Ranges
Vacuum / compound to 200 psi
Pressure from 15 psi to 15,000 psi
or other equivalent units of pressure or vacuum

Working pressure

2” & 2½”:	Steady:	3/4 scale value
	Fluctuating:	2/3 full scale value
	Short time:	full scale value
4 ”:	Steady:	full scale value
	Fluctuating:	0.9 x full scale value
	Short time:	1.3 x full scale value

Operating temperature
Ambient: -40°F to +140°F (-40°C to +60°C) - dry
-4°F to +140°F (-20°C to +60°C) - glycerine filled
-40°F to +140°F (-40°C to +60°C) - silicone filled
Medium: +212°F (+100°C) maximum

Temperature error
Additional error when temperature changes from reference temperature of 68°F (20°C) ±0.4% for every 18°F (10°C) rising or falling. Percentage of span.

Weather protection
Weather tight (NEMA 4X / IP65)

Pressure connection
Material: 316L stainless steel
Lower mount (LM) or center back mount (CBM)
Lower back mount (LBM) for 4” size
1/8” NPT, 1/4” NPT or 1/2” NPT limited to wrench flat area

Bourdon tube
Material: 316L stainless steel
2” & 2½”: ≤ 1,000 PSI: C-type,
≥ 1,500 PSI: helical type
4”: ≤ 1,500 PSI: C-type,
≥ 2,000 PSI: helical type

Movement
Stainless steel

Dial
White aluminum with black lettering, 2½” with stop pin

Pointer
Black aluminum

Case
304 stainless steel with vent plug and SS crimp ring.
Welded case / socket connection

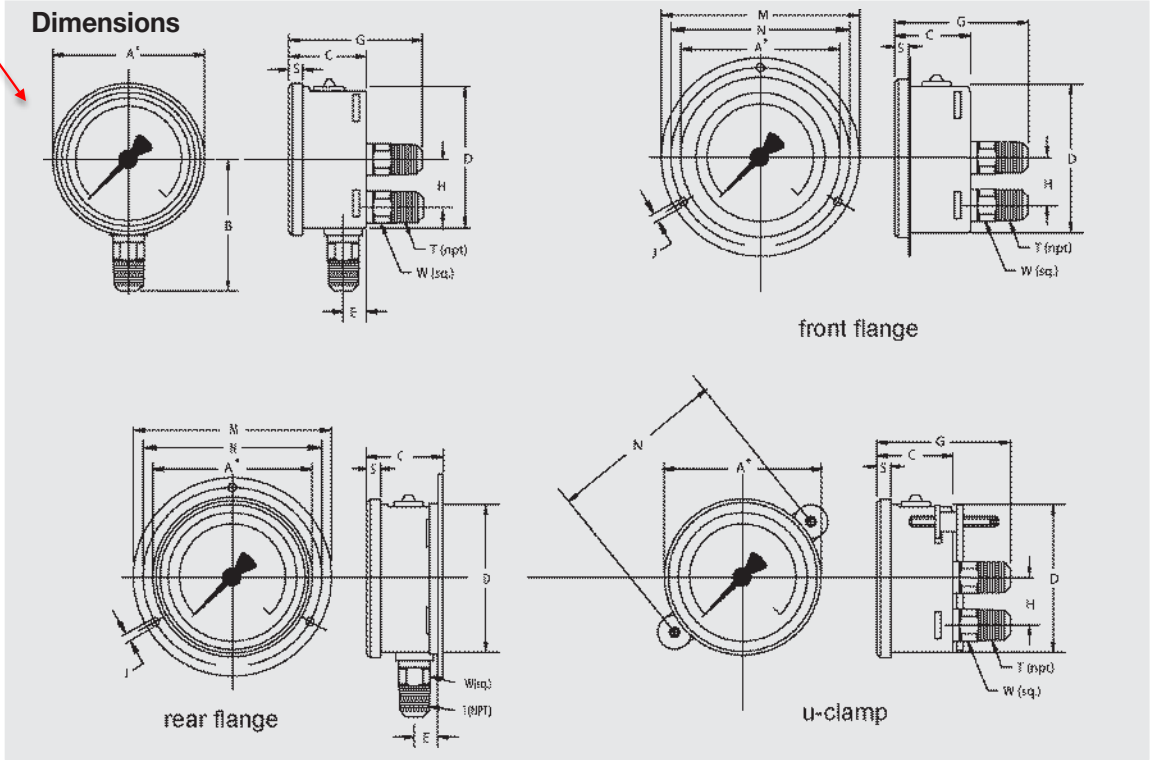
Window
Polycarbonate

Liquid filling
Glycerine 99.7% - Type 233.53

Optional extras

- SS restrictor
- SS front or rear flanges
- Zinc-plated steel or SS u-clamp bracket (field installable)
- Cleaned for oxygen service
- Red drag pointer for mark pointer
- Other pressure connections
- Silicone or Fluorolube case filling
- Other pressure scales available:
  bar, kPa, MPa, kg/cm² and dual scales

Dimensions



Size		A	B	C	D	E	G	H	J	K	L	M	N	S	T	W	Weight	
2”	mm	55	48	30	50	12	53	-	3.6	n/a	6.5	71	60	5.5		14	0.27 lb.	dry
	in	2.17	1.89	1.18	1.97	0.47	2.09	-	0.14	n/a	0.26	2.80	2.36	0.22	1/4”	0.55	0.33 lb.	filled
2.5”	mm	69	54	32	62	13	54	-	3.6	72	7.5	85	75	6.5		14	0.36 lb.	dry
	in	2.69	2.13	1.26	2.45	0.51	2.13	-	0.14	2.83	0.30	3.35	2.95	0.26	1/4”	0.55	0.44 lb.	filled
4”	mm	107	87	48	100	15.5	79.5	30	4.8	109	9	132	116	8		22	1.10 lb.	dry
	in	4.21	3.43	1.89	3.91	0.61	3.13	1.18	0.19	4.29	0.35	5.20	4.57	0.31	1/2”	0.87	1.76 lb.	filled

Recommended panel cutout is dimension D + 1 mm

Ordering information
Pressure gauge model / Nominal size / Scale range / Size of connection / Optional extras required
Specifications and dimensions given in this leaflet represent the state of engineering at the time of printing.
Modifications may take place and materials specified may be replaced by others without prior notice.

WIKA Instrument Corporation
1000 Wiegand Boulevard
Lawrenceville, GA 30045
Tel (770) 513-8200 Toll-free 1-888-WIKA-USA
Fax (770) 338-5118
E-Mail info@wika.com

AquaCarb® S Series granular reactivated carbon

AquaCarb® NS, AquaCarb® RS, AquaCarb® RSD

For Industrial and Remedial Water Treatment

Description

AquaCarb® S Series carbons are produced through thermal reactivation of approved grades of spent carbon at one of our state-of-the-art ISO 14001 certified reactivation facilities. Through careful control of the residence time in the reactivation furnace, reactivation temperature, and reactivation gas composition, adsorbed contaminants on the spent carbon are removed and destroyed, and the carbon's internal pore structure is maintained as close to virgin condition as possible. AquaCarb® S Series reactivated carbons are pooled from a variety of sources, ensuring consistent product properties. The resulting carbon serves as an excellent economic alternative to virgin carbon for the removal of a broad range of organic contaminants from wastewater, process water, and groundwater streams.

Applications

Cost effective AquaCarb® S Series reactivated carbons have been demonstrated to provide excellent performance in a variety of liquid phase treatment applications, including the following:

- Removal of organic contaminants
- Pesticide removal
- Groundwater remediation
- Wastewater treatment
- Industrial process water treatment
- Biological activated carbon support

Quality Control

Siemens' laboratories are fully equipped to provide complete quality control analysis using ASTM standard test methods in order to assure the consistent quality of all Westates® actived carbons.

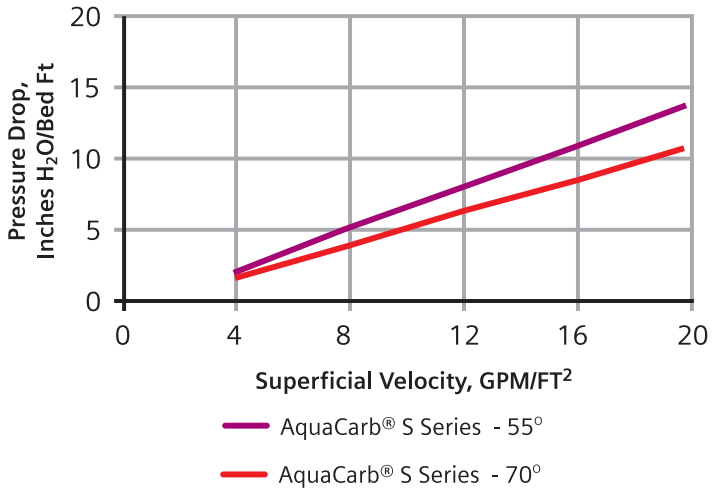
Our technical staff offers hands-on guidance in selecting the most appropriate system, operating conditions and carbon to meet your needs. For more information contact your nearest Siemens representative.

Features and Benefits:

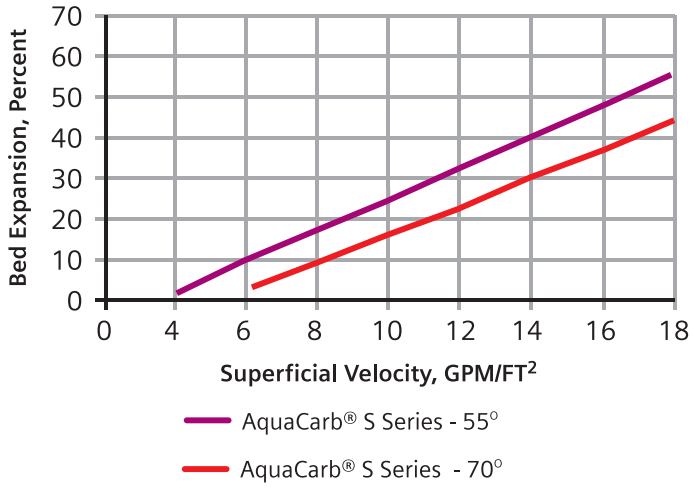
- Reactivated carbons serve as an economical alternative to virgin carbon in many applications
- Use of reactivated carbons reduce the volume of spent carbon sent to landfill and encourages responsible usage of natural resources
- A detailed quality assurance program guarantees consistent quality from lot to lot and shipment to shipment
- Pooled reactivated carbons provide consistent properties and performance
- Reactivated carbons produced at ISO 14001 certified reactivation facilities, ensuring minimization of environ-ental liability and continued benchmarking against best practice standards for environmental management

Typical Properties	
Parameter	AquaCarb® S
Carbon Type	Reactivated Coconut/Coal
Mesh Size, U.S. Sieve	8 x 30
Iodine No., mg I2/g	800 -1000
Apparent Density, g/cc	0.46 -0.60
Moisture as Packed, Wt. %	2

Downflow Pressure Drop Through A Backwashed and Stratified Bed (Typical)



Percent Bed Expansion During Backwash (Typical)



Safety Note: Under certain conditions, some compounds may oxidize, decompose or polymerize in the presence of activated carbon causing a carbon bed temperature rise that is sufficient to cause ignition. Particular care must be exercised when compounds that have a peroxide-forming tendency are being adsorbed. In addition the adsorption of VOCs will lead to the generation of heat within a carbon bed. These heats of reaction and adsorption need to be properly dissipated in order to fully assure the safe operation of the bed.

Wet activated carbon readily adsorbs atmospheric oxygen. Dangerously low oxygen levels may exist in closed vessels or poorly ventilated storage areas. Workers should follow all applicable state and federal safety guidelines for entering oxygen depleted areas.

All information presented herein is believed reliable and in accordance with accepted engineering practices. Siemens makes no warranties as to the completeness of this information. Users are responsible for evaluating individual product suitability for specific applications. Siemens assumes no liability whatsoever for any special, indirect or consequential damages arising from the sale, resale or misuse of its products.

Siemens Industry, Inc.
11711 Reading Road
Red Bluff, CA 96080

866-613-5620

www.siemens.com/es

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Order No.: WS-AQUASdr-DS-1011
Printed in USA

SYNERGY ENVIRONMENTAL, LLC

APPENDIX F

Equipment Manuals

SYNERGY ENVIRONMENTAL, LLC

FLOW METERS

SIEMENS

Handbook

Edition 04/2005 - Revision 04

SITRANS F M MAGFLO®

Electromagnetic flowmeters

Sensor types MAG 1100, MAG 3100, MAG 5100 W

Transmitter types MAG 5000, MAG 6000

Technical Documentation (handbooks, instructions, manuals etc.) on the complete product range SITRANS F can be found on the internet/intranet on the following links:

English: http://www4.ad.siemens.de/WW/view/en/10806951/133300

Order no.: FDK-521H0723

SFIDK.PS.027.W4.02

Siemens Flow Instruments range of electromagnetic flowmeters

	MAG 1100	MAG 1100 FOOD	MAG 3100	MAG 3100 W	MAG 5100 W
					
Size [mm]	DN 2-100	DN 10-100	DN 15-2000	DN 25-1200	DN 25-1200
Connection	Flangeless (Sandwich design)	Weld-in adapter, clamp adapter, thread adapter	Flange	Flange	Flange
Pressure [bar]	Max. 40	Max. 40	Max. 100	Max. 40	Max. 40
Temperature [°C]	–20 to 200	–30 to 150	–40 to180	–10 to 95	–5 to 90
Liner	Zirconium oxide (Z_rO_2) Ceramic (Al_2O_3), PFA	Ceramic (Al_2O_3), PFA	Neoprene, EPDM, Teflon (PTFE), Ebonite, Linatex®	Neoprene and EPDM	DN 25-40 & DN 350-1200 hard elastomer DN 50-300 composite elastomer
Electrodes	Platinum Hastelloy C276	Platinum Hastelloy	AISI 316 Ti, Hastelloy C, Platinum/Iridium, Titanium, Tantalum, PE electrodes	AISI 316 Ti, PE electrodes	AISI 316 Ti, PE electrodes
Enclosure	IP 67	IP 67	IP 67/IP 68	IP 67/IP 68	IP 67/IP 68
Ex-version	EEx [ia] [ib] IIB T4-T6		EEx e ia IIC T3-T6 EEx d [ia] [ib] IIB T4-T6		

	MAG 5000	MAG 6000
		
Outputs	1 current output 1digital output 1 relay output	1 current output 1digital output 1 relay output
Flow direction	Uni/bidirectional	Uni/bidirectional
Communication	Optional HART®	Add-on modules
Display	3 lines 20 characters (optional without display)	3 lines 20 characters (optional without display)
Meter uncertainty	±0,5% o.r.	±0,25% o.r.
Enclosure	IP 67, IP 20	IP 67, IP 20
Custody transfer approval	PTB (cold water)	PTB OIML R75 OIML R117
Ex-version Safety barrier 19"	[EEx ia] IIC	[EEx ia ib] IIB [EEx ia] IIC
Power supply	12-24 V AC/DC 115-230 V AC	12-24 V AC/DC 115-230 V AC
Batch	No	Yes

	MAG 6000 Industry	MAG 8000 W
		
Refer to	Operating manual SFIDK.PS.026.E1.02	Operating manual SFIDK.PS.026.D2.02

2.4 Sensor MAG 5100 W

			
Type	Sensor with flanges		
Design	Straight	Coned 1 DN reduction	Straight
Nominal size *mm*	25-40	50-300	350-1200
Liner	Hard elastomer (hard rubber)[3)]	Composite elastomer (hard & soft rubber)[3)]	Hard elastomer (hard rubber)[3)]
Liner approvals	WRc	WRc	WRc
Medium temperature	–5 to 70°C[1)]		
Ambient temperature			
Remote transmitter	–40 to 100°C		
Compact transmitter	–20 to 50°C		
Operating pressure	0.01 to 40 bar	0.03 to 20 bar	0.01 to 16 bar
Excitation frequency	12.5 Hz	50-65 mm: 12.5 Hz	3.125 Hz
		80-150 mm: 6.25 Hz	
		200-300 mm: 3.125 Hz	
Enclosure rating *Standard*	IP 67 to EN 60529 1 m w.g. for 30 minutes		
Option	IP 68 to EN 60529 10 m w.g. continuously		
Cable entries	4 Pg 13.5		
Mechanical load	18-1000 Hz random, 3.17 G rms in all directions to EN 60068-2-36		
Test pressure	1.5 × nominal pressure		
Flanges			
EN 1092-1 *Standard*	PN 40	50-150 mm: PN 16	PN 10
		200-300 mm: PN 10	
Option		200-300 mm: PN 16	PN 16
ANSI B16.5 *Standard*	Class 150 lb	Class 150 lb	14"-24": Class 150 lb
AWWA C-207 Standard			28"-48": Class D
Pressure drop at 3 m/sec.	As straight pipe	Max. 25 mbar	As straight pipe
Electrodes	AISI 316 Ti (1.4571)		
PE/grounding electrodes *Standard*	AISI 316 Ti (1.4571)		
Measuring pipe/meter body	AISI 304 (1.4301)	Composite elastomer	AISI 304 (1.4301)
Flanges	Carbon steel		
Housing	Carbon steel		
Surface finish	Two component epoxy min. 150 microns	Polyester powder coat min. 100 microns	Two component epoxy min. 150 microns
Colour	Siemens 700 light basic		
Approvals *Conforms to*	PED - 97/23EC, LVD - 73/23 EEC + amendment 93/68/EEC, EMC - 89/336 EEX[2)]		

1) Peak temperature up to +90°C (194°F) in periods < 1 hour
2) For sizes greater than 600 mm PED conformity is available as a cost added option, the basic unit will only carry the LVD (Low Voltage Directive) and EMC approval.
3) Nitrile, NBR

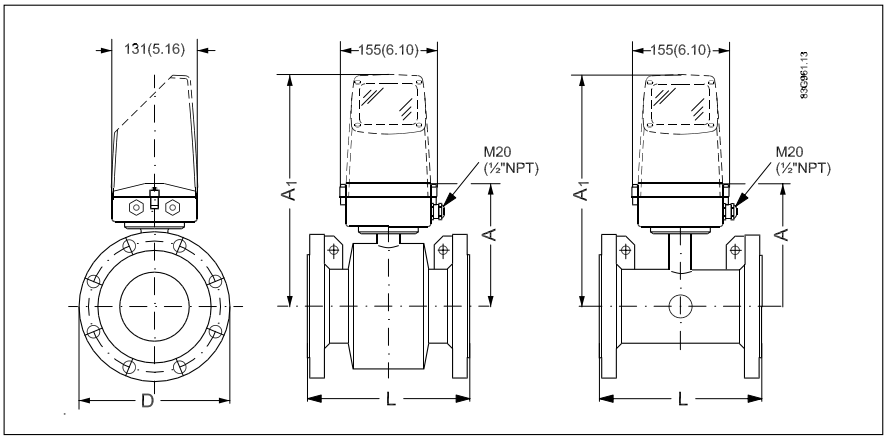
2.5.1 Transmitter MAG 5000 (DN 2 to DN 1200)


Accuracy 0.5%

Current output		
	Current	0-20 mA, 4-20 mA or 4-20 mA + alarm
	Load	< 800 ohm
	Time constant	0.1-30 s adjustable
Digital output		
	Frequency	0-10 kHz, 50% duty cycle
	Time constant	0.1-30 s adjustable
	Active	24 V DC, 30 mA, 1 KΩ ≤ R_{load} ≤ 10 KΩ, short-circuit-protected
	Passive	3-30 V DC, max. 110 mA, 200 Ω ≤ R_{load} ≤ 10 KΩ
Relay	Time constant	Changeover relay, time constant same as current time constant
	Load	42 V AC/2 A, 24 V DC/1A
Digital input		11-30 V DC, R_i = 4.4 KΩ
	Activation time	50 ms
	Current	$I_{11\ V\ DC}$ = 2.5 mA, $I_{30\ V\ DC}$ = 7 mA
Functions		Flow rate, 2 totalizers, low flow cut-off, empty pipe cut-off [1], flow direction, error system, operating time, uni/bidirectional flow, limit switches, pulse output, control for cleaning unit
Galvanic isolation		All inputs and outputs are galvanically isolated
Cut-off	Low flow	0-9.9% of maximum flow
	Empty pipe	Detection of empty pipe, special cable required in separate mounted installation
Totalizer		Two eight-digit counters for forward, net or reverse flow
Display		Background illumination with alphanumerical text, 3 × 20 characters to indicate flow rate, totalized values, settings and faults
		Reverse flow indicated by negative sign
	Time constant	Time constant as current output time constant
Zero point adjustment		Automatic
Electrode input impedance		> 1 x 10^{14} Ω
Excitation frequency		Sensor size depending pulsating DC current (125 mA)
Ambient temperature		Display version during operation: –20 to +50°C
		Blind version during operation: –20 to +60°C
		During storage: –40 to +70°C (RH max. 95%)
Custody transfer approval		PTB
MAG 5000 CT		(cold water) 6.221 99.19
Communication		
	Standard	Without serial communication
	Optional	HART®
Compact		
	Enclosure material	Fibre glass-reinforced polyamide
	Enclosure rating	IP 67 to EN 60529 and DIN 40050 (1 m w.g. for 30 minutes)
	Mechanical load	18-1000 Hz random, 3.17 G rms in all directions to EN 60068-2-36
19" insert		
	Enclosure material	Standard 19" insert of aluminium/steel (DIN 41494)
		Width: 21 TE
		Height: 3 HE
	Enclosure rating	IP 20 to EN 60529 and DIN 40050
	Mechanical load	Version: 1 G, 1-800 Hz sinusoidal in all directions to EN 60068-2-36
EMC performance		Emission: EN 50081-1 (Light industry)
		Immunity: EN 50082-2 (Industry)
Supply voltage		115-230 V AC +10% to –15%, 50-60 Hz
		11-30 V DC or 11-24 V AC
Power consumption		230 V AC: 17 VA
		24 V DC: 9 W, I_N = 380 mA, I_{ST} = 8 A (30 ms)
		12 V DC: 11 W, I_N = 920 mA, I_{ST} = 4 A (250 ms)

[1]) **Not** remote Ex, **not** DN 2, 3

4.3 Sensor MAG 5100 W



New dimension from DN 350 to DN 1200

Nominal size		A		L									
				PN 10		PN 16		PN 40		Class 150		AWWA	
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
25	1"	187	7.4	N/A	N/A	N/A	N/A	200	7.9	200	7.9	N/A	N/A
40	1½"	197	7.8	N/A	N/A	N/A	N/A	200	7.9	200	7.9	N/A	N/A
50	2"	188	7.4	N/A	N/A	200	7.9	N/A	N/A	200	7.9	N/A	N/A
65	2½"	194	7.6	N/A	N/A	200	7.9	N/A	N/A	200	7.9	N/A	N/A
80	3"	200	7.9	N/A	N/A	200	7.9	N/A	N/A	200	7.9	N/A	N/A
100	4"	207	8.1	N/A	N/A	250	9.8	N/A	N/A	250	9.8	N/A	N/A
125	5"	217	8.5	N/A	N/A	250	9.8	N/A	N/A	250	9.8	N/A	N/A
150	6"	232	9.1	N/A	N/A	300	11.8	N/A	N/A	300	11.8	N/A	N/A
200	8"	257	10.1	350	13.8	350	13.8	N/A	N/A	350	13.8	N/A	N/A
250	10"	284	11.2	450	17.7	450	17.7	N/A	N/A	450	17.7	N/A	N/A
300	12"	310	12.2	500	19.7	500	19.7	N/A	N/A	500	19.7	N/A	N/A
350	14"	382	15.0	550	21.7	550	21.7	N/A	N/A	550	21.7	N/A	N/A
400	16"	407	16.0	600	23.6	600	23.6	N/A	N/A	600	23.6	N/A	N/A
450	18"	438	17.2	600	23.6	600	23.6	N/A	N/A	600	23.6	N/A	N/A
500	20"	463	18.2	600	23.6	600	23.6	N/A	N/A	600	23.6	N/A	N/A
600	24"	514	20.2	600	23.6	600	23.6	N/A	N/A	600	23.6	N/A	N/A
700	28"	564	22.2	700	27.6	700	27.6	N/A	N/A	N/A	N/A	700	27.6
750	30"	591	23.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	750	29.5
800	32"	616	24.3	800	31.5	800	31.5	N/A	N/A	N/A	N/A	800	31.5
900	36"	663	26.1	900	35.4	900	35.4	N/A	N/A	N/A	N/A	900	35.4
1000	40"	714	28.1	1000	39.4	1000	39.4	N/A	N/A	N/A	N/A	1000	39.4
	42"	714	28.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1000	39.4
1100	44"	765	30.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1100	43.3
1200	48"	820	32.3	1200	47.2	1200	47.2	N/A	N/A	N/A	N/A	1200	47.2

Will be discontinued

350	14"	362	14.3	550	21.7	550	21.7	N/A	N/A	550	21.7	N/A	N/A
400	16"	387	15.2	600	23.6	600	23.6	N/A	N/A	600	23.6	N/A	N/A
450	18"	418	16.5	600	23.6	600	23.6	N/A	N/A	600	23.6	N/A	N/A
500	20"	443	17.4	625	24.6	625	24.6	N/A	N/A	680	26.8	N/A	N/A
600	24"	494	19.4	750	29.5	750	29.5	N/A	N/A	820	32.3	N/A	N/A
700	28"	544	21.4	875	34.4	875	34.4	N/A	N/A	N/A	N/A	875	34.4
750	30"	571	22.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	937	36.9
800	32"	606	23.9	1000	39.4	1000	39.4	N/A	N/A	N/A	N/A	1000	39.4
900	36"	653	25.7	1125	44.3	1125	44.3	N/A	N/A	N/A	N/A	1125	44.3
1000	40"	704	27.7	1250	49.2	1250	49.2	N/A	N/A	N/A	N/A	1250	49.2
	42"	704	27.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1250	49.2
1100	44"	755	29.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1375	54.1
1200	48"	810	31.9	1500	59.1	1500	59.1	N/A	N/A	N/A	N/A	1500	59.1

D = Outside diameter of flange, see flange tables

MAG 5100 W weight

Nominal size		PN 10		PN 16		PN 40		Class 150		AWWA	
mm	inch	kgs	lbs	kgs	lbs	kgs	lbs	kgs	lbs	kgs	lbs
25	1"	N/A	N/A	N/A	N/A	4	9	4	9	N/A	N/A
40	1½"	N/A	N/A	N/A	N/A	7	15	6	13	N/A	N/A
50	2"	N/A	N/A	9	20	N/A	N/A	8	20	N/A	N/A
65	2½"	N/A	N/A	10.7	24	N/A	N/A	11	24	N/A	N/A
80	3"	N/A	N/A	11.6	26	N/A	N/A	13	28	N/A	N/A
100	4"	N/A	N/A	15.2	33	N/A	N/A	19	41	N/A	N/A
125	5"	N/A	N/A	20.4	45	N/A	N/A	24	52	N/A	N/A
150	6"	N/A	N/A	26	57	N/A	N/A	29	64	N/A	N/A
200	8"	48	106	48	106	N/A	N/A	56	124	N/A	N/A
250	10"	64	141	69	152	N/A	N/A	79	174	N/A	N/A
300	12"	76	167	86	189	N/A	N/A	110	243	N/A	N/A

New weight from DN 350 to DN 1200

350	14"	104	229	125	274	N/A	N/A	139	307	N/A	N/A
400	16"	119	263	143	314	N/A	N/A	159	351	N/A	N/A
450	18"	136	299	173	381	N/A	N/A	182	400	N/A	N/A
500	20"	163	359	223	491	N/A	N/A	225	495	N/A	N/A
600	24"	236	519	338	744	N/A	N/A	320	704	N/A	N/A
700	28"	270	595	314	692	N/A	N/A	N/A	N/A	273	602
750	30"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	329	725
800	32"	346	763	396	873	N/A	N/A	N/A	N/A	365	804
900	36"	432	951	474	1043	N/A	N/A	N/A	N/A	495	1089
1000	40"	513	1130	600	1321	N/A	N/A	N/A	N/A	583	1282
	42"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	687	1512
1100	44"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	763	1680
1200	48"	643	1415	885	1948	N/A	N/A	N/A	N/A	861	1896

Will be discontinued

350	14"	100	220	116	255	N/A	N/A	131	289	N/A	N/A
400	16"	127	280	144	317	N/A	N/A	165	364	N/A	N/A
450	18"	152	335	178	393	N/A	N/A	176	388	N/A	N/A
500	20"	184	405	232	512	N/A	N/A	235	518	N/A	N/A
600	24"	258	568	343	736	N/A	N/A	345	761	N/A	N/A
700	28"	315	693	350	772	N/A	N/A	N/A	N/A	309	681
750	30"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	480	1058
800	32"	410	904	442	975	N/A	N/A	N/A	N/A	421	928
900	36"	512	1129	550	1213	N/A	N/A	N/A	N/A	539	1188
1000	40"	650	1433	732	1614	N/A	N/A	N/A	N/A	670	1477
	42"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	700	1544
1100	44"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1100	2426
1200	48"	990	2183	1106	2439	N/A	N/A	N/A	N/A	1030	2271

The effect of temperature on working pressure MAG 5100 W

Metric (Pressures in bar)					
Sizes 25 mm, 40 mm & > 300 mm					
Flange spec.	**Flange rating**	**Temperature °C**			
		–5	10	50	90
EN 1092-1	PN 10	10.0	10.0	9.7	9.4
	PN 16	16.0	16.0	15.5	15.1
	PN 40	40.0	40.0	38.7	37.7
ANSI B16.45	150 lb	19.7	19.7	19.3	18.0
AWWA C-207	Class D	10.3	10.3	10.3	10.3
Sizes 50 mm to 300 mm					
EN 1092-1	PN 10	10.0	10.0	10.0	8.2
	PN 16	10.0	16.0	16.0	13.2
	PN 40	10.0	40.0	40.0	32.9
ANSI B16.45	150 lb	10.0	19.7	19.7	16.2

Imperial (Pressures in Psi)					
Sizes 1", 1½", & > 12"					
Flange spec.	**Flange rating**	**Temperature °F**			
		23	50	120	200
EN 1092-1	PN 10	145	145	141	136
	PN 16	232	232	225	219
	PN 40	580	580	561	547
ANSI B16.45	150 lb	286	286	280	261
AWWA C-207	Class D	150	150	150	150
Sizes 2" to 12"					
EN 1092-1	PN 10	145	145	145	119
	PN 16	145	232	232	191
	PN 40	145	580	580	477
ANSI B16.45	150 lb	145	286	286	235

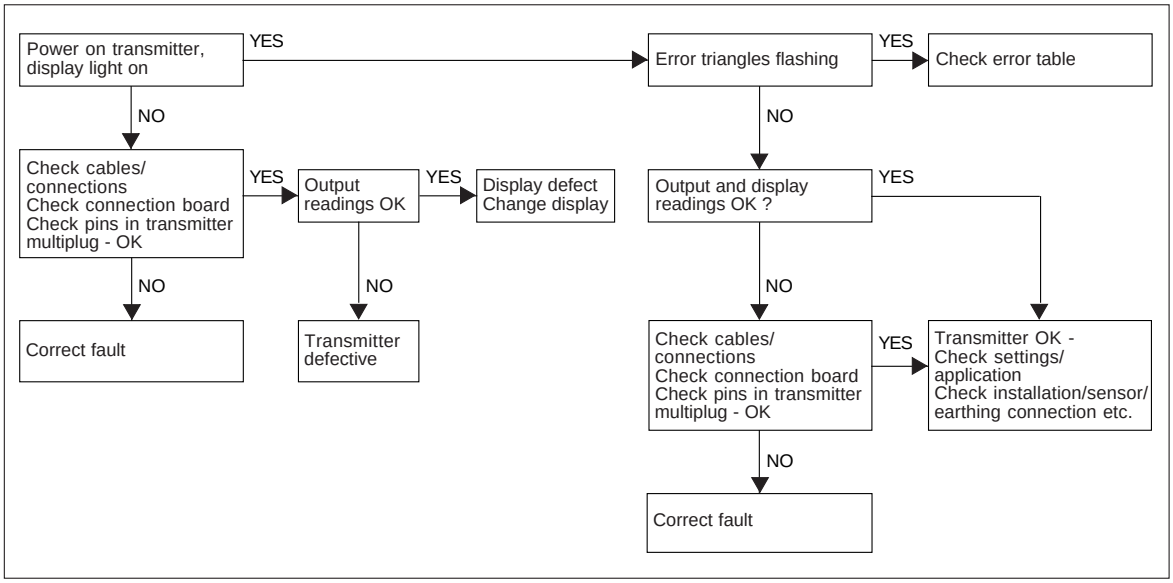
9. Service

Often problems with unstable/wrong measurements occur due to insufficient/wrong earthing or potential equalization. Please check this connection. If OK, the SITRANS F M MAGFLO® transmitter can be checked as described under 9.1 and sensor under 9.3.

9.1 Transmitter check list

When checking SITRANS F M MAGFLO® installations for malfunction the easiest method to check the transmitter is to replace it with another MAG 5000/6000 transmitter with a similar power supply.
A replacement can easily be done as all settings are stored in and downloaded from the SENSORPROM® unit - no extra settings need to be made.

If no spare transmitter is available - then check transmitter according to check table.



9.2 Trouble shooting MAG transmitter

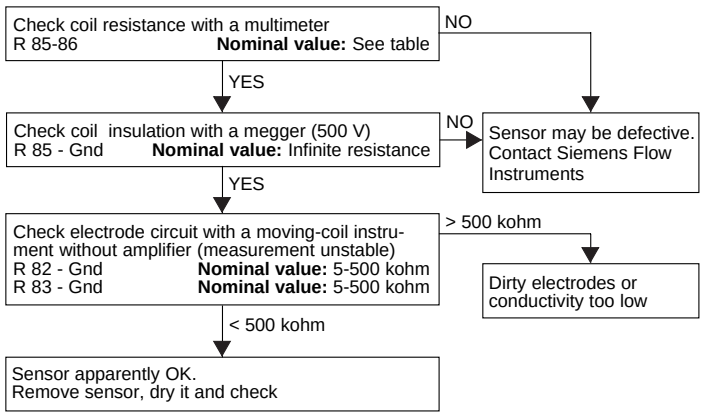
Symptom	Output signals	Error code	Cause	Remedy
Empty display	Minimum		1. No power supply	Power supply Check MAG 5000/6000 for bended pins on the connector
			2. MAG 5000/6000 defective	Replace MAG 5000/6000
No flow signal	Minimum		1. Current output disabled	Turn on current output
			2. Digital output disabled	Turn on digital output
			3. Reverse flow direction	Change direction
		F70	Incorrect or no coil current	Check cables/connections
		W31	Measuring pipe empty	Ensure that the measuring pipe is full
		F60	Internal error	Replace MAG 5000/6000
	Undefined	P42	1. No load on current output	Check cables/connections
			2. MAG 5000/6000 defective	Replace MAG 5000/6000
		P41	Initializing error	Switch off MAG 5000/6000, wait 5 s and switch on again
Indicates flow with no flow in pipe	Undefined		Measuring pipe empty	Select empty pipe cut-off
			Empty pipe cut-off is OFF	Ensure that the measuring pipe is full
			Electrode connection missing/ electrode cable is insufficiently screened	Ensure that electrode cable is connected and sufficiently screened
Unstable flow signal	Unstable		1. Pulsating flow	Increase time constant
			2. Conductivity of medium too low	Use special electrode cable
			3. Electrical noise potential between medium and sensor	Ensure sufficient potential equalization
			4. Air bubbles in medium	Ensure medium does not contain air bubbles
			5. High concentration of particles or fibres	Increase time constant
Measuring error	Undefined		Incorrect installation	Check installation
		P40	No SENSORPROM® unit	Install SENSORPROM® unit
		P44	CT SENSORPROM® unit	Replace SENSORPROM® unit or reset SENSORPROM® unit with MAG CT transmitter
		F61	Deficient SENSORPROM® unit	Replace SENSORPROM® unit
		F62	Wrong type of SENSORPROM® unit	Replace SENSORPROM® unit
		F63	Deficient SENSORPROM® unit	Replace SENSORPROM® unit
		F71	Loss of internal data	Replace MAG 5000/6000
	Maximum	W30	Flow exceeds 100% of $Q_{max.}$	Check $Q_{max.}$ (Basic Settings)
		W21	Pulse overflow • Volume/pulse too small • Pulse width too large	 Change volume/pulse Change pulse width
Measuring approx. 50%			Missing one electrode connection	Check cables
Loss of totalizer data	OK	W20	Initializing error	Reset totalizer manually
##### Signs in display	OK		Totalizer roll over	Reset totalizer or increase totalizer unit

9.3 Check list MAG sensor

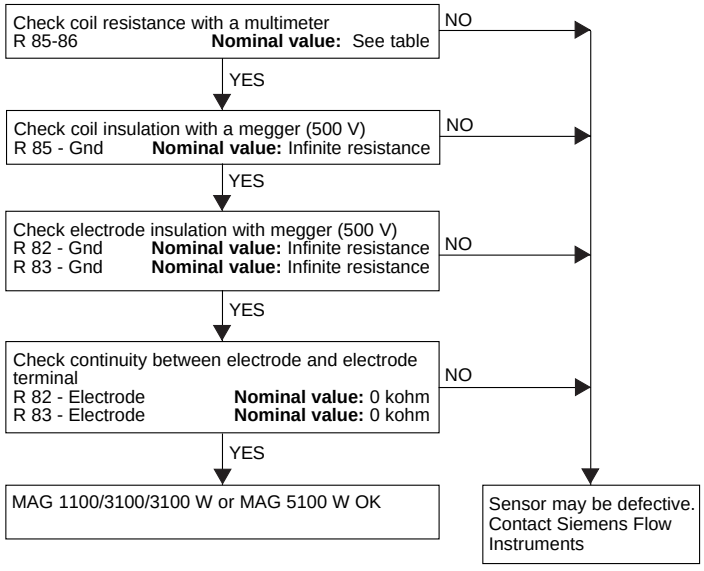
ATTENTION!
If there is leakage from MAG 1100/3100/3100 W or MAG 5100 W and the unit has been used to measure inflammable/explosive liquids, there might be a risk of explosion when checking with a megger.

Disconnect all leads to MAG 1100/3100/3100 W or MAG 5100 W

MAG 1100/3100/3100 W or MAG 5100 W installed and filled with the medium:



MAG 1100/3100/3100 W or MAG 5100 W removed from system – empty and dry:



9.4 Coil resistance

	Coil resistance						
	MAG 1100	MAG 3100		MAG 3100 W		MAG 5100 W	
DN	Resistance	Resistance	Tolerance	Ohms	Tolerance	Ohms	Tolerance
2	104 Ω +/– 5	104					
3	104 Ω +/– 5	104					
6	98 Ω +/– 4	104					
10	98 Ω +/– 4	104					
15 [1])	98 Ω +/– 4	104					
25	98 Ω +/– 4	104	+/– 2	104	+/– 2	104	+/– 2
40	98 Ω +/– 4	92	+/– 2	92	+/– 2	92	+/– 2
50	98 Ω +/– 4	92	+/– 2	92	+/– 2	124	+/– 4
65	98 Ω +/– 4	100	+/– 2	100	+/– 2	127	+/– 4
80	98 Ω +/– 4	94	+/– 2	94	+/– 2	126	+/– 4
100	98 Ω +/– 4	92	+/– 2	92	+/– 2	125	+/– 4
125		92	+/– 2	92	+/– 2	126	+/– 4
150		94	+/– 2	94	+/– 2	116	+/– 4
200		90	+/– 2	90	+/– 2	109	+/– 4
250		92	+/– 2	92	+/– 2	104	+/– 4
300		100	+/– 2	100	+/– 2	108	+/– 4
350		112	+/– 2	112	+/– 2	112	+/– 2
400		100	+/– 4	100	+/– 4	100	+/– 4
450		108	+/– 4	108	+/– 4	108	+/– 4
500		122	+/– 4	122	+/– 4	122	+/– 4
600		115	+/– 4	114	+/– 4	114	+/– 4
700		128	+/– 4	112	+/– 4	112	+/– 4
750		133					
800		128	+/– 4	127	+/– 4	127	+/– 4
900		131	+/– 4	93	+/– 4	93	+/– 4
1000		131	+/– 4	103	+/– 4	103	+/– 4
1100		126					
1200		130	+/– 4	124	+/– 4	124	+/– 4
1400		130					
1500		124					
1600		133					
1800		133					
2000		147					

[1]) On MAG 1100 DN 15 produced as from May 1999 the coil resistance must be 86 ohm, +8/–4 ohm.

All resistance values are at 20 °C.
The resistance changes proportionally 0.4% / °C.

10. Ordering

Please look on our homepage **http://www.siemens.com/flow** under "Product Selector".

SYNERGY ENVIRONMENTAL, LLC

PRESSURE TRANSMITTERS

Overview

The SITRANS P200 pressure transmitter measures the gauge and absolute pressure of liquids, gases and vapors.

- Ceramic measuring cell
- Gauge and absolute measuring ranges 1 to 60 bar (15 to 1000 psi)
- For general applications

Benefits

- High measuring accuracy
- Rugged stainless steel enclosure
- High overload withstand capability
- For aggressive and non-aggressive media
- For measuring the pressure of liquids, gases and vapors
- Compact design

Application

The SITRANS P200 pressure transmitter for gauge and absolute pressure is used in the following industrial areas:

- Mechanical engineering
- Shipbuilding
- Power engineering
- Chemical industry
- Water supply

Design

Device structure without explosion protection

The pressure transmitter consists of a piezoresistive measuring cell with a diaphragm installed in a stainless steel enclosure. It can be used with a connector per EN 175301-803-A (IP65), a round plug M12 (IP67), a cable (IP67) or a cable quick screw connection (IP67) connected electrically. The output signal is between 4 and 20 mA or 0 and 10 V.

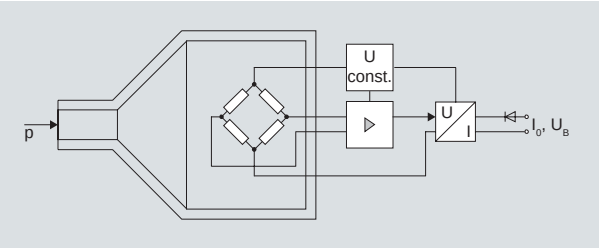
Device structure with explosion protection

The pressure transmitter consists of a piezoresistive measuring cell with a diaphragm installed in a stainless steel enclosure. It can be used with a connector per EN 175301-803-A (IP65) or a round plug M12 (IP67) connected electrically. The output signal is between 4 and 20 mA.

Function

The pressure transmitter measures the gauge and absolute pressure of liquids and gases as well as the level of liquids.

Mode of operation



SITRANS P200 pressure transmitters (7MF1565-...), functional diagram

The ceramic measuring cell has a thin-film resistance bridge to which the operating pressure p is transmitted through a ceramic diaphragm.

The voltage output from the measuring cell is converted by an amplifier into an output current of 4 to 20 mA or an output voltage of 0 to 10 V DC.

The output current and voltage are linearly proportional to the input pressure.

SITRANS P200

2

Technical specifications

Application	
Gauge and absolute pressure measurement	Liquids, gases and vapors
Mode of operation	
Measuring principle	Piezo-resistive measuring cell (ceramic diaphragm)
Measured variable	Gauge and absolute pressure
Inputs	
Measuring range	
• Gauge pressure - Metric - US measuring range	 1 … 60 bar g (15 … 870 psi g) 15 … 1000 psi g
• Absolute pressure - Metric - US measuring range	 0.6 … 16 bar a (10 … 232 psi a) 10 … 300 psi a
Output	
Current signal	4 ... 20 mA
• Load	$(U_B - 10\ V) / 0.02\ A$
• Auxiliary power U_B	DC 7 ... 33 V (10 ... 30 V for Ex)
Voltage signal	0 ... 10 V DC
• Load	≥ 10 kΩ
• Auxiliary power U_B	12 ... 33 V DC
• Power consumption	< 7 mA at 10 kΩ
Characteristic curve	Linear rising
Measuring accuracy	
Error in measurement at 25 °C (77 °F), including conformity error, hysteresis and repeatability	• Typical: 0.25 % of full-scale value • Maximum: 0.5 % of full-scale value
Setting time T99	< 0.1 s
Long-term drift	
• Lower range value and measuring span	0.25 % of full-scale value/year
Influence of ambient temperature	
• Lower range value and measuring span	0.25 %/10 K of full-scale value
• Influence of power supply	0.005 %/V
Conditions of use	
Process temperature with gasket made of:	
• FPM (Standard)	-15 ... +125 °C (+5 ... +257 °F)
• Neoprene	-35 ... +100 °C (-31 ... +212 °F)
• Perbunan	-20 ... +100 °C (-4 ... +212 °F)
• EPDM	-40 ... +145 °C (-40 ... +293 °F), usable for drinking water
Ambient temperature	-25 ... +85 °C (-13 ... +185 °F)
Storage temperature	-50 ... +100 °C (-58 ... +212 °F)
Degree of protection (to EN 60529)	• IP 65 with connector per EN 175301-803-A • IP 67 with M12 connector • IP 67 with cable • IP 67 with cable quick screw connection
Electromagnetic compatibility	• acc. EN 61326-1/-2/-3 • acc. NAMUR NE21, only for ATEX versions and with a max. measuring deviation ≤ 1 %

Design	
Weight	Approx. 0.090 kg (0.198 lb)
Process connections	See dimension drawings
Electrical connections	• Connector per EN 175301-803-A Form A with cable inlet M16x1.5 or ½-14 NPT or Pg 11 • M12 connector • 2 or 3-wire (0.5 mm^2) cable (Ø ± 5.4 mm) • Cable quick screw connection
Wetted parts materials	
• Measuring cell	Al_2O_3 - 96 %
• Process connection	Stainless steel, mat. No. 1.4404 (SST 316 L)
• Gasket	• FPM (Standard) • Neoprene • Perbunan • EPDM
Non-wetted parts materials	
• Enclosure	Stainless steel, mat. No. 1.4404 (SST 316 L)
• Rack	Plastic
• Cables	PVC
Certificates and approvals	
Classification according to pressure equipment directive (PED 97/23/EC)	For gases of fluid group 1 and liquids of fluid group 1; complies with requirements of article 3, paragraph 3 (sound engineering practice)
Lloyds Register of Shipping (LR)	Applied
Germanischer Lloyds Register of Shipping (GL)	Applied
American Bureau of Shipping (ABS)	Applied
Bureau Veritas (BV)	Applied
Det Norske Veritas (DNV)	Applied
Drinking water approval (ACS)	Applied
GOST	Applied
Explosion protection	
Intrinsic safety "i" (only with current output)	Ex II 1/2 G Ex ia IIC T4 Ga/Gb Ex II 1/2 D Ex ia IIIC T125 °C Da/Db
EC type-examination certificate	SEV 10 ATEX 0146
Connection to certified intrinsically-safe resistive circuits with maximum values:	$U_i \leq 30\ V$ DC; $I_i \leq 100\ mA$; $P_i \leq 0.75\ W$
Effective internal inductance and capacity for versions with plugs per EN 175301-803-A and M12	$L_i = 0\ nH$; $C_i = 0\ nF$

2

Selection and ordering data

Order No. 7MF1565 - ■■■■■ - ■■■■ Order code ■■■

SITRANS P 200 pressure transmitters for pressure and absolute pressure for general applications
Characteristic curve deviation typ. 0.25 %
Wetted parts materials: Ceramic and stainless steel + sealing material
Non-wetted parts materials: stainless steel

Measuring range	Overload limit Min.	Overload limit Max.	Burst pressure		Order code
For gauge pressure					
0 ... 1 bar g (0 ... 14.5 psi g)	-0.4 bar g (-5.8 psi g)	2.5 bar g (36.26 psi g)	> 2,5 bar g	(> 36.3 psi g) ►	3BA
0 ... 1.6 bar g (0 ... 23.2 psi g)	-0.4 bar g (-5.8 psi g)	4 bar g (58.02 psi g)	> 4 bar g	(> 58.0 psi g) ►	3BB
0 ... 2.5 bar g (0 ... 36.3 psi g)	-0.8 bar g (-11.6 psi g)	6.25 bar g (90.65 psi g)	> 6,25 bar g	(> 90.7 psi g) ►	3BD
0 ... 4 bar g (0 ... 58.0 psi g)	-0.8 bar g (-11.6 psi g)	10 bar g (145 psi g)	> 10 bar g	(> 145 psi g) ►	3BE
0 ... 6 bar g (0 ... 87.0 psi g)	-1 bar g (-14.5 psi g)	15 bar g (217 psi g)	> 15 bar g	(> 217 psi g) ►	3BG
0 ... 10 bar g (0 ... 145 psi g)	-1 bar g (-14.5 psi g)	25 bar g (362 psi g)	> 25 bar g	(> 362 psi g) ►	3CA
0 ... 16 bar g (0 ... 232 psi g)	-1 bar g (-14.5 psi g)	40 bar g (580 psi g)	> 40 bar g	(> 580 psi g) ►	3CB
0 ... 25 bar g (0 ... 363 psi g)	-1 bar g (-14.5 psi g)	62.5 bar g (906 psi g)	> 62,5 bar g	(> 906 psi g) ►	3CD
0 ... 40 bar g (0 ... 580 psi g)	-1 bar g (-14.5 psi g)	100 bar g (1450 psi g)	> 100 bar g	(> 1450 psi g) ►	3CE
0 ... 60 bar g (0 ... 870 psi g)	-1 bar g (-14.5 psi g)	150 bar g (2175 psi g)	> 150 bar g	(> 2175 psi g) ►	3CG
Other version, add order code and plain text: Measuring range: ... up to... bar (psi g)					9AA H1Y
For absolute pressure					
0 ... 600 bar a (0 ... 8.7 psi a)	0 bar a (0 psi a)	3 bar a (43.51 psi a)	> 2,5 bar a	(> 36.3 psi a)	5AG
0 ... 1 bar a (0 ... 14.5 psi a)	0 bar a (0 psi a)	2.5 bar a (36.26 psi a)	> 2,5 bar a	(> 36.3 psi a) ►	5BA
0 ... 1.6 bar a (0 ... 23.2 psi a)	0 bar a (0 psi a)	4 bar a (58.02 psi a)	> 4 bar a	(> 58.0 psi a) ►	5BB
0 ... 2.5 bar a (0 ... 36.3 psi a)	0 bar a (0 psi a)	6.25 bar a (90.65 psi a)	> 6,25 bar a	(> 90.7 psi a) ►	5BD
0 ... 4 bar a (0 ... 58.0 psi a)	0 bar a (0 psi a)	10 bar a (145 psi a)	> 10 bar a	(> 145 psi a) ►	5BE
0 ... 6 bar a (0 ... 87.0 psi a)	0 bar a (0 psi a)	15 bar a (217 psi a)	> 15 bar a	(> 217 psi a) ►	5BG
0 ... 10 bar a (0 ... 145 psi)	0 bar a (0 psi a)	25 bar a (362 psi a)	> 25 bar a	(> 362 psi a) ►	5CA
0 ... 16 bar a (0 ... 232 psi)	0 bar a (0 psi a)	40 bar a (580 psi a)	> 40 bar a	(> 580 psi a) ►	5CB
Other version, add order code and plain text: Measuring range: ... up to ... mbar a (psi a)					9AA H1Y
Measuring ranges for gauge pressure (only for US market)					
(0 ... 15 psi g)	(-5.8 psi g)	(35 psi g)		(> 35 psi g)	4BB
(3 ... 15 psi g)	(-5.8 psi g)	(35 psi g)		(> 35 psi g)	4BC
(0 ... 20 psi g)	(-5.8 psi g)	(50 psi g)		(> 50 psi g)	4BD
(0 ... 30 psi g)	(-5.8 psi g)	(80 psi g)		(> 80 psi g)	4BE
(0 ... 60 psi g)	(-11.5 psi g)	(140 psi g)		(> 140 psi g)	4BF
(0 ... 100 psi g)	(-14.5 psi g)	(200 psi g)		(> 200 psi g)	4BG
(0 ... 150 psi g)	(-14.5 psi g)	(350 psi g)		(> 350 psi g)	4CA
(0 ... 200 psi g)	(-14.5 psi g)	(550 psi g)		(> 550 psi g)	4CB
(0 ... 300 psi g)	(-14.5 psi g)	(800 psi g)		(> 800 psi g)	4CD
(0 ... 500 psi g)	(-14.5 psi g)	(1400 psi g)		(> 1400 psi g)	4CE
(0 ... 750 psi g)	(-14.5 psi g)	(2000 psi g)		(> 2000 psi g)	4CF
(0 ... 1000 psi g)	(-14.5 psi g)	(2000 psi g)		(> 2000 psi g)	4CG
Other version, add order code and plain text: Measuring range: ... up to ... psi g					9AA H1Y
Measuring ranges for absolute pressure (only for US market)					
(0 ... 10 psi a)	(0 psi a)	(35 psi a)		(> 35 psi a)	6AG
(0 ... 15 psi a)	(0 psi a)	(35 psi a)		(> 35 psi a)	6BA
(0 ... 20 psi a)	(0 psi a)	(50 psi a)		(> 50 psi a)	6BB
(0 ... 30 psi a)	(0 psi a)	(80 psi a)		(> 80 psi a)	6BD
(0 ... 60 psi a)	(0 psi a)	(140 psi a)		(> 140 psi a)	6BE
(0 ... 100 psi a)	(0 psi a)	(200 psi a)		(> 200 psi a)	6BG
(0 ... 150 psi a)	(0 psi a)	(350 psi a)		(> 350 psi a)	6CA
(0 ... 200 psi a)	(0 psi a)	(550 psi a)		(> 550 psi a)	6CB
(0 ... 300 psi a)	(0 psi a)	(800 psi a)		(> 800 psi a)	6CC
Other version, add order code and plain text: Measuring range: ... up to ... psi a					9AA H1Y

► Available ex stock

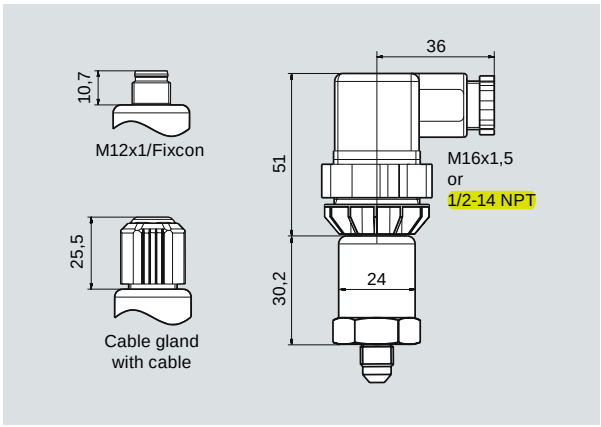
SITRANS P200

2

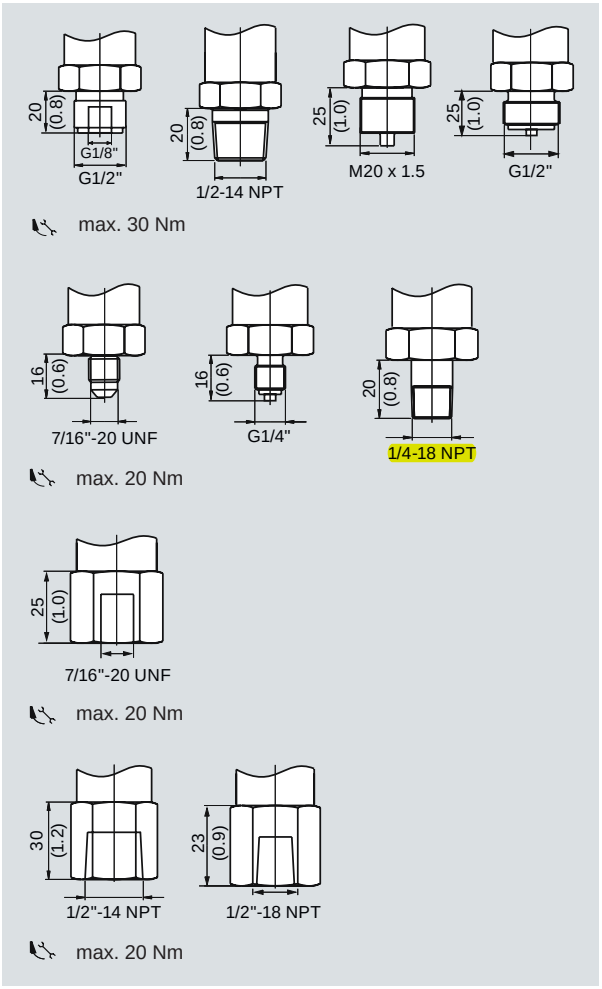
Selection and ordering data		Order No.	Order code
SITRANS P 200 pressure transmitters for pressure and absolute pressure for general applications Characteristic curve deviation typ. 0.25 % Wetted parts materials: Ceramic and stainless steel + sealing material Non-wetted parts materials: stainless steel		7MF1565 -	-
Output signal			
4 ... 20 mA; two-wire system; power supply 7 ... 33 V DC (10 ... 30 V DC for ATEX versions)	►		0
0 ... 10 V; three-wire system; power supply 12 ... 33 V DC	►		10
Explosion protection (only 4 ... 20 mA)			
None	►		0
With explosion protection EEx ia IIC T4	►		1
Electrical connection			
Connector per DIN EN 175301-803-A, stuffing box thread M16 (with coupling)	►		1
Round connector M12 per DIN EN 60139-9 (not for gauge pressure ranges ≤ 16 bar)			2
Connection via fixed mounted cable, 2m (not for type of protection "Intrinsic safety i")			03
Cable quick screw connection PG9 (not for type of protection "Intrinsic safety i")			04
Connector per DIN EN 175301-803-A, stuffing box thread 1/2"-14 NPT (with coupling)			5
Connector per DIN EN 175301-803-A, stuffing box thread PG11 (with coupling)			6
Special version			9 N1Y
Process connection			
G½" male per EN 837-1 (½" BSP male) (standard for metric pressure ranges mbar, bar)	►		A
G½" male thread and G1/8" female thread			B
G¼" male per EN 837-1 (¼" BSP male)			C
7/16"-20 UNF male			D
¼"-18 NPT male (standard for pressure ranges in H_2O and psi)			E
¼"-18 NPT female			F
½"-14 NPT male			G
½"-14 NPT female			H
7/16"-20 UNF female			J
M20x1.5 male			P
Special version			Z P1Y
Sealing material between sensor and enclosure			
Viton (FPM, standard)	►		A
Neoprene (CR)			B
Perbunan (NBR)			C
EPDM			D
Special version			Z Q1Y
Version			
Standard version	►		1
Further designs			
Supplement the order no. with "**-Z**" and add order code.			
Manufacturer's test certificate M per DIN 55340, Part 18 and ISO 8402 (calibration certificate) supplied		**C11**	
Oxygen application, oil and grease-free cleaning (only in conjunction with the sealing material Viton between sensor and enclosure)		**E10**	

► Available ex stock

Dimensional drawings



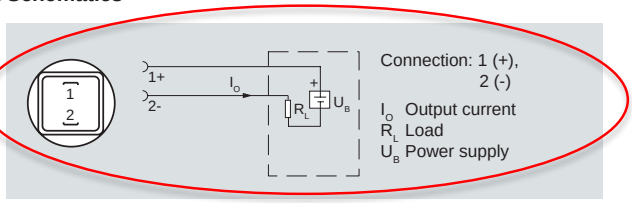
SITRANS P200, electrical connections, dimensions in mm (inch)



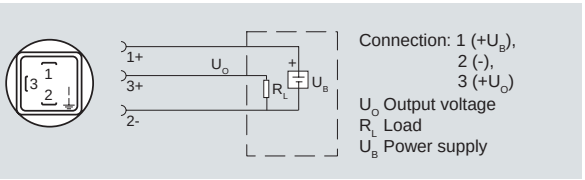
SITRANS P200, process connections, dimensions in mm (inch)

SITRANS P200

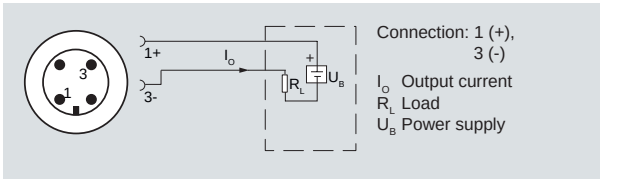
Schematics



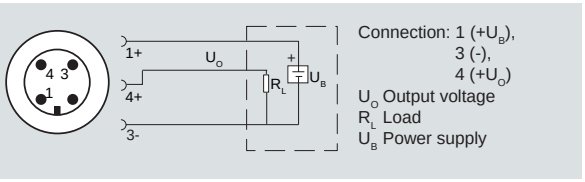
Connection with current output and connector per EN 175301



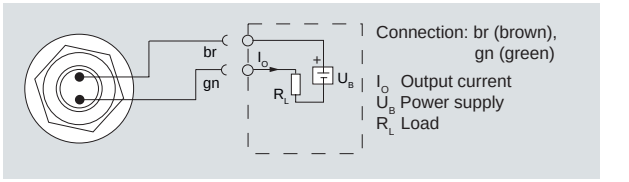
Connection with voltage output and connector per EN 175301



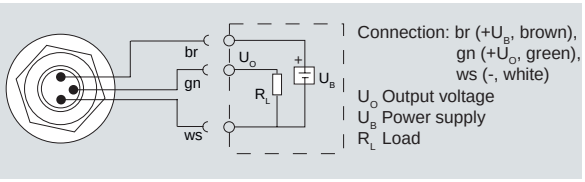
Connection with current output and connector M12x1



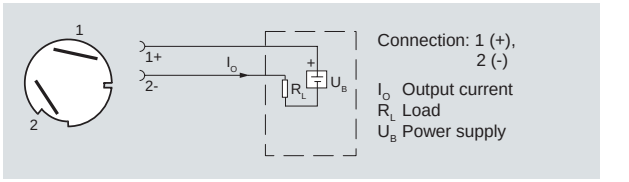
Connection with voltage output and connector M12x1



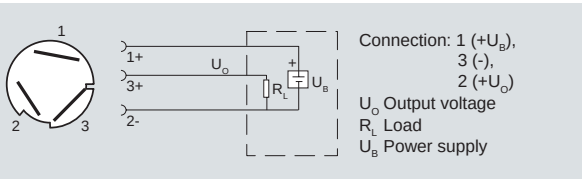
Connection with current output and cable



Connection with voltage output and cable



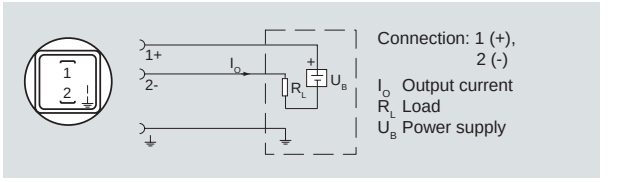
Connection with current output and cable quick screw connection



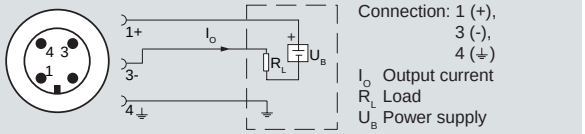
Connection with voltage output and cable quick screw connection

Version with explosion protection: 4 ... 20 mA

The grounding connection is conductively bonded to the transmitter enclosure



Connection with current output and connector per EN 175301 (Ex)



Connection with current output and connector M12x1 (Ex)

SYNERGY ENVIRONMENTAL, LLC

3-WAY VALVES

14" ϕ 3-Way
2-position/Electric

VSI

SERIES 1000 ELECTRIC ACTUATORS

SERIES 1000

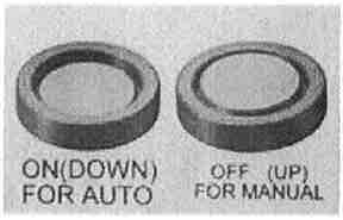
DESIGN FEATURES

Series 1000 On-Off Rotary Electric Actuator

Standard Features

Torque Output Range: 434in-lb to 17,700in-lb
Housing: NEMA 4, watertight, corrosion-resistant, powder coated, robust aluminum die cast
Mounting: ISO 5211 Standard mounting configurations
Electric Motor: 120VAC, single phase, 60Hz totally enclosed, non-ventilated, high starting torque, reversible induction type, Class F insulation
Thermal Overload Motor Protection: Auto reset thermal switch embedded in the motor winding - trips when the maximum winding temperature is exceeded
Position Limit Switches: 2 x SPDT for Open and Close travel limit - easily adjustable, cam operated
Position Indicator: Mechanical dome type with visible red/yellow closed/open indicator
Terminal Strip: Refer to wiring diagrams for details
Conduit Entries: 1 x 1/2" NPT for power and control wiring
Power Gears: Alloy steel spur gears to final stage aluminum bronze worm sector gear
Break: An electro-mechanical brake is NOT required. The worm gear drive prevents back driving and hunting
Bearings: High quality alloy steel sleeve and ball bearings
Manual Override: Allen Handle
Ambient Temperature Range: -31°F to +150°F
Certification and Approvals: CE, NEMA 4, NRTL, CSA File 226201
Internal Heater

Manual Override Power Switch: Disconnects power from the actuator without the need to disconnect power from the terminals or the panel. The power needs to be disconnected to manually operate the actuator.



Optional Features

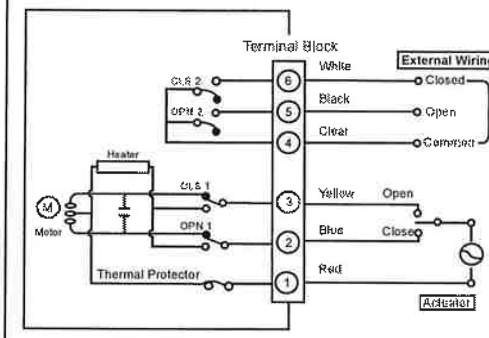
- 220V AC 50/60Hz power
- 24V AC 50/60Hz power - models 1005 and 1010
- 12/24V DC 1005 through 1040
- Torque Limit Switches for Close direction of travel
- Feedback Potentiometer - 1000ohm
- DeClutchable Handwheel Override

ON-OFF SPECIFICATIONS

Series 1000 On-Off Actuator Specifications

Model	1005-24VAC	1005 (-F)	1010-24VAC	1010-24VDC	1010 (-F)	1040 (-F)	1200
Output Torque(in-lb)	487	434	1239	885	880	3520	17,700
Output Torque(Nm)	55	49	140	100	99	398	2000
Duty Cycle	75%	75%	75%	75%	75%	50%	50%
Travel Speed at 60Hz(Sec)	60	25	140	13	25	25	50
Maximum Current (Amp. @ 110/220VAC)		.35/.18			.41/.22	1.66/.90	2.40/1.21
Run Current (Amp. @ 24VAC)	.6		.6				
Maximum Current (Amp. @ 24VAC)	.9		.9				
Run Current (Amp. @ 24DC)				1.6			
Maximum Current (Amp. @ 24DC)				4			
Enclosure Rating	WATERTIGHT NEMA 4						
Weight(lb)	5.7	5.7	8.2	8.2	8.2	16.1	24.7

1000 (ON/OFF) With Standard Limit Switches

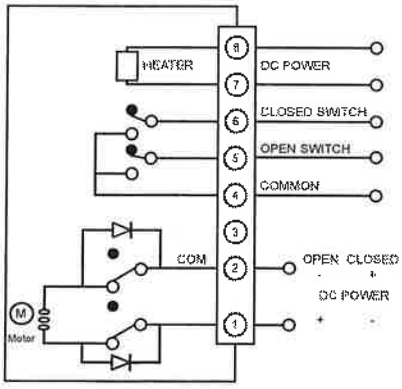


OPN 1 = Open Limit Switch
OPN 2 = Open Direction Aux. Switch
CLS 1 = Closed Limit Switch
CLS 2 = Closed Direction Aux. Switch

*Power source dependant on model

wiring

1010-24DC (ON/OFF) With Standard Limit Switches



SYNERGY ENVIRONMENTAL, LLC

SUMP LEVEL SWITCHES

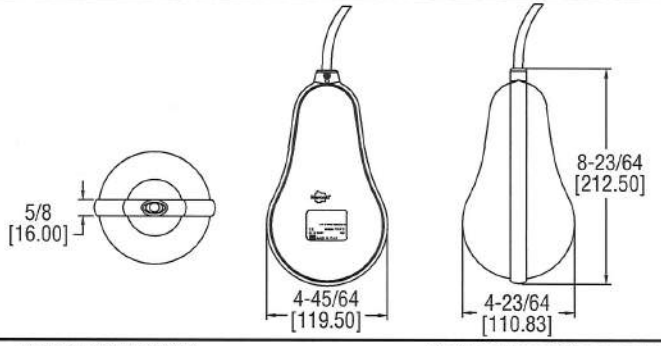
Mercoid®

Series FSW2

Free-Floating Level Switch

Designed for Industrial Applications, Mercury-Free, Self Counter-Weighted

CE



The Series FSW2 Free-Floating Level Switch is a mercury-free self counter-weighted floating switch designed for the automation of pumps, specifically filling and draining of tanks, wells, and reservoirs. The FSW2 body is free of any irregularities making it ideal for use in sewage water applications. The polypropylene body consists of a double airtight chamber with high-pressure melted polypropylene re-injection sealing to ensure a perfect seal against infiltration. Cable hangers are available to suit a variety of mounting applications. Featuring CE approval and optional cables available that include higher chemical compatibility, high temperature durability, oil resistance, and drinking water suitability. Contact factory for piggyback plug option, and cable length options ranging from 10 to 70 ft (3.04 to 21.34 m).

SPECIFICATIONS

Service: Compatible liquids, slurries.
Wetted Materials: Enclosure: Polypropylene; Cable: PVC.
Operating Temperature: -4 to 176°F (-20 to 80°C).
Pressure Limits: 29 psi (2 bar).
Enclosure Rating: IP68.
Switch Type: See model chart.
Electrical Rating: 10 (8) A @ 250 VAC.
Mounting Orientation: Vertical.
Shipping Weight:
Enclosure: 2.4 lb (1100 g);
Cable: 0.77 oz (21.27 g) per ft.
Agency Approval: CE.

Model	Switch Type	Cable Length	Model	Switch Type	Cable Length
FSW2-ONPN-20	SPST NO	20 ft (6.10 m)	**FSW2-CNPN-40**	SPST NC	40 ft (12.19 m)
FSW2-ONPN-30	SPST NO	30 ft (9.14 m)	**FSW2-CNPN-50**	SPST NC	50 ft (15.24 m)
FSW2-ONPN-40	SPST NO	40 ft (12.19 m)	**FSW2-DNPN-20**	SPDT	20 ft (6.10 m)
FSW2-ONPN-50	SPST NO	50 ft (15.24 m)	**FSW2-DNPN-30**	SPDT	30 ft (9.14 m)
FSW2-CNPN-20	SPST NC	20 ft (6.10 m)	**FSW2-DNPN-40**	SPDT	40 ft (12.19 m)
FSW2-CNPN-30	SPST NC	30 ft (9.14 m)	**FSW2-DNPN-50**	SPDT	50 ft (15.24 m)

ACCESSORY

Model	Description
A-459	Cable hanger

NOT USED RS.

Mercoid®

Series FSW2
Free-Floating Level Switch
Designed for Industrial Applications, Mercury-Free, Self Counter-Weighted

CE

Product Details
Pricing / Ordering
Introduction
Specifications
Options/Accessories
Approval
Service Manual
Dimensional Drawings
Catalog Pages

Product Specifications

Service: Compatible Liquids, slurries.

Wetted Materials: Housing: Polypropylene; Cable: PVC.

Operating Temperature:: -4 to 176°F (-20 to 80°C).

Pressure Limits: 29 psi (2 bar).

Enclosure Rating: IP68.

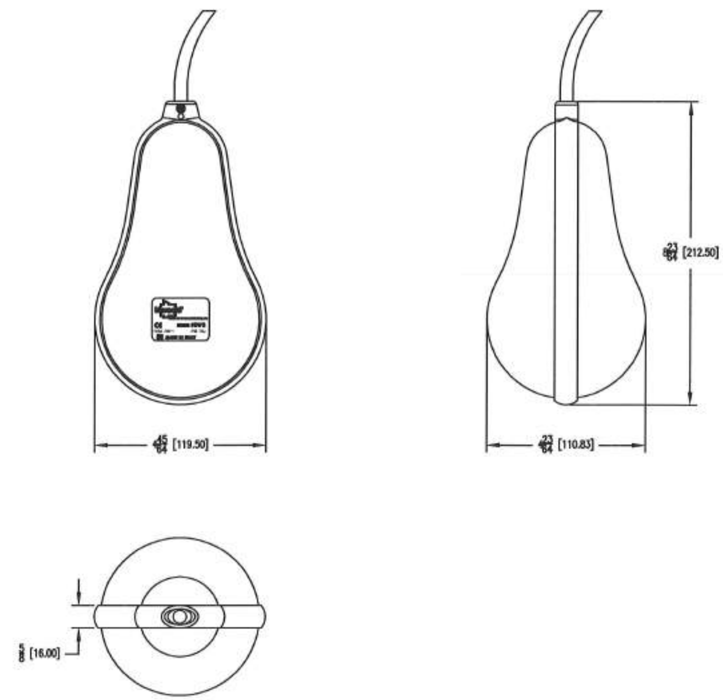
Switch Type: See model chart.

Electrical Rating: 10 (8) A @ 250 VAC.

Mounting Orientation: Vertical.

Shipping Weight: Housing: 2.4 lb (1100 g); Cable: 0.77 oz (21.27 g) per foot.

Agency Approval: CE.



SCALE 1:2

CRITICAL DIMENSION
STANDARD TOLERANCES UNLESS NOTED:
ALL DECIMAL DIMENSIONS ±
ALL ANGLES ±

*** DWYER PURCHASING USE ONLY ***	
FR. Number	Description

☐ Items to be supplied with each order. Quantities plus 20%.
☐ Items to be supplied in blanket quantities, vendor to inform DWYER when they require additional quantities.

NO.	CHANGES	BY/DATE	DATE / DWN BY / CHKD / APPD	NAME	MATERIAL / FINISH
				FSW2 FREE FLOATING LEVEL SWITCH ARTWORK (FOR REFERENCE ONLY)	**DWYER INSTRUMENTS, INC.** MICHIGAN CITY, INDIANA 46360 U.S.A.

ACAD2002

3

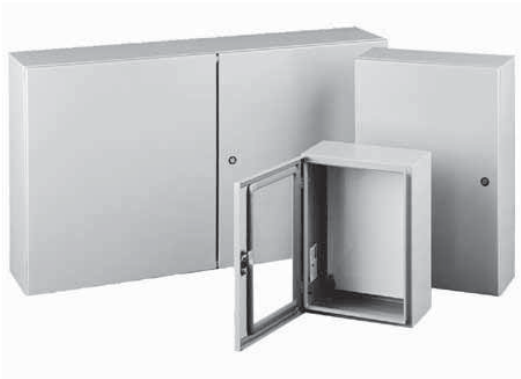
FR. NO.

SYNERGY ENVIRONMENTAL, LLC

CONTROLS SYSTEM COMPONENTS

CONCEPT® Wall-Mount Enclosures

CONCEPT®, Type 4 and 12



Industry Standards

Wall-mounting brackets required to maintain UL/CSA external mounting requirement.

CONCEPT solid single-door, door with window and flush-mount models

UL 508A Listed; Type 4, 12; File No. E61997
cUL Listed per CSA C22.2 No. 94; Type 4, 12; File No. E61997

NEMA/EEMAC Type 4, 12, 13
CSA, File No. 42186: Type 4, 12
VDE IP66
IEC 60529, IP66

CONCEPT two-door models

UL 508A Listed; Type 12; File No. E61997
cUL Listed per CSA C22.2 No. 94; Type 12; File No. E61997

NEMA/EEMAC Type 12
CSA, File No. 42186, Type 12
VDE IP 55
IEC 60529, IP55

Application

CONCEPT® Enclosures are ideal for machine control applications. With streamlined styling, flush quarter-turn latches and an attractive, durable finish. Available in solid or window single-door and two-door landscape, flush-mount and sloped-top versions for application and mounting flexibility. Two-door landscape models provide full-width access and easy panel installation.

Specifications

- 14, 16 or 18 gauge steel (see table)
- Seams continuously welded and ground smooth
- Corner-formed doors
- Simple easy-to-remove and install hinge pins with built-in captivation clip
- High-torque threadless studs and fasteners on door
- Minimum-width body flange provides maximum door opening (210 degrees)
- External formed body flange
- Panel mounting studs fit optional CONCEPT panels and other accessories
- Mounting holes in back of body for optional external wall-mount brackets
- Hidden hinges
- Doors are interchangeable and easily removed by pulling clip-style hinge pins
- Seamless foam-in-place gasket
- Quarter-turn slotted latch(es)
- Door alignment device on doors wider than 30 in.
- Four hinges on 60-in.-high enclosures
- Grounding stud on body; bonding provision on door (except window-door models)
- Provisions for thermoplastic data pocket (right-hand hinged door on two-door models)
- Hardware kit with panel mounting nuts, panel grounding hardware and sealing washers
- Single-door enclosures have a three-point latch system on enclosures where A is equal to or greater than 42-in. with quarter-turn, slotted latch
- Window-door enclosures have a clear polycarbonate window flush with door surface
- Mounting frame on flush-mount enclosures extends completely around enclosure
- Two-door enclosures have a overlapping door design which provides full-width access
- Two door enclosures have a three-point latch system on right-hand hinged door furnished with flush slotted insert
- Illustrated instruction sheet

Finish

Two standard finishes are available: ANSI 61 gray or RAL 7035 textured light-gray polyester powder paint inside and out.

Accessories

Door Stop Kit
Handles
Lock Inserts
CONCEPT® Panels
Mounting-Bracket Kits

Modification and Customization

Hoffman excels at modifying and customizing products to your specifications. Contact your local Hoffman sales office or distributor for complete information.

Bulletin: CW1

SIEMENS

Product Announcement

SITOP Power Supplies October 3, 2011

Delivery Release – SITOP PSU 100C Compact Line 12VDC/ 6.5A, 24VDC/ 2.5A, and 24VDC/ 4A Power Supplies

Effective immediately the SITOP PSU 100C Compact power supplies in 12VDC/ 6.5A, 24VDC/ 2.5A, and 24VDC/ 4A are available and released for delivery

With the newly released SITOP compact power supplies, the SITOP portfolio has been expanded to include four 24 VDC output versions with 0.6 A (15 W), 1.3A (30 W), a *new* 2.5 A (60 W), and a *new* 4 A (96 W) and two 12VDC output versions with 2 A (24 W) and the *new* 6.5 A (78 W) power supply. This further expands the SITOP portfolio in the lower performance ranges. The most prominent features of the new power supplies are their small width, high efficiency across the whole load range, minimum no-load losses (standby) as well as connection via plug terminals.

Exceptional Features of the SITOP PSU 100C Compact Line

- Compact design with a width of only 22.5 mm to 52.5 mm
  - 22.5mm (24VDC/ 0.6A), 30mm (12VDC/ 2A & 24VDC/ 1.3A), 45mm (24VDC/ 2.5A), & 52.5mm (24VDC/ 4A & 12VDC/ 6.5A)
- Wide input voltage range from 85 to 264VAC or 110 to 300VDC
- Regulated output voltage of +/- 3%
- A settable output voltage up to 26.4VDC for most 24VDC versions and up to 12.9VDC for both 12VDC versions allows to compensate voltage drops
  - 24VDC/ 0.6A cannot be adjusted
- High efficiency from 82 % to 89% at rated load (maximum load) based on the version
  - Also provides high efficiency at loads below the rated values (partial load range)
  - Minimum no-load losses (standby) of < 0.5 W (24VDC/ 0.6A and 12VDC/ 2.0A version) and < 0.75 W (12VDC/ 6.5A, 24VDC/ 1.3A, 24VDC/ 2.5A, and 24VDC/ 4A version)
- Connection via plug-in terminals (included in delivery are removable plug-in screw terminals)
  - Removable plug-in spring terminals are optionally available
- LED display for reliable identification of operating states
- Operating temperature range from –20 to +70 °C

Siemens Industry, Inc.
Industry Automation
5300 Triangle Parkway
Norcross, GA 30092 USA

Tel.: +1 (800) 333 7421
www.usa.siemens.com/support

Customer Benefits

- Panel space-saving due to slim-line design perfectly suites this power supply line for control boxes, control panels and wall mount housings
- Low energy consumption due to the high efficiency across the whole load range as well as minimum losses at no-load operation (standby)
- Plug in terminals provide user-friendly, fast connection
- High flexibility regarding connection options with included screw terminal adapters, spring terminal adapters available are optionally available
- Wide input voltage range from 85 – 265 VAC covers all single phase applications worldwide
- Can also be used as a DC/DC converter with an input voltage range from 110 to 300VDC
- Adjustable output voltage for compensation of voltage drops (not with 24VDC/ 0.6A version)
- Can be used in extreme environment conditions due to an operating temperature range from -20 to 70°C

Order Information

The new part numbers are set up in SAP/ Industry Mall and can be ordered through the system.

Part number	Description	List price
6EP1322-5BA10	SITOP PSU 100C Compact single phase 12VDC/ 6.5A power supply	$ 130.00
6EP1332-5BA00	SITOP PSU 100C Compact single phase 24VDC/ 2.5A power supply	$ 86.00
6EP1332-5BA10	SITOP PSU 100C Compact single phase 24VDC/4A power supply	$ 124.00

Sales Tools

Please find attached the following supporting sales tools for the new product

- SITOP Lunch & Learn Presentation
- SITOP compact flyer

Siemens Industry, Inc.
Industry Automation
5300 Triangle Parkway
Norcross, GA 30092 USA

Tel.: +1 (800) 333 7421
www.usa.siemens.com/support

Standard CPUs - CPU 1214C

Overview

- The compact high-performance CPU
- With 24 integral input/outputs
- Expandable by:
  - 1 signal board (SB)
  - 8 signal modules (SM)
  - max. 3 communication modules (CM)

Design

The compact CPU 1214C has:

- 3 device versions with different power supply and control voltages
- Integrated power supply either as wide-range AC or DC power supply (85 to 264 V AC or 24 V DC)
- Integrated 24 V encoder/load current supply:
  For direct connection of sensors and encoders. With 400 mA, the output current can also be used as load power supply
- 14 integrated digital inputs 24 V DC (current sinking/current sourcing (IEC type 1 current sinking))
- 10 integrated digital outputs, either 24 V DC or relay
- 2 integrated analog inputs 0 to 10 V
- 2 pulse outputs (PTO) with a frequency of up to 100 kHz
- Pulse-width modulated outputs (PWM) with a frequency of up to 100 kHz
- Integrated Ethernet interface (TCP/IP native, ISO-on-TCP)
- 6 fast counters (3 with max. 100 kHz; 3 with max. 30 kHz), with parameterizable enable and reset inputs, can be used simultaneously as up and down counters with 2 separate inputs or for connecting incremental encoders
- Expansion by additional communication interfaces, e.g. RS485 or RS232
- Expansion by analog or digital signals directly on the CPU via signal board (with retention of CPU mounting dimensions)
- Expansion by a wide range of analog and digital input and output signals via signal modules
- Optional memory expansion (SIMATIC Memory Card)
- PID controller with auto-tuning functionality
- Integral real-time clock
- Interrupt inputs:

For extremely fast response to rising or falling edges of process signals
- Removable terminals on all modules
- Simulator (optional):
  For simulating the integrated inputs and for testing the user program

Device versions				
Version	Supply voltage	Input voltage DI	Output voltage DO	Output current
• DC/DC/DC	24 V DC	24 V DC	24 V DC	0.5 A, transistor
• DC/DC/relay	24 V DC	24 V DC	5 … 30 V DC / 5 … 250 V AC	2 A; 30 W DC / 200 W AC
• AC/DC/relay	85 … 264 V AC	24 V DC	5 … 30 V DC / 5 … 250 V AC	2 A; 30 W DC / 200 W AC

Function

- Comprehensive instruction set:
  A wide range of operations facilitate programming:
  - basic operations such as binary logic operations, result allocation, save, count, create times, load, transfer, compare, shift, rotate, create complement, call subprogram (with local variables)
  - integral communication commands (e.g. USS protocol, Modbus RTU, S7 communication "T-Send/T-Receive" or Freeport)
  - user-friendly functions such as pulse-width modulation, pulse sequence function, arithmetic functions, floating point arithmetic, PID closed-loop control, jump functions, loop functions and code conversions
  - mathematical functions, e.g. SIN, COS, TAN, LN, EXP
- Counting:
  User-friendly counting functions in conjunction with the integrated counters and special commands for high-speed counters open up new application areas for the user
- Interrupt processing:
  - edge-triggered interrupts (activated by rising or falling edges of process signals on interrupt inputs) support a rapid response to process events
  - time-triggered interrupts
  - counter interrupts can be triggered when a setpoint is reached or when the direction of counting changes
  - communication interrupts allow the rapid and easy exchange of information with peripheral devices such as printers or bar code readers
- Password protection
- Test and diagnostics functions:
  Easy-to-use functions support testing and diagnostics, e.g. online/offline diagnostics
- "Forcing" of inputs and outputs during testing and diagnostics:
  Inputs and outputs can be set independently of cycle and thus permanently, for example, to test the user program
- Motion Control in accordance with PLCopen for simple movements
- Library functionality

Programming

The STEP 7 Basic programming package permits complete programming of all S7-1200 controllers and the associated I/O.

Technical specifications

	6ES7 214-1BE30-0XB0	6ES7 214-1AE30-0XB0	6ES7 214-1HE30-0XB0
Product type designation	CPU 1214C AC/DC/Relay	CPU 1214C DC/DC/DC	CPU 1214C DC/DC/Relay
Supply voltages			
Rated value			
● 24 V DC		Yes	Yes
● permissible range, lower limit (DC)		20.4 V	20.4 V
● permissible range, upper limit (DC)		28.8 V	28.8 V
● 120 V AC	Yes		
● 230 V AC	Yes		
● permissible range, lower limit (AC)	85 V		
● permissible range, upper limit (AC)	264 V		
● permissible frequency range, lower limit	47 Hz		
● permissible frequency range, upper limit	63 Hz		
Load voltage L+			
● Rated value (DC)	24 V	24 V	24 V
● permissible range, lower limit (DC)	5 V	20.4 V	5 V
● permissible range, upper limit (DC)	250 V	28.8 V	250 V
Current consumption			
Current consumption (rated value)			500 mA; Typical
Current consumption, max.		1.5 A; 24 VDC	1.2 A; 24 VDC
Inrush current, max.	20 A; At 264 V	12 A	12 A
Current output to backplane bus (DC 5 V), max.	1 600 mA	1 600 mA	1 600 mA
Power losses			
Power loss, typ.	14 W	12 W	12 W
Memory			
Usable memory for user data	50 kbyte	50 kbyte	50 kbyte
Work memory			
● integrated	50 kbyte	50 kbyte	50 kbyte
● expandable	No	No	No
Load memory			
● integrated	2 Mbyte	2 Mbyte	2 Mbyte
● expandable, max.	24 Mbyte	24 Mbyte	24 Mbyte
Backup			
● present	Yes; entire project maintenance-free in the integral EEPROM	Yes; entire project maintenance-free in the integral EEPROM	Yes; entire project maintenance-free in the integral EEPROM
● without battery	Yes	Yes	Yes
CPU-blocks			
OB			
● Number, max.	Limited only by RAM for code	Limited only by RAM for code	Limited only by RAM for code
CPU processing times			
for bit operations, min.	0.1 µs	0.1 µs	0.1 µs
for word operations, min.	12 µs	12 µs	12 µs
for floating point arithmetic, min.	18 µs	18 µs	18 µs
Data areas and their retentivity			
retentive data area in total (incl. times, counters, flags), max.	2 048 byte	2 048 byte	2 048 byte
Flag			
● Number, max.	8 kbyte; Size of bit memory address area	8 kbyte; Size of bit memory address area	8 kbyte; Size of bit memory address area

Address area			
I/O address area			
● I/O address area, overall	1024 bytes for inputs / 1024 bytes for outputs	1024 bytes for inputs / 1024 bytes for outputs	1024 bytes for inputs / 1024 bytes for outputs
● overall	1 024 byte	1 024 byte	1 024 byte
● Outputs	1 024 byte	1 024 byte	1 024 byte
Process image			
● Inputs, adjustable	1 kbyte	1 kbyte	1 kbyte
● Outputs, adjustable	1 kbyte	1 kbyte	1 kbyte
Digital channels			
● integrated channels (DI)	14	14	14
● integrated channels (DO)	10	10	10
Analog channels			
● Integrated channels (AI)	2	2	2
● Integrated channels (AO)	0	0	0
Hardware configuration			
Number of modules per system, max.	3 comm. modules, 1 signal board, 8 signal modules	3 comm. modules, 1 signal board, 8 signal modules	3 comm. modules, 1 signal board, 8 signal modules
Time of day			
Clock			
● Hardware clock (real-time clock)	Yes	Yes	Yes
● Backup time	240 h; Typical	240 h; Typical	240 h; Typical
Test commissioning functions			
Status/control			
● Status/control variable	Yes	Yes	Yes
● Variables	Inputs/outputs, memory bits, DB, distributed I/Os, timers, counters	Inputs/outputs, memory bits, DB, distributed I/Os, timers, counters	Inputs/outputs, memory bits, DB, distributed I/Os, timers, counters
Forcing			
● Forcing	Yes	Yes	Yes
Communication functions			
S7 communication			
● supported	Yes	Yes	Yes
● as server	Yes	Yes	Yes
Web server			
● supported	Yes	Yes	Yes
● User-defined websites	Yes	Yes	Yes
Open IE communication			
● TCP/IP	Yes	Yes	Yes
● ISO-on-TCP (RFC1006)	Yes	Yes	Yes
Number of connections			
● overall	15; dynamically	15; dynamically	15; dynamically
1st interface			
Type of interface	PROFINET	PROFINET	PROFINET
Physics	Ethernet	Ethernet	Ethernet
Isolated	Yes	Yes	Yes
automatic detection of transmission speed	Yes	Yes	Yes
Autonegotiation	Yes	Yes	Yes
Autocrossing	Yes	Yes	Yes
Functionality			
● PROFINET IO Controller	Yes	Yes	Yes
programming			
Programming language			
● LAD	Yes	Yes	Yes
● FBD	Yes	Yes	Yes

● SCL	Yes	Yes	Yes
Cycle time monitoring			
● can be set	Yes	Yes	Yes
Digital inputs			
Number of digital inputs	14; Integrated	14; Integrated	14; Integrated
● of which, inputs usable for technological functions	6; HSC (High Speed Counting)	6; HSC (High Speed Counting)	6; HSC (High Speed Counting)
m/p-reading	Yes	Yes	Yes
Input voltage			
● Rated value, DC	24 V	24 V	24 V
● for signal "0"		5 VDC at 1 mA	
● for signal "1"		15 VDC at 2.5 mA	
Input current			
● for signal "1", typ.	1 mA	1 mA	1 mA
Input delay (for rated value of input voltage)			
● for standard inputs			
– parameterizable	0.2, 0.4, 0.8, 1.6, 3.2, 6.4, and 12.8 ms, selectable in groups of four	0.2, 0.4, 0.8, 1.6, 3.2, 6.4, and 12.8 ms, selectable in groups of four	0.2, 0.4, 0.8, 1.6, 3.2, 6.4, and 12.8 ms, selectable in groups of four
– at "0" to "1", min.	0.2 ms	0.2 ms	0.2 ms
– at "0" to "1", max.	12.8 ms	12.8 ms	12.8 ms
● for interrupt inputs			
– parameterizable	Yes	Yes	Yes
Cable length			
● Cable length, shielded, max.	500 m; 50 m for technological functions	500 m; 50 m for technological functions	500 m; 50 m for technological functions
● Cable length unshielded, max.	300 m; For technological functions: No	300 m; For technological functions: No	300 m; For technological functions: No
Digital outputs			
Number of digital outputs	10	10	10
● of which high-speed outputs		2; 100 kHz Pulse Train Output	
Short-circuit protection	No; to be provided externally	No; to be provided externally	No; to be provided externally
Limitation of inductive shutdown voltage to		L+ (-48 V)	
Switching capacity of the outputs			
● with resistive load, max.	2 A	0.5 A	2 A
● on lamp load, max.	30 W DC; 200 W AC	5 W	30 W DC; 200 W AC
Output voltage			
● for signal "1", min.		20 V	
Output current			
● for signal "1" rated value		0.5 A	
● for signal "0" residual current, max.		0.1 mA	
Output delay with resistive load			
● 0 to "1", max.	10 ms; max.	1 µs	10 ms; max.
● 1 to "0", max.	10 ms; max.	5 µs	10 ms; max.
Switching frequency			
● of the pulse outputs, with resistive load, max.	1 Hz	100 kHz	1 Hz
Cable length			
● Cable length, shielded, max.	500 m	500 m	500 m
● Cable length unshielded, max.	150 m	150 m	150 m
Relay outputs			
Number of relay outputs	10		10
Number of operating cycles	mechanically 10 million, at rated load voltage 100,000		mechanically 10 million, at rated load voltage 100,000
Analog inputs			
Number of analog inputs	2	2	2

Cable length, shielded, max.	100 m; twisted and shielded	100 m; twisted and shielded	100 m; twisted and shielded
Input ranges			
● Voltage	Yes	Yes	Yes
Input ranges (rated values), voltages			
● 0 to +10 V	Yes	Yes	Yes
● Input resistance (0 to 10 V)	≥100k ohms	≥100k ohms	≥100k ohms
Analog outputs			
Cable length			
● Cable length, shielded, max.	100 m; Shielded, twisted wire pair	100 m; Shielded, twisted wire pair	100 m; Shielded, twisted wire pair
Analog value creation			
Integrations and conversion time/ resolution per channel			
● Resolution with overrange (bit including sign), max.	10 bit	10 bit	10 bit
● Integration time, parameterizable	Yes	Yes	Yes
● Conversion time (per channel)	625 µs	625 µs	625 µs
Encoder supply			
24 V encoder supply			
● 24 V	permissible range: 20.4 to 28.8 V	permissible range: 20.4 to 28.8 V	permissible range: 20.4 to 28.8 V
Encoder			
Connectable encoders			
● 2-wire BEROS	Yes	Yes	Yes
Integrated Functions			
Number of counters	6	6	6
Counter frequency (counter) max.	100 kHz	100 kHz	100 kHz
Frequency meter	Yes	Yes	Yes
controlled positioning	Yes	Yes	Yes
PID controller	Yes	Yes	Yes
Number of alarm inputs	4	4	4
Number of pulse outputs		2	
Limit frequency (pulse)		100 kHz	
Operator control and monitoring			
Display			
● Integrated	No	No	No
Galvanic isolation			
Galvanic isolation digital inputs			
● Galvanic isolation digital inputs	No	No	No
● between the channels, in groups of	1	1	1
Galvanic isolation digital outputs			
● Galvanic isolation digital outputs	Yes; Relays	Yes	Relays
● between the channels	No	No	No
● between the channels, in groups of	2	2	1
Permissible potential difference			
between different circuits	500 VDC between 24 VDC and 5 VDC	500 VDC between 24 VDC and 5 VDC	500 VDC between 24 VDC and 5 VDC
EMC			
Interference immunity against discharge of static electricity			
● Interference immunity against discharge of static electricity acc. to IEC 61000-4-2	Yes	Yes	Yes
– Test voltage at air discharge	8 kV	8 kV	8 kV
– Test voltage at contact discharge	6 kV	6 kV	6 kV
Interference immunity to cable-borne interference			
● on the supply lines acc. to IEC 61000-4-4	Yes	Yes	Yes

• Interference immunity on signal lines acc. to IEC 61000-4-4	Yes	Yes	Yes
Surge immunity			
• on the supply lines acc. to IEC 61000-4-5	Yes	Yes	Yes
Immunity against conducted interference induced by high-frequency fields			
• Interference immunity against high-frequency radiation acc. to IEC 61000-4-6	Yes	Yes	Yes
Emission of radio interference acc. to EN 55 011			
• Emission of radio interferences acc. to EN 55 011 (limit class A)	Yes; Group 1	Yes; Group 1	Yes; Group 1
• Emission of radio interference acc. to EN 55 011 (limit class B)	Yes	Yes	Yes
Climatic and mechanical conditions for storage and transport			
Climatic conditions for storage and transport			
• Free fall			
– Drop height, max. (in packaging)	0.3 m; five times, in dispatch package	0.3 m; five times, in dispatch package	0.3 m; five times, in dispatch package
• Temperature			
– Permissible temperature range	-40 °C to +70 °C	-40 °C to +70 °C	-40 °C to +70 °C
• Relative humidity			
– Permissible range (without condensation) at 25 °C	95%	95%	95%
Mechanical and climatic conditions during operation			
Climatic conditions in operation			
• Temperature			
– permissible temperature change	5° C to 55°, 3° C/minute		
• Air pressure acc. to IEC 60068-2-13			
– Permissible air pressure	1080 to 795 hPa	1080 to 795 hPa	1080 to 795 hPa
– Permissible operating height	-1000 to 2000 m	-1000 to 2000 m	-1000 to 2000 m
• Pollutant concentrations			
– SO2 at RH < 60% without condensation	S02: < 0.5 ppm; H2S: < 0.1 ppm; RH < 60% condensation-free	S02: < 0.5 ppm; H2S: < 0.1 ppm; RH < 60% condensation-free	S02: < 0.5 ppm; H2S: < 0.1 ppm; RH < 60% condensation-free
Environmental requirements			
Operating temperature			
• Min.	0 °C	0 °C	0 °C
• max.	55 °C	55 °C	55 °C
• vertical installation, min.	0 °C	0 °C	0 °C
• vertical installation, max.	45 °C	45 °C	45 °C
• horizontal installation, min.	0 °C	0 °C	0 °C
• horizontal installation, max.	55 °C	55 °C	55 °C
Storage/transport temperature			
• Min.	-40 °C	-40 °C	-40 °C
• max.	70 °C	70 °C	70 °C
Air pressure			
• Operation, min.	795 hPa	795 hPa	795 hPa
• Operation, max.	1 080 hPa	1 080 hPa	1 080 hPa
• Storage/transport, min.	660 hPa	660 hPa	660 hPa
• Storage/transport, max.	1 080 hPa	1 080 hPa	1 080 hPa
Relative humidity			
• Operation, max.	95 %; no condensation	95 %; no condensation	95 %; no condensation
Vibrations			
• Vibrations	2G wall mounting, 1G DIN rail	2G wall mounting, 1G DIN rail	2G wall mounting, 1G DIN rail

• Operation, checked according to IEC 60068-2-6	Yes	Yes	Yes
Shock test			
• checked according to IEC 60068-2-27	Yes; IEC 68, Part 2-27 half-sine: Strength of the shock 15 g (peak value), duration 11 ms	Yes; IEC 68, Part 2-27 half-sine: Strength of the shock 15 g (peak value), duration 11 ms	Yes; IEC 68, Part 2-27 half-sine: Strength of the shock 15 g (peak value), duration 11 ms
Degree of protection			
IP20	Yes	Yes	Yes
Standards, approvals, certificates			
CE mark	Yes	Yes	Yes
C-TICK	Yes	Yes	Yes
cULus	Yes	Yes	Yes
FM approval	Yes	Yes	Yes
Dimensions and weight			
Dimensions			
• Width	110 mm	110 mm	110 mm
• Height	100 mm	100 mm	100 mm
• Depth	75 mm	75 mm	75 mm
Weight			
• Weight, approx.	455 g	415 g	435 g

More information

Brochures

Information material for downloading can be found in the Internet:

http://www.siemens.com/simatic/printmaterial

Analog modules - SM 1231 analog input module

Overview

- Analog inputs for SIMATIC S7-1200
- With extremely short conversion times
- For connecting analog sensors without additional amplifiers
- For solving even more complex automation tasks

Application

The SM 1231 analog input signal modules allow the connection of the controller to analog signals of the process.

This provides users with the following advantages:

- Optimal adaptation:
  With analog signal modules, users can optimally adapt their controllers even to more complex tasks
- Direct connection of sensors:
  Up to 14 bit resolution and different input ranges permit the connection of sensors without additional amplifier
- Flexibility:
  If the task is expanded subsequently, the controller can be upgraded. Updating of the user program is extremely simple

Design

The signal modules have the same design features as the basic devices.

- Installation on DIN rails:
  The modules are snapped onto the rail next to the CPU on the right and are electrically and mechanically connected to each other and to the CPU by the integral slide mechanism.
- Direct installation:
  Horizontal or vertical mounting on DIN rail or direct mounting in the cabinet using integral lugs.

Function

The SM 1231 analog input signal modules convert analog signals from the process into digital signals for internal processing by the SIMATIC S7-1200.

Technical specifications

	6ES7 231-4HD30-0XB0	6ES7 231-4HF30-0XB0
Product type designation	SM 1231 AI 4x13 bit	SM 1231 AI 8 x 13 bit
Supply voltages		
Rated value		
● 24 V DC	Yes	Yes
Current consumption		
Current consumption, typ.	45 mA	45 mA
from backplane bus 5 V DC, typ.	80 mA	90 mA
Power losses		
Power loss, typ.	1.5 W	1.5 W
Connection method		
required front connector	Yes	Yes
Analog inputs		
Number of analog inputs	4; Current or voltage differential inputs	8; Current or voltage differential inputs
permissible input frequency for current input (destruction limit), max.	± 35 V	± 35 V
permissible input current for voltage input (destruction limit), max.	40 mA	40 mA
Cycle time (all channels) max.	625 µs	625 µs
Input ranges		
● Voltage	Yes; ±10 V, ±5 V, ±2.5 V	Yes; ±10 V, ±5 V, ±2.5 V
● Current	Yes; 0 to 20 mA	Yes; 0 to 20 mA
● Thermocouple	No	No
● Resistance thermometer	No	No
● Resistance	No	No
Input ranges (rated values), voltages		
● -10 V to +10 V	Yes	Yes
● Input resistance (-10 V to +10 V)	≥9M ohms	≥9M ohms
● -2.5 V to +2.5 V	Yes	Yes
● Input resistance (-2.5 V to +2.5 V)	≥9M ohms	≥9M ohms
● -5 V to +5 V	Yes	Yes
● Input resistance (-5 V to +5 V)	≥9M ohms	≥9M ohms
Input ranges (rated values), currents		
● 0 to 20 mA	Yes	Yes
● Input resistance (0 to 20 mA)	≥ 250 ohms	≥ 250 ohms
Voltage input		
● permissible input voltage for voltage input (destruction limit), max.	35 V	35 V
Current input		
● permissible input current for current input (destruction limit), max.	40 mA	40 mA
Temperature compensation		
● Temperature compensation parameterizable	No	No
Analog outputs		
Number of analog outputs	0	0
Analog value creation		
Integrations and conversion time/ resolution per channel		

• Resolution with overrange (bit including sign), max.	12 bit; + sign	12 bit; + sign
• Integration time, parameterizable	Yes	Yes
• Interference voltage suppression for interference frequency f1 in Hz	40 dB, DC to 60 V for interference frequency 50 / 60 Hz	40 dB, DC to 60 V for interference frequency 50 / 60 Hz
Smoothing of measured values		
• parameterizable	Yes	Yes
• Step: None	Yes	Yes
• Step: Low	Yes	Yes
• Step: Medium	Yes	Yes
• Step: High	Yes	Yes
Errors/accuracies		
Temperature error (relative to input area)	25°C ±0.1% to 55°C ±0.2% total measurement range	25°C ±0.1% to 55°C ±0.2% total measurement range
Basic error limit (operational limit at 25 °C)		
• Voltage, relative to input area	+/- 0,1 %	+/- 0,1 %
• Current, relative to input area	+/- 0,1 %	+/- 0,1 %
Interference voltage suppression for f = n x (fl +/- 1%), fl = interference frequency		
• common mode voltage, max.	12 V	12 V
Interrupts/diagnostics/status information		
Alarms		
• Alarms	Yes	Yes
• Diagnostic alarm	Yes	Yes
Diagnoses		
• Diagnostic functions	Yes	Yes
• Monitoring the supply voltage to the electronics	Yes	Yes
• Wire break	No	No
Diagnostics indication LED		
• for status of the inputs	Yes	Yes
• for maintenance	Yes	Yes
Galvanic isolation		
Galvanic isolation analog outputs		
• between the channels and the power supply of the electronics	No	No
Climatic and mechanical conditions for storage and transport		
Climatic conditions for storage and transport		
• Free fall		
– Drop height, max. (in packaging)	0.3 m; five times, in dispatch package	0.3 m; five times, in dispatch package
• Temperature		
– Permissible temperature range	-40 °C to +70 °C	-40 °C to +70 °C
• Air pressure acc. to IEC 60068-2-13		
– Permissible air pressure	1080 to 660 hPa	1080 to 660 hPa
• Relative humidity		
– Permissible range (without condensation) at 25 ° C	95%	95%
Mechanical and climatic conditions during operation		
Climatic conditions in operation		
• Air pressure acc. to IEC 60068-2-13		
– Permissible air pressure	1080 to 795 hPa	1080 to 795 hPa
• Pollutant concentrations		
– SO2 at RH < 60% without condensation	S02: < 0.5 ppm; H2S: < 0.1 ppm; RH < 60% condensation-free	S02: < 0.5 ppm; H2S: < 0.1 ppm; RH < 60% condensation-free
Degree of protection		
IP20	Yes	Yes
Standards, approvals, certificates		
CE mark	Yes	Yes

C-TICK	Yes	Yes
FM approval	Yes	Yes
Mechanics/material		
Type of housing (front)		
• Plastic	Yes	Yes
Dimensions and weight		
Dimensions		
• Width	45 mm	45 mm
• Height	100 mm	100 mm
• Depth	75 mm	75 mm
Weight		
• Weight, approx.	180 g	180 g

More information

Brochures

Information material for downloading can be found in the Internet:

http://www.siemens.com/simatic/printmaterial

Communication - CSM 1277 unmanaged

Overview

- Unmanaged switch for connecting a SIMATIC S7-1200 to an Industrial Ethernet network with a line, tree or star topology
- Multiplication of Ethernet interfaces on a SIMATIC S7-1200 for additional connection of up to three programming devices, operator controls, and further Ethernet nodes
- Simple, space-saving mounting on the SIMATIC S7-1200 mounting rail
- Low-cost solution for implementing small, local Ethernet networks
- Connection without any problems using RJ45 standard connectors
- Simple and fast status display via LEDs on the device
- Integral autocrossover function permits use of uncrossed connecting cables

Benefits

get Designed for Industry

- Reduction in assembly costs and mounting space compared to use of external network components
- Fast commissioning, as no configuration is necessary
- Flexible expansion of the network by simply inserting the CSM

Application

The CSM 1277 is an Industrial Ethernet switch of compact design for use in the SIMATIC S7-1200. The CSM 1277 can be used to multiply the Ethernet interface of the SIMATIC S7-1200 for simultaneous communication with operator panels, programming devices, other controllers, or the office world.

The CSM 1277 and the SIMATIC S7-1200 controller can be used to implement simple automation networks at low cost.

Design

The CSM 1277 compact switch module offers all advantages of the SIMATIC S7-1200 design:

- Compact design;
  the rugged plastic enclosure contains:
  - 4 x RJ45 ports for connecting to Industrial Ethernet
  - 3-pole plug-in terminal strip for connection of the external 24 V DC supply on the top
  - LEDs for diagnostics and for status display of the Industrial Ethernet ports
- Simple mounting on the mounting rail of the S7-1200
- Fanless and consequently low-maintenance design
- The module can be replaced without using a programming device

Function

- Multiplication of Ethernet interfaces of the SIMATIC S7-1200
- Design of a small, local Industrial Ethernet network with three further nodes
- Automatic detection of data transfer rate by means of autosensing and autocrossover functions
- LEDs for diagnostics and for status display

Network topology and network configuration

Various network topologies can be implemented using the CSM 1277 compact switch module:

- Connection of SIMATIC S7-1200 in linear topology:
  at least one RJ45 connection of the SIMATIC S7-1200 remains vacant, e.g. for connecting a programming device (PG)
- Connection of SIMATIC S7-1200 to a higher-level network in a tree/star topology:
  at least two RJ45 connections of the SIMATIC S7-1200 remain vacant, e.g. for connecting a programming device/operator panel (PG/OP)
- Design of a small, local network with a SIMATIC S7-1200 and three further Ethernet nodes

Configuration

The CSM 1277 compact switch module is an unmanaged switch and need not be configured.

Diagnostics

The following information is displayed on LEDs on the device:

- Power
- Port status
- Data traffic

Technical specifications

Bestell-Nr.	**6GK7 277-1AA00-0AA0**
Product type designation	**CSM 1277**
Data transmission rate	
Transmission rate 1	10 Mbit/s
Transmission rate 2	100 Mbit/s
Interfaces	
Maximum number of electrical/optical connections for network components or terminal equipment	4
Number of electrical connections	
• For network components or terminal equipment	4
• For signal contact	-
• For power supply	1
Design of electrical connection	
• For network components or terminal equipment	RJ45 port
• For signal contact	-
• For power supply	3-pin terminal block

Supply voltage, current consumption, power loss	
Type of power supply	DC
Supply voltage, external	24 V
● Minimum	19.2 V
● Maximum	28.8 V
Current consumption, maximum	0.07 A
Product component: fusing of power supply input	Yes
Type of fusing of power supply input	0.5 A / 60 V
Effective power loss at 24 V with DC	1.6 W
Permitted ambient conditions	
Ambient temperature	
● During operating phase	0 … 60 °C
● During storage	-40 … +70 °C
● During transport	-40 … +70 °C
Relative humidity at 25 °C without condensation during operating phase, maximum	95 %
IP degree of protection	IP20
Design, dimensions and weights	
Type of construction	SIMATIC S7-1200 device design
Width	45 mm
Height	100 mm
Depth	75 mm
Net weight	0.15 kg
Type of mounting	
● 35 mm DIN rail mounting	Yes
● Wall mounting	No
● S7-300 rail mounting	No
Type of mounting	-
Product properties, functions, components General	
Cascading with star topology	-
Product function: switch-managed	No
Standards, specifications, approvals	
Standard	
● For EMC from FM	FM3611: Class 1, Division 2, Group A, B, C, D / T.., CL.1, Zone 2, GP. IIC, T.. Ta
● For Ex zone	EN 600079-15:2005, EN 600079-0:2006, II 3 G Ex nA II T4, KEMA 08 ATEX 0003 X
● For CSA and UL safety	UL 508, CSA C22.2 No. 142
● For Ex zone of CSA and UL	-
● For emitted interference	EN 61000-6-4 (Class A)
● For noise immunity	EN 61000-6-2
Certificate of suitability	EN 61000-6-2, EN 61000-6-4
● CE mark	Yes
● C-Tick	Yes

More information

To assist in selecting the right Industrial Ethernet switches as well as configuration of modular versions, the SIMATIC NET Selection is available at:
http://www.siemens.de/switchselection

3.10 SCALANCE XB005 product characteristics

Possible connections

The SCALANCE XB005 has five RJ-45 jacks for connection of end devices or other network segments.

Figure 3-5 SCALANCE XB005

3.11 SCALANCE XB005 TP ports

Connector pinout

On the SCALANCE XB005, the TP ports are implemented as an RJ-45 jack with MDI-X assignment (Medium Dependent Interface–Autocrossover) of a network component.

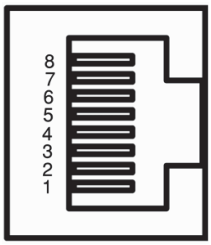


Figure 3-6 RJ-45 jack

Table 3- 5 Pin assignment of the RJ-45 jack

Pin number	Assignment
Pin 8	n. c.
Pin 7	n. c.
Pin 6	TD-
Pin 5	n. c.
Pin 4	n. c.
Pin 3	TD+
Pin 2	RD-
Pin 1	RD+

NOTICE

TP cords or TP-XP cords with a maximum length of 10 m can be connected to the RJ-45 TP port.

With the IE FC cables and IE FC RJ-45 plug 180, an overall cable length of up to 100 m is permitted between two devices depending on the cable type.

SIEMENS

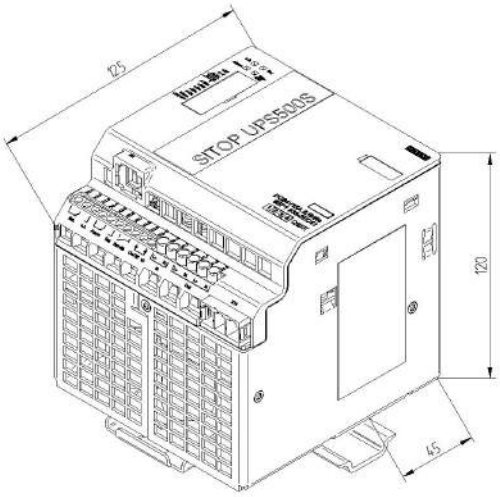
SITOP UPS500S – Grundmodul / basic module
SITOP UPS501S – Kondensatormodul / capacitor module

6EP1933-2EC41
6EP1933-2EC51
6EP1935-5PG01

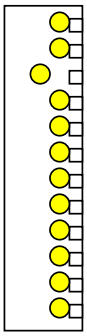
Betriebsanleitung		C98130-A7584-A2-04-7419
Operating instructions		
Manuel d'utilisation	voir Internet	http://www.siemens.com/sitop/manuals
Manuale di servizio	vedi Internet	http://www.siemens.com/sitop/manuals
Manual de instrucciones	véase Internet	http://www.siemens.com/sitop/manuals

Maßbild
Dimension drawings

6EP1933-2EC41/51 / 6EP1935-5PG01



On / Off



+2V
+1V
+0,5V
} Zuschaltschwelle (cut-in threshold) +22V fest eingestellt (fixed)

2A / 1A Ladestrom (charging current)

eingestellte Zeit / max. Zeit (set time/max.)

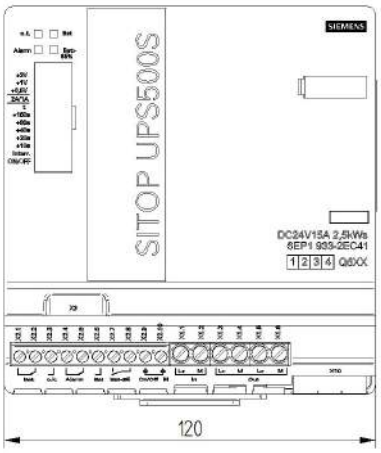
+160s
+ 80s
+ 40s
+ 20s
} Pufferzeit (buffering time)

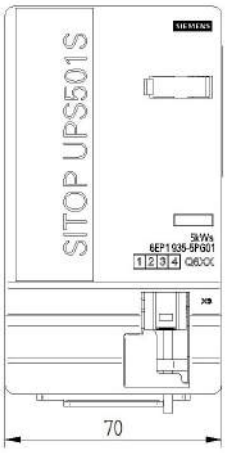
+ 10s +5s fest eingestellt (fixed)

Unterbrechung output (disconnection)

Betriebszustand Akku On / Off (operating state battery)

● Grundeinstellung, Auslieferzustand (basic setting, delivery state)





Hinweis
Diese Betriebsanleitung enthält aus Gründen der Übersichtlichkeit nicht sämtliche Detailinformationen des Produkts und kann auch nicht jeden denkbaren Fall der Aufstellung, des Betriebes oder der Instandhaltung berücksichtigen. Technische Änderungen jederzeit vorbehalten. In Zweifelsfällen gilt der deutsche Text.

Note
These operating instructions do not purport to cover all details of the product, nor to provide for every possible contingency that may arise during installation, operation or maintenance. Subject to change without notice. The German text applies in cases of doubt.

WARNHINWEISE

Nur entsprechend qualifiziertes Fachpersonal darf an diesem Gerät oder in dessen Nähe arbeiten.
Der einwandfreie und sichere Betrieb dieses Gerätes setzt sachgemäßen Transport, fachgerechte Lagerung, Aufstellung, Montage und die ausschließliche Verwendung von SITOP Kondensator-Modulen voraus.

ACHTUNG

Nur geschultes Personal darf das Gerät öffnen. **Elektrostatisch gefährdete Bauelemente (EGB)**

Entsorgungsrichtlinien

Verpackung und Packhilfsmittel sind recyclingfähig und sollten grundsätzlich der Wiederverwertung zugeführt werden.
Das Produkt selbst darf nicht über den Hausmüll entsorgt werden.

Beschreibung und Aufbau

Das DC-USV-Modul ist ein Einbaugerät der SITOP -Reihe zur Montage auf Normprofilschiene DIN EN 50022-35x15/7,5. Für die Installation der Geräte und Kondensator-Module sind die einschlägigen DIN/VDE-Bestimmungen oder länderspezifischen Vorschriften zu beachten .
Es dient zur Pufferung eines Teiles des Laststromes (max. 15A) von 24V-Laststromversorgungen der Reihe SITOP.
Der Eingang "Input L+" des DC-USV-Grundmoduls ist mit dem Ausgang L+ des versorgenden 24V DC-Netzteils zu verbinden, der Eingang "Input M" mit dem Ausgang M des versorgenden Netzteils. Optional können bis zu 3 Kondensator-Module an den Klemmen X10 bzw. X30 angeschlossen werden. Die zu puffernden Verbraucher werden über den Ausgang „Output L+“ und „Output M“ des DC-USV-Grundmoduls mit der am Eingang angelegten Spannung versorgt, bei Ausfall der 24V DC-Versorgungsspannung bzw. Spannungseinbruch unter die eingestellte Zuschaltschwelle werden die Verbraucher durch Zuschaltung des Kondensator-Moduls bzw. der internen Kondensatoren über einen Spannungswandler versorgt.
Über DIP-Schalter können die Zuschaltschwelle, die Ladeleistung und die Überbrückungszeit eingestellt werden. Ein Schalter dient zur Einstellung einer definierten Überbrückungszeit mit anschließender Abschaltung (siehe Einstellungen), ein Schalter zur Überbrückung des ON/OFF-Kreises, ein Schalter zur Wahl „vor Abschaltung des Pufferbetriebes U_a für 5s unterbrechen“.
Vier Leuchtdioden, zwei potentialfreie Wechsler, ein Schließer und eine USB-Schnittstelle übernehmen die Signalisierung von Betriebszuständen des DC-USV-Moduls (siehe Signalisierung) und die Steuerung „Remote-Timerstart“ und „Shutdown“.

Technische Daten

Eingangsgrößen:

Eingangsnennspannung:	24V DC
Arbeitsspannungsbereich:	22 bis 29V DC
max. Eingangsstrom bei 24V und Kondensatorladung:	17,5A DC
max. Eingangsstrom bei 24V und geladenem Kondensator:	15,2A DC
Verlustleistung bei 24V und Kondensatorladung:	ca. 11,0W
Verlustleistung 24V und geladenem Kondensator:	ca. 9,0W

Ladezeit bei kleiner Ladeleistung und Grundmodul -2EC41/-2EC51 ca. 110s / 220s
Ladezeit bei großer Ladeleistung und Grundmodul -2EC41/-2EC51 ca. 55s / 120s
Ladezeit bei kleiner Ladeleistung und Grundmodul -2EC41/-2EC51 und einem Zusatzmodul ca. 320s / 430s
Ladezeit bei großer Ladeleistung und Grundmodul -2EC41/-2EC51 und einem Zusatzmodul ca. 160s / 220s

Ausgangsgrößen:

Ausgangsnennspannung: U_{A1} = 24V DC
Ausgangsnennstrom: I_{A1} = 15A DC

Ausgangsstrombereich: I_{A1} = 0 ... 15A DC

Ausgangskennlinie des Ladereglers:
Die Ladung des Kondensatormoduls bzw. der internen Kondensatoren erfolgt mit einstellbarer Konstantleistung bis zur Ladeschlussspannung.

Ladeschlussspannung: U = 21,8V DC
Ladestrom: I_L = 1 oder 2A

Pufferzeit bei 15A Laststrom Grundmodul -2EC41/-2EC51 tp = 3s / 9s (typisch)
Pufferzeit bei 15A Laststrom mit Grundmodul -2EC41/-2EC51 und einem Zusatzmodul tp = 15s / 20s (typisch)
(siehe Diagramm 1 auf Seite 7)

Einstellungen

Einstellung der Zuschaltschwelle:

Sinkt die Eingangsspannung unter den eingestellten Wert der Zuschaltschwelle, so schaltet das USV-Modul in den Pufferbetrieb um. Die Verbraucher werden dann ausschließlich durch das USV-Modul versorgt. Die Einstellung der Zuschaltschwelle erfolgt mittels 3 Stück DIP-Schalter (Position siehe Seite 2) gemäß Tabelle 1 (siehe Seite 7). Einstellbereich: 22,0 bis 25,5 V DC in 0,5V-Schritten (Auslieferzustand: 22,5V DC ± 0,1V). Genauigkeit: ± 1,8%

Einstellung des Ladestromes:

Die Ladung des Kondensator-Moduls bzw der internen Kondensatoren erfolgt mittels Konstantleistung, bis die eingestellte Ladeschlussspannung erreicht ist. Der Ladevorgang wird dann beendet. Die Einstellung des Ladestromes bestimmt wie schnell die Pufferbereitschaft nach einem Entladevorgang wiederhergestellt ist. Die Einstellung des Ladestromes erfolgt mittels eines DIP-Schalters (Position siehe Seite 2). Einstellbereich: typ. 1A oder typ. 2A (Auslieferzustand: 1A)

Einstellung des Betriebszustandes ON/OFF:

ACHTUNG: Zur normalen Funktion muss der Betriebszustand unbedingt auf „ON“ eingestellt werden (Auslieferzustand ist „OFF“), dazu DIP-Schalter auf „ON“ oder X2.9 mit X2.10 verbinden !!

Um eine unbeabsichtigte Entladung der Kondensatoren (z.B. durch Ausschalten der Anlage) zu verhindern, kann das DC-USV-Modul mittels DIP-Schalter (oder durch Öffnen einer potenzialfreien Verbindung oder Drahtbrücke zw. Klemme X2.9 und X2.10) in den Betriebszustand „OFF“ (Auslieferzustand) geschaltet werden.
Im Betriebszustand „ON“ (DIP-Schalter geschlossen oder Klemme X2.9 mit X2.10 mit potenzialfreiem Schließer für Umax = 15V DC, Imax. = 10mA verbunden oder X2.9 auf Masse gelegt) bietet das DC-USV-Modul die volle Funktionalität laut Spezifikation. Im Betriebszustand „OFF“ erfolgt bei Wegfall der Versorgungsspannung keine Umschaltung in den Pufferbetrieb. Alle anderen Funktionen bleiben erhalten. Wird das USV-Modul während des Pufferbetriebes in den Zustand „OFF“ geschaltet, so wird auch der Pufferbetrieb beendet. Im Normalbetrieb wird die Einstellung ON/OFF alle ca. 20s abgefragt.

Einstellung der Pufferzeit

Die Einstellung der Pufferzeit erfolgt mittels 5 Stück DIP-Schaltern (Position siehe Seite 2) und kann gemäß Tabelle 2 (siehe Seite 7) in 10s-Schritten von 5s bis 315s vorgenommen werden. Mit Schalter 5 (eingestellte Zeit / max. Zeit) kann gewählt werden, ob die Beendigung des Pufferbetriebes nach der eingestellten Zeit oder erst bei Erreichen der Tiefentladeschwelle der Kondensatoren (= maximale Pufferzeit) erfolgt. (Auslieferzustand Pos. Off = maximale Pufferzeit). Mit dem Remote-Signal (wird bei der Schnittstelle beschrieben) kann der Puffertimer gestartet werden um die USV nach der eingestellten Pufferzeit abzuschalten. Wenn die Abschaltung erfolgt ist, besteht keine Möglichkeit mittels Änderung der Schaltereinstellung den Pufferbetrieb wieder einzuschalten. Erst nach Wiederkehr der Eingangsspannung kann ein neuerlicher Pufferbetrieb erfolgen. Bei geladenem USV-Modul und 15A Laststrom beträgt die Pufferzeit ca 3s.

Unterbrechung der Ausgangsspannung

Mittels DIP-Schalter (Position siehe Seite 2) kann gewählt werden, ob die Ausgangsspannung nach Ablauf der eingestellten Pufferzeit für ca. 5 sec unterbrochen wird oder nicht (Auslieferzustand: Keine Unterbrechung). Bei Einstellung „maximale Pufferzeit“ erfolgt eine Unterbrechung der Ausgangsspannung über das Remote-Signal der Schnittstelle.

Schutz- und Überwachungsfunktionen

Verpolschutz: Das USV-Modul ist gegen Verpolung der Eingangsspannung elektronisch geschützt.

Überstrom und Kurzschlussschutz: Im Normalbetrieb und im Pufferbetrieb ist das USV-Modul durch die interne dynamische Strombegrenzung und die interne statische Strombegrenzung geschützt. Die dynamische Strombegrenzung begrenzt den Ausgangsstrom auf typ. 25A. Die statische Strombegrenzung schaltet den Ausgang bei Strömen größer typ. 18A nach ca. 110ms bei Kurzschluss, sowie nach ca. 200ms bei Überlast ab. Eine eingebaute (nicht zugängliche) 20A - Sicherung schützt im Fehlerfall. Im Normalbetrieb erfolgen automatische Wiederanlaufversuche alle ca. 20s. Im Pufferbetrieb erfolgt speichernde Abschaltung. Wiederanlauf erfolgt nach Rückkehr in den Normalbetrieb.

Signalisierung

„Normalbetrieb“, d.h. die Eingangsspannung am DC-USV-Modul ist höher als die eingestellte Zuschaltschwelle. Die Verbraucher werden von der vorgeschalteten Stromversorgung versorgt. Falls ein Kondensator-Modul angeschlossen ist, wird dieses geladen. Im Normalbetrieb leuchtet die **grüne Leuchtdiode** (o.k.) und der Relaiskontakt X2.2 – X2.3 (o.k.) ist geschlossen.
„>85% Vollladung“, d.h. Kondensatorladung größer 85%. **Es wird ausschließlich das Grundmodul überwacht.** Es leuchtet die zweite **grüne Leuchtdiode** (Bat>85%) und der Relaiskontakt X2.7 – X2.8 ist geschlossen. (zweite grüne Leuchtdiode aus und Relaiskontakt X2.7 – X2.8 offen (Ruhestellung bei abgeschaltetem Gerät) bedeutet : Bat<85%, d.h. Kondensatorladung unter 85%)
„Pufferbetrieb“, d.h. die Eingangsspannung ist niedriger als die eingestellte Zuschaltschwelle. Die Verbraucher werden vom USV-Modul versorgt. Im Pufferbetrieb leuchtet die **gelbe Leuchtdiode** (Bat) und der Relaiskontakt X2.1 – X2.2 (Bat) ist geschlossen (Ruhestellung bei abgeschaltetem Gerät).
Alarmmeldung “Pufferbereitschaft fehlt“: Bei Signal „Pufferbereitschaft fehlt“ leuchtet die **rote Leuchtdiode** (Alarm) und der Relaiskontakt X2.4 – X2.5 (Alarm) ist geschlossen (Ruhestellung bei abgeschaltetem Gerät). Ursachen für eine fehlende Pufferbereitschaft **im Normalbetrieb** können sein:
Betriebszustand OFF, defekter Kondensator bzw. Kondensatorspannung < 7V. **Es wird ausschließlich das Grundmodul überwacht.**
Die Abfrage von Betriebszustand ON/OFF, Kondensator bzw. Kondensatorspannung < 7V und somit auch die Ausgabe des Signals erfolgt im Normalbetrieb alle 20s. Nach Fehlerende erfolgt die Rücksetzung nach der nächsten Abfrage.
Im Pufferbetrieb bedeutet das Signal „Alarm“, dass die Kondensatorspannung auf <12V gesunken ist und eine Zwangsabschaltung unmittelbar bevor steht. Nach Abschaltung des Pufferbetriebes aufgrund Überlast, Kurzschluss, Entladung oder abgelaufener Pufferzeit erlischt die rote Leuchtdiode (Alarm), der Relaiskontakt X2.4 – X2.5 bleibt geschlossen. Belastbarkeit der Relaiskontakte: 60V DC / 1A oder 30V AC / 1A

USB: Die Signale werden zusätzlich über eine PC-fähige USB-Schnittstelle ausgegeben. Die Signale werden mit einem jeweils 5 Zeichen langen String ausgegeben. Es gilt die nebenstehende Tabelle. Ein Softwaretool zum Auslesen und Verarbeiten der Signale steht im Internet unter http://www.siemens.de/sitop-usv kostenlos zur Verfügung. Hier sind auch weitere Informationen zur Schnittstelle angeführt.
Technische Ausführung: Die USB Schnittstelle entspricht der Spezifikation 2.0. Die Kommunikation erfolgt aber nur mit Full Speed, d.h. 12Mbit/s, die USB-Optionsbaugruppe wird von der DC-USV mit +5V versorgt („self powered“), Ausgabe der Signalzustände alle 75ms ± 20%; 29ms ± 20% Datenausgabe; 46ms ± 20% Pause. Die Verbindung zum PC erfolgt über ein handelsübliches 4-adriges, geschirmtes USB-Kabel mit einem Wellenwiderstand von 90Ohm, einem USB Series „A“ Stecker zum PC und einem USB Series „B“ Stecker zur DC-USV und einer maximalen Länge von 5m. Das Kabel besteht aus zwei 28 bis 20 AWG „non-twisted“ USB-Versorgungsleitungen (VBUS und GND) und aus zwei 28 AWG „twisted pair“ Datenleitungen (D+ und D-).
Steckerbelegung: Pin 1: VBUS (+4,40V ... +5,25V DC), Sendedaten auf Pin2 (D-) und Pin 3 (D+), Pin 4: GND.
Empfangsdaten: Der Empfang des Zeichens „R“ (Signal Remote Timerstart) startet den Timer im DC-USV-Modul mit der dort eingestellten Überbrückungszeit (Tabelle 2). Nach der eingestellten Überbrückungszeit wird der Pufferbetrieb beendet bzw. im Normalbetrieb die Ausgangsspannung bei Einstellung „Unterbrechung“ für 5s unterbrochen. Der Empfang des Zeichens „S“ (Signal Shutdown) startet den Timer im DC-USV-Modul mit der dort eingestellten Überbrückungszeit (Tabelle 2). Nach der eingestellten Überbrückungszeit wird das DC-USV-Modul speichernd abgeschaltet. Ein Wiederanlauf erfolgt durch Unterbrechung der DC-Versorgungsspannung für min. 1s. In Kombination mit einer SITOP PowerSupply muss für einen Wiederanlauf die Netzspannung für ca 10s unterbrochen werden.

Signal	Klartext
Pufferbereitschaft vorhanden	BUFRD
Pufferbereitschaft fehlt	ALARM
Normalbetrieb	DC_OK
kein Normalbetrieb	DC_LO
kein Pufferbetrieb	*****
Pufferbetrieb	*BAT*
≥ 85% Vollladung	BA>85
≤ 85% Vollladung	BA<85

Umgebung

Einsatzbedingungen nach EN 60721-3-3, Klimaklasse 3K3 (relative Luftfeuchte 5% bis 85% und absolute Luftfeuchte 1 g/m³ bis 25 g/m³; keine Betauung).
Ortsfester Einsatz, wettergeschützt, Verschmutzungsgrad 2
Temperatur für Lagerung und Transport: -40 bis +70°C
Temperatur für Betrieb: 0 bis +60°C

Gewicht

6EP1933-2EC41 1,0kg
6EP1933-2EC51 1,2kg
6EP1935-5PG01 0,7kg

Vorschriften

Schutzart: IP20 nach EN60529 (VDE 0470 Teil1)
Schutzklasse III nach EN60950
VDE 0100 Teil 410 (IEC 364-4-41)
VDE 0106 Teil 1 (IEC 536)
VDE 0113 Teil 1 (EN 60204-1)
IEC 61131; UL 508 / CSA C22.2 File E197259

Montagehinweise

Das Gerät ist zwecks ordnungsgemäßer Entwärmung vertikal so zu montieren, dass die Eingangsklemmen, die Ausgangsklemmen und Zuluftschlitze unten sind. Unterhalb und oberhalb des Gerätes soll mindestens ein Freiraum von je 50mm eingehalten werden.
Um Störeinkopplungen und thermische Beanspruchung zu minimieren, sollen DC-USV-Module und zugehörige Kondensator-Module mindestens 50 cm entfernt von Kommutierungsdrosseln installiert werden! Schnittstellen- (USB) und Steuerleitungen (ON/OFF-Steuerstromkreis) dürfen nicht direkt parallel zu Leistungsleitungen (insbesondere Leitungen zwischen Frequenzumrichter und Motor sowie Frequenzumrichter und Kommutierungsdrossel) verlegt werden. Um Störeinkopplungen zu minimieren soll zu diesen Leitungen ein Abstand von mindestens 10cm eingehalten werden.

Vor Beginn der Installations oder Instandhaltungsarbeiten ist der Hauptschalter der Anlage auszuschalten und gegen Wiedereinschalten zu sichern. Es ist die Betriebsanleitung von SITOP power zu beachten.

Anschluss und Klemmenbelegung

Klemmen	Funktion	Anschlusswert	Bemerkung
X1.1	Eingangsspannung DC 24V	1,0 ... 4mm²	Schraubklemmen für Schraubendreher mit
X1.3, X1.5	Ausgangsspannung DC 24V	17...11 AWG	4,5mm Klingenbreite
X1.2/X1.4, X1.6	Ein/Ausgangsspannung DC 0V		empfohlenes Anzugsmoment 0,7-0,9Nm
X2.1,2,3	Signal: Normalbetrieb / Pufferbetrieb	0,5... 2,5mm²	Schraubklemmen für Schraubendreher mit
X2.4,5,6	Signal: Pufferbereitschaft fehlt / vorhanden	20...13 AWG	3,5mm Klingenbreite
X2.7,8	Signal: Ladezustand >85%		
X2.9/X2.10	On/Off – Brücke (keine Brücke =Off)		empfohlenes Anzugsmoment 0,5-0,7Nm
X3	USB-Schnittstelle		Siehe Beschreibung oben
X10	Kondensator-Modul		Konfektionierter Kabelsatz

ACHTUNG

Die externe Beschaltung aller Klemmen (auch Signal- und Meldekontakte) muss den Anforderungen an SELV-Kreise nach VDE 0805 / EN 60950 genügen.

WARNINGS

Only properly qualified personnel may work on or around this equipment.
The successful and safe operation of this equipment is dependent on proper handling, storage and installation. Correct functioning is also dependent on the use of SITOP ultra modules

CAUTION

Only trained personnel may open the unit. **Electrostatically sensitive devices (ESD)**

Disposal Guideline

Packaging and packing aids can be recycled and should always be disposed of for reuse.
The product itself shall not be disposed of as normal domestic waste.

Description and Design

The DC-UPS module is a chassis unit in the SITOP power product range for mounting on a DIN rail of type DIN EN 50022-35x15/7.5.
The modules and the capacitor modules must be installed in accordance with the applicable DIN/VDE specifications or pertinent regulations in the country of installation.
It buffers a proportion of the load current (max. 15A) of 24V load current supplies in the SITOP range.
Input "Input L+" on the DC-UPS module must be connected to output L+ of the 24V DC power supply unit and input "Input M" to output M of the power supply unit. It is possible to connect max. 3 capacitor-modules via the connectors X10 and X30. The loads to be buffered are supplied via outputs "Output L+" and "Output M" on the DC-UPS module with the voltage connected to the input. If the 24V DC supply voltage fails or drops below the set cut-in threshold, the capacitor module or the internal capacitors are connected in to supply the loads.
The cut-in threshold, charging power and the buffering time can be set via DIP-switches. A switch is provided for setting a defined buffering (stored energy) time with subsequent disconnection of the battery (see Settings), one switch for bridging the ON/OFF circuit, one switch for choosing if the output voltage is interrupted for 5 s at the end of the buffering time or not.
The operating states of the DC-UPS module are signaled by four LEDs, two floating changeover and one normally-open contacts and a USB-interface (see Signaling) and the control signal “Remote Timerstart” and “Shutdown”.

Technical Data

Input quantities:

Rated input voltage:	24V DC
Operating voltage range:	22 to 29V DC
Max. input current at 24V and capacitor charging:	17.5A DC
Max. input current at 24V and charged capacitors:	15.2A DC
Power loss at 24V and capacitor charging:	appr. 11.0W
Power loss at 24V and charged capacitors:	appr. 9.0W

Charging time with low charging power and basic module -2EC41/-2EC51: appr. 110s / 220s
Charging time with high charging power and basic module -2EC41/-2EC51: appr. 55s / 120s
Charging time with low charging power and basic module -2EC41/-2EC51 and one capacitor module: appr. 320s / 430s
Charging time with high charging power and basic module -2EC41/-2EC51 and one capacitor module: appr. 160s / 220s

Output quantities:

Rated output DC voltage:	VA1 = 24V DC
Rated output direct current:	IA1 = 15A DC
Output current range:	IA1 = 0 … 15A DC

Output characteristic of charging regulator:
The capacitors are charged at an adjustable constant power until the end-of-charge voltage is reached.
End-of-charge voltage: V = 21.8V DC
Charging current: P = 1 or 2A
Buffering time at 15A load current with basic module -2EC41/-2EC51: tp = 3s / 9s (typ.)
Buffering time at 15A load current with basic module -2EC41/-2EC51 and one add-on capacitor module: tp = 15s / 20s (typ.)
(see diagram 1 on page 7)

Settings

Setting the cut-in threshold:

If the input voltage drops below the selected cut-in threshold voltage, the UPS module switches over to floating operation. The loads are then supplied solely by the UPS module. The cut-in threshold is set via three DIP-switches (see page 2 for position) according to table 1 (see page 7).
Setting range: 22.0 to 25.5V DC in 0.5-steps (delivery state: 22.5V DC ± 0.1V), accuracy ± 1.8%

Setting the charging current:

The capacitor module or the internal capacitors are charged via constant current until the set end-of-charge voltage is reached. Charging is then terminated. The setting of the charging current determines how quickly the buffer ready state is restored after a discharging process. The charging current is set by a DIP switch (position see page 2). Setting range: typ. 1A or typ. 2A (delivery state: 1A)

Setting the operating state ON/OFF:

Caution: For normal operation "ON" state is necessary (delivery state is “OFF”), in order to achieve that use DIP-switch closed or terminals X2.8 and X2.9 connected with X2.10
To prevent the capacitors from being discharged unintentionally (e.g. when the system power is disconnected), the DC-UPS module can be switched with a DIP-switch (or a wire jumper (or floating connection) inserted between terminals X2.9 and X2.10) to operating state "OFF" (delivery state). In the "ON" state (DIP-switch closed or terminals X2.8 and X2.9 connected with a floating normally-open contact (V_{max} = 15V DC, I_{max} = 10mA)), the DC-UPS module is fully functional according to specification. In the "OFF" state, the module does not switch over to floating operation when the mains supply is disconnected but remains functional in every other respect. If the module is switched to "OFF" in floating operation, it stops operating in floating mode.
During normal operation, the polling interval for the ON/OFF setting is appr. 20s.

Setting the buffering time:

The buffering time is set via five DIP-switches (see page 2 for position) as illustrated in Table 2 (see page 7) in 10s-steps from 5s to 315s. By switch 5 (delivery state max. time) you can choose whether floating operation will be terminated after a prespecified period or when the exhaustive discharge threshold of the capacitors (= maximum buffering time) is reached (delivery state: max. buffering time). Using the remote signal starts the timer to terminate after a prespecified period. Once the battery has been disconnected, there is no way in which floating operation can be restarted again by altering the switch setting. Only when the input voltage has recovered floating operation can be resumed. The buffering time is a appr. 3s with fully charged capacitors and a load current of 15A.

Interruption of the output voltage:

By a DIP-switch (see page 2 for position) you can choose if the output voltage is interrupted for 5 s at the end of the buffering time or not (delivery state : no interruption). Using the setting “max. time” an interruption is started by the remote signal.

Protective and Monitoring Functions

Reverse polarity protection: The UPS module is electronically protected against polarity reversal of the input voltage.

Overcurrent and short-circuit protection: In normal operation and floating operation the UPS module is protected by the internal dynamic current limitation and the internal static current limitation. Dynamic current limitation limits the output current to typ. 25A. Static dynamic limitation shuts down the output if currents are greater than typ. 18A after about 110ms at short-circuit, and after about 200ms at overload. An internal (not accessible) 20A fuse protects the module in the event of a fault. In normal operation automatic restart attempts are made approximately every 20s. In floating operation the module shuts down in store mode. Restart after return to normal operation.

Signaling

"Normal operation", i.e. the input voltage at the DC-UPS module is higher than the set cut-in threshold. The loads are being fed by the line-side power supply. If a battery module is connected, it is fully charged. Under normal operation, the **green LED** (o.k.) is illuminated and relay contact X2.2 – X2.3 (o.k.) is closed.
">85% charge", i.e. battery is loaded more than 85% (**available rest capacity dependent upon aging**). The second green LED (Bat>85%) is illuminated and relay contact X2.7 – X2.8 is closed. (second green LED off and relay contact X2.7 – X2.8 open (de-energized position when unit is disconnected) means : Bat<85%, i.e. battery charge below 85%)
"Floating operation", i.e. the input voltage is lower than the set cut-in threshold. The loads are being supplied by the battery module. In floating operation, the **yellow LED** (Bat) is illuminated and relay contact X2.1 – X2.2 (Bat) closed (de-energized position when unit is disconnected).
Alarm signal "Battery not ready": When the "Battery not ready" signal is active, the **red LED** (Alarm) is illuminated and relay contact X2.4 – X2.5 (Alarm) closed (de-energized position when unit is disconnected). Causes for the "battery not ready" state in **normal operation** are as follows: "OFF" operating state, no battery module connected, reversed polarity or defective battery (battery voltage < 18.5V) or open circuit between battery and UPS module. The interval for polling the operating states ON/OFF, reversed polariy, defective battery or no battery module connected, open circuit between battery and UPS module, and for activating the relevant signal output is 20 s during normal operation. After the end of the failure the signal remains till to the next polling.
If the signal flashes in a 2s cycle, this indicates that the battery is defective, but still capable of floating operation. The specified buffering times cannot be kept in such cases. The battery module must be replaced.
The "Alarm" signal in **floating operation** means that the battery voltage has dropped to <20.4V and automatic disconnection to protect the battery is imminent. When the battery has been disconnected due to overload, short circuit, exhaustive discharge protection or buffering timeout, the red LED (Alarm) gets dark, but relay contact X2.4 – X2.5 remains closed. Load rating of relay contacts: 60V DC / 1A or 30V AC / 1A

USB: The signals are additionally outputs via a PC-capable USB interface. They are each displayed in the shape of 5 characters of plain text. The assignment is shown in the table on the right. A tool for reading out and processing the signals is available free of charge on the Internet at http://www.siemens.com/sitop-ups. This website also contains further information about the interface.
Technical specification: The USB interface is according to specification 2.0, the communication runs only at full speed, i.e. 12Mbit/s. The Interface will be supplied by the DC-UPS with +5V ("self-powered"), signal state output every 75ms ± 20%; data output 29ms ± 20%, pause 46ms ± 20%. The connection to the PC is made by means of a usual 4-wired shielded USB-cable with a wave-resistance of 90Ohm, a USB Series"A" connector to the PC and a USB Series "B" connector to the DC-UPS module and a maximum length of 5m. The cable contains two 28 to 20 AWG "non-twisted" USB-supply wires (VBUS and GND) and two 28 AWG "twisted pair" data wires (D+ and D-).
Pin assignment: Pin1: VBUS (+4.4V to +5.25V DC), transmit data on Pin2 (D-) and Pin3 (D+), Pin4: GND
Receiving data: Receive of the character "R" (Signal Remote Timerstart) starts the timer of the DC-UPS module with the set buffering time (table 2). After the set buffering time, floating operation ends or, during normal operation, the output voltage is interrupted for 5 s if "disconnection" is set. Receipt of the character "S" (shutdown signal) starts the timer in the DC-UPS module with the set buffering time (table 2). After the set buffering time the DC-UPS module is switched off retentively. It is restarted by disconnecting the DC supply voltage for at least 1 s. In combination with a SITOP power supply the line voltage has to be interrupted for approx. 10 s for a restart.

Signal	Text
Buffering ready Buffering not ready	BUFRD ALARM
Normal operation Not normal operation	DC_OK DC_LO
Not floating operation Floating operation	***** *BAT*
>85% charge <85% charge	BA>85 BA<85

Environment

Operating conditions acc. to EN 60721-3-3, climate model 3K3 (relative air humidity 5% to 85%, absolute air humidity 1 g/m^3 to 25 g/m^3, no condensation)
Stationary operation, weather protected, pollution degree 2
Temperature for storage and shipment: -40 to +70°C
Temperature for operation: 0 to +60°C

Weight

6EP1933-2EC41 1.0kg
6EP1933-2EC51 1.2kg
6EP1935-5PG01 0.7kg

Standards

Degree of protection: IP20 to EN60529 (VDE 0470 Part1)
Protection class III to EN60950
VDE 0100 Part 410 (IEC 364-4-41)
VDE 0106 Part 1 (IEC 536)
VDE 0113 Part 1 (EN 60204-1)
IEC 61131; ; UL 508 / CSA C22.2 File E197259

Installation Instructions

In order to guarantee effective cooling, the unit must be vertically installed such that the input and output terminals and the incoming air slots are at the bottom. A clearance of at least 50 mm must be left above and below the unit. Assembly / disassembly see page 8.
To reduce EMI and thermal strain DC-UPS and capacitor modules should be installed at least 50cm away from commutating chokes ! Interface (USB) and control leads (ON/OFF control circuit) must not be laid directly in parallel to power leads or cables (especially leads between frequency converter and motor or frequency converter and commutating choke).
To minimize EMI the distance to those leads should be at least 10cm.

Before commencing with the installation or any repair work, switch off the plant main switch and lock it in the "OFF" position. Please read the operating instructions for SITOP power.

Connection and Terminal Assignments

Terminals	Function	Cable cross-section	Comments
X1.1	Input voltage DC 24V	1.0 ... 4mm^2 17...11 AWG	Screw-type terminals for screwdriver with 4.5mm blade width Recommended tightening torque 0.7-0.9Nm
X1.3, X1.5	Output voltage DC 24V		
X1.2/X1.4, X1.6	Input/output voltage DC 0V		
X2.1,2,3	Signal: Normal operation / Floating operation	0.5... 2.5mm^2 20...13 AWG	Screw-type terminals for screwdriver with 3.5mm blade width Recommended tightening torque 0.5-0.7Nm
X2.4,5,6	Signal: Battery not ready / ready		
X2.7,8	Signal: charge >85%		
X2.9/X2.10	On/Off jumper (no jumper =Off)		
X3	Serial interface or USB-interface		See description above
X10	Capacitor module		Tailored wire set

CAUTION
The external circuitry of all terminals (including signaling and status contacts) must meet the safety requirements stipulated by VDE 0805 (EN 60950): SELV.

Tabelle 1: Einstellbare Zuschaltschwellen
Table 1: Adjustable cut-in threshold

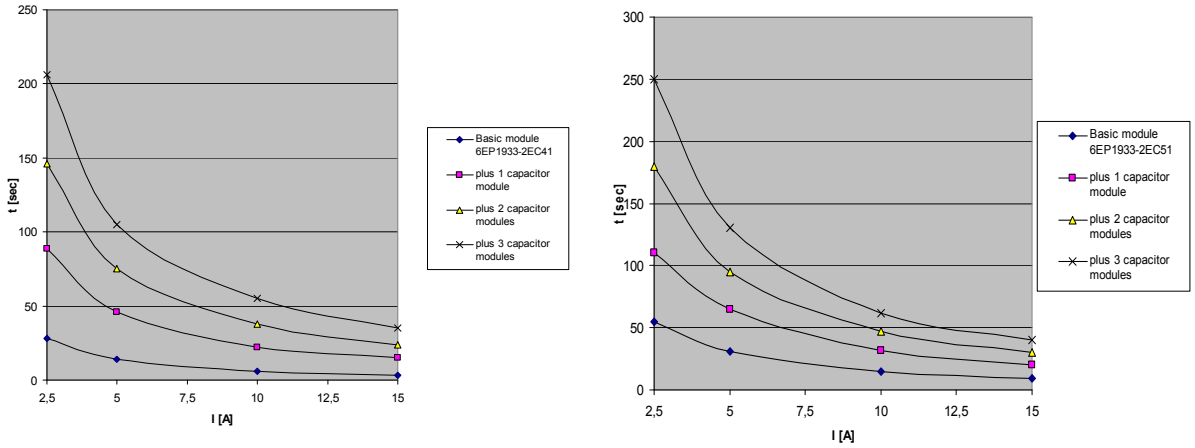
	gewünschte Zuschaltschwelle [V]							
	22,0	22,5	23,0	23,5	24,0	24,5	25,0	25,5
On←1	0	0	0	0	1	1	1	1
2	0	0	1	1	0	0	1	1
3	0	1	0	1	0	1	0	1

Tabelle 2: Einstellbare Pufferzeiten
Table 2: Adjustable buffering time

Schalterstellung / Switch position: On = 1 ; Off = 0
Schalter 1 auf Pos. On: Einstellung um nach der gewünschten Pufferzeit abzuschalten (setting to terminate after the prespecified buffering time)
Schalter 1 auf Pos. Off: Die Abschaltung erfolgt erst bei Erreichen der Tiefentladeschwelle des Akkus. Im Remote-Betrieb kann nach der eingestellten Pufferzeit die Spannung unterbrochen werden (DIP-Schalter Unterbrechung – On)
Setting to terminate when the exhaustive discharge threshold of the battery is reached. An interruption is started by the remote signal. (DIP-switch Disconnection – On)

	gewünschte Pufferzeit / buffering time [s]																																
	5	15	25	35	45	55	65	75	85	95	105	115	125	135	145	155	165	175	185	195	205	215	225	235	245	255	265	275	285	295	305	315	
On ←																																	
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
7	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1		
8	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1		
9	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	
10	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	

Diagramm 1: Pufferzeit
Diagram 1: buffering time



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› Comfort Panels - Standard

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https://eb.automation.siemens.com/goos/catalog/pages/PrintPreviewProductData.aspx

Current View:
Product Information

e.g. Dear Customer

○ Product Information ◉ Additional Information

Design

KTP400 Comfort

- 4.3" widescreen TFT display, resolution 480 x 272, 16 million colors
- 1 PROFINET and 1 PROFIBUS interface
- Touch screen and membrane keyboard with 4 tactile function keys
- Innovative successor to the TP 177B Touch Panels 4"

KP400 Comfort

- 4.3" widescreen TFT display, resolution 480 x 272, 16 million colors
- 1 PROFINET and 1 PROFIBUS interface
- Membrane keyboard with 8 tactile function keys and system keyboard
- Innovative successor to the Operator Panels OP77B

TP700 Comfort

- 7.0" widescreen TFT display, resolution 800 x 480, 16 million colors
- 1 PROFINET (2 ports with integrated switch) and 1 PROFIBUS interface
- Touch screen
- Innovative successor to the TP 177B/TP 277 Touch Panels and to the Multi Panel MP 177 6"

KP700 Comfort

- 7.0" widescreen TFT display, resolution 800 x 480, 16 million colors
- 1 PROFINET (2 ports with integrated switch) and 1 PROFIBUS interface
- Membrane keyboard with 24 function keys and system keyboard
- Innovative successor to the OP 177B/OP 277 6" Operator Panels

TP900 Comfort

- 9.0" widescreen TFT display, resolution 800 x 480, 16 million colors
- 1 PROFINET (2 ports with integrated switch) and 1 PROFIBUS interface
- Touch screen
- Innovative successor to the Multi Panel MP 277 8" Touch

KP900 Comfort

- 9.0" widescreen TFT display, resolution 800 x 480, 16 million colors
- 1 PROFINET (2 ports with integrated switch) and 1 PROFIBUS interface
- Membrane keyboard with 26 function keys and system keyboard
- Innovative successor to the Multi Panel MP 277 8" Key

TP1200 Comfort

- 12.1" widescreen TFT display, resolution 1280 x 800, 16 million colors
- 1 PROFINET (2 ports with integrated switch) and 1 PROFIBUS interface
- Touch screen
- Innovative successor to the Multi Panel MP 277 10" Touch

KP1200 Comfort

- 12.1" widescreen TFT display, resolution 800 x 480, 16 million colors
- 1 PROFINET (2 ports with integrated switch) and 1 PROFIBUS interface
- Membrane keyboard with 34 function keys and system keyboard
- Innovative successor to the Multi Panel MP 277 10" Key

Integration

The SIMATIC HMI Comfort Panels can be connected to:

- SIMATIC S7 controllers
- Third-party controllers
  - Allen Bradley DF1, Allen Bradley EtherNet/IP
  - Modicon MODBUS RTU, Modicon MODBUS TCP/IP
  - Mitsubishi FX, Mitsubishi MC TCP/IP
  - Omron Hostlink/Multilink
- Multi-protocol capability
- http communication with other SIMATIC HMI systems
- Over Ethernet (TCP/IP) to a higher-level PC, network printer

Note:
Further information can be found under "System interfaces".

Technical specifications

	6AV2 124-2DC01-0AX0	6AV2 124-0GC01-0AX0	6AV2 124-0JC01-0AX0	6AV2 124-0MC01-0AX0
	KTP400 Comfort	TP700 Comfort	TP900 Comfort	TP1200 Comfort
Display				
Design of display	TFT	TFT	TFT	TFT
Screen diagonal	4.3 in	7 in	9 in	12.1 in
Display width	95 mm	152.4 mm	195 mm	261.1 mm
Display height	53.8 mm	91.4 mm	117 mm	163.2 mm
Number of colors	16 777 200	16 777 200	16 777 200	16 777 200
Resolution (pixels)				
■ Horizontal image resolution	480	800	800	1 280

■ Vertical image resolution	272	480	480	800
Backlighting				
■ MTBF backlighting (at 25 °C)	50 000 h; At 50 ° C	50 000 h; At 50 ° C	50 000 h; At 50 ° C	50 000 h; At 50 ° C
■ Dimmable backlight	Yes; 0-100 %	Yes; 0-100 %	Yes; 0-100 %	Yes; 0-100 %
Control elements				
Keyboard fonts				
■ Number of function keys	4	0	0	0
■ Keys with LED	Yes	No	No	No
■ System keys	No	No	No	No
Touch operation				
■ Design as touch screen	Yes	Yes	Yes	Yes
Supply voltage				
Type of supply voltage	DC	DC	DC	DC
Rated voltage/DC	24 V	24 V	24 V	24 V
permissible range, lower limit (DC)	19.2 V	19.2 V	19.2 V	19.2 V
permissible range, upper limit (DC)	28.8 V	28.8 V	28.8 V	28.8 V
Memory				
Usable memory for user data	4 Mbyte	12 Mbyte	12 Mbyte	12 Mbyte
Type of output				
Acoustics	Buzzer	Speaker	Speaker	Speaker
■ Buzzer	Yes	No	No	No
■ Speaker	No	Yes	Yes	Yes
Time of day				
Clock				
■ Hardware clock (real-time clock)	Yes	Yes	Yes	Yes
■ Software clock	No	No	No	No
■ Battery-backed	Yes	Yes	Yes	Yes
■ Synchronizable	Yes	Yes	Yes	Yes
Interfaces				
Number of RS 485 interfaces	1	1	1	1
Number of USB interfaces	2; USB 2.0	3; USB 2.0	3; USB 2.0	3; USB 2.0

Number of SD card slots	2	2	2	2
Industrial Ethernet				
■ Number of Industrial Ethernet interfaces	1	2	2	2
■ IRT, supported	No	Yes	Yes	Yes
■ MRP supported	No	No	No	No
■ Number of ports of the integrated switch	1	2	2	2
Protocols				
PROFINET	Yes	Yes	Yes	Yes
Supports protocol for PROFINET IO	Yes	Yes	Yes	Yes
Further protocols				
■ PROFIBUS	Yes	Yes	Yes	Yes
■ MPI	Yes	Yes	Yes	Yes
Ambient conditions				
Mounting position	vertical	vertical	vertical	vertical
maximum permissible angle of inclination without external ventilation	35°	35°	35°	35°
Operating temperature				
■ Operation (vertical installation)				
■ ■ in vertical mounting position/ minimum	0 °C	0 °C	0 °C	0 °C
■ ■ in vertical mounting position/ maximum	50 °C	50 °C	50 °C	50 °C
■ Operation (max. tilt angle)				
■ ■ at maximum tilt angle/minimum	0 °C	0 °C	0 °C	0 °C
■ ■ at maximum tilt angle/maximum	40 °C	40 °C	40 °C	40 °C
■ Operation (vertical installation, portrait				

format)				
■ in vertical mounting position/ minimum	0 °C	0 °C	0 °C	0 °C
■ in vertical mounting position/ maximum	40 °C	40 °C	40 °C	40 °C
■ Operation (max. tilt angle, portrait format)				
■ at maximum tilt angle/minimum	0 °C	0 °C	0 °C	0 °C
■ at maximum tilt angle/maximum	35 °C	35 °C	35 °C	35 °C
Relative humidity				
■ max. relative humidity	90 %	90 %	90 %	90 %
Degree and class of protection				
Type of protection	IP20	IP20	IP20	IP20
IP (at the front)	IP65	IP65	IP65	IP65
Enclosure Type 4 at the front	Yes	Yes	Yes	Yes
Enclosure type 4x at the front	Yes	Yes	Yes	Yes
Standards, approvals, certificates				
CE	Yes	Yes	Yes	Yes
KC approval	Yes	Yes	Yes	Yes
cULus	Yes	Yes	Yes	Yes
C-TICK	Yes	Yes	Yes	Yes
FM Class I Div. 2	Yes	Yes	Yes	Yes
GL	Yes; Available soon	Yes; Available soon	Yes; Available soon	Yes; Available soon
ABS	Yes; Available soon	Yes; Available soon	Yes; Available soon	Yes; Available soon
BV	Yes; Available soon	Yes; Available soon	Yes; Available soon	Yes; Available soon
DNV	Yes; Available soon	Yes; Available soon	Yes; Available soon	Yes; Available soon
LRS	Yes; Available soon	Yes; Available soon	Yes; Available soon	Yes; Available soon

Class NK	Yes; Available soon	Yes; Available soon	Yes; Available soon	Yes; Available soon
PRS	No	No	No	No
Use in hazardous areas				
■ EX zone 2	Yes; Available soon	Yes; Available soon	Yes; Available soon	Yes; Available soon
■ EX zone 22	Yes; Available soon	Yes; Available soon	Yes; Available soon	Yes; Available soon
■ Class I Zone 1	No	No	No	No
■ Class I Zone 2, Division 2	Yes; Available soon	Yes; Available soon	Yes; Available soon	Yes; Available soon
Configuration				
Configuration software				
■ STEP 7 Basic (TIA Portal)	No	No	No	No
■ STEP 7 Professional (TIA Portal)	No	No	No	No
■ WinCC flexible Compact	No	No	No	No
■ WinCC flexible Standard	No	No	No	No
■ WinCC flexible Advanced	No	No	No	No
■ WinCC Basic (TIA Portal)	No	No	No	No
■ WinCC Comfort (TIA Portal)	Yes; from V11	Yes; from V11	Yes; from V11	Yes; from V11
■ WinCC Advanced (TIA Portal)	Yes; from V11	Yes; from V11	Yes; from V11	Yes; from V11
■ WinCC Professional (TIA Portal)	Yes; from V11	Yes; from V11	Yes; from V11	Yes; from V11
Languages				
Online languages				
■ Number of online/runtime languages	32	32	32	32
Languages				
■ Languages per project	32	32	32	32
Functionality under WinCC flexible				

Libraries	Yes	Yes	Yes	Yes
Applications/options				
■ Internet Explorer	Yes	Yes	Yes	Yes
■ Pocket Word	Yes	Yes	Yes	Yes
■ Pocket Excel	Yes	Yes	Yes	Yes
■ PDF Viewer	Yes	Yes	Yes	Yes
■ Media Player	Yes	Yes	Yes	Yes
■ Sm@rtService	Yes	Yes	Yes	Yes
Number of Visual Basic Scripts				
■ Number	50	100	100	100
With alarm logging system (incl. buffer and acknowledgment)				
■ Number of messages	2 000	4 000	4 000	4 000
■ Message buffer				
■ Number of entries	256	1 024	1 024	1 024
■ Circulating buffer	Yes	Yes	Yes	Yes
■ retentive	Yes	Yes	Yes	Yes
■ maintenance-free	Yes	Yes	Yes	Yes
Recipes				
■ Recipes	100	300	300	300
■ Data records per recipe	200	500	500	500
■ Entries per data record	200	1000	1000	1000
■ integrated Flash	256 kbyte	1 Mbyte	1 Mbyte	1 Mbyte
■ expandable	Yes	Yes	Yes	Yes
Number of process images				
■ Process images	500	500	500	500
■ Variables	1 024	2 048	2 048	2 048
Lists				
■ Text lists	300	500	500	500
■ Number of entries in text lists	30	500	500	500

■ Graphics list	100	500	500	500
■ Number of entries in graphics lists	30	500	500	500
Archiving				
■ Number of archives per project	10	50	50	50
■ Number of measuring points per project	100	2 048	2 048	2 048
■ Number of entries per archive	10 000	20 000	20 000	20 000
Security				
■ Number of user groups	50	50	50	50
■ Number of users	50	50	50	50
■ Passwords exportable	Yes	Yes	Yes	Yes
Process coupling				
■ S7-1200				
■ MPI	Yes	Yes	Yes	Yes
■ PROFIBUS DP	Yes	Yes	Yes	Yes
■ PROFINET	Yes	Yes	Yes	Yes
■ S7-200				
■ PPI (point-to-point)	Yes	Yes	Yes	Yes
■ PPI network	Yes	Yes	Yes	Yes
■ MPI	Yes	Yes	Yes	Yes
■ PROFIBUS DP	Yes	Yes	Yes	Yes
■ Ethernet	Yes	Yes	Yes	Yes
■ S7-300/400				
■ MPI	Yes	Yes	Yes	Yes
■ PROFIBUS DP	Yes	Yes	Yes	Yes
■ PROFINET	Yes	Yes	Yes	Yes
■ WinAC MP	Yes	Yes	Yes	Yes
■ Win AC				
■ TCP/IP	Yes	Yes	Yes	Yes
■ SINUMERIK	No	No	No	No
■ SIMOTION	No	No	No	No

■ Allen Bradley (EtherNet/IP)	Yes	Yes	Yes	Yes
■ Allen Bradley (DF1)	Yes	Yes	Yes	Yes
■ Mitsubishi (MC TCP/IP)	Yes	Yes	Yes	Yes
■ Mitsubishi (FX)	Yes	Yes	Yes	Yes
■ OMRON (LINK/Multilink)	Yes	Yes	Yes	Yes
■ OMRON (LINK/Multilink)	Yes	Yes	Yes	Yes
■ Modicon (Modbus TCP/IP)	Yes	Yes	Yes	Yes
■ Modicon (Modbus)	Yes	Yes	Yes	Yes
■ other non-Siemens drivers	Yes	Yes	Yes	Yes
Service tools/configuration aids				
■ Backup/restore	Yes	Yes	Yes	Yes
■ Backup/Restore automatically	Yes	Yes	Yes	Yes
■ Simulation	Yes	Yes	Yes	Yes
■ Device switchover	Yes	Yes	Yes	Yes
I/O				
I/O devices				
■ Printer	Yes	Yes	Yes	Yes
Mounting				
Mounting in portrait format possible	Yes	Yes	Yes	Yes
Mounting in landscape format possible	Yes	Yes	Yes	Yes
Mechanics/material				
Type of housing (front)				
■ Plastic	Yes	No	No	No
■ Aluminum	No	Yes	Yes	Yes
Dimensions				
Width of the housing front	140 mm	214 mm	274 mm	330 mm
Height of housing front	116 mm	158 mm	190 mm	241 mm
Depth/installation dimension	49 mm	63 mm	63 mm	65 mm

Mounting cutout, width	123 mm	197 mm	251 mm	310 mm
Mounting cutout, height	99 mm	141 mm	166 mm	221 mm
Weight				
Weight without packaging	0.6 kg	1.4 kg	1.9 kg	2.8 kg
	6AV2 124-1DC01-0AX0	**6AV2 124-1GC01-0AX0**	**6AV2 124-1JC01-0AX0**	**6AV2 124-1MC01-0AX0**
	KP400 Comfort	KP700 Comfort	KP900 Comfort	KP1200 Comfort
Display				
Design of display	TFT	TFT	TFT	TFT
Screen diagonal	4.3 in	7 in	9 in	12.1 in
Display width	95 mm	152.4 mm	195 mm	261.1 mm
Display height	53.8 mm	91.4 mm	117 mm	163.2 mm
Number of colors	16 777 200	16 777 200	16 777 200	16 777 200
Resolution (pixels)				
■ Horizontal image resolution	480	800	800	1 280
■ Vertical image resolution	272	480	480	800
Backlighting				
■ MTBF backlighting (at 25 °C)	50 000 h; At 50 °C	50 000 h; At 50 °C	50 000 h; At 50 °C	50 000 h; At 50 °C
■ Dimmable backlight	Yes; 0-100 %	Yes; 0-100 %	Yes; 0-100 %	Yes; 0-100 %
Control elements				
Keyboard fonts				
■ Number of function keys	8	24	26	34
■ Keys with LED	Yes	Yes	Yes	Yes
■ System keys	Yes	Yes	Yes	Yes
Touch operation				
■ Design as touch screen	No	No	No	No
Supply voltage				
Type of supply voltage	DC	DC	DC	DC
Rated voltage/DC	24 V	24 V	24 V	24 V
permissible range, lower limit (DC)	19.2 V	19.2 V	19.2 V	19.2 V
permissible range, upper limit (DC)	28.8 V	28.8 V	28.8 V	28.8 V

Memory				
Usable memory for user data	4 Mbyte	12 Mbyte	12 Mbyte	12 Mbyte
Type of output				
Acoustics	Buzzer	Speaker	Speaker	Speaker
■ Buzzer	Yes	No	No	No
■ Speaker	No	Yes	Yes	Yes
Time of day				
Clock				
■ Hardware clock (real-time clock)	Yes	Yes	Yes	Yes
■ Software clock	No	No	No	No
■ Battery-backed	Yes	Yes	Yes	Yes
■ Synchronizable	Yes	Yes	Yes	Yes
Interfaces				
Number of RS 485 interfaces	1	1	1	1
Number of USB interfaces	2; USB 2.0	3; USB 2.0	3; USB 2.0	3; USB 2.0
Number of SD card slots	2	2	2	2
Industrial Ethernet				
■ Number of Industrial Ethernet interfaces	1	2	2	2
■ IRT, supported	No	Yes	Yes	Yes
■ MRP supported	No	No	No	No
■ Number of ports of the integrated switch	1	2	2	2
Protocols				
PROFINET	Yes	Yes	Yes	Yes
Supports protocol for PROFINET IO	Yes	Yes	Yes	Yes
Further protocols				
■ PROFIBUS	Yes	Yes	Yes	Yes
■ MPI	Yes	Yes	Yes	Yes
Ambient conditions				
Mounting position	vertical	vertical	vertical	vertical
maximum permissible angle of inclination without external ventilation	35°	35°	35°	35°

Operating temperature				
■ Operation (vertical installation)				
■ in vertical mounting position/ minimum	0 °C	0 °C	0 °C	0 °C
■ in vertical mounting position/ maximum	50 °C	50 °C	50 °C	50 °C
■ Operation (max. tilt angle)				
■ at maximum tilt angle/minimum	0 °C	0 °C	0 °C	0 °C
■ at maximum tilt angle/maximum	40 °C	40 °C	40 °C	40 °C
■ Operation (vertical installation, portrait format)				
■ in vertical mounting position/ minimum	0 °C	0 °C	0 °C	0 °C
■ in vertical mounting position/ maximum	40 °C	40 °C	40 °C	40 °C
■ Operation (max. tilt angle, portrait format)				
■ at maximum tilt angle/minimum	0 °C	0 °C	0 °C	0 °C
■ at maximum tilt angle/maximum	35 °C	35 °C	35 °C	35 °C
Relative humidity				
■ max. relative humidity	90 %	90 %	90 %	90 %
Degree and class of protection				
Type of protection	IP20	IP20	IP20	IP20
IP (at the front)	IP65	IP65	IP65	IP65

Enclosure Type 4 at the front	Yes	Yes	Yes	Yes
Enclosure type 4x at the front	Yes	Yes	Yes	Yes
Standards, approvals, certificates				
CE	Yes	Yes	Yes	Yes
KC approval	Yes	Yes	Yes	Yes
cULus	Yes	Yes	Yes	Yes
C-TICK	Yes	Yes	Yes	Yes
FM Class I Div. 2	Yes	Yes	Yes	Yes
GL	Yes; Available soon	Yes; Available soon	Yes; Available soon	Yes; Available soon
ABS	Yes; Available soon	Yes; Available soon	Yes; Available soon	Yes; Available soon
BV	Yes; Available soon	Yes; Available soon	Yes; Available soon	Yes; Available soon
DNV	Yes; Available soon	Yes; Available soon	Yes; Available soon	Yes; Available soon
LRS	Yes; Available soon	Yes; Available soon	Yes; Available soon	Yes; Available soon
Class NK	Yes; Available soon	Yes; Available soon	Yes; Available soon	Yes; Available soon
PRS	No	No	No	No
Use in hazardous areas				
■ EX zone 2	Yes; Available soon	Yes; Available soon	Yes; Available soon	Yes; Available soon
■ EX zone 22	Yes; Available soon	Yes; Available soon	Yes; Available soon	Yes; Available soon
■ Class I Zone 1	No	No	No	No
■ Class I Zone 2, Division 2	Yes; Available soon	Yes; Available soon	Yes; Available soon	Yes; Available soon
Configuration				
Configuration software				
■ STEP 7 Basic (TIA Portal)	No	No	No	No
■ STEP 7 Professional (TIA Portal)	No	No	No	No
■ WinCC flexible Compact	No	No	No	No
■ WinCC flexible Standard	No	No	No	No
■ WinCC flexible	No	No	No	No

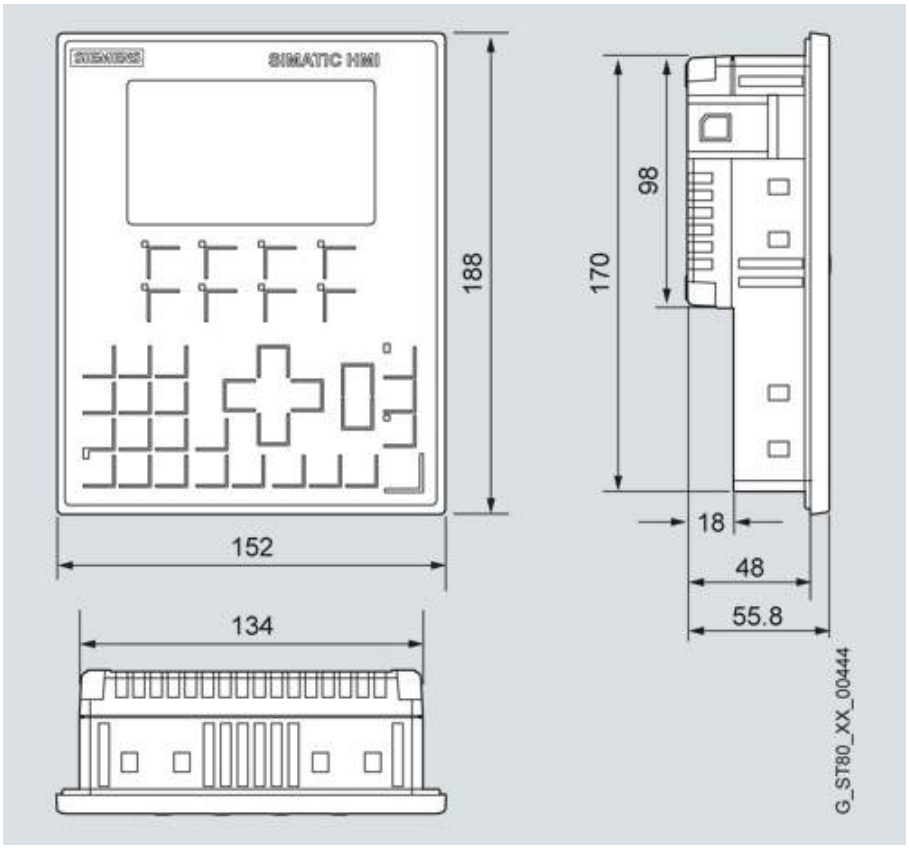
Advanced				
■ WinCC Basic (TIA Portal)	No	No	No	No
■ WinCC Comfort (TIA Portal)	Yes; from V11	Yes; from V11	Yes; from V11	Yes; from V11
■ WinCC Advanced (TIA Portal)	Yes; from V11	Yes; from V11	Yes; from V11	Yes; from V11
■ WinCC Professional (TIA Portal)	Yes; from V11	Yes; from V11	Yes; from V11	Yes; from V11
Languages				
Online languages				
■ Number of online/runtime languages	32	32	32	32
Languages				
■ Languages per project	32	32	32	32
Functionality under WinCC flexible				
Libraries	Yes	Yes	Yes	Yes
Applications/options				
■ Internet Explorer	Yes	Yes	Yes	Yes
■ Pocket Word	Yes	Yes	Yes	Yes
■ Pocket Excel	Yes	Yes	Yes	Yes
■ PDF Viewer	Yes	Yes	Yes	Yes
■ Media Player	Yes	Yes	Yes	Yes
■ Sm@rtService	Yes	Yes	Yes	Yes
Number of Visual Basic Scripts				
■ Number	50	100	100	100
With alarm logging system (incl. buffer and acknowledgment)				
■ Number of messages	2 000	4 000	4 000	4 000
■ Message buffer				
■ Number of entries	256	1 024	1 024	1 024
■ Circulating buffer	Yes	Yes	Yes	Yes
■ retentive	Yes	Yes	Yes	Yes

■ maintenance-free	Yes	Yes	Yes	Yes
Recipes				
■ Recipes	100	300	300	300
■ Data records per recipe	200	500	500	500
■ Entries per data record	200	1000	1000	1000
■ integrated Flash	256 kbyte	1 Mbyte	1 Mbyte	1 Mbyte
■ expandable	Yes	Yes	Yes	Yes
Number of process images				
■ Process images	500	500	500	500
■ Variables	1 024	2 048	2 048	2 048
Lists				
■ Text lists	300	500	500	500
■ Number of entries in text lists	30	500	500	500
■ Graphics list	100	500	500	500
■ Number of entries in graphics lists	30	500	500	500
Archiving				
■ Number of archives per project	10	50	50	50
■ Number of measuring points per project	100	2 048	2 048	2 048
■ Number of entries per archive	10 000	20 000	20 000	20 000
Security				
■ Number of user groups	50	50	50	50
■ Number of users	50	50	50	50
■ Passwords exportable	Yes	Yes	Yes	Yes
Process coupling				
■ S7-1200				
■ MPI	Yes	Yes	Yes	Yes
■ PROFIBUS DP	Yes	Yes	Yes	Yes
	Yes	Yes	Yes	Yes

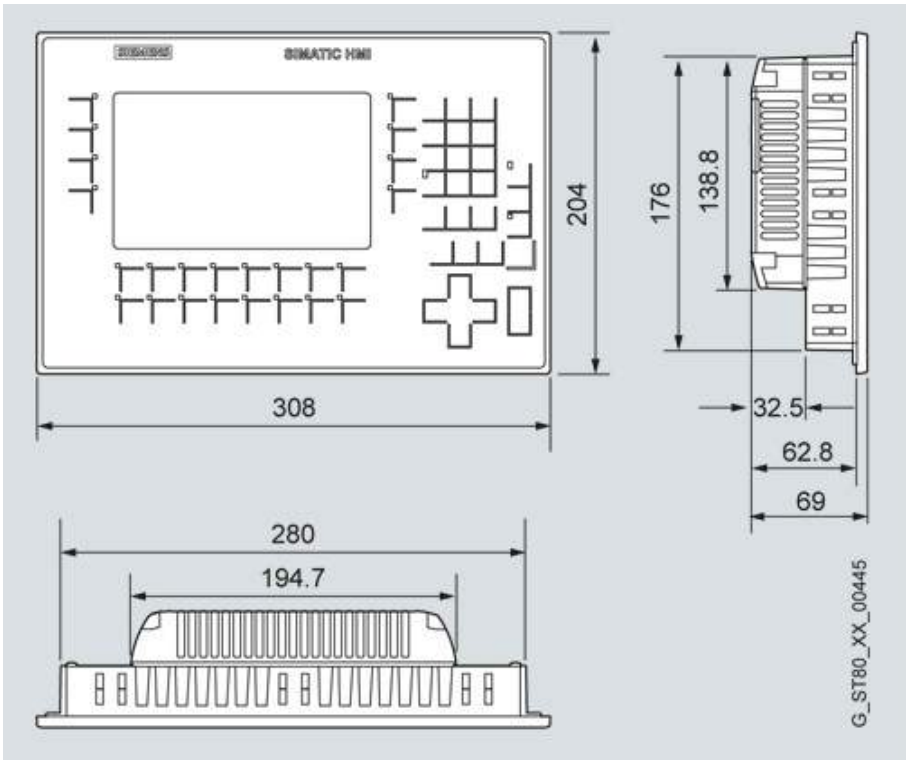
■ PROFINET				
■ S7-200				
■ PPI (point-to-point)	Yes	Yes	Yes	Yes
■ PPI network	Yes	Yes	Yes	Yes
■ MPI	Yes	Yes	Yes	Yes
■ PROFIBUS DP	Yes	Yes	Yes	Yes
■ Ethernet	Yes	Yes	Yes	Yes
■ S7-300/400				
■ MPI	Yes	Yes	Yes	Yes
■ PROFIBUS DP	Yes	Yes	Yes	Yes
■ PROFINET	Yes	Yes	Yes	Yes
■ WinAC MP	Yes	Yes	Yes	Yes
■ Win AC				Yes
■ TCP/IP	Yes	Yes	Yes	Yes
■ SINUMERIK	No	No	No	No
■ SIMOTION	No	No	No	No
■ Allen Bradley (EtherNet/IP)	Yes	Yes	Yes	Yes
■ Allen Bradley (DF1)	Yes	Yes	Yes	Yes
■ Mitsubishi (MC TCP/IP)	Yes	Yes	Yes	Yes
■ Mitsubishi (FX)	Yes	Yes	Yes	Yes
■ OMRON (LINK/Multilink)	Yes	Yes	Yes	Yes
■ OMRON (LINK/Multilink)	Yes	Yes	Yes	Yes
■ Modicon (Modbus TCP/IP)	Yes	Yes	Yes	Yes
■ Modicon (Modbus)	Yes	Yes	Yes	Yes
■ other non-Siemens drivers	Yes	Yes	Yes	Yes
Service tools/configuration aids				
■ Backup/restore	Yes	Yes	Yes	Yes
■ Backup/Restore automatically	Yes	Yes	Yes	Yes
■ Simulation	Yes	Yes	Yes	Yes

■ Device switchover	Yes	Yes	Yes	Yes
I/O				
I/O devices				
■ Printer	Yes	Yes	Yes	Yes
Mounting				
Mounting in portrait format possible	No	No	No	Yes
Mounting in landscape format possible	Yes	Yes	Yes	Yes
Mechanics/material				
Type of housing (front)				
■ Plastic	Yes	No	No	No
■ Aluminum	No	Yes	Yes	Yes
Dimensions				
Width of the housing front	152 mm	308 mm	362 mm	454 mm
Height of housing front	188 mm	204 mm	230 mm	289 mm
Depth/installation dimension	49 mm	63 mm	63 mm	65 mm
Mounting cutout, width	135 mm	281 mm	338 mm	434 mm
Mounting cutout, height	171 mm	177 mm	206 mm	269 mm
Weight				
Weight without packaging	0.8 kg	2.2 kg	2.7 kg	4.4 kg

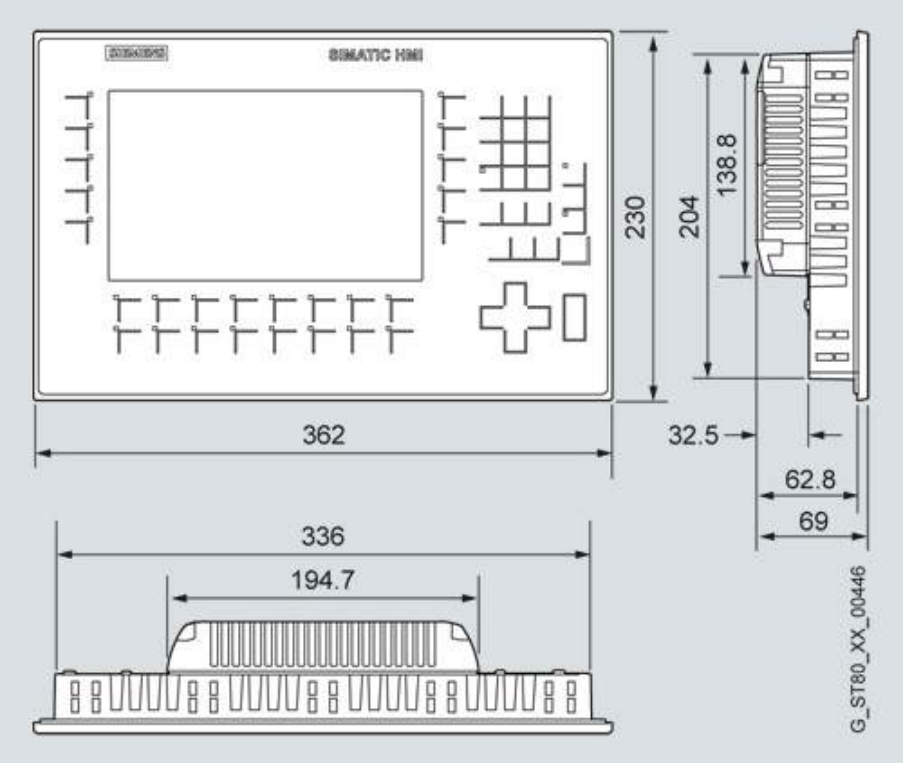
Dimensional drawings



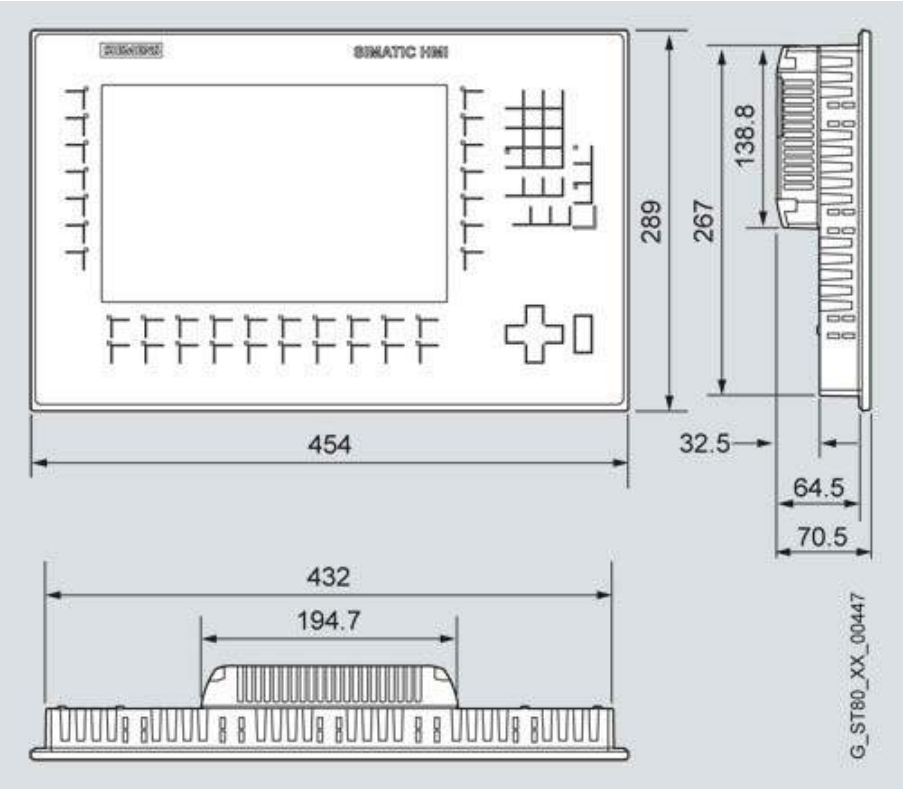
KP400 Comfort



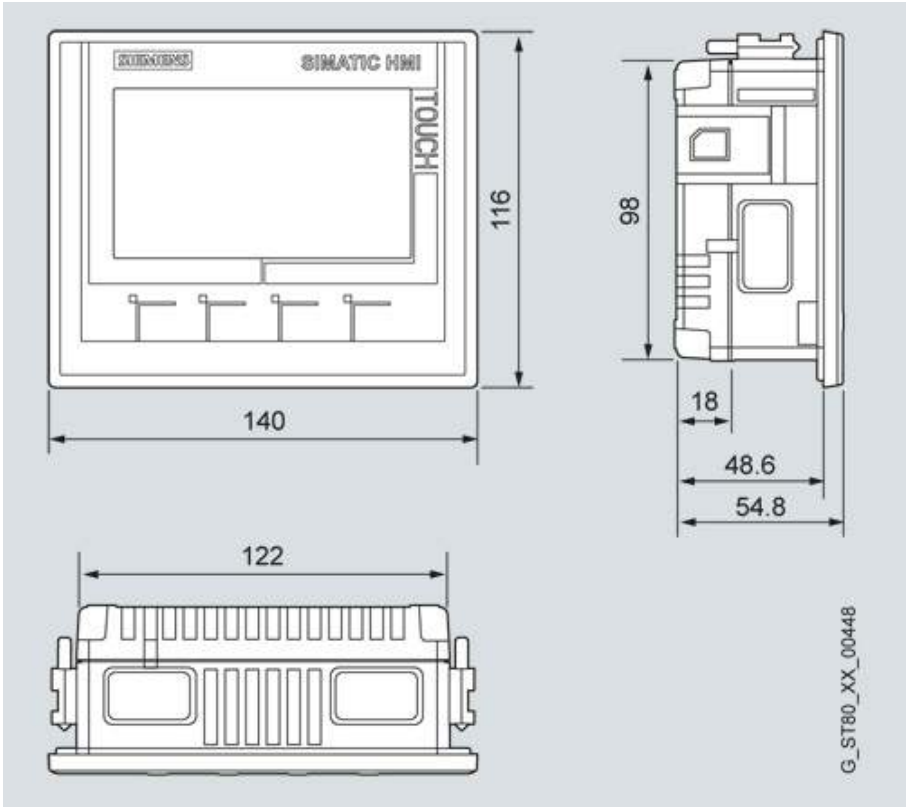
KP700 Comfort



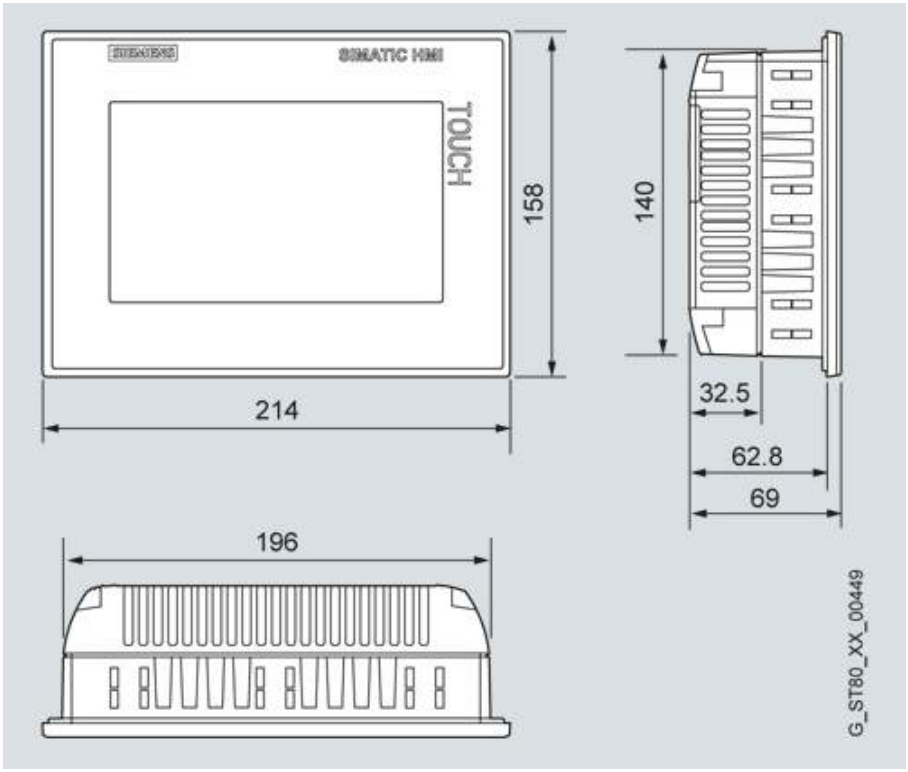
KP900 Comfort



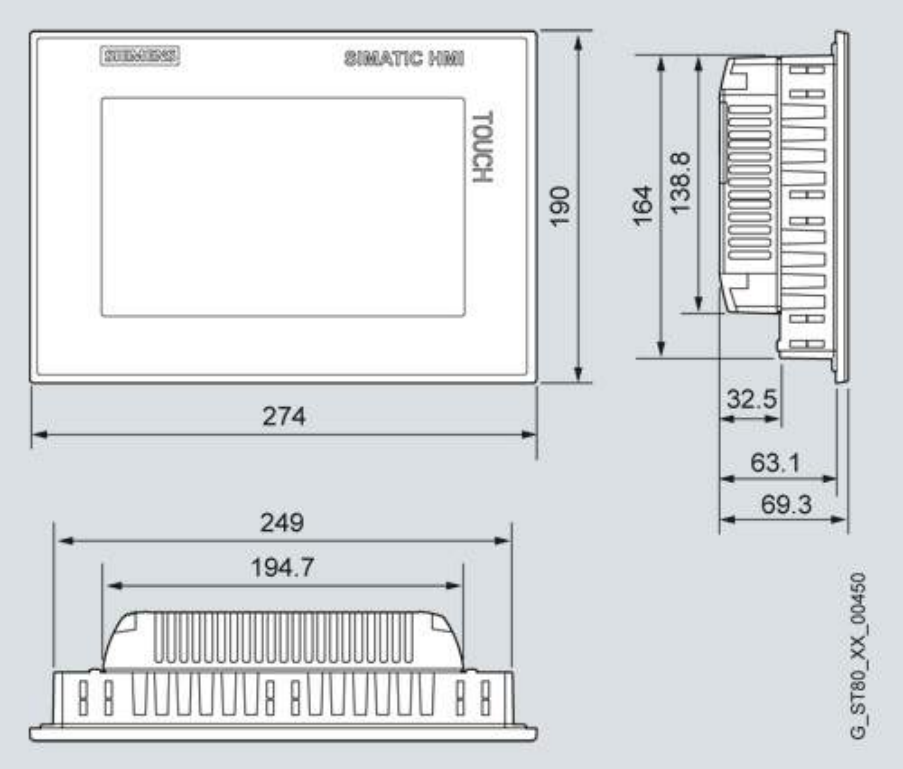
KP1200 Comfort



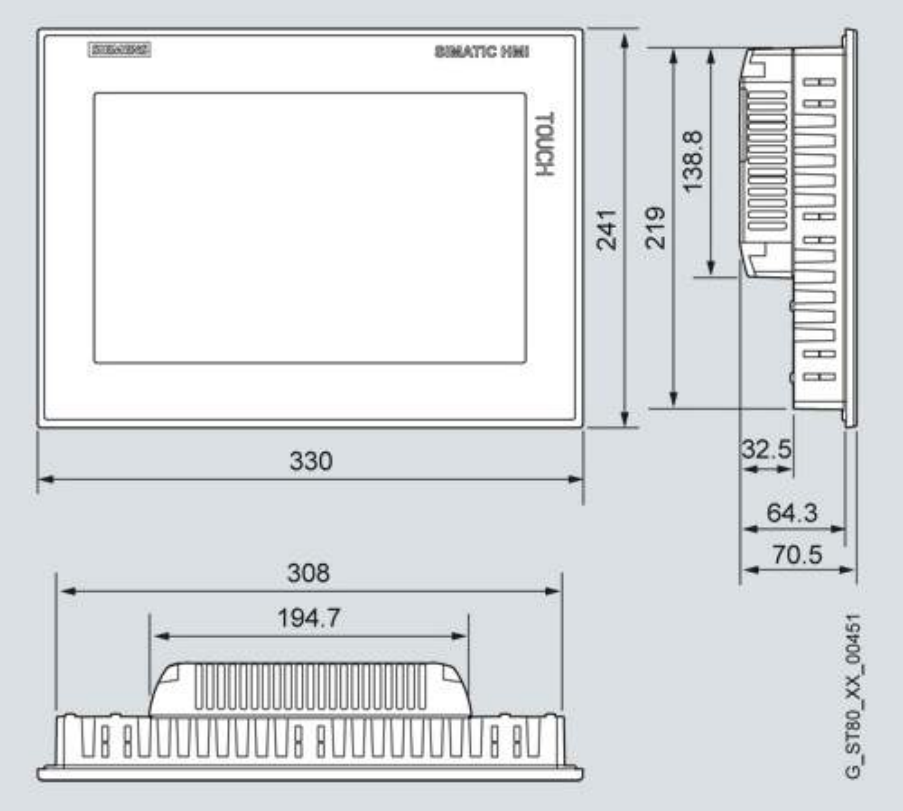
KTP400 Comfort



TP700 Comfort



TP900 Comfort



TP1200 Comfort

More information

Further information can be found in the Internet at:

http://www.siemens.com/simatic-comfort-panels

Note

Do you require a specific modification or extension to the products described here? If so, please see the "Custom Products" section. There you will find information about additional and generally available sector-specific products as well as options for customer-specific modification and adaptation.

Extract from the online catalog

RAD-ISM-900-EN-BD

Order No.: 2900016

http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2900016

Wireless transceiver (transmitter and receiver) with Ethernet, RS-232, RS-485 interfaces, for 900 MHz ISM band (America).This product is exclusively for export outside of the European Economic Area (EEA).

Ethernet

Product notes

WEEE/RoHS-compliant since: 11/03/2008

http://www.download.phoenixcontact.com
Please note that the data given here has been taken from the online catalog. For comprehensive information and data, please refer to the user documentation. The General Terms and Conditions of Use apply to Internet downloads.

Commercial data

GTIN (EAN)	4 046356 461580
Note	Made-to-order
sales group	H172
Pack	1 pcs.
Customs tariff	85176200
Catalog page information	Page 674 (IF-2011)

Technical data

Wireless set

Set contents	1 transceiver

Wireless path

Direction	Bi-directional

Frequency range	902 MHz ... 928 MHz
Transmission power	1 W (adjustable in 1 dBm increments)
Transmit capacity, minimum	10 dBm
Transmit capacity, maximum	30 dBm

Serial interface

Name	RS-232
Data rate	300 ... 57,6 kBit/s
Connection method	9-pos. D-SUB (female connector)
File format/coding	Asynchronous
Data flow control/protocols	RTS/CTS
Name	RS-485/RS-422
Connection method	COMBICON plug-in screw terminal block

Supply

Supply voltage	24 V DC
Supply voltage range	11 V DC ... 30 V DC
Max. current consumption	250 mA (at 24 V DC)

General data

Width	52 mm
Height	99 mm
Depth	115 mm
Ambient temperature (operation)	-40 °C ... 65 °C
Ambient temperature (storage/transport)	-40 °C ... 75 °C
Degree of protection	IP20
Mounting position	Any
Assembly instructions	on standard DIN rail NS 35 in accordance with EN 60715
Housing material	Polyamide PA non-reinforced with aluminum heatsink
Conformance	FCC Directive, Part 15.247
	ISC Directive RSS 210
UL, USA / Canada	Class I, Div. 2, Groups A, B, C, D

Connection data

Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	4 mm²
Conductor cross section stranded min.	0.2 mm²

Conductor cross section stranded max.	2.5 mm²
Conductor cross section AWG/kcmil min.	24
Conductor cross section AWG/kcmil max	14
Connection method	Screw connection
Stripping length	8 mm
Screw thread	M3

Certificates / Approvals

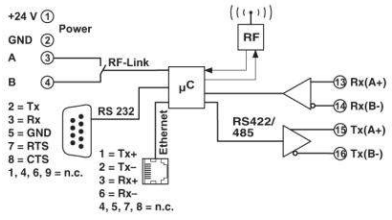
Certification Ex:	CUL-EX LIS, UL-EX LIS

Accessories

Item	Designation	Description
Cable/conductor		
2867597	RAD-CAB-RG213-25	Antenna extension cable, length: 25 ft
General		
2867160	RAD-ISM-900-ANT-OMNI-0-6	Omnidirectional antenna, IP65 protection, cable length 2 m, connection MCX (male)
2867791	RAD-ISM-900-ANT-OMNI-FG-3-N	Omnidirectional antenna, IP65 protection, gain 5 dBi, connection N (female)
2867830	RAD-ISM-900-ANT-YAGI-6.5-50-AS	Panel antenna with surge protection, adapter cable MCX->N and assembly material, IP65 protection, gain 8.5 dBi, cable length 15.2 m, connection N (female)
Plug/Adapter		
2885207	RAD-CON-MCX90-N-SS	Adapter cable, pigtail 120 cm 90° MCX(m) -> N(m)

Diagrams/Drawings

Block diagram



Address

PHOENIX CONTACT GmbH & Co. KG
Flachsmarktstr. 8
32825 Blomberg,Germany
Phone +49 5235 3 00
Fax +49 5235 3 41200
http://www.phoenixcontact.com

Mini Power-Zone® Unit Substation

Catalog
7440CT0901

2009
Class 7440

CONTENTS

SQUARE D

by Schneider Electric

Product Description

The Mini Power-Zone Unit Substation from Schneider Electric is a miniaturized version of our Power-Zone Unit Substation. Included are:

- Primary Main Circuit Breaker
- Sealed Step-Down Transformer
- Secondary Main Circuit Breaker
- Distribution Panelboard

Because the Mini Power-Zone Unit Substation is furnished as a complete package, considerable savings in installation time and costs can be realized.

Features

- NEMA 3R enclosure; suitable for both indoor and outdoor use
- Rated for Service Entrance use
- 185 °C insulation with 115 °C temperature rise
- Sealed, epoxy-resin encapsulated transformer
- Panel section has copper bus and uses Square D® brand QO® style circuit breakers
- UL Listed per UL 1062 File E92978.

Mini Power-Zone centers are furnished with factory-installed primary main and secondary main circuit breakers only. Circuit breaker ratings are selected to meet National Electrical Code® (NEC®) requirements and to coordinate with transformer magnetizing inrush current.

Feeder circuit breakers are standard QO plug-on type, which can be ordered, as required, from your local Schneider Electric distributor. If ground fault protection is required, Square D brand Qwik-Gard® circuit breakers may be used in all sizes. Tandem circuit breakers are not permitted.

Typical Applications

- Small shopping centers
- Portable offices
- Assembly lines
- Construction site
- Emergency power
- Temporary power
- Guard shacks/other shacks
- Retail
- Areas with limited space

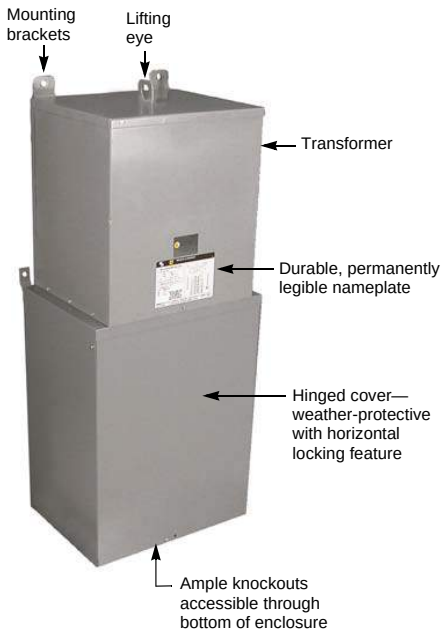
The Mini Power-Zone Unit Substation uses a separate transformer and panelboard section. This allows the panel section to be removed and wired first, if desired. Also the transformer can be replaced without disturbing the panel section and associated wiring. The new transformer simply slides into the top of the panel section, and the primary and secondary leads are reconnected to the main circuit breakers.

General Information

- Available in single and three phase configurations
  - — Single phase configuration supplies a 120/240 branch panelboard
  - — Three phase configuration supplies a 208Y/120 branch panelboard
- Two panelboard options for Mini Power-Zone products protected by a backfeed (secondary main) circuit breaker:
  - — QO load center interior (MPZ prefix); branch circuit accepts QO (plug-on) circuit breakers only
  - — NQ panelboard interior (MPZB prefix); branch circuit accepts QO or QOB (bolt-on) circuit breakers
- Available in multiple interrupting ratings, based on the customer's available fault current.
  - — FAL primary main for 18 kAIC
  - — FHL primary main for 25 kAIC
  - — HJ primary main for 65 kAIC; only available with the MPZB option

  A shunt trip option can be added to the primary main circuit breaker.
- Two choices of enclosure material
  - — Powder coat painted, standard hot-rolled steel
  - — Powder coat painted, 316 stainless steel
- All designs are NEMA Type 3R rated for indoor/outdoor use
- Not available as a packaged solution for NEMA Type 4X applications. However, Schneider Electric does offer all three components separately in NEMA Type 4X enclosures:
  - — NEMA Type 4X enclosed circuit breakers (primary main)
  - — NEMA Type 4X encapsulated transformers
  - — NEMA Type 4X NQ panelboards

Contact your local Schneider Electric representative for catalog numbers, price, and availabilty.



Single Phase Unit Substation

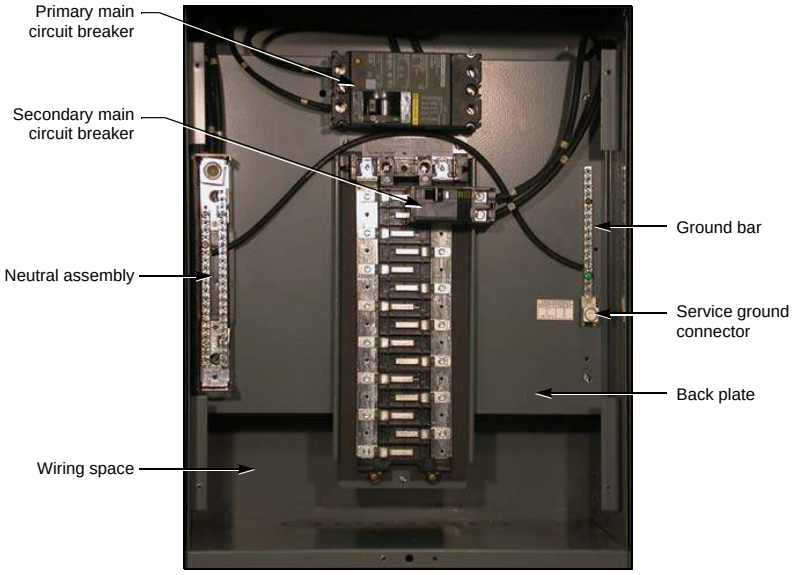
The single phase Mini Power-Zone Unit Substation is UL Listed for indoor and outdoor applications.

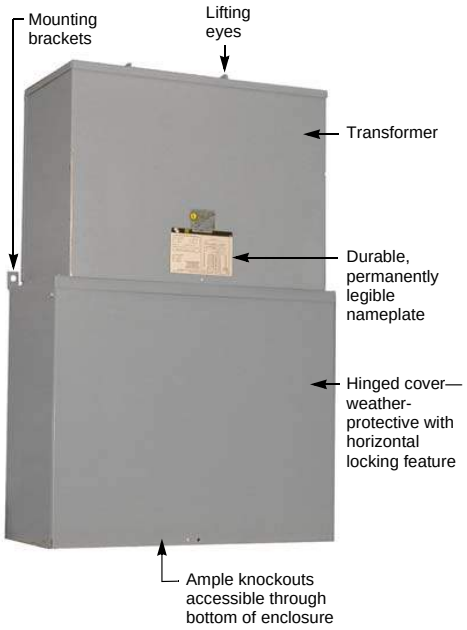
Standard Square D brand QO plug-on branch circuit breakers or Qwik-Gard ground fault circuit breakers may be ordered from any Schneider Electric distributor as required.

Shunt trip capability on the primary circuit breaker is available by special order if your local fire department requires remote tripping provisions where used as service equipment.

UL Listed, electrostatically shielded Mini Power-Zone units are also available by special order.

Interior view showing primary main, secondary main, and plug-on panel.





Three Phase Unit Substation

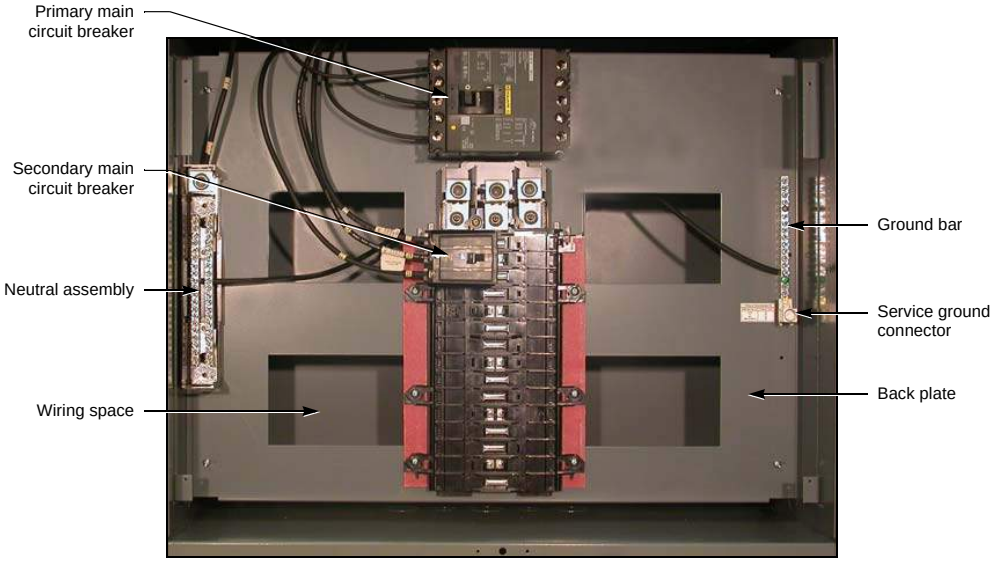
The three phase Mini Power-Zone Unit Substation is UL Listed for indoor and outdoor applications.

Standard Square D brand QO plug-on branch circuit breakers or Qwik-Gard ground fault circuit breakers may be ordered from any Schneider Electric distributor as required.

Shunt trip capability on the primary circuit breaker is available by special order if your local fire department requires remote tripping provisions where used as service equipment.

UL Listed, electrostatically shielded Mini Power-Zone units are also available by special order.

Interior view showing primary main, secondary main, and plug-on panel.



Selection Tables

NOTE: The enclosure drawings referenced in the Enclosure column of the selection tables are shown on pages 10–15. The wiring diagrams referenced in the selection tables are shown on page 16.

Single Phase

480 Volt Primary, Load Center Interior, Interrupt Rating 18 kAIR, NEMA Type 3R

kVA	Part Number	Primary Main	Secondary Main	Feeder Circuit Breakers			Enclosure	Wiring Diagram
				Maximum Number		Maximum Ampere Rating		
				1 pole	2 pole			
5	MPZ5S40F	FAL24015	QO230	10	5	20	A	i
7.5	MPZ7S40F	FAL24020	QO240	10	5	30	A	i
10	MPZ10S40F	FAL24030	QO260	10	5	40	A	i
15	MPZ15S40F	FAL24060	QO280	24	12	60	B	i
25	MPZ25S40F	FAL24100	QO2125	24	12	100	B	i

480 Volt Primary, NQ Panelboard Interior, Interrupt Rating 18 kAIR, NEMA Type 3R

kVA	Part Number	Primary Main	Secondary Main	Feeder Circuit Breakers			Enclosure	Wiring Diagram
				Maximum Number		Maximum Ampere Rating		
				1 pole	2 pole			
5	MPZB5S40F	FAL24015	QOB230	10	5	20	AA	i
7.5	MPZB7S40F	FAL24020	QOB240	10	5	30	AA	i
10	MPZB10S40F	FAL24030	QOB260	10	5	40	AA	i
15	MPZB15S40F	FAL24060	QOB280	24	12	60	BB	i
25	MPZB25S40F	FAL24100	QOB2125	24	12	100	BB	i

480 Volt Primary, Load Center Interior, Interrupt Rating 25 kAIR, NEMA Type 3R

kVA	Part Number	Primary Main	Secondary Main	Feeder Circuit Breakers			Enclosure	Wiring Diagram
				Maximum Number		Maximum Ampere Rating		
				1 pole	2 pole			
5	MPZ5S40F25K	FHL26015	QO230	10	5	20	A	i
7.5	MPZ7S40F25K	FHL26020	QO240	10	5	30	A	i
10	MPZ10S40F25K	FHL26030	QO260	10	5	40	A	i
15	MPZ15S40F25K	FHL26060	QO280	24	12	60	B	i
25	MPZ25S40F25K	FHL26100	QO2125	24	12	100	B	i

480 Volt Primary, NQ Panelboard Interior, Interrupt Rating 25 kAIR, NEMA Type 3R

kVA	Part Number	Primary Main	Secondary Main	Feeder Circuit Breakers			Enclosure	Wiring Diagram
				Maximum Number		Maximum Ampere Rating		
				1 pole	2 pole			
5	MPZB5S40F25K	FHL26015	QOB230	10	5	20	AA	i
MPZB7S40F → 7.5	MPZB7S40F25K	FHL26020	QOB240	10	5	30	AA	i
10	MPZB10S40F25K	FHL26030	QOB260	10	5	40	AA	i
15	MPZB15S40F25K	FHL26060	QOB280	24	12	60	BB	i
25	MPZB25S40F25K	FHL26100	QOB2125	24	12	100	BB	i

Single Phase (continued)

480 Volt Primary, NQ Panelboard Interior, Interrupt Rating 65 kAIR, NEMA Type 3R

kVA	Part Number	Primary Main	Secondary Main	Feeder Circuit Breakers			Enclosure	Wiring Diagram
				Maximum Number		Maximum Ampere Rating		
				1 pole	2 pole			
5	MPZB5S40F65K	HJL26015	QOB230	10	5	20	AA	i
7.5	MPZB7S40F65K	HJL26020	QOB240	10	5	30	AA	i
10	MPZB10S40F65K	HJL26030	QOB260	10	5	40	AA	i
15	MPZB15S40F65K	HJL26060	QOB280	24	12	60	BB	i
25	MPZB25S40F65K	HJL26100	QOB2125	24	12	100	BB	i

Single Phase with 316 Stainless Steel Enclosure

480 Volt Primary, Load Center Interior, Interrupt Rating 18 kAIR, NEMA Type 3R

kVA	Part Number	Primary Main	Secondary Main	Feeder Circuit Breakers			Enclosure	Wiring Diagram
				Maximum Number		Maximum Ampere Rating		
				1 pole	2 pole			
5	MPZ5S40FSS	FAL24015	QO230	10	5	20	A	i
7.5	MPZ7S40FSS	FAL24020	QO240	10	5	30	A	i
10	MPZ10S40FSS	FAL24030	QO260	10	5	40	A	i
15	MPZ15S40FSS	FAL24060	QO280	24	12	60	B	i
25	MPZ25S40FSS	FAL24100	QO2125	24	12	100	B	i

480 Volt Primary, NQ Panelboard Interior, Interrupt Rating 18 kAIR, NEMA Type 3R

kVA	Part Number	Primary Main	Secondary Main	Feeder Circuit Breakers			Enclosure	Wiring Diagram
				Maximum Number		Maximum Ampere Rating		
				1 pole	2 pole			
5	MPZB5S40FSS	FAL24015	QOB230	10	5	20	AA	i
7.5	MPZB7S40FSS	FAL24020	QOB240	10	5	30	AA	i
10	MPZB10S40FSS	FAL24030	QOB260	10	5	40	AA	i
15	MPZB15S40FSS	FAL24060	QOB280	24	12	60	BB	i
25	MPZB25S40FSS	FAL24100	QOB2125	24	12	100	BB	i

Three Phase

480 Volt Primary, Load Center Interior, Interrupt Rating 18 kAIR, NEMA Type 3R

kVA	Part Number	Primary Main	Secondary Main	Feeder Circuit Breakers			Enclosure	Wiring Diagram
				Maximum Number		Maximum Ampere Rating		
				1 pole	3 pole			
15	MPZ15T2F	FAL34040	QO360	24	8	40	C	ii
22.5	MPZ22T2F	FAL34070	QO380	24	8	60	C	ii
30	MPZ30T2F	FAL34090	QO3100	24	8	80	C	iii

480 Volt Primary, NQ Panelboard Interior, Interrupt Rating 18 kAIR, NEMA Type 3R

kVA	Part Number	Primary Main	Secondary Main	Feeder Circuit Breakers			Enclosure	Wiring Diagram
				Maximum Number		Maximum Ampere Rating		
				1 pole	3 pole			
15	MPZB15T2F	FAL34040	QOB360	24	8	40	CC	ii
22.5	MPZB22T2F	FAL34070	QOB380	24	8	60	CC	ii
30	MPZB30T2F	FAL34090	QOB3100	24	8	80	CC	iii

480 Volt Primary, Load Center Interior, Interrupt Rating 25 kAIR, NEMA Type 3R

kVA	Part Number	Primary Main	Secondary Main	Feeder Circuit Breakers			Enclosure	Wiring Diagram
				Maximum Number		Maximum Ampere Rating		
				1 pole	3 pole			
15	MPZ15T2F25K	FAL34040	QO360	24	8	40	C	ii
22.5	MPZ22T2F25K	FAL34070	QO380	24	8	60	C	ii
30	MPZ30T2F25K	FAL34090	QO3100	24	8	80	C	iii

480 Volt Primary, NQ Panelboard Interior, Interrupt Rating 25 kAIR, NEMA Type 3R

kVA	Part Number	Primary Main	Secondary Main	Feeder Circuit Breakers			Enclosure	Wiring Diagram
				Maximum Number		Maximum Ampere Rating		
				1 pole	3 pole			
15	MPZB15T2F25K	FAL34040	QOB360	24	8	40	CC	ii
22.5	MPZB22T2F25K	FAL34070	QOB380	24	8	60	CC	ii
30	MPZB30T2F25K	FAL34090	QOB3100	24	8	80	CC	iii

480 Volt Primary, NQ Panelboard Interior, Interrupt Rating 65 kAIR, NEMA Type 3R

kVA	Part Number	Primary Main	Secondary Main	Feeder Circuit Breakers			Enclosure	Wiring Diagram
				Maximum Number		Maximum Ampere Rating		
				1 pole	3 pole			
15	MPZB15T2F65K	HJL34040	QOB360	24	8	40	CC	ii
22.5	MPZB22T2F65K	HJL34070	QOB380	24	8	60	CC	ii
30	MPZB30T2F65K	HJL34090	QOB3100	24	8	80	CC	iii

Three Phase with 316 Stainless Steel Enclosure

480 Volt Primary, Load Center Interior, Interrupt Rating 18 kAIR, NEMA Type 3R

kVA	Part Number	Primary Main	Secondary Main	Feeder Circuit Breakers			Enclosure	Wiring Diagram
				Maximum Number		Maximum Ampere Rating		
				1 pole	3 pole			
15	MPZ15T2FSS	FAL34040	QO360	24	8	40	C	ii
22.5	MPZ22T2FSS	FAL34070	QO380	24	8	60	C	ii
30	MPZ30T2FSS	FAL34090	QO3100	24	8	80	C	iii

480 Volt Primary, NQ Panelboard Interior, Interrupt Rating 18 kAIR, NEMA Type 3R

kVA	Part Number	Primary Main	Secondary Main	Feeder Circuit Breakers			Enclosure	Wiring Diagram
				Maximum Number		Maximum Ampere Rating		
				1 pole	3 pole			
15	MPZB15T2FSS	FAL34040	QOB360	24	8	40	CC	ii
22.5	MPZB22T2FSS	FAL34070	QOB380	24	8	60	CC	ii
30	MPZB30T2FSS	FAL34090	QOB3100	24	8	80	CC	iii

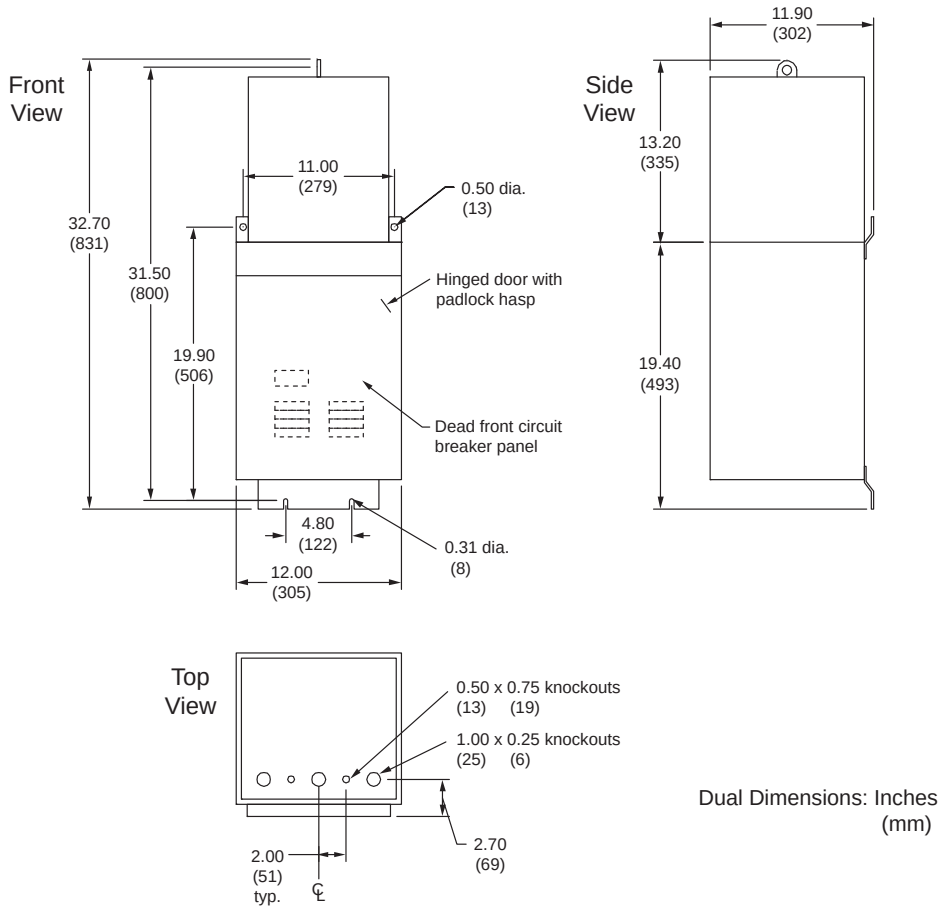
Made-to-Order Units

- Secondary voltages are always:

  Single phase: 120/240
  Three phase: 208Y/120
- Primary voltage options are:
  - — Single Phase
    600 Volts
    240 Volts
    208 Volts
  - — Three Phase
    600 Volts
    240 Volts
    208 Volts
- Transformer with electrostatic shielding
- Temperature rise 80°C on transformer
  - — 5 to 15 kVA, single phase (not available on 25 kVA)
  - — 15 to 22.5 kVA, three phase (not available on 30 kVA)
- Primary circuit breaker options
  - — Shunt trip, 120 Volts
- Other packaged products available
  - — Transformer combo available as floor mounted switchboards: 15 to 225 kVA; see the current edition of the Schneider Electric Digest

Enclosure Drawings

Single Phase—Enclosure A

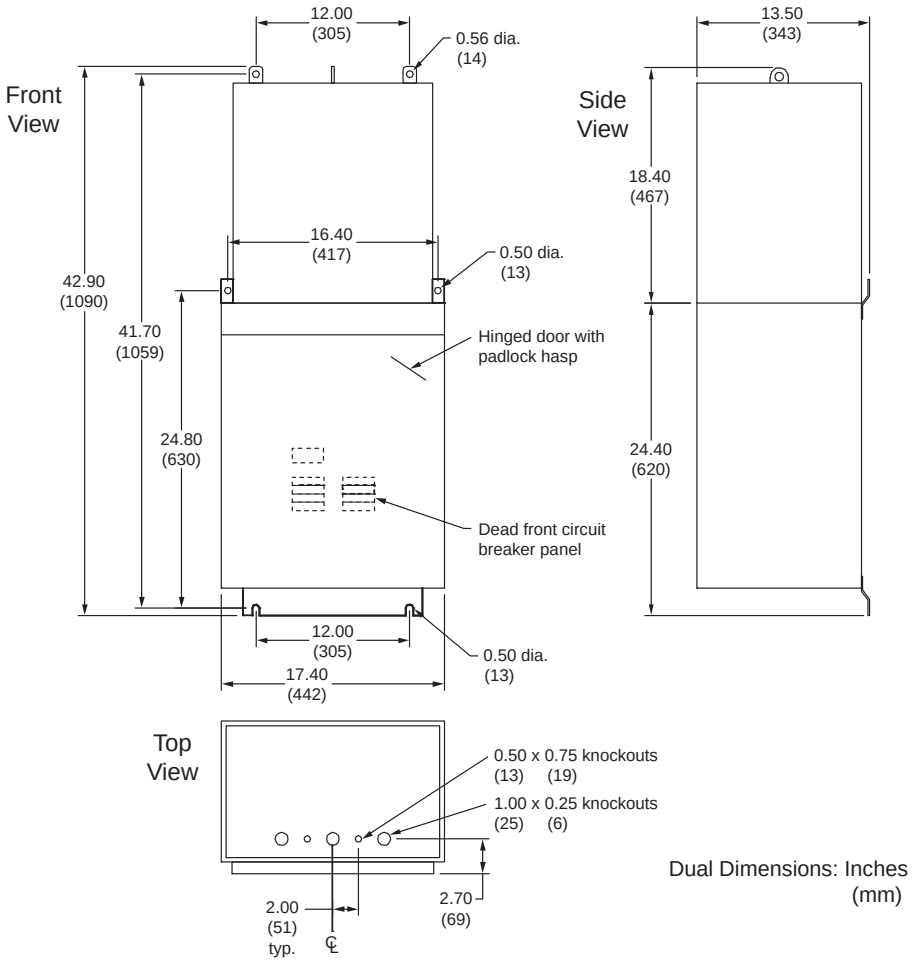


Dual Dimensions: Inches
(mm)

Replacement Parts

Item	Catalog Number
Box	39002-350-50
Dead front	39002-360-01
Hinged cover	39002-351-01
Back plate	39002-353-01
Ground bar	PK18GTA

Single Phase—Enclosure B

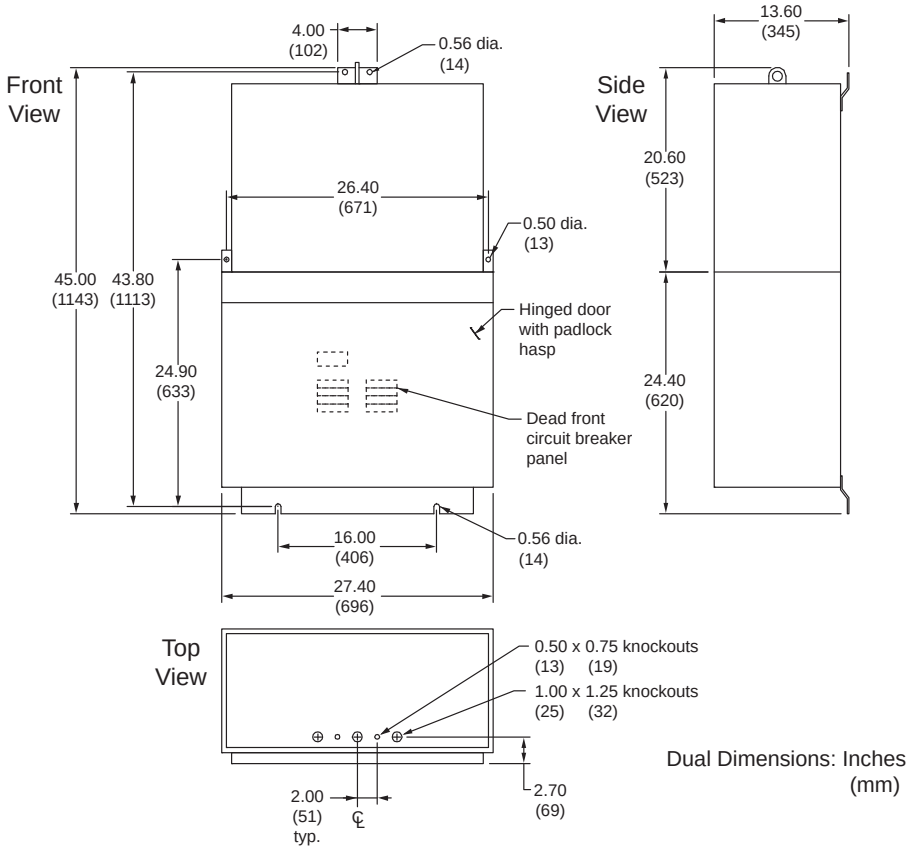


Dual Dimensions: Inches
(mm)

Replacement Parts

Item	Catalog Number
Box	39002-366-50
Dead front	39002-387-01
Hinged cover	39002-368-01
Back plate	39002-369-01
Ground bar	PK18GTA
Neutral assembly	SN-38

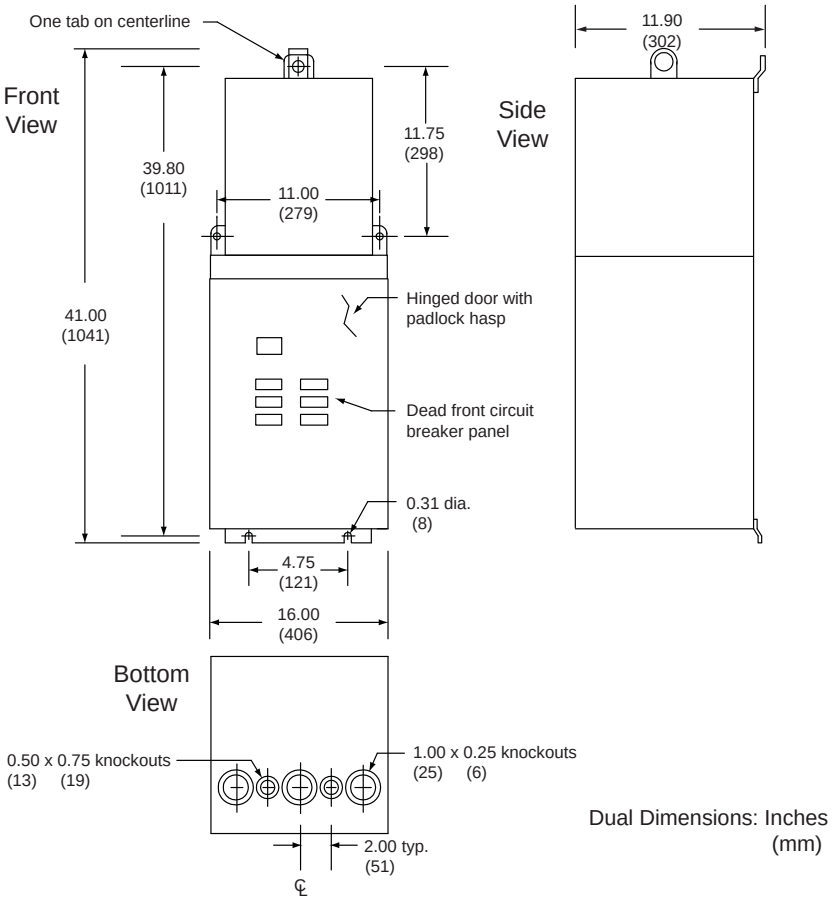
Three Phase—Enclosure C



Replacement Parts

Item	Catalog Number
Box	39002-400-50
Dead front	39007-023-01
Hinged cover	39002-388-01
Back plate	39002-389-01
Ground bar	PK18GTA
Neutral assembly	SN-38

Single Phase—Enclosure AA

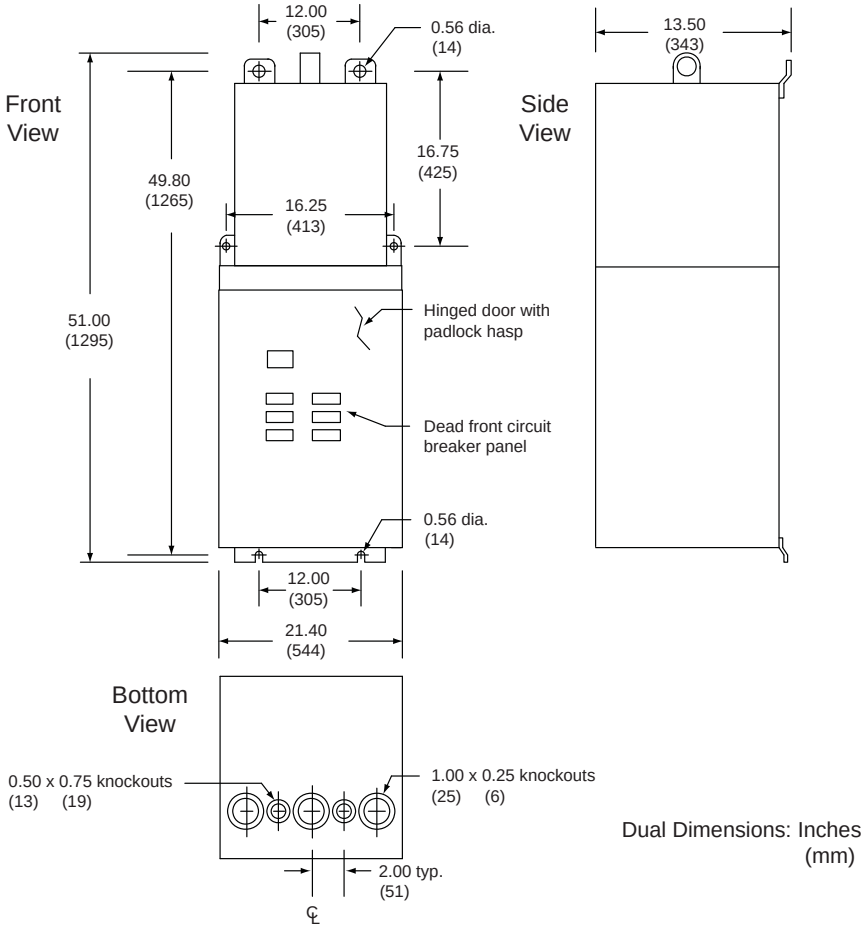


Dual Dimensions: Inches (mm)

Replacement Parts

Item	Catalog Number
Box	39002-412-50
Dead front	39002-412-07
Hinged cover	39002-412-08
Back plate	39002-419-01
Ground bar	PK18GTA
Neutral assembly	SN-38

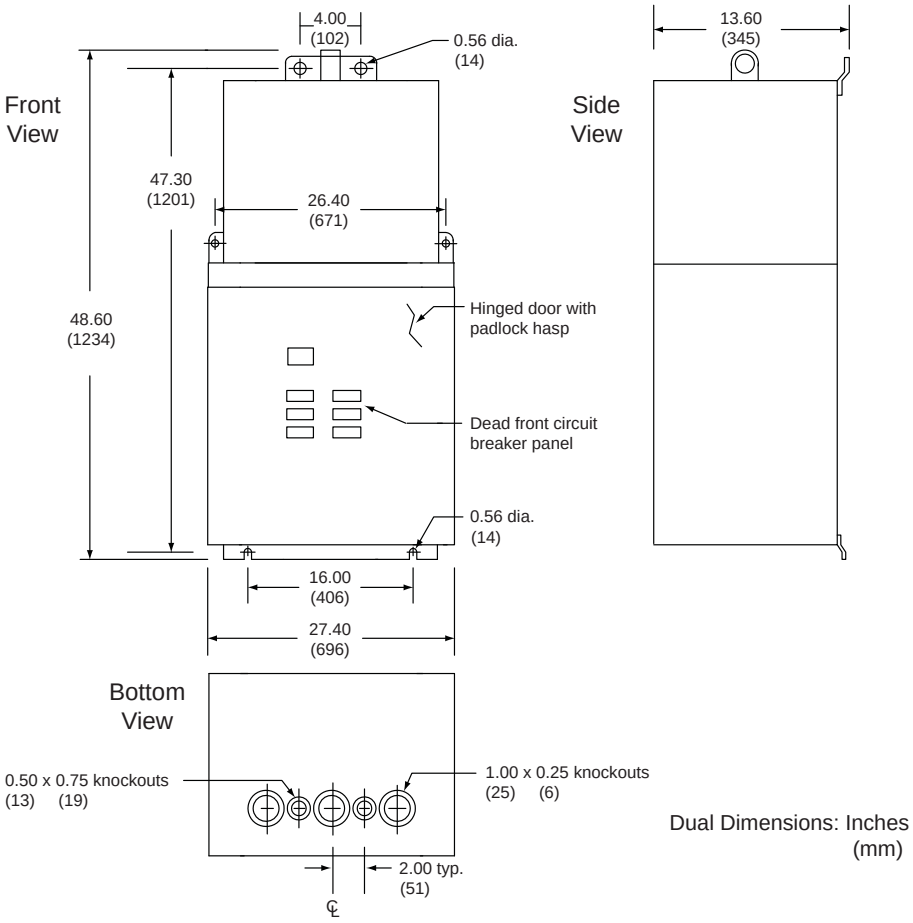
Single Phase—Enclosure BB



Replacement Parts

Item	Catalog Number
Box and back plate	39002-431-50
Dead front	39002-431-05
Hinged cover	39002-431-06
Ground bar	PK18GTA
Neutral assembly	SN-38

Three Phase—Enclosure CC



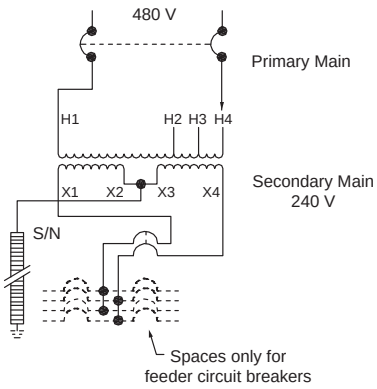
Replacement Parts

Item	Catalog Number
Box and back plate	39007-189-50
Dead front	39007-186-02
Hinged cover	39002-416-01
Ground bar	PK18GTA
Neutral assembly	SN-38

Wiring Diagrams

Single Phase

Diagram i



Three Phase

Diagram ii

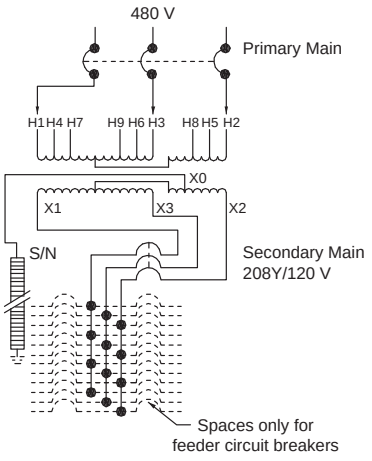
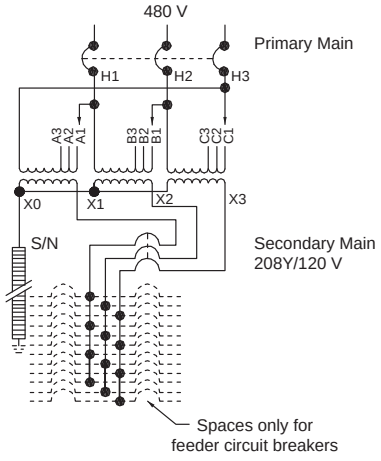


Diagram iii



Additional Information

Designed for Ease of Installation

The Mini Power-Zone Unit Substation has a unique two-part construction that provides installation flexibility. This two-part construction uses removable transformers, available from factory stock, which can be replaced without disturbing external panelboard wiring. The transformer and panelboard can be mounted one part at a time if there is a space or handling problem.

The panelboard can be removed and wired first, if desired. The transformer simply mounts on top of the panelboard, and the primary and secondary leads are re-connected to the main circuit breakers.

All sizes are carried in Schneider Electric warehouse system stock. Each comes complete with the transformer and the main primary and secondary circuit breakers, all sized in accordance with NEC requirements. Branch circuit breakers are supplied separately.

Replacement Transformers and Interiors
Does not include backfeed secondary main circuit breaker

Phase	kVA	Catalog Number		
		Transformer	Interior	
			Load Center	Panelboard
1	5	MPT5S40F	QON30CCI	NQM18L1C
	7.5	MPT7S40F		
	10	MPT10S40F		
	15	MPT15S40F		NQM30L2C
	25	MPT25S40F		
3	15	MPT15T2F	QON330L200	NQM430L1C
	22.5	MPT22T2F		
	30	MPT30T2F		

Special Applications

Solar Photovoltaic Systems

- NEC 690.64 Point of Connection

  The output of a photovoltaic (PV) utility interactive inverter can be connected to either the line or load side of the utility service, based on the system design and the requirements found in NEC 690.64. Mini Power-Zone units are ideal where voltage transformation is needed. The units include both primary and secondary overcurrent protective devices along with panelboard mounted devices for each inverter output.

  Particular attention must be paid for load side connections and the requirements of NEC 690.64(B). If the panelboard in the Mini Power-Zone unit contains overcurrent protective devices for both PV inverter sources and system branch circuits or feeders, the sum of the ampere ratings of devices supplying power to the panelboard cannot exceed 120% of its ratings to comply with 690.64(B)(2). In addition, consider 690.64(B)(7), where the sum of the ampere ratings of devices supplying power exceeds the panelboard rating the devices used to connect PV inverters must be located at the opposite end from the input feeder or main circuit location. Since the panelboard devices are backfed from the PV inverters, hold down brackets are required to comply with 690.64(B)(6). Contact your local Schneider Electric representative for specific application assistance on using Mini Power-Zone units in PV systems.

- NEC 690.9 (B) Power Transformers

  Must meet NEC 450.3 for overcurrent protection for primary protection.

  Since the Mini Power-Zone unit will be used in both directions, the main circuit breakers must both comply with the secondary overcurrent protection limit of 125% maximum. That being the case, the limits for the primary circuit breakers at 480 V are as shown in the following table.

kVA	Phase	480 V Current	125% Handle Rating
5	1	10.42	15 [1]
7.5	1	15.63	20 [1]
10	1	20.83	30 [1]
15	1	31.25	40
25	1	50.08	70
15	3	18.04	25
22.5	3	27.06	35
30	3	36.08	50

[1] The standard single phase 5, 7.5, and 10 kVA circuit breakers comply with NEC 690.9 (B). Others will have to be quoted as special orders to meet the requirement.

Product Specifications

Unit Substations

UL Listed per UL 1062 File E92978

Transformers

Specification Number: 26 20 00.16

Product Name: DRY TYPE RESIN ENCAPSULATED TRANSFORMERS

Primary Overcurrent Protection (Circuit Breaker)

Specification Number: 26 28 16.14

Product Name: MOLDED CASE CIRCUIT BREAKERS

Secondary Panelboard and Secondary Main

Specification Number: 26 24 19.05

Product Name: LIGHTING AND APPLIANCE BRANCH CIRCUIT LOAD CENTERS

or

Specification Number: 26 24 16.14

Product Name: LIGHTING AND APPLIANCE BRANCH CIRCUIT PANELBOARDS 240 VAC, 48 VDC MAXIMUM

Surge Voltage Protection Adapter for Mobile Phone and Radio Link Systems COAXTRAB

Stay on the air with COAXTRAB. For the connection of antennae in transceiver systems with F or N connectors, COAXTRAB offers ideal surge voltage protection. Thanks to the good impedance matching, high transmission capacities of frequencies up to 3 GHz are no problem.

As coarse protection, there is a replaceable gas-filled surge voltage arrester in the CN-UB-280DC... adapter housing. In the case of a fault the surge voltage arrester can be removed by unscrewíng a screw in the housing and inserting the replacement CN-UB-G1 gas arrester.

The protective adapter can be mounted permanently, in the switch cabinet, for example, with the CN-UB assembly board.

Phoenix Contact GmbH & Co. KG • 32823 Blomberg, Germany
Phone +49 52 35 3-00 • Fax +49 52 35 3-4 12 00 • www.phoenixcontact.com

COAXTRAB CN-UB-280DC
with N-Connector

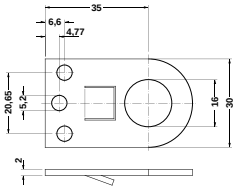
Technical data

		Type	Article no.	Pcs. Pkt.
COAXTRAB,				
as surge voltage protection for coaxial cables	N-Connector	**CN-UB-280DC-SB**[1])	**28 18 14 8**	**1**
	N-Connector	**CN-UB-280DC-BB**[1])	**28 18 85 0**	**1**
Reserve gas-filled surge arrester		**CN-UB-G1**	**28 18 20 3**	**10**
CN-UB assembly board		**CN-UB/MP**	**28 18 13 5**	**10**

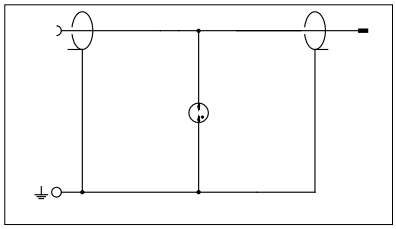
Technical data

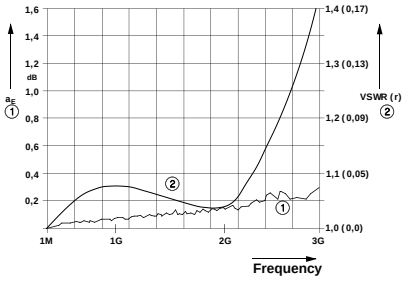
IEC category/VDE requirement class:		C2, C3, D1
Arrester rated voltage (highest constant volt.) U_C:		280 V DC
Nominal current I_N:		5 A/25 °C
Operating current I_C at U_C:		≤ 1 µA
Nominal discharge surge current I_n (8/20):		20 kA
Output voltage threshold at 1 kV/µs:	asym. (⏚)	≤ 700 V
Protection level U_p:	asym. (⏚)	≤ 700 V
Response time t_a:	asym. (⏚)	≤ 100 ns
Cut-off frequency f_g (3 dB) (typ.):	asym. in a 50 Ω system	> 3 GHz
Standing wave ratio (SWR) in a 50 Ω system:		≤ 1.1 bis 2.0 GHz
perm. HF power P_{max} at SWR= 1.1/∞ in a 50 Ω system:		700 W/200 W
Capacitance (typ.):	asym. (GND/⏚)	1.5 pF
Connection:		N-Connector 50 Ω
Temperature range:		– 25 °C bis + 80 °C
Protection type in acc. with IEC 529/ EN 60 529:		IP 55
Approvals:		
Based on test standards:		Draft IEC 61643-21:2000-09, E VDE 0845 T.3-1:1999-07

[1]) with 7/16 connectors on request

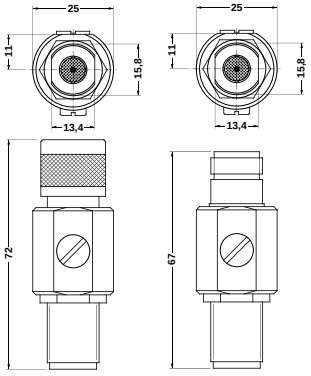


Dimensional drawing CN-UB assembly board





①Typical attenuation curve CN-UB-280DC...
②Typical VSWR on CN-UB-280DC...



Dimensional drawing CN-UB 280 DC-SB and CN-UB 280 DC-BB

COAXTRAB CF-UB-280DC-SB-SET
with F-Connector

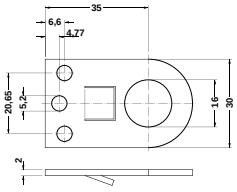
Technical data

		Type	Article no.	Pcs. Pkt.
COAXTRAB, as surge voltage protection for coaxial cables	N-Connector N-Connector	**CF-UB-280DC-SB-SET**	**28 39 54 1**	**1**
Reserve gas-filled surge arrester		**CN-UB-G1**	**28 18 20 3**	**10**
CN-UB assembly board		**CN-UB/MP**	**28 18 13 5**	**10**

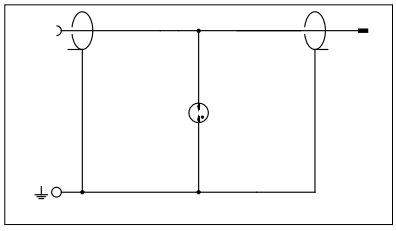
Technical data

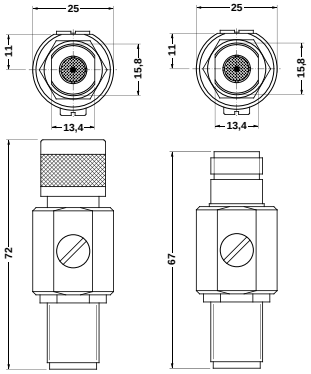
IEC category/VDE requirement class:		C2, C3, D1
Arrester rated voltage (highest constant volt.) U_C:		280 V DC
Operating current I_C at U_C:		≤ 1 µA
Nominal discharge surge current I_n (8/20):		10 kA
Output voltage threshold at 1 kV/µs:	asym. (⏚)	≤ 700 V
Protection level U_p:	asym. (⏚)	≤ 700 V
Response time t_a:	/asym. (⏚)	≤ 100 ns
Cut-off frequency f_g (3 dB) (typ.):	asym. in a 50 Ω system	> 2 GHz
Capacitance (typ.):	asym. (⏚)	1.5 pF
Connection:		F-Connector 75 Ω
Temperature range:		– 20 °C bis + 80 °C
Protection type in acc. with IEC 529/ EN 60 529		IP 55
Based on test standards:		Draft IEC 61643-21:2000-09, E VDE 0845 T.3-1:1999-07

[1]) with 7/16 connectors on request



Dimensional drawing CN-UB assembly board





Dimensional drawing CN-UB 280 DC-SB and CN-UB 280 DC-BB

Extract from the online catalog

RAD-CAB-LMR400-60

Order No.: 2867380

http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2867380

Antenna extension cable, length: 60 ft

Commercial data	
GTIN (EAN)	4 017918 931759
Note	Made-to-order
sales group	H178
Pack	1 pcs.
Customs tariff	85442000
Catalog page information	Page 679 (IF-2011)

Product notes

WEEE/RoHS-compliant since: 07/01/2006

http://www.download.phoenixcontact.com
Please note that the data given here has been taken from the online catalog. For comprehensive information and data, please refer to the user documentation. The General Terms and Conditions of Use apply to Internet downloads.

Technical data

General

Connection 1	Plug connector connection
Connection method	Type N (male)
Fixed cable length	18 m
Cable type	LMR-400
Cable, attenuation	0.13 dB/m

Minimum bending radius	25.00 mm
External diameter	10.00 mm
Outer sheath, material	PE
Connection name	Plug connector connection
Connection method	Type N (male)
Note	Both sides
Ambient temperature (operation)	-40 °C ... 85 °C

Address

PHOENIX CONTACT Deutschland GmbH
Flachsmarktstr. 8
32825 Blomberg,Germany
Phone +49 5235 3 12000
Fax +49 5235 3 41200
http://www.phoenixcontact.de

Extract from the online catalog

RAD-CON-MCX90-N-SS

Order No.: 2885207

http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2885207

Adapter cable, pigtail 120 cm 90° MCX(m) -> N(m)

Commercial data	
GTIN (EAN)	4 017918 986513
sales group	H178
Pack	1 pcs.
Customs tariff	85442000
Catalog page information	Page 679 (IF-2011)

Product notes

WEEE/RoHS-compliant since: 06/30/2006

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Technical data

General

Connection 1	Plug connector connection
Connection method	Type 90° MCX (male)
Connection 2	Plug connector connection
Connection method	Type N (male)
Fixed cable length	1.2 m

Cable type	RG 316
Cable, attenuation	0.89 dB/m
Minimum bending radius	25.40 mm
External diameter	2.50 mm
Outer sheath, material	Fluorinated ethylene propylene (FEP)
Connection name	Plug connector connection
Connection method	Type 90° MCX (male)
Ambient temperature (operation)	-40 °C ... 75 °C

Address

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Flachsmarktstr. 8
32825 Blomberg,Germany
Phone +49 5235 3 12000
Fax +49 5235 3 41200
http://www.phoenixcontact.de

Extract from the online catalog

RAD-ISM-900-ANT-OMNI-FG-6-N

Order No.: 2885579

http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2885579

Omnidirectional antenna, IP65 protection, gain 8 dBi, connection N (female)

Commercial data	
GTIN (EAN)	4 046356 149471
Note	Made-to-order
sales group	H179
Pack	1 pcs.
Customs tariff	85177019
Catalog page information	Page 676 (IF-2011)

Product notes

WEEE/RoHS-compliant since: 06/30/2006

http://www.download.phoenixcontact.com
Please note that the data given here has been taken from the online catalog. For comprehensive information and data, please refer to the user documentation. The General Terms and Conditions of Use apply to Internet downloads.

Technical data

General data

Frequency range	900 MHz
Horizontal beamwidth	360 °
Vertical beamwidth	15 °
Impedance	50 Ω
Gain	8 dBi

Connection method	N (female)
Degree of protection	IP65
Ambient temperature (operation)	-40 °C ... 80 °C
Width	6.05 cm
Height	180.34 cm

Address

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Flachsmarktstr. 8
32825 Blomberg,Germany
Phone +49 5235 3 12000
Fax +49 5235 3 41200
http://www.phoenixcontact.de

Extract from the online catalog

RAD-CAB-RG213-40

Order No.: 2867377

http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2867377

Antenna extension cable, length: 40 ft

Commercial data	
GTIN (EAN)	4 017918 931735
Note	Made-to-order
sales group	H178
Pack	1 pcs.
Customs tariff	85442000
Catalog page information	Page 679 (IF-2011)

Product notes

WEEE/RoHS-compliant since: 07/01/2006

http://www.download.phoenixcontact.com
Please note that the data given here has been taken from the online catalog. For comprehensive information and data, please refer to the user documentation. The General Terms and Conditions of Use apply to Internet downloads.

Technical data

General

Connection 1	Plug connector connection
Connection method	Type N (male)
Fixed cable length	12 m
Cable type	RG-213U
Cable, attenuation	0.25 dB/m

Minimum bending radius	127.00 mm
External diameter	10.00 mm
Outer sheath, material	PE
Connection name	Plug connector connection
Connection method	Type N (male)
Note	Both sides
Ambient temperature (operation)	-40 °C ... 80 °C

Address

PHOENIX CONTACT Deutschland GmbH
Flachsmarktstr. 8
32825 Blomberg,Germany
Phone +49 5235 3 12000
Fax +49 5235 3 41200
http://www.phoenixcontact.de

RAD-ISM-900-ANT-YAGI-6.5-N

6.5 dB Yagi for 900 MHz

INTERFACE

Data Sheet

Antenna Specifications

Part No. 2867814

Bottom Operating Frequency	890 MHz
Top Operating Frequency	960 MHz
Nominal Gain	6.5 dBd
Horizontal Beamwidth (Deg-3dB)	100°
Vertical Beamwidth (Deg-3dB)	62°
Front to Back Ration	15 dB
Length	6.8 in. (172 mm)
Width	2.38 in. (60.5 mm)
Antenna Weight	1.3 lb. (590 g)
Rated Wind Velocity	125 mph (201 kph)
Connector	2 ft. (0.6 m) RG-213 with N-Type Female

2203B001

PHOENIX CONTACT • P.O. Box 4100 • Harrisburg, PA 17111-0100
Phone: 800-888-7388 • 717-944-1300 • Technical Service: 800-322-3225 • Fax: 717-944-1625 • E-mail: info@phoenixcon.com
Website: www.phoenixcon.com

RAD-ISM-900-ANT-YAGI-10-N

10 dB Yagi for 900 MHz

INTERFACE

Data Sheet

Antenna Specifications

Part No. 5606614

Bottom Operating Frequency	890 MHz
Top Operating Frequency	960 MHz
Nominal Gain	10 dBd
Horizontal Beamwidth (Deg-3dB)	56°
Vertical Beamwidth (Deg-3dB)	46°
Front to Back Ration	20 dB
Length	6.8 in. (172 mm)
Width	2.38 in. (60.5 mm)
Antenna Weight	2.0 lb. (907 g)
Rated Wind Velocity	125 mph (201 kph)
Connector	2 ft. (0.6 m) RG-213 with N-Type Female

PHOENIX CONTACT • P.O. Box 4100 • Harrisburg, PA 17111-0100
Phone: 800-888-7388 • 717-944-1300 • Technical Service: 800-322-3225 • Fax: 717-944-1625 • E-mail: info@phoenixcon.com
Website: www.phoenixcon.com

SYNERGY ENVIRONMENTAL, LLC

TEMPERATURE SENSORS

SIEMENS

Technical Specification Sheet
Document No. 149-428
June 3, 2008

4-20 mA Room Temperature Sensors

Figure 1. Room Sensor.

Description

The 4-20 mA room temperature sensors provide input for accurate loop powered temperature sensing (detecting) via a 20 AWG twisted, shielded cable pair. The loop current varies according to the temperature being measured. Several models are available with different temperature ranges for sensing applications.

The room housing incorporates ventilation slits around the perimeter for accurate sensing of the controlled space. The Siemens logo is also featured on the front.

The sensor mounts either directly on drywall or on a 2 ×4 box with an accessory (see *Accessories Ordering Information*). No calibration or maintenance is required.

Specifications

Temperature mounting range	See Table 1.
Output signal	4-20mA
Elements	Platinum RTD
Accuracy	See Table 1.
Reference resistance at 32°F (0°C)	100 Ω

Table 1. Sensor Specifications.

Application	Temperature Range (Transmitter and Sensor Combined)	Element Package	Product Number
Room – Sensing only	40°F to 90°F/±0.7°F (4°C to 32°C/±0.3°C)	Series 1000 Room Housing	536-752*
	20°F to 120°F/±0.7°F (-7°C to 49°C/±0.3°C)		536-753*

* Add letter suffix to indicate desired color: A = Desert Beige; B = White: BN = White, No Logo

Accessories Ordering Information

Description	Product Part Number
Blank Bezel, 25-pack, (Beige)	544-482A
Blank Bezel, 25-pack, (White)	544-482B
Single Adapter Base Kit (Beige)	544-782A
Single Adapter Base Kit (White)	544-782B
Double Adapter Base Kit (Beige)	544-783A
Double Adapter Base Kit (White)	544-783B
Non-Conduit Rough-In Kit	544-784
Extender Ring Kit (Beige)	544-785A
Extender Ring Kit (White)	544-785B

SYNERGY ENVIRONMENTAL, LLC

SITE SECURITY

COOPER LIGHTING - LUMARK®

energy solutions

DESCRIPTION

The Lumark Tribute is the most versatile, functionally designed, universally adaptable outdoor luminaire available. The Tribute brings outstanding performance to walkways, parking lots, roadways, loading docks, building areas, and any security lighting application. U.L. listed and CSA certified for wet locations.

Catalog #	MPTR-SL-150-120-LL	Type
Project	RID - 95	SA
Comments	SSS POLE 15.5 W/ 2.5' BASE	Date
Prepared by		

SPECIFICATION FEATURES

Construction
Rugged one-piece die-cast aluminum housing and door frame. One-piece silicone gasket protects the optical chamber from performance degrading contaminants. One (1) stainless spring latch and two (2) stainless hinges allow toolless opening and removal of door frame.

Reflector
Choice of nine (9) high efficiency optical distributions, including five (5) segmented optical systems constructed of premium 95% reflective odized aluminum sheet. Optical segments are rigidly mounted inside a thick gauge aluminum housing for superior protection. All segment faces are clean of rivet heads, tabs or other means of attachment which may cause streaking in the light distribution. Optical modules are field rotatable in 90° increments and offered standard with mogul base lampholders for High Pressure Sodium and 200-400W Metal Halide assemblies or medium-base lampholders for Metal Halide 150W and below.

Electrical
Ballast and related electrical componentry are hard mounted to die-cast housing for optimal heat transfer and operating efficiency. Optional swing-down galvanized steel power tray with integral handle and quick disconnects allows tray to be completely removed from housing providing ample room for fixture installation and maintenance.

Mounting
Extruded 8" aluminum arm features internal bolt guides for easy positioning of fixture during installation to pole or wall surface.

Standard single carton packaging of housing, square pole arm and round pole adapter allow for consolidated product arrival to site. Optional internal mast arm mount accepts a 1 1/4" to 2 3/8" O.D. horizontal tenon, while a 4-bolt clamping mechanism secures fixture. Cast-in leveling guides provide +/-5° vertical leveling adjustment.

Finish
Housing and arm finished in a 5 stage premium TGIC bronze polyester powder coat paint. Optional colors include black, grey, white, dark platinum and graphite metallic. RAL and custom color matches available.

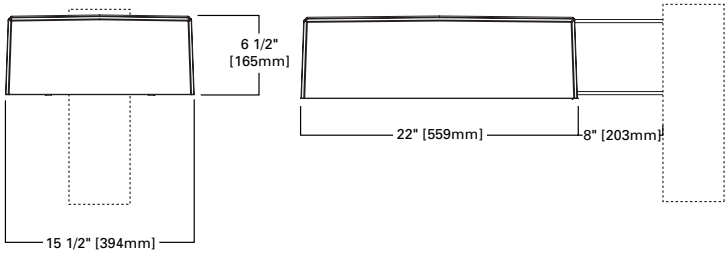
TR
TRIBUTE

70 - 400W
High Pressure Sodium
Pulse Start Metal Halide
Metal Halide

AREA LUMINAIRE

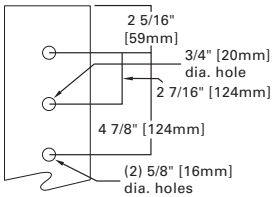
DARK SKY COMPLIANT FCO Full Cutoff

DIMENSIONS

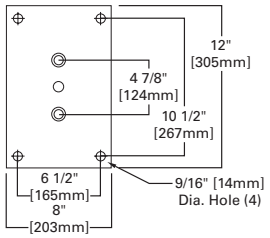


DRILLING PATTERNS

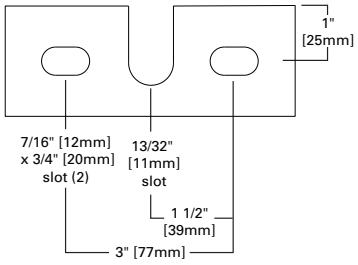
TYPE "M"



WALL MOUNT (MA1219-XX)



TRUNNION MOUNT



TECHNICAL DATA

UL Wet Locations Listed
CSA Certified
EISA Compliant Ⓔ

ENERGY DATA

Hi-Reactance Ballast Input Watts
70W HPS HPF (95 Watts)
100W HPS HPF (130 Watts)
150W HPS HPF (190 Watts)
150W MP HPF (185 Watts)

CWI Ballast Input Watts
250W HPS HPF (300 Watts)

CWA Ballast Input Watts
175W MH HPF (210 Watts)
200W MP HPF (227 Watts) Ⓔ
200W HPS HPF (250 Watts)
250W MH HPF (295 Watts)
250W MP HPF (283 Watts) Ⓔ
320W MP HPF (365 Watts) Ⓔ
350W MP HPF (397 Watts) Ⓔ
400W MP HPF (452 Watts) Ⓔ
400W MH HPF (455 Watts)
400W HPS HPF (465 Watts)

EPA

Effective Projected Area: (Sq. Ft.)
Without Arm: 1.19

SHIPPING DATA

Approximate Net Weight:
39 lbs. (17.73 kgs.)

ORDERING INFORMATION

Sample Number: MHTR-SL-400-MT-LL

Lamp Type
MP=Pulse Start Metal Halide
MH=Metal Halide
HP=High Pressure Sodium

Series [1]
TR= Tribute (Arm Included)

Distribution
2F=Type II Formed
2S=Type II Segmented
3F=Type III Formed
3S= Type III Segmented
4F= Type IV Formed
4S= Type IV Segmented
5F= Type V Formed
5S= Type V Segmented
SL= Spill Light Eliminator

Lamp Wattage [2]
MP
70=70W
100=100W
150=150W
200= 200W
250= 250W
320= 320W
350= 350W
400= 400W[3]
MH
175= 175W[4]
250= 250W[4]
400= 400W[3, 4]
HPS
70= 70W
100= 100W
150= 150W
250= 250W
400= 400W[3]

Voltage [5]
120V=120V
208V=208V
240V=240V
277V=277V
347V=347V[6]
480V=480V
DT=Dual-Tap
MT=Multi-Tap, wired 277V
TT=Triple-Tap, [6] wired 347V
5T=5 Tap Wired [5] 480V

Options
F1=Single Fuse (120, 277 or 347V [7] only)
F2=Double Fuse (208, 240 or 480V [7] only)
Q= Quartz Restrike (Hot Strike Only) [8]
EM= Quartz Restrike with "Delay Relay" (Quartz lamp strikes at both hot and cold starts) [8]
EM/SC= Emergency Separate [8] Circuit
LL= Lamp Included
S= 1 1/4" - 2 3/8" Internal Mast Arm Mount
TM= Trunnion Mount
PT= Electrical Power Tray
PER= NEMA Twistlock Photocontrol Receptacle
PC= Button Type Photocontrol [9]
HS= House Side Cutoff [10]
LA= Less Arm (Order Mounting Separately)

Accessories [11]
MA1201-XX=Direct Wall Mount Kit [1]
MA1218-XX=Direct Mount for Pole [1]
MA1219-XX=Wall Mounting Plate
OA1090-XX=Adjustable slipfitter Arm for Tenon Mount 2 3/8" O.D. [1]
MA1221-XX= External House Side Shield Kit (EPA= 0.38)
MA1222= Internal House Side Shield Kit for 2S/3S
MA1223= Internal House Side Shield Kit 4S
MA1224= Internal House Side Shield Kit for 2F/3F
MA1225= Internal House Side Shield Kit for 4F
MA1010-XX= SingleTenon Adapter for 3 1/2" O.D. Tenon
MA1011-XX= 2 @ 180 degrees Tenon Adapter for 3 1/2" O.D.Tenon
MA1012-XX= 3 @ 120 degrees Tenon Adaptor for 3 1/2" O.D. Tenon
MA1013-XX= 4 @ 90 degrees Tenon Adapter for 3 1/2" O.D. Tenon
MA1014-XX= 2 @ 90 degrees Tenon Adapter for 3 1/2" O.D. Tenon
MA1015-XX= 2 @ 120 degrees Tenon Adapter for 3 1/2" O.D. Tenon
MA1016-XX= 3 @ 90 degrees Tenon Adapter for 3 1/2" O.D. Tenon
MA1017-XX= Single Tenon Adapter for 2 3/8 " O.D. Tenon
MA1018-XX= 2 @ 180 degrees Tenon Adapter for 2 3/8" O.D. Tenon
MA1019-XX= 3 @ 120 degrees Tenon Adapter for 2 3/8" O.D. Tenon
MA1045-XX= 4 @ 90 degrees Tenon Adapter for 2 3/8" O.D. Tenon
MA1048-XX=2 @ 90 degrees Tenon Adapter for 2 3/8" O.D.Tenon
MA1049-XX=3 @ 90 degrees Tenon Adapter for 2 3/8" O.D. Tenon
OA/RA1013=Shorting Cap
OA/RA1016=Photoelectric Control 105-285V NEMA Type
OA/RA1027=Photoelectric Control 480V NEMA Type
OA/RA1201=Photoelectric Control 347V NEMA Type
TR/VS=Field Installed Vandal Shield [12]

Notes: 1 8 Inch Arm and pole adapter included with fixture. Specify Less Arm "LA" option when mounting accessory is ordered separately. 2 150W and below in Metal Halide are medium base sockets. All other wattages are mogul base. 3 Requires reduced envelope lamp. 4 175W, 250W, and 400W MH available in non-U.S. markets only. 5 Products also available in non-US voltages and 50HZ for international markets. Consult your Cooper Representative for availabiltiy and ordering information. 5T only available in 400W MH. 6 88% efficient EISA Compliant MP fixtures not available in 347V or TT Voltages. 7 Must specify voltage. 8 Quartz options not available with SL optics. 9 PC not available in 480V. 10 House side shield not available on 5S, 5F, or SL optics. 11 Order separately/replace XX with color specification. 12 Not available with SLE or House Side Sheild.

STOCK SAMPLE NUMBER (Lamp Included)

SAMPLE NUMBER: MPTR2340

MP	TR	23	
Lamp Type **MP**=Pulse Start Metal Halide **HP**=High Pressure Sodium [2]	**Series** [1] **TR**=Tribute	**Distribution** **23**=Type II/III Formed	**Lamp Wattage** **15**=150W **25**=250W **32**=320W **40**=400W

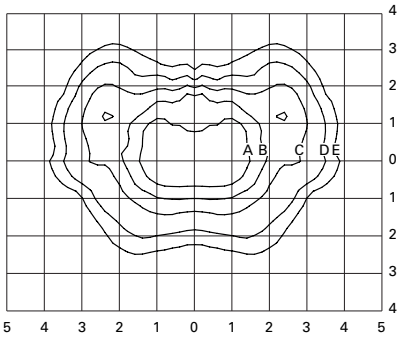
NOTES:

[1] Short logic fixtures are finished bronze include multi-tap ballast, lamp, arm and round pole adapter. Other options not available. Refer to standard ordering logic. [2] Available in 150, 250 and 400 Watt. Refer to In Stock Guide for availability.

VOLTAGE CHART	
DT=Dual-Tap	120/277 (wired 277V)
MT=Multi-Tap	120/208/240/277 (wired 277V)
TT=Triple-Tap	120/277/347 (wired 347V)
5T=5-Tap	120/208/240/277/480 (wired 480V)

LAMP TYPE	WATTAGE
Pulse Start Metal Halide	70, 100, 150, 250, 320, 350, 400W
Metal Halide	175, 250, 400W
High Pressure Sodium	70, 100, 150, 250, 400W

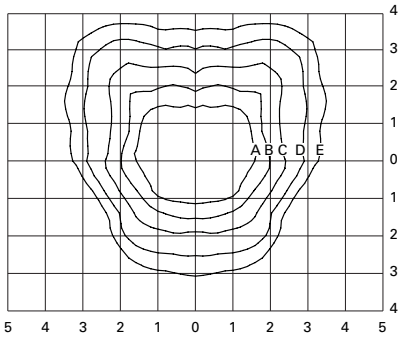
PHOTOMETRICS [Complete IES files available at www.cooperlighting.com]



MPTR-3S-320
320—Watt MP
30,000—Lumen Clear Lamp
Type III Segmented

Footcandle Table
Select mounting height and read across for footcandle values of each isofootcandle line. Distance in units of mounting height.

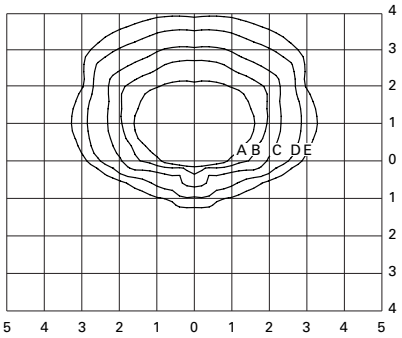
Mounting Height	Footcandle Values for Isofootcandle Lines				
	A	B	C	D	E
20'	3.00	1.50	0.75	0.30	0.15
25'	**2.00**	**1.00**	**0.50**	**0.20**	**0.10**
30'	1.38	0.69	0.34	0.13	0.06



MPTR-4S-400
400—Watt MP
40,000—Lumen Clear Lamp
Type IV Segmented

Footcandle Table
Select mounting height and read across for footcandle values of each isofootcandle line. Distance in units of mounting height.

Mounting Height	Footcandle Values for Isofootcandle Lines				
	A	B	C	D	E
20'	3.00	1.50	0.75	0.30	0.15
25'	**2.00**	**1.00**	**0.50**	**0.20**	**0.10**
30'	1.38	0.69	0.34	0.13	0.06



MPTR-SL-400
400—Watt MP
40,000—Lumen Clear Lamp
Spill Light Eliminator

Footcandle Table
Select mounting height and read across for footcandle values of each isofootcandle line. Distance in units of mounting height.

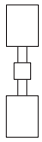
Mounting Height	Footcandle Values for Isofootcandle Lines				
	A	B	C	D	E
20'	3.00	1.50	0.75	0.30	0.15
25'	**2.00**	**1.00**	**0.50**	**0.20**	**0.10**
30'	1.38	0.69	0.34	0.13	0.06

MOUNTING CONFIGURATIONS

Wall Mount

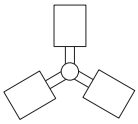
Arm Mount Single
EPA: 1.62

Arm Mount 2 @ 180
EPA: 3.24

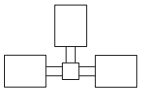


Arm Mount 2 @ 90
EPA: 3.24

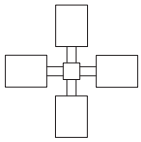
Arm Mount 3 @ 120
(Round Pole Only)
EPA: 4.43



Arm Mount 3 @ 90
EPA: 4.43



Arm Mount 4 @ 90
EPA: 5.03



PTZ-3330-NC10

Outdoor – Pan Tilt Zoom - IP Camera

IV&C
Industrial Video and Control

The PTZ-3330-NC10 is a quality, high-resolution color video camera, with an 18x motor-driven optical zoom. The pan, tilt and zoom functions can be controlled automatically and precisely from anywhere using the click-to-point, and preset view features in the IVC Relay Server. PTZ-3330-NC10 supports dual codecs and is able to deliver both MPEG4 and M-JPEG video. The PTZ camera is a high performance low-light camera that automatically switches to black and white and removes an IR cut filter to increase sensitivity in low light conditions. The camera is housed in a rugged, outdoor enclosure

The camera can accept one contact closure or TTL connect from an auxiliary security or process-monitoring devices, such as motion detectors or door alarms, to initiate automatic views and video recordings of intrusions.

The camera is ready for direct mounting and requires only a network connection. The network connection can be via the RJ-45 connector for a standard, Cat-5 copper network. The camera is powered via PoE.

Specifications

Imager	1/4" Sony ExView HAD CCD
Shutter	1 to 1/10,000 Seconds
Exposure	Auto
Min. Illumination	0.3 lux (Color) 0.005 lux (B/W)
White Balance	Auto
Iris	Auto
Gain	Auto
Focus	Auto
Zoom Ratio	18x Optical; 4x Digital
View Angle	2.7° - 48°
Focal Length	4.1 – 73.8 mm
F-number	1.4
Pan Angle	±170°
Pan Speed	Max. 100°per Second

Tilt Angle	-30° to +90°
Tilt Speed	Max. 90°per Second
Ethernet	Wireless 802.11g
I/O Terminals	1 input, 1 output
Resolution	704x480, 352x240
Compression	M-JPEG, MPEG4
Frame Rate	30 FPS (MJPEG); 30/21 FPS (MPEG4)
Protocols	TCP/IP, HTTP, FTP, SMTP
Oper. Temp.	32° - 114°C
Weight	14 lbs
Dimensions	14"H x 11"D (Camera Enclosure) 15"L x 5.5"H x 4"W (Mounting Arm)
Power Req.	12VDC via PoE
Power Cons.	15W

PTZ-3330-NC10 -24 VDC
Installation Guide

1 Check Receipt of All Components

Before you proceed, make sure you have received all of the components listed below:

1. Camera with Lens (including)
    a. PTZ IP Camera Dome
    b. Sun Shield and Arm already assembled and attached to the dome
    c. Lens. This is the transparent lower half of the dome.
2. Allen Wrench
3. Bench Test Kit (including)
    a. Cross-Over cable

Note: Only one Bench Test Kit is enclosed per order, it may be in a separate box

4. Any special mounting equipment (e.g. IVC Pole Mount Kit).

Note: Special mounting equipment may be in a separate box and may require additional materials for installation (Consult the specific kit for more information.).

In addition to the package contents you will also require:

- A flathead screwdriver
- A Windows™ computer running the Relay Server Software
- A Windows™ computer running Internet Explorer 6.x (or higher)
- Rain-X™ (optional, available from any hardware store)
- Tools for Special Mounting Kit (e.g. IVC Pole Mount Kit). (See kit for details)

2 Setup and Bench Test Camera

2.1 REMOVE PACKAGING AND INSPECT CAMERA

To ensure the integrity of the camera during shipping certain packing materials are placed inside the camera to protect the lens and electronics. To remove these:

1. Loosen the thumbscrews on either side of the dome.
2. Loosen the hex screw in between the two thumbscrews using the included Allen wrench.
3. Carefully remove the dome.
4. Remove the plastic wrap covering the camera lens.
5. We recommend that you apply Rain-X™ to the outer lens as directed by the instructions in the Rain-X™ container. Rain-X™ can be obtained at any hardware store.
6. Replace the dome and tighten the thumbscrews.
7. The dome lens is constructed of soft acrylic for optimal optical characteristics. It can be scratched easily. Use only a damp soft cloth or vigorous water spray to clean.

If any damage occurred during shipping please call our support line (617-467-3059) for assistance.

2.2 CONNECT THE CAMERA

This camera requires 24V DC to operate. To begin:

1. Locate the open Network connection. (see picture below)
2. Connect one end of the included Crossover cable to the open Ethernet port of the camera.

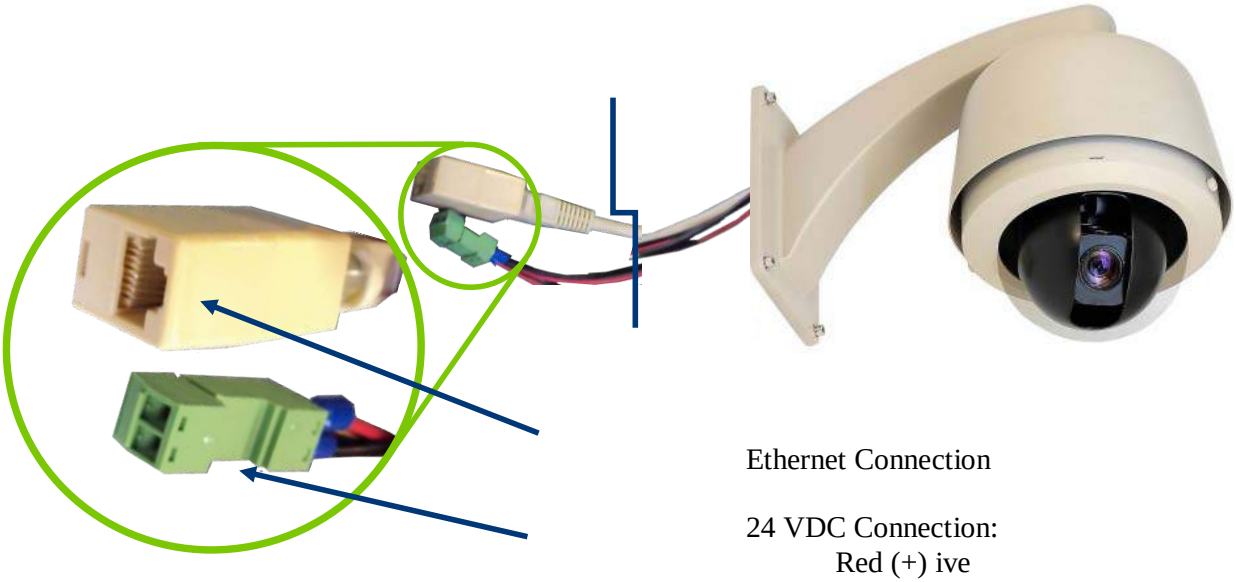
Note: If you are connecting the camera to a network switch or hub, use a straight-through network cable.

3. Connect the other end of the Crossover cable to your computer.
4. Connect the leads on the 24 VDC power cable to the camera. (see picture below)

Note: To connect the leads, insert the small screw driver in the upper “D” shaped hole and place the lead into the lower circular hole.

5. The camera should undergo a self-test. (i.e. the camera head will pan and tilt)

CONNECTION DIAGRAM



Ethernet Connection

24 VDC Connection:
Red (+) ive
Black (-) ive

2.3 SET THE CAMERA'S IP ADDRESS

For your convenience, the camera's default IP is printed on the information label attached to the camera box.

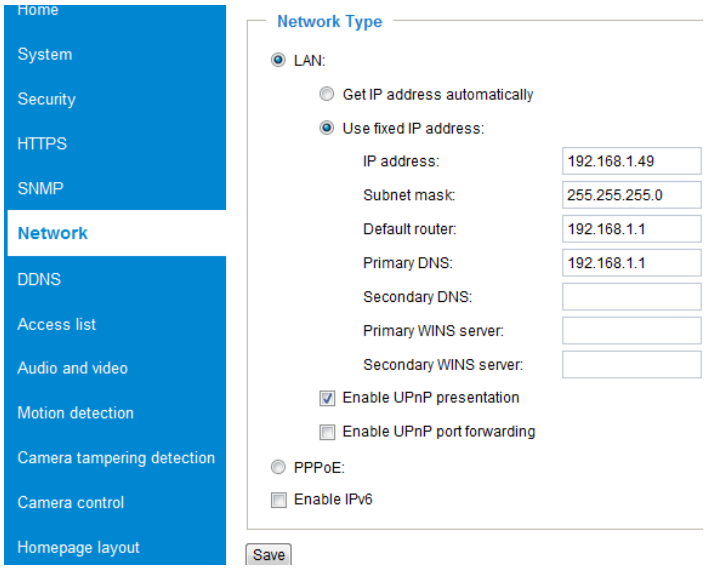
Fig. 2.3.1

The camera IP address has been set to one of ten addresses (192.168.0.99 through 192.168.0.108). For this section, the computer you are using for bench testing must be set to the same subnet as the camera (e.g. 192.168.0.###). Consult your network administrator if you need assistance. If you have difficulty locating the cameras IP address, the address can be determined by pinging each of the above addresses individually.

Once you have located the IP address please follow the instructions below to set it to a permanent address:

Note: For this section, the machine you are using for bench testing must be set to the same subnet as the camera (e.g. 192.168.0.###). Consult your network administrator if you need assistance.
Note: If you have lost the packaging materials for any reason, the address can be obtained by pinging each of the above addresses individually.
Note: If your system has been pre-configured do not change the IP address.

1. Type the camera's IP address into your browser's address bar and make sure you can see video.
2. Click **Configuration** on the left hand side at the bottom.
3. Now go to Network and enter the IP address the camera will be using. Optionally, you may also change the port setting and then his SAVE.



1) Camera will reboot. Wait for 10 seconds and then click **HOME**.

2.4 BENCH TEST COMPLETE

This concludes the bench test.

3 Mount and Connect Camera

3.1 MOUNT THE DOME

It is important to mount the dome to a solid, stable surface or pole. If the dome is to be bolted to a flat vertical surface, refer to the drill pattern (right). The arm underside has two ports for cable access. These will accommodate a ½ inch cable gland or NPT conduit fittings.

Note: If the dome is to be attached to a round pole 3'' to 15" in diameter, we suggest the IVC Pole Mount Kit. The Pole Mount Kit requires a steel band installation. A banding tool is required but not included. It is available from McMaster Carr (1-732-329-3200) and is listed as "Standard Banding Tool" Item No: "PN 5424K1."

3.2 CONNECT POWER

The power for each camera should be routed through a permanent and conveniently accessible power switch.

Note: In some circumstances, all IP cameras may require an occasional power interruption to reinitiate the camera software after installation.

As always, if you experience any problems please call us (617–467–3059). Our Technical Support staff is always happy to assist you.

Caution: All installations must insure the camera assembly is mounted securely to ensure that it cannot become dislodged during high wind, accidental bumping or other such incidents. All wiring must comply with NEC, NFPA, and local codes.

Note: IVC is not liable for direct or consequential damages resulting from use of this product and IVC makes no guarantees regarding results of intended and unintended use of the product.

APPENDIX G

SCADA System Screen Shots

APPENDIX H

Health & Safety Plan

SYNERGY ENVIRONMENTAL, LLC

HEALTH & SAFETY PLAN

RID WELLHEAD TREATMENT SYSTEMS

OCTOBER 2014

WEST VAN BUREN AREA WQARF SITE
PHOENIX, ARIZONA

Prepared by: **Synergy Environmental, LLC**

On Behalf of: **Roosevelt Irrigation District**

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October 2014

HEALTH & SAFETY PLAN – RID WELLHEAD TREATMENT SYSTEMS

WEST VAN BUREN AREA WQARF SITE

1.0 INTRODUCTION

This Health and Safety Plan (HASP) for wellhead treatment systems constructed at Roosevelt Irrigation District (RID) wells RID-89, RID-92, RID-95 and RID-114, has been developed for operation and maintenance (O&M) activities, carbon change-out activities, inspections, and sampling events at the treatment system sites, which are located within the West Van Buren Area Water Quality Assurance Revolving Fund Site (WVBA Site). The groundwater beneath the WVBA Site contains hazardous substances, principally volatile organic compounds (VOCs) that have impacted RID production wells.

The activities to be conducted as part of this HASP shall be in compliance with the applicable Occupational Safety and Health Administration (OSHA) regulations, particularly those in Title 29 Code of Federal Regulations (CFR) 1910.120. This HASP addresses the potential hazards associated with activities conducted at the wellhead treatment system sites.

Participants conducting work at the wellhead treatment system sites, including Synergy Environmental (engineer), Spinnaker Holdings (operator), and their respective contractors and subcontractors, shall adhere to the procedures and safeguards outlined in this HASP. At a minimum, Synergy Environmental and Spinnaker Holdings personnel conducting work at the wellhead treatment system sites must have completed all training requirements specified in 29 CFR 1910.120, which provides for 40-hour hazardous waste operator safety training and 8-hour annual refresher safety training.

In addition to the procedures and safeguards outlined in this HASP, all personnel, including contractor and subcontractor personnel, shall follow all applicable federal, state, and local regulations. In the event of conflicting requirements, the procedures or practices that provide the highest degree of personnel protection shall be implemented.

A copy of this HASP shall be kept at the RID-95 field office and shall be readily accessible to on-site personnel and inspectors. A copy of this HASP, with addenda, will be available for review

by all contractors and subcontractors a minimum of 72-hours prior to the start of field activities.

2.0 BACKGROUND

A summary of the physical setting, hydrogeologic and groundwater conditions, sources of contamination and impacts on RID wells and operations was provided in the Remedial Investigation (RI) Report (Terranext, 2012). The RI Report was published by ADEQ in August 2012, and included a discussion of the nature and extent of contamination in the WVBA Site.

Figure 1 depicts the approximate boundaries of the groundwater contamination, as well as relevant features within the WVBA Site. The extent of groundwater contamination associated with the WVBA Site is generally bounded on the north by McDowell Road, on the east by 7th Avenue, on the south by Lower Buckeye Road, and on the west beyond 79th Avenue.

3.0 GENERAL WORK DESCRIPTION

The general work activities to be conducted as part of this HASP are as described in the *Operation & Maintenance Plan, RID Wellhead Treatment Systems, Revision 4* (Synergy, 2014) and include the following:

1. Routine O&M activities;
2. Carbon change-out activities;
3. Inspections of wellhead treatment systems components;
4. Sampling events; and,
5. Major equipment repair/replacement activities (non-routine).

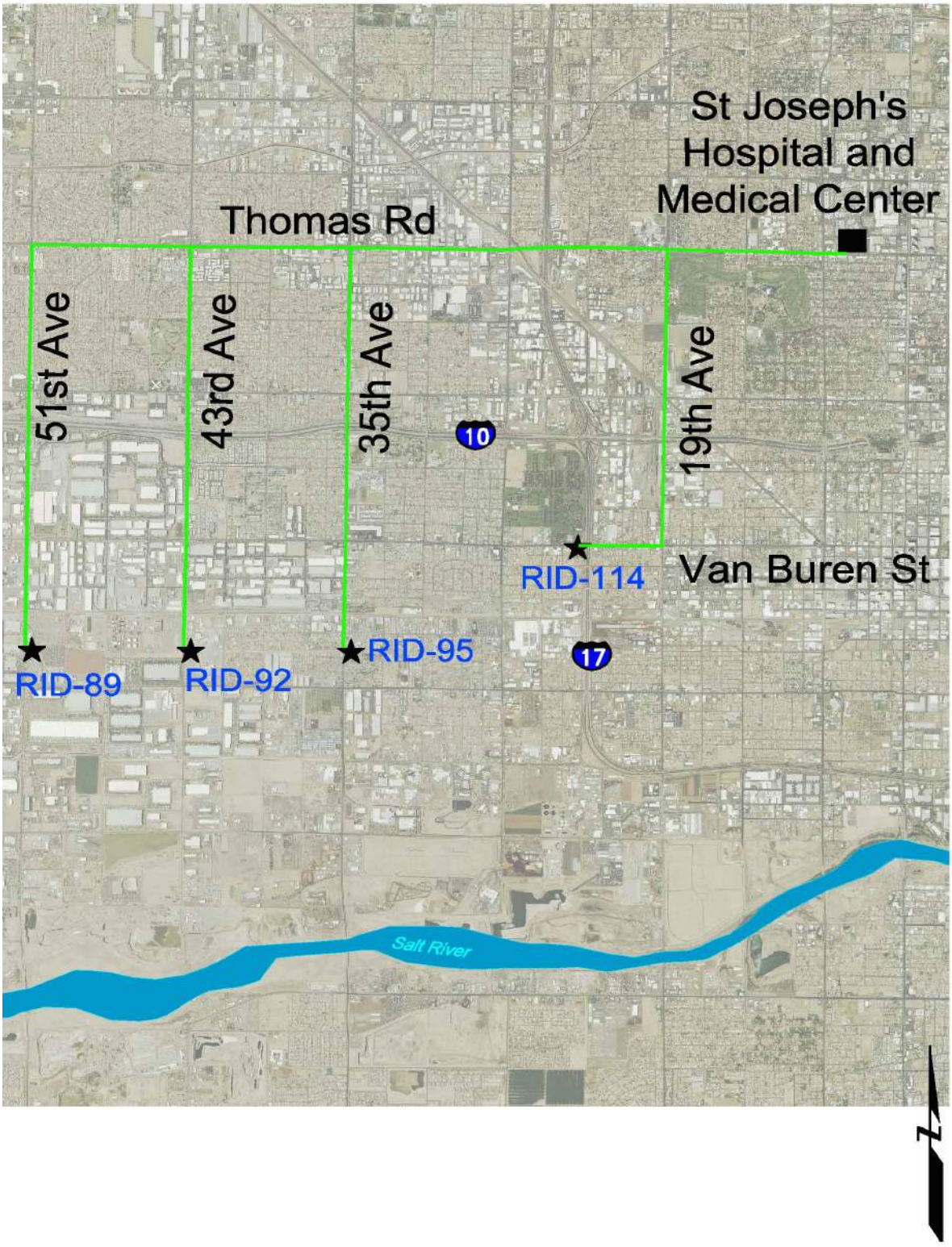
4.0 KEY PERSONNEL AND RESPONSIBILITIES

The health and safety of all personnel involved with activities that are part of this HASP is of primary importance. Therefore, this HASP was developed and will be followed by all on-site personnel. It is the responsibility of the Project Manager, Site Supervisor, and the Health & Safety Coordinator/Officer (HSC) to implement and enforce this HASP and any subsequent revisions, however, each individual is responsible for conducting themselves in a safe and reasonable manner. All personnel entering the wellhead treatment system sites will be briefed regarding the hazards present in a tailgate safety meeting.

Key Personnel, their responsibilities, and contact information are included below:

Project Manager:	Dennis Shirley, PG	(602) 319-2977
Site Supervisor:	Joel Peterson, PE	(480) 284-3518
Health & Safety Coordinator:	Andrew MacHugh, PE	(602) 430-2785

Agency/Facility	Location	Phone Number
Police Department	Multiple	911
Fire Department	Multiple	911
Nearest Hospital (see below for route map)	St. Joseph's Hospital 350 W. Thomas Road	(602) 406-3000


St Joseph's Hospital and Medical Center
Thomas Rd
51st Ave
43rd Ave
35th Ave
19th Ave
10
RID-114
Van Buren St
RID-89
RID-92
RID-95
17
Salt River
N

Key contacts for the wellhead treatment systems include:

Roosevelt Irrigation District –

Donovan Neese, PE
Superintendent
Email: dneese@rooseveltirrigation.org
Phone: (623) 670-4760

Ken Craig
Watermaster
Email: kcraig@rooseveltirrigation.org
Phone: (623) 695-5855

Wellhead Treatment Systems Owner/Operator –

Jim Madole, PE
President
Spinnaker Holdings, LLC
Email: spnkrenergy@mac.com
Phone: (602) 810-2105

Terry Blood
Operator
Spinnaker Holdings, LLC
Email: tblood8@gmail.com
Phone: (480) 231-6509

Agency Oversight –

Danielle Taber
Arizona Department of Environmental Quality
Email: taber.danielle@azdeq.gov
Phone: (602) 771-4414

Engineering Technical Support –

Joel Peterson, PE
Synergy Environmental, LLC
Email: joel.peterson@syn-env.com
Phone: (480) 284-3518

Compliance Coordinator –

Andrew MacHugh, PE
Synergy Environmental, LLC
Email: andrew.machugh@syn-env.com
Phone: (602) 430-2785

5.0 HAZARD ANALYSIS

Potential chemical, physical and general safety hazards that may be encountered during wellhead treatment system work activities include the following:

Chemical Hazards

- dermal
- respiratory

Physical Hazards

- slips, trips, and falls
- heavy equipment
- heat stress
- noise
- electrical sources
- overhead utilities
- traffic (during carbon change-out activities at RID-92)
- material and equipment handling
- confined space entry
- biological hazards
- elevated work areas
- fire/explosion
- traffic

Chemical hazards are attributable primarily to the presence of the WVBA Site contaminants of concern (COCs) in groundwater beneath the Site (see Section 5.1). Physical hazards may arise from O&M-related activities at the wellhead treatment system sites.

5.1 CHEMICAL HAZARDS

The COCs in the WVBA Site have been identified based on analytical data obtained from samples collected by ADEQ and RID from the impacted RID groundwater production wells over the past 20 years. These COCs comprise the commingled WVBA Site plume and are listed as follows (including the chemical name and the Chemical Abstract Service (CAS) number:

- 1,1-Dichloroethene (1,1-DCE) CAS number 75-53-4
- Tetrachloroethene (PCE) CAS number 127-18-4
- Trichloroethene (TCE) CAS number 79-01-6

- 1,1,1-Trichloroethane (TCA) CAS number 71-55-6
- cis 1,2-Dichloroethene (cis 1,2-DCE) CAS number 156-59-2
- 1,1-Dichloroethane (1,1-DCA) CAS number 75-34-3

Chromium is also a COC that occurs locally within the WVBA Site. The chromium concentrations in the impacted groundwater are well below the federal maximum contaminant level (MCL) for drinking water and have only been detected in two (2) RID wells: RID-102 and RID-104; neither of which was selected for wellhead treatment. Consequently, chromium is not included in the wellhead treatment systems sampling and analysis program.

Only three (3) of the listed COCs (i.e., TCE, PCE and 1,1-DCE) are present in the impacted groundwater within the WVBA Site at concentrations that exceed the federal MCLs. A summary of recent historical analytical data that presents concentrations of these "target" COCs for samples collected by ADEQ from the wellhead treatment system sites is included below. All results that are equal to or exceed MCLs are indicated in red text.

Table 1. Summary of Recent Water Quality – Treatment System Wells

TCE, presented as micrograms per liter (µg/L)

Sample Date	Well			
	89	92	95	114
Sep-13	37.5	86.4	59.6	39.0
Mar-14	35.5	76.2	44.0	45.6

PCE, presented as µg/L:

Sample Date	Well			
	89	92	95	114
Sep-13	11.7	14.5	3.71	2.63
Mar-14	10.3	13.5	2.99	2.86

1,1-DCE, presented as µg/L:

Sample Date	Well			
	89	92	95	114
Sep-13	3.14	6.22	7.52	2.50
Mar-14	2.84	4.84	6.18	3.01

5.1.1 Exposure Pathways

The exposure pathway of concern for the WVBA Site COCs is dermal contact. Dermal contact can be minimized by wearing protective equipment, such as chemical resistant gloves. During non-routine major equipment repair/replacement activities, site personnel will conduct work in a manner as to minimize untreated water releases at the site(s).

Based on the well investigation activities previously conducted at RID-95, it is not anticipated that sustained photo-ionization detector (PID) readings of six (6) parts per million (initial action level for Level C PPE, see Section 8) or greater will be encountered. In addition, each discharge structure is enclosed and sealed for volatilization control when the wellhead treatment systems are maintained in bypass mode. Consequently, Level C PPE (including respirators and chemical resistant suites) will not be maintained at the sites.

5.1.2 Material Safety Data Sheets – WVBA Site COCs

Descriptions of the WVBA Site COCs are included in Material Safety Data Sheets (MSDSs) included as **Appendix A**. Each data sheet includes available physical and odor recognition characteristics, the effects of acute and chronic exposures, the permissible exposure limits and threshold limit values for the COCs. These MSDSs will be maintained at the RID-95 field office as part of the O&M Plan.

5.2 PHYSICAL HAZARDS

This section includes a summary of the physical hazards that may be encountered at the wellhead treatment system sites, and the appropriate health and safety practices for each.

5.2.1 General Safe Work Practices

- Accidents and/or injuries associated with work at the wellhead treatment system sites will be immediately reported to the HSC. If necessary, an incident report will be prepared by the HSC.
- Periodic safety briefings will be held to discuss current conditions at the wellhead treatment system sites, field tasks being performed, planned modifications, and work concerns.
- Site conditions may include uneven, unstable, or slippery work surfaces. Substantial care and personal observation is required on the part of on-site personnel to prevent injuries from slips, trips, and falls.

- Workers will maintain good housekeeping practices during all field activities to maintain a safe working environment. The wellhead treatment system sites shall be kept free of debris, waste, and trash.
- The "buddy system" will be used whenever appropriate.
- To prevent head injury, American National Standards Institute (ANSI)-approved hard hats will be worn at all times while on-site personnel are in an area where overhead obstructions or falling objects may be encountered.
- To prevent eye injuries, on-site personnel must wear ANSI-approved safety glasses during field activities.

5.2.2 Heavy Equipment

If heavy equipment is utilized during carbon change-out or non-routine major equipment repair/replacement activities, the following precautions shall be followed:

- PPE, including steel-toed boots, safety glasses, hearing protection, and hard hats must be worn.
- On-site personnel must at all times be aware of the location and operation of heavy equipment and take precautions to avoid getting in the way of its operation; however, proper warning devices are required. Personnel must never assume that the equipment operator sees the personnel; eye contact and hand signals should be used to inform the operator of intent.
- Traffic safety vests are required for on-site personnel working near mobile heavy equipment.
- On-site personnel should never walk directly behind, or to the side of, heavy equipment without the operator's knowledge.
- Nonessential personnel shall be kept out of the work area.

5.2.3 Heat Stress

Adverse climate conditions, primarily heat, are important considerations in planning and conducting activities at the wellhead treatment system sites. Heat-related illnesses range from heat fatigue to heat stroke, with heat stroke being the most serious condition. The effects of ambient temperature can cause physical discomfort, loss of efficiency, and personal injury, and can increase the probability of accidents. In particular, protective clothing that decreases the body's ventilation can be an important factor leading to heat-related illnesses.

To reduce the possibility of heat-related illness, workers should drink plenty of fluids and establish a work schedule that will provide sufficient rest periods for cooling down. Personnel shall maintain an adequate supply of non-caffeinated drinking fluids on-site for personal

hydration. Workers should be aware of signs and symptoms of heat-related illnesses, as well as first aid for these conditions. The conditions are summarized in the following table.

Condition	Signs	Symptoms	Response
Heat Rash or Prickly Heat	Red rash on skin.	Intense itching and inflammation.	Increase fluid intake and observe affected person.
Heat Cramps	Heavy sweating, lack of muscle coordination.	Weakness, headache, dizziness, nausea.	Increase fluid uptake and rest periods. Closely observe affected worker for more serious symptoms.
Heat Exhaustion	Heavy sweating; pale, cool, moist skin; lack of coordination; fainting.	Weakness, headache, dizziness, nausea.	Remove worker to a cool, shady area. Administer fluids and allow worker to rest until fully recovered. Increase rest periods and closely observe worker for additional signs of heat exhaustion. If symptoms of heat exhaustion recur, treat as above and release worker from the day's activities and he/she has fully recovered.
Heat Stroke	Red, hot, dry skin; disorientation; unconsciousness.	Lack of or reduced perspiration; nausea; dizziness and confusion; strong, rapid pulse.	Immediately contact emergency medical services by dialing 911. Remove the victim to a cool, shady location and observe for signs of shock. Attempt to comfort and cool the victim by administering small amounts of cool water (if conscious), loosen clothing, and placing cool compresses at locations where major arteries occur close to the body's surface (neck, underarms, and groin areas). Carefully follow instructions given by emergency medical services until help arrives.

5.2.4 Noise

Noise will result primarily from the operation of an air compressor during carbon change-out activities or other heavy equipment utilized for non-routine major equipment repair/replacement activities. The air compressor or other heavy equipment may generate noise above the OSHA permissible exposure limit for noise of 90 dBA for an 8-hour time-weighted average. Workers shall wear appropriate hearing protection when operating or working near the air compressor or other heavy equipment. If loud noise is encountered or normal conversation becomes difficult, hearing protection in the form of ear plugs, or equivalent, will be required.

5.2.5 Electric Shock

Electrical equipment to be used during field activities will be suitably grounded and insulated.

Lockout/tagout procedures in accordance with 29 CFR 1910.147 will be conducted before activities begin on or near energized or mechanical equipment that may pose a hazard to on-site personnel. Workers conducting the operation will positively isolate the piece of equipment, lock/tag the energy source, and verify effectiveness of the isolation. Only on-site personnel who perform the lockout/tagout procedure may remove their own tags/locks. Personnel will be trained (if necessary) before initiating this procedure.

5.2.6 Overhead Utilities

Equipment with articulated upright booms or masts shall not be permitted to pass within 20 feet of an overhead utility line while the boom is in the upright position.

5.2.7 Materials and Equipment Handling Procedures

The movement and handling of equipment and materials at the wellhead treatment system sites pose a risk to workers in the form of muscle strains and minor injuries. These injuries can be avoided by using safe handling practices, proper lifting techniques, and proper personal safety equipment including steel-toed boots and sturdy work gloves. Where practical, mechanical devices will be utilized to assist in the movement of equipment and materials.

5.2.8 Confined Space Entry

Entry into confined spaces (i.e., LGAC vessels) will be conducted in accordance with 29 CFR 1910.146. Before workers may enter a permit-required confined space, an entry permit must be completed and approved by the HSC and all requirements for entry must be met. Confined spaces may be described as having, but not being limited to, the following characteristics:

- is large enough to permit an employee to enter and perform work;
- has limited or restricted means of entry and exit; and,
- is not equipped, designed, or intended for continuous human occupancy.

In addition, one or more of the following conditions may be present in a permit-required confined space:

- contains or has the potential to contain a hazardous atmosphere;

- contains or has the potential to contain a material with the potential to engulf or entrap an employee;
- is so configured that an employee may become trapped, disoriented, or asphyxiated by wall configurations or smaller cross sections; and
- contains any other established safety or health hazards, such as energized equipment or moving parts.

All fluid, electrical, and steam lines and other sources of energy into confined spaces must be completely isolated before entry. The following conditions must be met before entry is permissible (air monitoring will be necessary to verify these conditions):

- Flammable vapor must be at a concentration less than 10 percent of the lower explosive limit (LEL).
- Oxygen must be at a concentration greater than 19.5 percent and less than 23.5 percent.
- Toxic substances must be at a concentration less than their respective permissible exposure limits.

In addition, the following roles must be designated before entry into permit-required confined spaces is allowed: Entry Supervisor; Attendant; and Authorized Entrant(s). Only trained and properly equipped personnel may conduct permit-required confined space operations.

5.2.9 Biological Hazards

Biological hazards that may be encountered at the wellhead treatment system sites include possible exposure to:

- Fur-bearing animals. Animals may potentially carry the rabies virus or ticks that may transmit Lyme disease to humans. Avoid contact. Do not attempt to feed or touch.
- Poisonous reptiles. Primarily snakes. Avoid contact and areas that may harbor snake populations including high grass, shrubs, and crevices.
- Poisonous insects. Common examples include bees and wasps. Avoid contact with insects and their hives.
- Spiders. The black widow and brown recluse spiders are the most venomous. Avoid contact with spiders and areas where they may hide.
- Poisonous plants. Common examples include poison ivy and poison oak. Avoid contact. Long-sleeved shirts and pants will allow some protection against inadvertent contact.

If biological hazards are identified, workers shall immediately notify the HSC and on-site personnel.

5.2.10 Elevated Work Areas

When working at heights that expose employees to falls greater than six (6) feet, (i.e., activities requiring on-site personnel to work on the LGAC vessels), the requirements of 29 CFR 1926.502 (fall protection) shall be observed. In such instances, a safety harness shall be worn and the lanyard secured at a level not lower than the worker's waist, to decrease the fall distance.

5.2.11 Fire/Explosion

Workers shall have an increased awareness concerning fire and explosion hazards whenever working with or near flammable materials, especially when performing any activity that may generate sparks, flame, or other source of ignition. Intrinsically safe equipment is required when working in or near environments with the potential for an explosive atmosphere. The HSC will verify facility requirements for a "hot work" permit before activities that may serve as a source of ignition are conducted.

Flammable materials will be kept away from sources of ignition. In the event of fire, work will cease, the area will be evacuated, and the local fire response team will be notified immediately. Only trained, experienced fire fighters should attempt to extinguish substantial fires. On-site personnel should not attempt to fight fires, unless properly trained and equipped to do so. A fully charged ABC dry chemical fire extinguisher will be readily available for use during activities where fire and explosion hazards are present.

5.2.12 Traffic

Vehicular traffic presents opportunities for serious injury to on-site personnel and/or property. Traffic may consist of local street traffic or motor vehicles. Workers and other pedestrians are clearly at risk during carbon change-out activities conducted at RID-92. This activity will require a City of Phoenix right-of-way permit and traffic control with barricades/signage. Risk from motor vehicle operations may be minimized by good operating practices and alertness, and care on the part of on-site personnel and pedestrians.

On-site personnel shall wear high-visibility safety vests whenever activities are conducted in areas of heavy traffic. Work vehicles will be arranged for use as a barrier between on-site personnel and traffic.

6.0 PERSONAL PROTECTIVE EQUIPMENT

The purpose of personal protective equipment (PPE) is to protect on-site personnel from hazards and potential hazards they are likely to encounter during activities at the wellhead treatment system sites. The amount and type of PPE used will be based on the nature of the hazard encountered or anticipated.

Dermal protection, primarily in the form of chemical-resistant gloves will be worn whenever contact with groundwater is anticipated.

The HSC shall inform on-site personnel about necessary protection and shall provide proper training in the use of safety equipment, as necessary. The required PPE to be used is described in the following sections.

6.1 CONDITIONS REQUIRING LEVEL D PROTECTION

In general, activities conducted at the wellhead treatment system sites will commence in Level D PPE, unless otherwise specified, or if the HSC determines that a higher level of PPE is required. Air monitoring will be conducted if work is performed inside the LGAC vessels, using real-time air monitoring devices to determine if upgrading to Level C PPE is necessary. Level D PPE will be permitted as long as air monitoring data indicate that airborne concentrations of COCs are maintained below action levels (as defined in Section 8).

The following equipment is specified as the minimum PPE required to conduct activities at the wellhead treatment system sites:

- work shirt and long pants;
- ANSI-approved steel-toed boots or safety shoes; and,
- ANSI-approved safety glasses.

Other personal protection readily available for use, if necessary, includes the following:

- nitrile gloves when direct contact with groundwater is anticipated;
- ANSI-approved hard hat;
- hearing protection; and,
- sturdy work gloves.

6.2 CONDITIONS REQUIRING LEVEL C PROTECTION

If air monitoring indicates that the action levels defined in Section 8 of this HASP are exceeded, workers in the affected area(s) will upgrade PPE to Level C. In addition to the protective equipment specified for Level D, Level C also includes the following:

- National Institute for Occupational Safety & Health (NIOSH) / Mine Safety & Health Administration (MSHA)-approved half-face air-purifying respirator (APR) equipped with filter cartridges (per Section 8).
- Chemical-resistant clothing (e.g., Tyvek, polycoated Tyvek, or Saranex coveralls).
- Outer nitrile gloves and inner nitrile surgical gloves.
- Safety shoes/boots with protective overboots or knee-high PVC polyblend boots.

7.0 SAFETY REQUIREMENTS

Activities at the wellhead treatment system sites shall be conducted with the following minimum safe procedures:

- Eating, drinking, chewing gum or tobacco, smoking or any practice that increases the probability of hand to mouth transfer and ingestion of materials should be minimized.
- On-site personnel shall notify each other of potential symptoms of the presence of toxins, including: headaches; dizziness; nausea; blurred vision; cramps; irritation of the eyes, skin or respiratory tract; changes in complexion or skin discoloration; changes in apparent motor coordination; changes in personality or demeanor; excessive salivation; changes in papillary response; and changes in speech ability or pattern.
- On-site personnel are to be thoroughly briefed on the anticipated hazards, equipment requirements, safety practices, emergency procedures and communications methods, initially and in daily briefings.
- Monitor vital signs during prolonged activities in direct sunlight and/or when ambient temperatures exceed 95°F. An adequate supply of potable water shall be available at the site.
- Ensure that all walking/working surfaces and areas are in a safe condition.
- Any heavy equipment will be inspected at the beginning of each day to ensure safe and proper operation.

8.0 ACTION LEVELS

The following action levels were developed for exposure monitoring with real-time air monitoring instruments for work conducted inside the LGAC vessels. The air monitoring data will determine required PPE levels. The action levels are based on sustained readings indicated by the instrument(s). Air monitoring will be performed and recorded for 15-minutes. If during this time, sustained measurements are observed, the following actions will be instituted, and the Project Manager and HSC will be notified. For this HASP, sustained readings are defined as the average airborne concentration maintained for a period of five (5) minutes.

Activity	Action Level	Level of Respiratory Protection
O&M	0 to 5 ppm above background 0 to 0.5 mg/m^3 above background	Level D: No respiratory protection required
	6 to 50 ppm 0.6 to 5.0 mg/m^3	Level C: Half-face air-purifying respirator fitted with organic vapor/HEPA filter cartridges
	51 to 100 ppm 5.1 to 10 mg/m^3	Level C: Full-face air-purifying respirator fitted with organic vapor/HEPA filter cartridges
	>100 ppm >10 mg/m^3	Cease operations and evacuate work area. Contact Project Manager and HSC immediately

Level D PPE is anticipated for all activities conducted at the wellhead treatment system sites.

9.0 CONTINGENCY PROCEDURES

In the event of an emergency, on-site personnel will signal distress with three blasts of a horn (i.e., a vehicle horn, or similar). Communication signals, such as hand signals, must be established where communication equipment is not feasible or in areas of loud noise.

It is the HSC's responsibility (or their authorized representative) to evaluate the seriousness of the situation and to notify appropriate authorities as summarized in Section 4. Personnel must dial 911 in the event of an emergency.

9.1 INJURY/ILLNESS

If an exposure or injury occurs, work will be temporarily halted until an assessment can be made of whether it is safe to continue work. The HSC will make the decision regarding the safety of continuing work. The HSC will conduct an investigation to determine the cause of the incident and steps to be taken to prevent recurrence.

In the event of an injury, the extent and nature of the victim's injuries will be assessed and first aid will be rendered as appropriate. If necessary, the individual may be transported to the nearby hospital. The mode of transportation and the eventual destination will be based on the nature and extent of the injury. A hospital route map (from each of the wellhead treatment system sites) is included in Section 4. In the event of a life-threatening emergency, the injured person will be given immediate first aid (as appropriate) and emergency medical services will be contacted by dialing 911.

9.2 FIRE

In the event of fire, on-site personnel should contact the local fire department immediately by dialing 911. Only trained, experienced fire fighters should attempt to extinguish substantial fires at the sites. On-site personnel should not attempt to fight fires, unless properly trained and equipped to do so.

9.3 EVACUATION

The HSC will designate evacuation routes and refuge areas to be used in the event of an emergency. On-site personnel will stay upwind from vapors or smoke and upgradient from spills.

10.0 APPROVALS

10.1 KEY PERSONNEL

This HASP, covering activities at the RID wellhead treatment system sites, has been reviewed and signed below by the Key Personnel:

Signature – Health & Safety Coordinator — Date: 10/16/14

ANDREW J. MACHUGH
Printed Name

Signature – Site Supervisor — Date: 10/9/14

Joel D. Peterson
Printed Name

Signature – Project Manager — Date: 10/14/14

DENNIS H. SHIRLEY
Printed Name

10.2 OTHER PERSONNEL

The following personnel conducting activities at the RID wellhead treatment system sites certify that they have met the requirements of the OSHA Hazardous Waste Operations Standard contained in 29 CFR 1910.120 in addition to all other applicable federal, state, and local regulations.

In addition to meeting the OSHA requirements, the following personnel have received a copy of this HASP and will ensure that both OSHA requirements and the guidelines contained in this HASP will be complied with.

By their signature below, the following personnel have read, understand, and will comply with all provisions of this HASP, and it will take full responsibility for their health and safety at the site.

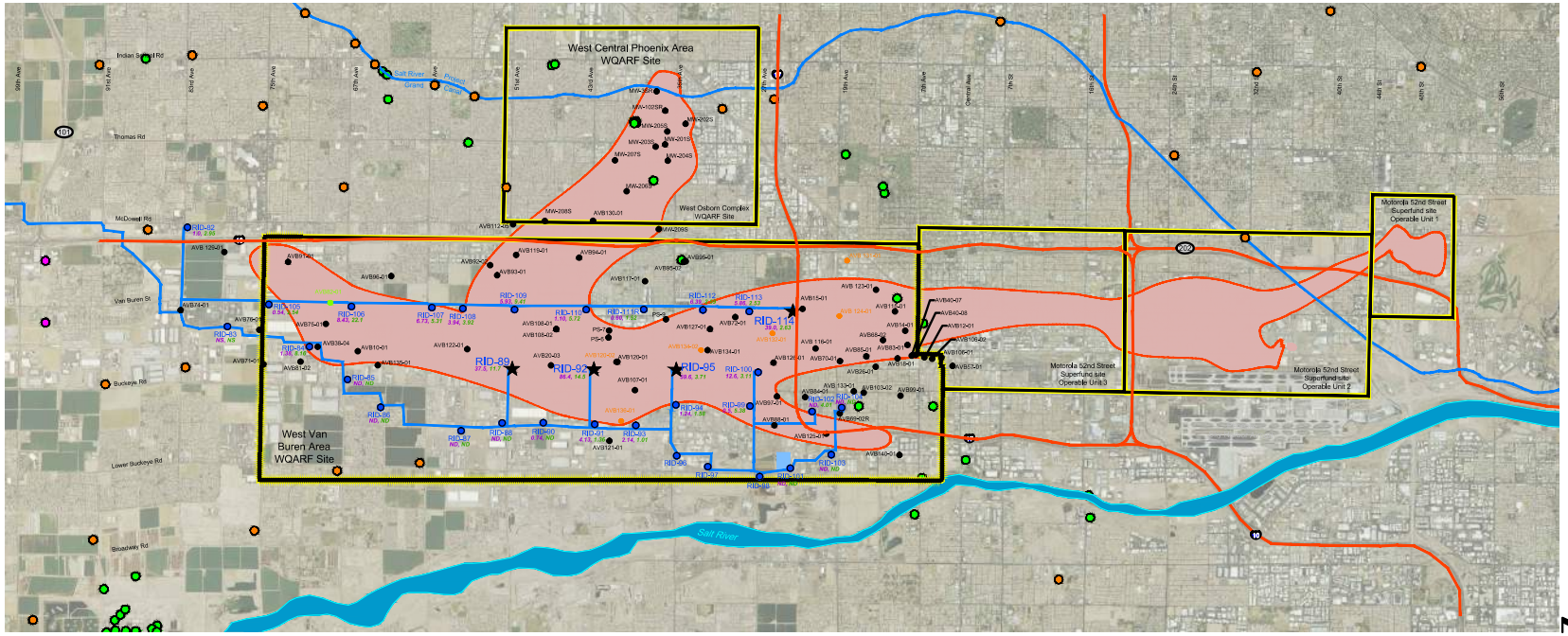
Participant (print name)	Signature	Company	Date

Participant (print name)	Signature	Company	Date

11.0 REFERENCES CITED

Synergy Environmental, 2014. **Operation and Maintenance Plan – RID Wellhead Treatment Systems, Revision 4**, prepared for ADEQ, October.

Terranext, 2012. **Remedial Investigation Report, West Van Buren WQARF Registry Site, Phoenix, AZ**, prepared for ADEQ, August.



0 6,600 13,200

APPROXIMATE SCALE IN FEET

EXPLANATION

- RID-90 / ND, ND — Roosevelt Irrigation District Well Identifier; Concentration of PCE, in µg/L; Concentration of TCE, in µg/L
- RID-89 — Location of Wellhead Treatment System
- AVB10-01 — Monitor Well and Identifier (Black=UAU1; Orange=UAU2; Green=MAU)
- City of Phoenix Well
- City of Tolleson Well
- Salt River Project Well
- Site Boundary
- Estimated Extent of PCE and/or TCE Contamination greater than 5µg/L in Central Phoenix Groundwater Contaminant Plume
- Existing Canal or Pipeline
- Interstates
- Local Streets

NOTE: Water quality data noted for RID wells are from September 2013.

Abbreviations

WQARF	- Water Quality Assurance Revolving Fund
WWTP	- Waste Water Treatment Plant
RID	- Roosevelt Irrigation District
LAU	- Lower Aquifer Unit
MAU	- Middle Aquifer Unit
UAU	- Upper Aquifer Unit
ND	- Not Detected
NS	- Not Sampled
ADEQ	- Arizona Department of Environmental Quality
PCE	- Tetrachloroethene
TCE	- Trichloroethene
µg/L	- Micrograms per Liter

Groundwater contamination depicted on this map represents the author's interpretation of currently available data to estimate the geographical extent of PCE and TCE contamination in commingled contaminant plumes throughout the central and west central Phoenix area. There are numerous sources of contaminants of concern in groundwater throughout this region and interpolation of data and its representation in a consolidated regional plume is subjective; the actual extent of contamination may be different. Sources of data include depth specific UAU and MAU monitor wells and large capacity RID wells that produce groundwater largely from the UAU. The representation of the extent of groundwater contamination within the Motorola 52nd Street Superfund site is generated from the most recent plume map published by ADEQ and posted on their web site.

SITE MAP AND VICINITY

Roosevelt Irrigation District
West Van Buren Area
WQARF Site

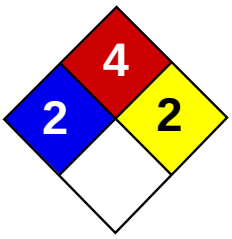
By: Id	Date: 09/24/14	Project No. 802.40
Sydnet Environmental, LLC / Montgomery & Associates		Figure 1

APPENDIX A

Material Safety Data Sheets

SYNERGY ENVIRONMENTAL, LLC

1,1-DICHLOROETHENE



Health	2
Fire	4
Reactivity	0
Personal Protection	G

Material Safety Data Sheet
Vinylidene Chloride MSDS

Section 1: Chemical Product and Company Identification

Product Name: Vinylidene Chloride

Catalog Codes: SLV1063

CAS#: 75-35-4

RTECS: KV9275000

TSCA: TSCA 8(b) inventory: Vinylidene Chloride

CI#: Not available.

Synonym: 1,1-Dichloroethylene

Chemical Name: Vinylidene Chloride

Chemical Formula: C2-H2-Cl2

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Vinylidene Chloride	75-35-4	100

Toxicological Data on Ingredients: Vinylidene Chloride: ORAL (LD50): Acute: 194 mg/kg [Mouse]. 200 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant). Slightly hazardous in case of eye contact (irritant), of inhalation (lung irritant). Severe over-exposure can result in death.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified 4 (No evidence.) by NTP. A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female [POSSIBLE]. The substance may be toxic to kidneys, liver, bladder, gastrointestinal tract, skin, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention if irritation occurs.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

Ingestion:
If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 520°C (968°F)

Flash Points: CLOSED CUP: -28°C (-18.4°F).

Flammable Limits: LOWER: 8.4% UPPER: 16.5%

Products of Combustion: These products are carbon oxides (CO, CO2), halogenated compounds.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid. Poisonous liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call

for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with skin. Wear suitable protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, moisture.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Do not store above 25°C (77°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Safety glasses. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
STEL: 20 (ppm) from ACGIH (TLV) [United States] TWA: 1 from OSHA (PEL) [United States] TWA: 2 (ppm) [Austria] TWA: 5 (ppm) [Belgium] TWA: 5 (ppm) [Denmark] TWA: 2 (ppm) [Germany] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Chloroform-like (Slight.)

Taste: Not available.

Molecular Weight: 96.94 g/mole

Color: Colorless.

pH (1% soln/water): Not available.

Boiling Point: 31°C (87.8°F)

Melting Point: -122.5°C (-188.5°F)

Critical Temperature: Not available.

Specific Gravity: 1.213 (Water = 1)

Vapor Pressure: 78.8 kPa (@ 20°C)

Vapor Density: 3.25 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Very slightly dispersed in cold water, hot water, diethyl ether, acetone.

Solubility: Very slightly soluble in cold water, hot water, diethyl ether, acetone.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents, moisture.

Corrosivity: Corrosive in presence of steel.

Special Remarks on Reactivity:
Do not mix with Aluminum or Copper. May cause polymerization when exposed to Nitric Acid, Chlorosulfonic Acid, Oleum

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 194 mg/kg [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 4 (No evidence.) by NTP. A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female [POSSIBLE]. May cause damage to the following organs: kidneys, liver, bladder, gastrointestinal tract, skin, central nervous system (CNS).

Other Toxic Effects on Humans:
Hazardous in case of skin contact (irritant). Slightly hazardous in case of inhalation (lung irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Vinylidene chloride, Inhibited UNNA: 1303 PG: I

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Vinylidene Chloride Florida: Vinylidene Chloride Minnesota: Vinylidene Chloride Michigan critical material: Vinylidene Chloride Massachusetts RTK: Vinylidene Chloride New Jersey: Vinylidene Chloride TSCA 8(b) inventory: Vinylidene Chloride TSCA 8(a) PAIR: Vinylidene Chloride TSCA 8(d) H and S data reporting: Vinylidene Chloride: 8/4/95 CERCLA: Hazardous substances.: Vinylidene Chloride: 100 lbs. (45.36 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).

DSCL (EEC):
R12- Extremely flammable. R20- Harmful by inhalation. R40- Possible risks of irreversible effects.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 4

Reactivity: 0

Personal Protection: g

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 4

Reactivity: 2

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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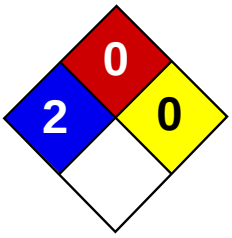
SYNERGY ENVIRONMENTAL, LLC

TETRACHLOROETHENE



Health	2
Fire	0
Reactivity	0
Personal Protection	G

Material Safety Data Sheet
Tetrachloroethylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Tetrachloroethylene

Catalog Codes: SLT3220

CAS#: 127-18-4

RTECS: KX3850000

TSCA: TSCA 8(b) inventory: Tetrachloroethylene

CI#: Not available.

Synonym: Perchloroethylene; 1,1,2,2-Tetrachloroethylene; Carbon bichloride; Carbon dichloride; Ankilostin; Didakene; Dilatin PT; Ethene, tetrachloro-; Ethylene tetrachloride; Perawin; Perchlor; Perclene; Perclene D; Percosolvel; Tetrachloroethene; Tetraleno; Tetralex; Tetravec; Tetroguer; Tetropil

Chemical Name: Ethylene, tetrachloro-

Chemical Formula: C2-Cl4

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Tetrachloroethylene	127-18-4	100

Toxicological Data on Ingredients: Tetrachloroethylene: ORAL (LD50): Acute: 2629 mg/kg [Rat]. DERMAL (LD): Acute: >3228 mg/kg [Rabbit]. MIST(LC50): Acute: 34200 mg/m 8 hours [Rat]. VAPOR (LC50): Acute: 5200 ppm 4 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of eye contact (irritant), of ingestion.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (anticipated carcinogen) by NTP. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, peripheral nervous system, respiratory tract, skin, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with skin. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, metals, acids, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

Personal Protection:
Safety glasses. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 25 (ppm) from OSHA (PEL) [United States] TWA: 25 STEL: 100 (ppm) from ACGIH (TLV) [United States] TWA: 170 (mg/m3) from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Ethereal.

Taste: Not available.

Molecular Weight: 165.83 g/mole

Color: Clear Colorless.

pH (1% soln/water): Not available.

Boiling Point: 121.3°C (250.3°F)

Melting Point: -22.3°C (-8.1°F)

Critical Temperature: 347.1°C (656.8°F)

Specific Gravity: 1.6227 (Water = 1)

Vapor Pressure: 1.7 kPa (@ 20°C)

Vapor Density: 5.7 (Air = 1)

Volatility: Not available.

Odor Threshold: 5 - 50 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 3.4

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Miscible with alcohol, ether, chloroform, benzene, hexane. It dissolves in most of the fixed and volatile oils. Solubility in water: 0.015 g/100 ml @ 25 deg. C It slowly decomposes in water to yield Trichloroacetic and Hydrochloric acids.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, metals, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Oxidized by strong oxidizing agents. Incompatible with sodium hydroxide, finely divided or powdered metals such as zinc, aluminum, magnesium, potassium, chemically active metals such as lithium, beryllium , barium. Protect from light.

Special Remarks on Corrosivity: Slowly corrodes aluminum, iron, and zinc.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2629 mg/kg [Rat]. Acute dermal toxicity (LD50): >3228 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 5200 4 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. May cause damage to the following organs: kidneys, liver, peripheral nervous system, upper respiratory tract, skin, central nervous system (CNS).

Other Toxic Effects on Humans:
Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of ingestion.

Special Remarks on Toxicity to Animals:
Lowest Publishe Lethal Dose/Conc: LDL [Rabbit] - Route: Oral; Dose: 5000 mg/kg LDL [Dog] - Route: Oral; Dose: 4000 mg/kg LDL [Cat] - Route: Oral; Dose: 4000 mg/kg

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects and birth defects(teratogenic). May affect genetic material (mutagenic). May cause cancer.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes skin irritation with possible dermal blistering or burns. Symtoms may include redness, itching, pain, and possible dermal blistering or burns. It may be absorbed through the skin with possible systemic effects. A single prolonged skin exposure is not likely to result in the material being absorbed in harmful amounts. Eyes: Contact causes transient eye irritation, lacrimation. Vapors cause eye/conjunctival irritation. Symptoms may include redness and pain. Inhalation: The main route to occupational exposure is by inhalation since it is readily absorbed through the lungs. It causes respiratory tract irritation, . It can affect behavior/central nervous system (CNS depressant and anesthesia ranging from slight inebriation to death, vertigo, somnolence, anxiety, headache, excitement, hallucinations, muscle incoordination, dizziness, lightheadness, disorentiation, seizures, enotional instability, stupor, coma). It may cause pulmonary edema Ingestion: It can cause nausea, vomiting, anorexia, diarrhea, bloody stool. It may affect the liver, urinary system (proteinuria, hematuria, renal failure, renal tubular disorder), heart (arrhythmias). It may affect behavior/central nervous system with symptoms similar to that of inhalation. Chronic Potential Health Effects: Skin: Prolonged or repeated skin contact may result in excessive drying of the skin, and irritation. Ingestion/Inhalation: Chronic exposure can affect the liver(hepatitis,fatty liver degeneration), kidneys, spleen, and heart (irregular heartbeat/arrhythmias, cardiomyopathy, abnormal EEG), brain, behavior/ central nervous system/peripheral nervous system (impaired memory, numbness of extremeties, peripheral neuropathy and other

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 18.4 mg/l 96 hours [Fish (Fatthead Minnow)]. 18 mg/l 48 hours [Daphnia (daphnia)]. 5 mg/l 96 hours [Fish (Rainbow Trout)]. 13 mg/l 96 hours [Fish (Bluegill sunfish)].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Tetrachloroethylene UNNA: 1897 PG: III

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Tetrachloroethylene California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Tetrachloroethylene Connecticut hazardous material survey.: Tetrachloroethylene Illinois toxic substances disclosure to employee act: Tetrachloroethylene Illinois chemical safety act: Tetrachloroethylene New York release reporting list: Tetrachloroethylene Rhode Island RTK hazardous substances: Tetrachloroethylene Pennsylvania RTK: Tetrachloroethylene Minnesota: Tetrachloroethylene Michigan critical material: Tetrachloroethylene Massachusetts RTK: Tetrachloroethylene Massachusetts spill list: Tetrachloroethylene New Jersey: Tetrachloroethylene New Jersey spill list: Tetrachloroethylene Louisiana spill reporting: Tetrachloroethylene California Director's List of Hazardous Substances: Tetrachloroethylene TSCA 8(b) inventory: Tetrachloroethylene TSCA 8(d) H and S data reporting: Tetrachloroethylene: Effective date: 6/1/87; Sunset date: 6/1/97 SARA 313 toxic chemical notification and release reporting: Tetrachloroethylene CERCLA: Hazardous substances.: Tetrachloroethylene: 100 lbs. (45.36 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R40- Possible risks of irreversible effects. R51/53- Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S23- Do not breathe gas/fumes/vapour/spray S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S37- Wear suitable gloves. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: g

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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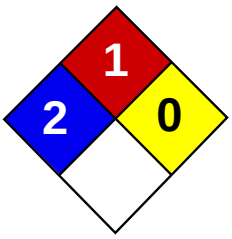
TRICHLOROETHENE



Health	2
Fire	1
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Trichloroethylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Trichloroethylene

Catalog Codes: SLT3310, SLT2590

CAS#: 79-01-6

RTECS: KX4560000

TSCA: TSCA 8(b) inventory: Trichloroethylene

CI#: Not available.

Synonym:

Chemical Formula: C2HCl3

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Trichloroethylene	79-01-6	100

Toxicological Data on Ingredients: Trichloroethylene: ORAL (LD50): Acute: 5650 mg/kg [Rat]. 2402 mg/kg [Mouse]. DERMAL (LD50): Acute: 20001 mg/kg [Rabbit].

Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 420°C (788°F)

Flash Points: Not available.

Flammable Limits: LOWER: 8% UPPER: 10.5%

Products of Combustion: These products are carbon oxides (CO, CO2), halogenated compounds.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/

spray. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Carcinogenic, teratogenic or mutagenic materials should be stored in a separate locked safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 50 STEL: 200 (ppm) from ACGIH (TLV) TWA: 269 STEL: 1070 (mg/m3) from ACGIH Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 131.39 g/mole

Color: Clear Colorless.

pH (1% soln/water): Not available.

Boiling Point: 86.7°C (188.1°F)

Melting Point: -87.1°C (-124.8°F)

Critical Temperature: Not available.

Specific Gravity: 1.4649 (Water = 1)

Vapor Pressure: 58 mm of Hg (@ 20°C)

Vapor Density: 4.53 (Air = 1)

Volatility: Not available.

Odor Threshold: 20 ppm

Water/Oil Dist. Coeff.: The product is equally soluble in oil and water; log(oil/water) = 0

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether, acetone.

Solubility:
Easily soluble in methanol, diethyl ether, acetone. Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity:
Extremely corrosive in presence of aluminum. Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): 2402 mg/kg [Mouse]. Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH. The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract.

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant, permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Passes through the placental barrier in human. Detected in maternal milk in human.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Trichloroethylene : UN1710 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Trichloroethylene California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Trichloroethylene Pennsylvania RTK: Trichloroethylene Florida: Trichloroethylene Minnesota: Trichloroethylene Massachusetts RTK: Trichloroethylene New Jersey: Trichloroethylene TSCA 8(b) inventory: Trichloroethylene CERCLA: Hazardous substances.: Trichloroethylene

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R36/38- Irritating to eyes and skin. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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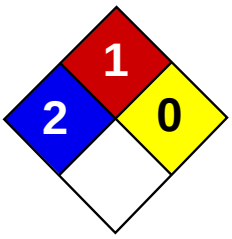
1,1,1-TRICHLOROETHANE



Health	2
Fire	1
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
1,1,1-Trichloroethane MSDS

Section 1: Chemical Product and Company Identification

Product Name: 1,1,1-Trichloroethane

Catalog Codes:

CAS#: 71-55-6

RTECS: KJ2975000

TSCA: TSCA 8(b) inventory: 1,1,1-Trichloroethane

CI#: Not available.

Synonym:

Chemical Formula: CH3CCl3

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
{1,1,1-}Trichloroethane	71-55-6	100

Toxicological Data on Ingredients: 1,1,1-Trichloroethane: ORAL (LD50): Acute: 9600 mg/kg [Rat]. 6000 mg/kg [Mouse]. DERMAL (LD50): Acute: 15800 mg/kg [Rabbit]. VAPOR (LC50): Acute: 18000 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of eye contact (irritant), of ingestion. Hazardous in case of skin contact (irritant, permeator), of inhalation. Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, the nervous system, liver, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 537°C (998.6°F)

Flash Points: Not available.

Flammable Limits: LOWER: 7.5% UPPER: 12.5%

Products of Combustion: These products are carbon oxides (CO, CO2), halogenated compounds.

Fire Hazards in Presence of Various Substances: Slightly flammable to flammable in presence of oxidizing materials, of acids, of alkalis.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive to explosive in presence of oxidizing materials, of acids, of alkalis.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 350 STEL: 440 CEIL: 440 (ppm) from ACGIH (TLV) [1995] TWA: 1900 STEL: 2460 CEIL: 2380 (mg/m3) from ACGIH [1995]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 133.41 g/mole

Color: Not available.

pH (1% soln/water): Not available.

Boiling Point: 74.1°C (165.4°F)

Melting Point: -32.5°C (-26.5°F)

Critical Temperature: Not available.

Specific Gravity: 1.3376 (Water = 1)

Vapor Pressure: 100 mm of Hg (@ 20°C)

Vapor Density: 4.6 (Air = 1)

Volatility: Not available.

Odor Threshold: 400 ppm

Water/Oil Dist. Coeff.: The product is equally soluble in oil and water; log(oil/water) = 0

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 6000 mg/kg [Mouse]. Acute dermal toxicity (LD50): 15800 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 18000 ppm 4 hour(s) [Rat].

Chronic Effects on Humans: The substance is toxic to lungs, the nervous system, liver, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of ingestion. Hazardous in case of skin contact (irritant, permeator), of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Detected in maternal milk in human.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : 1,1,1-Trichloroethane : UN2831 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: 1,1,1-Trichloroethane Massachusetts RTK: 1,1,1-Trichloroethane TSCA 8(b) inventory: 1,1,1-Trichloroethane SARA 313 toxic chemical notification and release reporting: 1,1,1-Trichloroethane CERCLA: Hazardous substances.: 1,1,1-Trichloroethane

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC).

DSCL (EEC):
R38- Irritating to skin. R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:31 PM

Last Updated: 05/21/2013 12:00 PM

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SYNERGY ENVIRONMENTAL, LLC

cis 1,2-DICHLOROETHENE

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MATHESON TRI-GAS, INC.
150 Allen Road Suite 302
Basking Ridge, New Jersey 07920
Information: 1-800-416-2505

Emergency Contact:
CHEMTREC 1-800-424-9300
Calls Originating Outside the US:
703-527-3887 (Collect Calls Accepted)

SUBSTANCE: CIS-1,2-DICHLOROETHYLENE

TRADE NAMES/SYNONYMS:
CIS-ACETYLENE DICHLORIDE; 1,2-DICHLOROETHYLENE; C2H2CL2; MAT05125; RTECS KV9420000

CHEMICAL FAMILY: halogenated, aliphatic

CREATION DATE: Jan 24 1989
REVISION DATE: Dec 11 2008

2. COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: CIS-1,2-DICHLOROETHYLENE
CAS NUMBER: 156-59-2
PERCENTAGE: 100.0

3. HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=3 REACTIVITY=2

EMERGENCY OVERVIEW:
COLOR: colorless
PHYSICAL FORM: liquid
ODOR: pleasant odor
MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, central nervous system depression
PHYSICAL HAZARDS: Flammable liquid and vapor. Vapor may cause flash fire. May react on contact with air, heat, light or water.

POTENTIAL HEALTH EFFECTS:
INHALATION:

SHORT TERM EXPOSURE: irritation, nausea, vomiting, drowsiness, symptoms of drunkenness
LONG TERM EXPOSURE: no information on significant adverse effects
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation
LONG TERM EXPOSURE: same as effects reported in short term exposure
EYE CONTACT:
SHORT TERM EXPOSURE: irritation
LONG TERM EXPOSURE: same as effects reported in short term exposure
INGESTION:
SHORT TERM EXPOSURE: symptoms of drunkenness
LONG TERM EXPOSURE: no information on significant adverse effects

4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: If vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.

NOTE TO PHYSICIAN: For ingestion, consider gastric lavage. Consider oxygen.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Severe fire hazard. Moderate explosion hazard. Vapor/air mixtures are explosive above flash point. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back.

EXTINGUISHING MEDIA: regular dry chemical, carbon dioxide, water, regular foam

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any

discoloration of tanks due to fire. For tank, rail car or tank truck: Evacuation radius: 800 meters (1/2 mile). Do not attempt to extinguish fire unless flow of material can be stopped first. Flood with fine water spray. Do not scatter spilled material with high-pressure water streams. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Water may be ineffective.

FLASH POINT: 39 F (4 C) (CC)
LOWER FLAMMABLE LIMIT: 9.7%
UPPER FLAMMABLE LIMIT: 12.8%
FLAMMABILITY CLASS (OSHA): IB

6. ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL RELEASE:
Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Reduce vapors with water spray. Small spills: Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: Dike for later disposal. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry.

7. HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Subject to storage regulations: U.S. OSHA 29 CFR 1910.106. Grounding and bonding required. Keep separated from incompatible substances.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
CIS-1,2-DICHLOROETHYLENE:
1,2-DICHLOROETHYLENE (ALL ISOMERS):
200 ppm (790 mg/m3) OSHA TWA
200 ppm ACGIH TWA
200 ppm (790 mg/m3) NIOSH recommended TWA 10 hour(s)

VENTILATION: Provide local exhaust ventilation system. Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.
2000 ppm
Any supplied-air respirator operated in a continuous-flow mode.
Any powered, air-purifying respirator with organic vapor cartridge(s).
Any air-purifying respirator with a full facepiece and an organic vapor canister.
Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted organic vapor canister.
Any self-contained breathing apparatus with a full facepiece.
Any supplied-air respirator with a full facepiece.
Emergency or planned entry into unknown concentrations or IDLH conditions -
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Escape -
Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted organic vapor canister.
Any appropriate escape-type, self-contained breathing apparatus.
For Unknown Concentrations or Immediately Dangerous to Life or Health -
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid
COLOR: colorless
ODOR: pleasant odor
MOLECULAR WEIGHT: 96.94
MOLECULAR FORMULA: C2-H2-CL2
BOILING POINT: 140 F (60 C)
FREEZING POINT: -114 F (-81 C)
VAPOR PRESSURE: 400 mmHg @ 41 C
VAPOR DENSITY (air=1): 3.34
SPECIFIC GRAVITY (water=1): 1.2837
WATER SOLUBILITY: insoluble
PH: Not available
VOLATILITY: Not available
ODOR THRESHOLD: Not available
EVAPORATION RATE: Not available

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available
SOLVENT SOLUBILITY:
Soluble: acetone, benzene, ether, alcohol

10. STABILITY AND REACTIVITY

REACTIVITY: May decompose on contact with air, light, moisture, heat or storage and use above room temperature. Releases toxic, corrosive, flammable or explosive gases.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat. Keep out of water supplies and sewers.

INCOMPATIBILITIES: bases, metals, combustible materials, oxidizing materials, acids

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: phosgene, halogenated compounds, oxides of carbon

POLYMERIZATION: May polymerize. Avoid contact with incompatible materials.

11. TOXICOLOGICAL INFORMATION

CIS-1,2-DICHLOROETHYLENE:
TOXICITY DATA: 13700 ppm inhalation-rat LC50
LOCAL EFFECTS:
Irritant: inhalation, skin, eye
ACUTE TOXICITY LEVEL:
Slightly Toxic: inhalation
TARGET ORGANS: central nervous system
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: respiratory disorders
MUTAGENIC DATA: Available.

12. ECOLOGICAL INFORMATION

Not available

13. DISPOSAL CONSIDERATIONS

Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): D001. Dispose in accordance with all applicable regulations.

14. TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: 1,2-Dichloroethylene
ID NUMBER: UN1150
HAZARD CLASS OR DIVISION: 3
PACKING GROUP: II
LABELING REQUIREMENTS: 3

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: 1,2-Dichloroethylene
UN NUMBER: UN1150
CLASS: 3
PACKING GROUP/CATEGORY: II

15. REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4): Not regulated.

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart B): Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart C): Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370 Subparts B and C):
ACUTE: Yes
CHRONIC: No
FIRE: Yes
REACTIVE: Yes
SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):
1,2-DICHLOROETHYLENE (ALL ISOMERS)

OSHA PROCESS SAFETY (29 CFR 1910.119): Not regulated.

STATE REGULATIONS:
California Proposition 65: Not regulated.

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: BD2

NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): Listed on inventory.

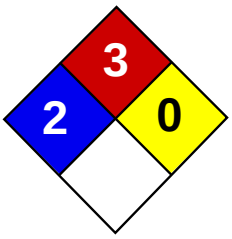
TSCA 12(b) EXPORT NOTIFICATION: Not listed.

CANADA INVENTORY (DSL/NDSL): Not determined.

16. OTHER INFORMATION

SYNERGY ENVIRONMENTAL, LLC

1,1-DICHLOROETHANE



Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
1,1-Dichloroethane MSDS

Section 1: Chemical Product and Company Identification

Product Name: 1,1-Dichloroethane

Catalog Codes: SLD3280

CAS#: 75-34-3

RTECS: KI0175000

TSCA: TSCA 8(b) inventory: 1,1-Dichloroethane

CI#: Not available.

Synonym:

Chemical Name: 1,1-Dichloroethane

Chemical Formula: C2-H4-Cl2

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
{1,1-}Dichloroethane	75-34-3	100

Toxicological Data on Ingredients: 1,1-Dichloroethane: ORAL (LD50): Acute: 725 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified 2 (Reasonably anticipated.) by NTP. A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE]. The substance is toxic to kidneys, lungs, liver, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 458°C (856.4°F)

Flash Points: CLOSED CUP: -17°C (1.4°F). OPEN CUP: -6°C (21.2°F).

Flammable Limits: LOWER: 5.6% UPPER: 11.4%

Products of Combustion: These products are carbon oxides (CO, CO2), halogenated compounds.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable liquid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes Keep away from incompatibles such as oxidizing agents, alkalis.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 100 STEL: 250 (ppm) from ACGIH (TLV) [1999] TWA: 100 (ppm) from OSHA (PEL) Australia: TWA: 200 (ppm) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Oily liquid.)

Odor: Chloroform like odor (Slight.)

Taste: Not available.

Molecular Weight: 98.96 g/mole

Color: Colorless.

pH (1% soln/water): Not available.

Boiling Point: 57.3°C (135.1°F)

Melting Point: -96.9°C (-142.4°F)

Critical Temperature: 261.5°C (502.7°F)

Specific Gravity: 1.175 (Water = 1)

Vapor Pressure: 180 mm of Hg (@ 20°C)

Vapor Density: 3.44 (Air = 1)

Volatility: Not available.

Odor Threshold: 120 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties:
Partially dispersed in diethyl ether. See solubility in water, diethyl ether.

Solubility: Partially soluble in diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents, alkalis.

Corrosivity: Corrosive in presence of aluminum.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Will attack some forms of plastic and rubber

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 725 mg/kg [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 2 (Reasonably anticipated.) by NTP. A4 (Not classifiable for human or animal.) by ACGIH. DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE]. The substance is toxic to kidneys, lungs, liver, central nervous system (CNS).

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification:
CLASS 3: Combustible liquid with a flash point greater than 37.8C (100F). Marine pollutant

Identification: : 1,1-Dichloroethane : UN2362 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65 (no significant risk level): 1,1-Dichloroethane California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: 1,1-Dichloroethane Rhode Island RTK hazardous substances: 1,1-Dichloroethane Pennsylvania RTK: 1,1-Dichloroethane Florida: 1,1-Dichloroethane Minnesota: 1,1-Dichloroethane Massachusetts RTK: 1,1-Dichloroethane New Jersey: 1,1-Dichloroethane New Jersey spill list: 1,1-Dichloroethane TSCA 8(b) inventory: 1,1-Dichloroethane TSCA 8(a) PAIR: 1,1-Dichloroethane TSCA 8(d) H and S data reporting: 1,1-Dichloroethane: June 1999 TSCA 12(b) one time export: 1,1-Dichloroethane SARA 313 toxic chemical notification and release reporting: 1,1-Dichloroethane: 1% CERCLA: Hazardous substances.: 1,1-Dichloroethane: 1000 lbs. (453.6 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R11- Highly flammable. R22- Harmful if swallowed. R37/38- Irritating to respiratory system and skin. R41- Risk of serious damage to eyes. R52- Harmful to aquatic organisms.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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APPENDIX I

Airtech Environmental Laboratories – Method 8260B SOP

1. SCOPE and APPLICATION

1.1. The intention of this SOP is to provide guidelines for the qualitative and quantitative determination of volatile compounds in water samples. This is a purge and trap gas chromatographic/mass spectrometry method applicable to the determination and quantitation of volatile organic compounds. The compounds determined by this method are insoluble or slightly soluble in water and methanol and are capable of being eluted, without derivatization, from a gas chromatograph fused silica capillary column coated with a slightly polar silicon phase.

1.2. Analytes highly soluble in water will have higher quantitation limits because of poor purging efficiency. 2-Chloroethylvinyl ether cannot be reported from samples containing acid preservation.

2. RANGES, SENSITIVITY, DETECTION LIMITS

2.1. Minimum reporting limits (PQLS) can be obtained in the absence of interferences.

3. RESPONSIBILITIES

3.1. This SOP is intended for the use of experienced analysts, well versed in the operation of purge and trap systems, gas chromatography and mass spectroscopy, and the interpretation of mass spectra. It should also be used for the training of technicians and chemists in the above referenced methods, and as a reference for data reviewers for data generated by use of this SOP.

3.2. It is the responsibility of the analyst to perform this method in accordance with the most current version of this SOP.

3.3. It is the responsibility of the analyst to perform this method in a manner that protects the health and safety of the analyst and fellow employees. The toxicity and carcinogenic properties of chemicals used in this method have not been precisely defined. Each chemical should be treated as a potential health hazard, and exposure to these chemicals should be minimized. The following parameters covered by this method have been tentatively classified as known or suspected, human or mammalian carcinogens: benzene, carbon tetrachloride, chloroform, 1,4-dichlorobenzene, and vinyl chloride. Stock standard solutions of these compounds should be handled in a manner that minimizes exposure and it is recommended that solutions be prepared in a fume hood. Protective equipment, such as safety glasses, must be worn by analysts while performing this analysis. All compressed gases cylinders must be secured with chains or straps. Analysts must be trained in tank changing procedures.

Author Date: 11/15/2013	Laboratory Director: Date: 11/15/2013	Quality Assurance Date: 11/15/2013
Issued To	Copy Number	Authorized By

3.4. MSDS: All reagents and standards used for analysis must be accompanied by a manufacturer's Material Safety Data Sheets (MSDS) upon arrival to the lab. The MSDS are to be kept on file in the lab and made available to laboratory personnel. As a part of training process analysts must make themselves familiar with the contents of MSDS.

3.5. It is the responsibility of the Laboratory Director or designee to provide proper training and equipment required to perform this method.

3.6. Data Reviewer: The data reviewer must ensure the submitted data package is complete.

4. INTERFERENCES

4.1. Solvents, reagents, glassware, and other sample processing hardware may yield artifacts and/or interferences to sample analysis. All these materials must be demonstrated to be free from interferences under the conditions of the analysis by analyzing method blanks.

4.2. Impurities in the purge gas, organic compounds, and solvent vapors from the laboratory account for the majority of contamination problems.

4.3. Samples can be contaminated by diffusion of VOC's (particularly by fluorocarbons and methylene chloride) into the sample during shipment and storage. A trip blank prepared from reagent water and carried through the sampling and handling procedure can serve as a check on such contamination.

4.4. Glassware with soap residue or other contaminants may cause degradation of some compounds. This problem is especially pronounced with glassware that may be difficult to rinse. These items should be hand rinsed very carefully to avoid this problem. Disposable glassware is used whenever possible.

4.5. Contamination by carryover can occur whenever high concentration and low concentration samples are sequentially analyzed. Whenever possible, a blank should be analyzed immediately after a high concentration sample to check for carryover. If carryover is suspected, the affected samples should be reanalyzed. The trap is subject to contamination; therefore, frequent baking out and purging of the entire system may be required.

4.6. Analytical difficulties may be encountered when analyzing for compounds with a low molecular weight, halogenated hydrocarbons, aromatic compounds, ketones, nitriles, acetates, acrylates, ethenes, and sulfides.

5. SAMPLE HANDLING AND PRESERVATION

5.1. Aqueous samples are collected in triplicate using 40 mL screw cap vials each equipped with a PTFE-faced silicone septum. Sample containers should be filled with care so as to prevent any portion of the collected sample coming in contact with the sampler's gloves, thus causing contamination.

5.1.1. All aqueous samples should contain 4-5 drops of 1:1 HCl so that the sample pH remains at less than 2 to prevent decomposition of method analytes by microbial

agents. The actual pH of each water sample is determined by test strip at the time of analysis and recorded on the Daily Cover Sheet.

5.1.2. Aqueous samples requiring analysis for 2-chloroethyl vinyl ether must be collected in unpreserved vials.

5.1.3. Aqueous samples must be chilled to 4.0 ± 2.0°C on the day of collection and maintained at that temperature until analysis. Samples must be analyzed within 14 days of collection.

5.1.4. All samples must be collected with no air bubbles present in the vial upon sealing. A bubble smaller than the size of a pea (i.e. bubble not exceeding ¼" or 6 mm) is permissible. Notation of headspace will be made in the case narrative of the final report.

6. EQUIPMENT

6.1. Gas Chromatograph

6.1.1. Gas Chromatograph: Hewlett-Packard Gas Chromatograph 5890 equipped with electronic pressure programmable split-splitless injection port.

6.1.2. Purge and Trap: Tekmar 2016 Purge and Trap Concentrator or equivalent with 10 mL sample handling capability.

6.1.3. Trap: #3 or Vocarb 3000 (K) from Supelco, or similar.

6.1.4. Column: 25 m x 0.20 mm ID bonded-phase silicone coated fused silica capillary column (DB624 or equivalent) with a film thickness of 1.12 micron, or similar.

6.1.5. Detector: Hewlett-Packard Mass Selective Detector 5972, or similar.

6.2. Volumetric Flasks: 5 mL and 10 mL Class A, with ground-glass or Teflon stoppers.

6.3. Syringes: Various sizes, gas tight.

6.4. Vials

6.4.1. 40 mL VOA vials, with Teflon lined septa.

6.4.2. 2 mL vials with Teflon lined screw caps for storing standards.

6.4.3. 1 mL micro-reaction vials with mininert valves for storing standards.

6.4.4. Scintillation vials, 20 mL with PTFE lined screw caps.

6.4.5. pH test strips 0-14 units

7. REAGENTS AND STANDARDS

Note: Concentrations and manufacturers/vendors of standards may vary. Adjust calculations accordingly to make standards at concentrations required for analysis.

7.1. Methanol: High Purity, Purge & Trap grade. Store at room temperature. The expiration date is the date specified by the manufacturer, or one year after receiving if no date is specified by the manufacturer.

7.2. Internal standards (IS)

7.2.1. The internal standards recommended are as follows:

Pentafluorobenzene
1,4-Difluorobenzene
Chlorobenzene-d_5
1,4-Dichlorobenzene-d_4

7.2.2. Stock Internal Standard (2.0 mg/mL): A certified prepared internal standard mix is purchased from Accustandard or another commercial supplier at a high concentration in methanol. Follow manufacturer's instructions for storage requirements and expiration dates. Document receipt of the standard in the "Reagent/Standard Receipt Logbook".

7.2.3. 8260 Internal Standard: From the Stock Internal Standard, prepare a Working Internal Standard solution at a concentration of 25 µg/mL. To prepare add approximately 9 mL of methanol to a 10 mL Class A volumetric flask. Add 125 µL of the Stock Internal Standard (2000ppm). Dilute to volume with methanol. Record the preparation of this solution in the "VOA Standard Prep Log" Log Book. Store the solution at < -10°C in labeled vials with Teflon lined screw caps. This solution must be replaced when the manufacturer's expiration date has passed.

7.3. Surrogate Standards

7.3.1. The recommended surrogates are as follows:

Dibromofluoromethane
Toluene-d8
4-Bromofluorobenzene

7.3.2. Stock Surrogate Standard (2.0 mg/mL): A certified prepared surrogate mix is purchased from Accustandard or another commercial supplier, each at a high concentration in methanol. Follow manufacturer's instructions for storage requirements and expiration dates. Document receipt of this standard in the "Reagent /Standard Receipt Logbook".

7.3.3. Working Surrogate Standard Solution: From the stock surrogate standard, prepare a Working Surrogate Solution at a concentration of 25 µg/mL. To prepare add approximately 9 mL of methanol to a 10 mL Class A volumetric flask. Add 125 µL of

the Stock Surrogate Standard (2000ppm). Dilute to volume with methanol. Record the preparation of this solution in the "VOA Standard Prep Log" Log Book. Store the solution at < -10°C in labeled vials with Teflon lined screw caps. This solution must be replaced when the manufacturer's expiration date has passed.

7.3.4. GC/MS Tuning Standard - 4-Bromofluorobenzene (BFB): The surrogate-working standard that contains BFB is used for the tuning standard.

7.4. Primary Standards

7.4.1. Stock Primary Standard: Certified calibration standard mixes (2000ug/mL or 5000ug/mL) are purchased from Ultra or another commercial supplier, each at a high concentration in methanol. When the mixes are combined, the resulting solution shall contain each analyte for detection by this method. All solutions prepared from these mixes shall be considered Primary Standards. Follow manufacturer's instructions for storage requirements and expiration dates. Document the receipt of these standards in the Reagent Logbook.

7.4.2. 8260 Primary Working Standard (50 µg/mL): Prepare a Working Primary Solution that will contain each target analyte at the final concentrations listed in the chart below. Prepare by combining and diluting required amounts of the stock primary mixes to a final volume of 5 mL in methanol. Record the preparation of this solution in the "VOA Standard Prep Log". Store the solution at < -10°C in labeled vials with Teflon lined screw caps. This solution must be replaced when the manufacturer's expiration date has passed.

7.4.3. 8260 Primary Working Standard 5 µg/mL: From the 8260 Primary Standard 50 µg/mL, make a 5 µg/mL primary standard by adding 100 µL of the 50 µg/mL Primary standard to 900 µL Methanol.

Note: This chart is an example of manufacturers and their stock concentrations. Equivalent suppliers may be used. Concentrations may change. Volume of stock added to 10 mL is adjusted to reach the final working standard concentration.

Preparation of Primary Working Standard Solutions

50 µg/mL Working Standard:
Final Volume = 10 mL MeOH

Name of Std.	Conc. Stock Std.	Amount added to 5 mL volumetric	Final working std Concentration
Vinyl Acetate	2000 µg/mL	250 µL	50 µg/mL
24 Compounds	2000 µg/mL	250 µL	50 µg/mL
54 Compounds	2000 µg/mL	250 µL	50 µg/mL
Az Custom Mix	2000 µg/mL	250 µL	50 µg/mL
502.2 Calibration Mix	2000 µg/mL	250 µL	50 µg/mL

7.5. Calibration Standards: Standards for initial calibration of the instrument and the continuing calibration verification are prepared from the Primary.

7.5.1. Initial Calibration Standard: Prepare standards for initial calibration of the instrument at eight concentration levels.

Initial Calibration Standards for Method 8260B
Final Volume = 10.0 mL

50 µg/mL Working Std (µL)	25 µg/mL Surrogate	Surrogate Conc. µg/L	Standard Conc. µg/L
*1 µL	0.5 µL	2.5	0.5
*2 µL	1 µL	5.0	1.0
*5 µL	2 µL	10	2.5
*10 µL	4 µL	20	5.0
2 µL	10 µL	50	1.0
5 µL	14 µL	70	25
10 µL	16 µL	80	50
20 µL	20 µL	100	100
40 µL			200

* 40 µg/mL Working Std used for these points

NOTE: A minimum of five levels is required for all target compounds being analyzed**.** Use a minimum of six standards if a linear or higher order regression is used for quantitation. Prepare calibration standards by diluting appropriate amounts of the primary and surrogate solutions to a final volume of 100 mL with water. Each calibration standard should contain every analyte and surrogate for detection by this method. Fresh standards should be prepared each time an initial calibration is performed.

7.6. Secondary Source Standards: The secondary source standards contain all of the target compounds that are contained in the Working Primary Standards.

7.6.1. Stock Secondary Standard (2.0 mg/mL): Certified calibration standard mixes are purchased from Restek/Accustandard or another commercial supplier, each at a high concentration in methanol. Follow the manufacturer's instructions for storage requirements and expiration dates. Document receipt of the standards in the Reagent Logbook.

7.6.2. 8260 Spike Standard (50 µg/mL): Prepare a Working Secondary solution (see table below), which will contain each target analyte at the final concentrations of 50 µg/mL. Prepare by combining and diluting required amounts of the stock primary mixes to a final volume of 5 mL in methanol. Record the preparation of this solution in the "VOA Standard Prep Log". Store the solution at < -10°C in labeled vials with Teflon lined screw caps. This solution must be replaced when the manufacturer's expiration date has passed or every 3 months, whichever comes first.

8. INSTRUMENTATION

8.1. Instrument (GC/MSVOA1)

8.1.1. Purge and Trap

Purge Time	11.0 min
Dry Purge	0 min
Desorb Preheat	245 °C
Desorb	1.0 min at 250 °C
Bake	10.0 min at 260 °C

8.1.2. Gas Chromatograph

8.1.2.1. Optimize GC conditions for analyte separation and sensitivity. Once optimized, the same GC conditions must be used for the analysis of all standards, samples, and QC.

8.1.2.2. The following are the recommended GC analytical conditions, actual conditions may vary:

Initial Column Temperature; Hold	35 °C for 4 min
First Temperature Ramp	200°C at °C / 0 min
Final Temperature, Hold	8° / min to 220°C for 2.37 min
Injector Temperature	180 °C
Source Temperature	230 °C
Injector	split @ 1:50
Sample Volume	10 mL

8.1.3. Mass Spectrometer

8.1.4. The following are the required mass spectrometer analytical conditions:

Electron Energy	70 volts (nominal)
Mass Range	35 to 270 amu
Scan Time	1.8 scans per second

9. PROCEDURE

9.1. The GC/MS must be turned on a minimum of 12 hours prior to the start of analysis.

9.2. The GC/MS system must be tuned to meet BFB target tune criteria using a PFTBA tuning standard. All tune criteria must be met according to manufacturer's specifications (See Chapter 3 Tuning procedures in the MS ChemStation User's Guide).

9.3. Prior to the analysis of any calibration standards, samples, or QC, the analyst must establish that the GC/MS system meets the mass spectral ion abundance criteria for the instrument performance check solution containing 4-Bromofluorobenzene (BFB).

9.4. BFB Tune Check: Prepare the Tune Check by adding 10 µL of the 25 µg/mL 8260 Surrogate Standard and 10 µL of the 25 µg/mL Internal Standard into 5 mL of Nanopure water. This will result in a surrogate concentration of 50 ppb.

9.4.1. The analysis of the instrument performance check solution must meet the ion abundance criteria.

9.4.2. The mass spectrum of BFB should be evaluated by taking the scan that occurs at the peak apex. Scans that occur within ± 3 scans from the peak apex, or an average of scans taken within that range, are also acceptable. Background subtraction must be performed. It should be straightforward and designed only to eliminate column bleed or instrument background ions.

9.4.3. The instrument performance check solution must be analyzed once at the beginning of each 12-hour period during which samples or standards are analyzed.

Note: All subsequent standards, samples, and QC associated with a BFB analysis must use identical mass spectrometer instrument conditions.

Note: Tune checks can also be taken from CCV runs.

Note: The 12-hour period for a GC/MS system instrument check begins at the moment of injection of the BFB analysis. A sample is considered to be within this 12 hour period if the injection time is before the 12 hours end, even though the run may extend after the 12 hour period.

9.5. Initial GC/MS Calibration

9.5.1. An initial calibration curve must meet the requirements outlined in this section before any samples or QC can be analyzed. After the GC/MS system has been tuned and the instrument performance check solution has been analyzed, prepare a minimum of five levels of calibration standards, the lower one of which is at the lowest reporting limit used for each compound. A minimum of six standards must be prepared if first or higher order regressions are used for quantitation.

9.5.2. Initial Calibration Verification using %RSD: The GC/MS software will calculate and generate a report with the %RSD. Alternatively, %RSD can be calculated using the following equations.

9.5.2.1. Response Factor (RF): Tabulate the area of the primary characteristic ion against the concentration for each target and surrogate compound for each initial calibration standard. Calculate the RF for each compound relative to one of the internal standards using the following equation:

$$RF = \frac{A_x}{A_{is}} \times \frac{C_{is}}{C_x}$$

Where:

A_X = Area of the characteristic ion for the compound being measured
A_{is} = Area of the characteristic ion for the specific internal standard
C_{is} = Concentration of the internal standard (µg/L)
C_X = Concentration of the compound to be measured (µg/L)

9.5.2.2. Percent Relative Standard Deviation (%RSD**)**: Calculate the %RSD of the RF values for the initial calibration using the following equation:

$$\%RSD = \frac{\text{Standard Deviation}}{\text{Mean}} \times 100$$

Where:

$$\text{Standard Deviation} = \sqrt{\sum_{i=1}\left[\frac{(x_i - \bar{x})^2}{n-1}\right]}$$

Where:

x_i = each individual value used to calculate the mean
$\overline{x}$ = the mean of n values
n = the total number of values

9.5.2.3. Initial calibration must meet acceptance criteria. For Method 8260B, the RSD of any target analyte must be 20% or less, with the exception of the Calibration Check Compound (CCC) (see table below) which must be equal or less than 30% *(unless a linear regression model was used for the compound).* When the response factors fall within the appropriate criteria, then the response factor is assumed to be constant over the calibration range, and the average response factor may be used for quantitation. If the % RSD for any compound is greater than 20% (30% for CCC compounds), the response factors will not be used for calibration.

Calibration Check Compounds-8260B	Maximum %RSD	Maximum %D (CCV)
1,1-Dichloroethene	30%	20%
Chloroform	30%	20%
1,2-Dichloropropane	30%	20%
Toluene	30%	20%
Ethylbenzene	30%	20%
Vinyl Chloride	30%	20%

9.5.3. Initial calibration evaluation using r or r^2. The GC/MS software will calculate and generate a report with the r or r^2 for each initial calibration compound. In this case, a calibration curve of area ratio versus concentration using first or higher order regression is used. The r^2 must be 0.990 or greater to use the calibration curve for quantitation. A minimum of six calibration standards must be used for first or higher order regressions. Do not include or force zero for the linear or quadratic regression.

9.5.3.1. Create a linear regression curve from the known concentrations of the Calibration Blank and all the Curve Standards and their respective absorbance readings. Calculate the correlation coefficient (r value) for the curve and record it on the instrument print out. The coefficient can be calculated as follows:

$$y = mx + b$$

Where:

y = Calibration Standard absorbance
m = Slope
x = Concentration of calibration standards
b = Intercept

And:

$$m = \frac{n\sum(xy) - (\sum x)(\sum y)}{n\sum x^2 - (\sum x)^2}$$

$$b = \frac{\sum y - m\sum x}{n}$$

$$r = \frac{n\sum(xy) - \sum x \sum y}{\sqrt{[n\sum(x^2) - (\sum x)^2][n\sum(y^2) - (\sum y)^2]}}$$

9.5.3.2. A second order (quadratic) regression (see equation below) may be used; however, a minimum of six calibration points is required. The r^2 must be 0.990 or greater (or r must be 0.995 or greater) to use the calibration curve for quantitation.

$$Q = ax^2 + bx + c$$

9.5.4. A system performance check must be performed to ensure that minimum average RFs are met before the initial calibration can be used. Specific compounds have been designated as System Performance Check Compounds (SPCC) for volatile analysis and are listed in the table below along with their minimum acceptable RF. These SPCC typically have very low RFs and tend to decrease in response as the chromatographic system begins to deteriorate. If the minimum RFs are not met, the system must be evaluated and corrective action taken. Once the problem has been determined and corrective action has been taken, repeat the initial calibration.

SPCC	ICAL Minimum RF	CCV Minimum RF
Chloromethane	0.100	0.100
1,1,-Dichloroethane	0.100	0.100
Bromoform	>0.100	>0.100
1,1,2,2-Tetrachloroethane	0.300	0.300
Chlorobenzene	0.300	0.300

9.5.5. Relative Retention Time (RRT): Calculate the (RRT) of each compound in each level of the initial calibration using the following equation:

$$RRT = \frac{RT_A}{RT_{IS}}$$

Where:

RT_A = Absolute retention time of compound

RT_{IS} = Absolute retention time of corresponding internal standard (See Table 3 for corresponding internal standard)

The RRT of each compound in each level of the initial calibration should agree within 0.06 relative retention time units.

9.5.6. A new initial calibration curve must be analyzed whenever corrective action has been taken which may change or affect the initial calibration criteria (i.e., ion source cleaning or repair, column removal or replacement, etc.), or if the continuing calibration acceptance criteria cannot be met.

9.6. Continuing Calibration Verification

9.6.1. The working calibration curve must be verified immediately after the curve, every 12 hours and prior to analyzing samples by running a continuing calibration standard. This standard is a working solution of the calibration standard at a concentration near the midpoint of the calibration curve (20 μg/L for example). The CCC and SPCC criteria for the continuing calibration must be met before any samples are analyzed.

9.6.2. Method 8260B requires that the RF for *SPCCs ≥ 0.30 for Chlorobenzene and 1,1,2,2-Tetrachloroethane, ≥ 0.10 for Chloromethane and 1,1-Dichloroethane and > 0.10 for Bromoform*. If the minimum response factors are not met, the system is evaluated and corrective action, including recalibration is taken. Response factors for SPCC may be affected by standard mixture degradation, degradation of the trap, contamination of the front end of the column and active sites in the column or purge and trap system.

9.6.3. The CCCs are also evaluated in order to verify the validity of the initial calibration. Percent Difference (PD) is calculated using the following equation:

$$\text{Percent Difference} = \frac{R1-R2}{R1} \times 100$$

Where:

R1 = Response Factor from a five-point calibration or true value
R2 = Response Factor from a continuing calibration or calculated value from curve

If the %D is greater than 20% for each CCC, corrective action including recalibration must be taken.

9.6.4. The non-CCC compounds must be checked against the limits. If the concentrations do not fall within the historically set limits, the system must be evaluated and corrective action taken.

9.6.5. Internal standard responses and retention times in the QC Check Standard must be evaluated after data acquisition. If the retention time for any internal standard changes by more than 0.5 minutes from retention time of the same internal

standard in the midpoint standard of the current initial calibration, the chromatographic system must be inspected for malfunctions and corrective action taken. The extracted ion current profile (EICP) of the internal standards must be monitored and evaluated for each standard. If the EICP area for any internal standard changes by more than a factor of two (50% to 200%) from the EICP area of the same internal standard in the midpoint standard of the current initial calibration, the mass spectrometric system must be inspected for malfunction and corrective action taken. When corrections are made, reanalysis of samples analyzed while the system was malfunctioning is necessary.

9.6.6. A new initial calibration curve must be run whenever the continuing calibration acceptance criteria cannot be met.

9.7. Sample Analysis

9.7.1. Samples may be analyzed only after the GC/MS system has met the instrument performance check, initial calibration, and QC Check Standard requirements stated above. The same instrument conditions must be employed for the analysis of samples and QC as were used for calibration. Document analysis of all samples in the Instrument Run Log.

9.7.2. Environmental samples received by *SAL* for analysis are recorded by the client on a chain of custody form. Each sample is given a unique laboratory ID that allows it to be tracked through all laboratory procedures. Verify ID from all samples to the chain of custody and note any discrepancies between the numbers. Any discrepancies should be discussed with Sample Receiving, the Laboratory Supervisor.

9.7.3. Remove the matrix samples from refrigerated storage and allow them to come to room temperature.

9.7.4. 8260B Aqueous Samples:

9.7.4.1. A suspect sample may be screened prior to analysis to determine if it will foam. Add approximately 5 mL of sample to a 20 mL scintillation vial. Shake the sample to see if it foams, if the aliquot foams, dilute the sample prior to analysis.

9.7.4.2. For each set of 20 or less matrix samples include a method blank, MS/MSD (if sufficient sample is available) and a LCS/LCSD.

9.7.4.3. Method Blank (MB): To prepare add 10 µL of 25 ppm Internal Standard, 10 µL of 25 ppm Surrogate Standard and to 5 mL Nanopure water.

9.7.4.4. Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD): Prepare 2 spikes at 25 µg/L each by adding 10 µL of Internal Standard, 10 µL of Surrogate Standard, 5 µL of the 50 µg/mL 8260 Secondary Standard to 10 mL water.

9.7.4.5. Sample Analysis: To prepare add 10 µL of 25 ppm Internal Standard, 10 µL of 25 ppm Surrogate Standard and to 10 mL of the sample aliquot.

Note: A MS/MSD must be analyzed on a 10% frequency. Precision and accuracy, either MS/MSD or LCS/LCSD pairs, must be analyzed every 12 hour shift.

9.7.4.5.1. Method Blank (MB):To prepare add 10 µL of 25 ppm Internal Standard, 100 µL of Sample Extract to 10 mL water.

9.8. Tekmar Purge and Trap Concentrator/ALS2016 Set-Up.

9.8.1. From the hand held programmer, select “schedule”, then choose “edit schedule”(E). A schedule is set up to start and stop at specified spargers. Choose the number of the spargers to be run using the numbers on the keypad and select “Enter”. This process can be repeated throughout the run to accommodate the need to add samples during the day. Be sure to choose the correct method for the concentrator.

9.8.2. After programming the schedule, select “schedule” and then select “commands” (C). Choose “Run Schedule”. The auto sampler will cycle to the first position programmed. Push start to begin the sequence.

9.9. Inject the Sample into the appropriate sparger.

9.9.1. The samples are typically analyzed in the following order: MB, LCS/LCSD, and samples including matrix samples (if enough sample available).

9.9.2. Instrument blanks should run after samples and standards containing high concentrations of target analytes or whenever there is a potential for carry over.

9.9.3. Analyze the samples using the specified instrument parameters.

9.9.4. Enviroquant Analytical Sequence Set Up.

9.9.4.1. Choose the “Sequence” menu on the HP-Chemstation. Click on “Load” and choose any previous run sequence.

9.9.4.2. When the sequence has loaded, click on “Sequence” from the menu bar, then click on “Edit Sample Log Table”.

9.9.4.3. Name each sample to be analyzed. The file naming format is MM_DD_YY_File#, i.e. 102607001.

9.9.4.4. In the “Miscellaneous” section enter the standardized sample type. These include CCV, LCS, LCSD, MS, MSD, MLBK, and SAMP.

9.9.4.5. Enter the name of the current method in the “Method” section. The method name is based on the date the current curve was analyzed.

9.9.4.6. Select "Repeat" to enter the appropriate information for each sample to be analyzed.

9.9.4.7. When the table is completed select "Enter".

9.9.4.8. The "Save Sequence" screen will appear. Name the sequence using the format Instrument #_MM_DD_YY, i.e. 102607. Select "OK".

9.9.4.9. Select "Sequence", then "Position and Run". Select the autosampler vial position that will start the run. Select "OK".

9.9.4.10. A screen will appear with run options. This will normally remain unchanged. Ensure that the "Method Section to Run" is set to "Full Method". Enter the file name.

9.9.4.11. Select "Run Sequence". A screen will appear with "Procession Key Words Before Starting Sequence". Ensure that it is set to "No".

9.9.4.12. After water samples have been analyzed, measure the pH using pH paper (use the same vial that was used in the analysis). If the pH is > 2, test a second VOA, If this pH is also > 2 the Laboratory Supervisor is notified and a note is made on the "Daily Coversheet" and on all reports.

9.10. Qualitative Analysis

9.10.1. The target compounds shall be identified by comparison of the sample mass spectra to a reference mass spectra. Reference spectra are obtained from the 20 ppb level of the initial calibration. The characteristic ions from the reference mass spectrum are defined to be the three ions of greatest relative intensity or any ions over 30% relative intensity if less than three such ions occur in the reference spectrum. The criteria for compound identification are listed in the following sections**.**

9.10.2. For establishing correspondence of the GC retention time (RT), the sample component RT must fall within ± 30 seconds of the CCV component RT. For samples analyzed during the same 24-hour time period as the initial calibration standards, compare the sample retention times to those from the standard that is the same concentration as the QC Check Standard. If coelution of interfering components prohibits accurate assignment of the sample component RT from the total ion chromatogram, the RT should be assigned by using extracted ion current profiles for ions unique to the component of interest.

9.10.3. The requirements for qualitative verification by comparison of mass spectra are as follows:

9.10.3.1. The relative intensities of the characteristic ions (**Table 5**) must agree within ± 20% between the standard and sample spectra. (Example: For an ion with an abundance of 50% in the standard spectra, the

corresponding sample ion abundance must be between 30 and 70 percent.).

9.10.3.2. Ions greater than 10% in the sample spectrum but not present in the standard spectrum must be considered and accounted for by the analyst making the comparison (i.e., ions contributing to the spectrum are interferences from coelution of another compound).

9.10.3.3. Structural isomers that produce very similar mass spectra shall be identified as individual isomers if they have sufficiently different GC retention times. Sufficient GC resolution is achieved if the height of the valley between two isomer peaks is less than 25% of the sum of the two peak heights. Otherwise, structural isomers shall be identified as isomeric pairs.

9.10.3.4. If a compound does not meet this criteria, it may still be reported at the analyst's discretion. An explanation and any supporting spectral information should accompany the data package.

9.10.4. A library search shall be executed for non-target sample components for the purpose of tentative identification if required by the client. For this purpose, an NIST/EPA/MSDC mass spectral library shall be used. The guidelines for making tentative identification are listed below.

9.10.4.1. Relative intensities of major ions in the reference spectrum (ions greater than 10% of the most abundant ion) should be present in the sample spectrum.

9.10.4.2. The relative intensities of the major ions should agree within ± 20%. (Example: for an ion with an abundance of 50% in the standard spectra, the corresponding sample ion abundance must be between 30 and 70 percent).

9.10.4.3. Molecular ions present in the reference spectrum should be present in the sample spectrum.

9.10.4.4. Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of coeluting compounds, both of which may be subtracted out. However, care should be taken not to subtract out relevant ions that occur in the peak of interest.

9.10.4.5. If, in the technical judgment of the analyst, no valid tentative identification can be made, the compound should be reported as unknown. Classification of the unknown compound (i.e. unknown phthalate, unknown hydrocarbon, unknown acid type, unknown chlorinated compound) should be given, if possible.

9.10.5. For Aqueous samples, the spectra for all reported compounds and for all false positives should be printed and included in the data package.

9.11. Quantitation

9.11.1. Target components identified shall be quantified by the internal standard (IS) method. The IS used shall be the one closest to the retention time to that of a given analyte (**Table 3**). The areas of characteristic ions listed in (**Table 5)** are used for quantitation.

9.11.1.1. The area and retention times of the IS must be monitored and evaluated for all samples and QC. If the area for any IS changes by more than a factor of two (50% to 200%) from the same IS in the midpoint standard of the current initial calibration, the mass spectrometric system must be inspected for malfunction and corrective action taken. If the retention time for any internal standard changes by more than 0.5 minutes from retention time of the same internal standard in the midpoint standard of the current initial calibration, the chromatographic system must be inspected for malfunctions and corrective action taken. If the analysis of a subsequent sample or standard indicates that the system is functioning properly, then corrections may not be required.

9.11.1.2. The samples or standards with areas outside the limits must be reanalyzed. If after reanalysis, the areas for all IS are inside the limits (50% to 200%), report the data from the reanalysis. The initial analysis may be noted on the report, but should not be reported in the result section.

9.11.1.3. If the reanalysis of the sample does not solve the problem, i.e., the areas are outside the control limits for both analyses, then submit the sample data from the first analysis. Note the results of the second analysis in the case narrative.

9.11.2. The $\overline{RRF}$ from the initial calibration are used to calculate the concentration in the sample for the compounds that had % RSD greater than 15% in the initial calibration. If secondary ion quantification is performed, reasons for doing so must be documented. The area of a secondary ion cannot be substituted for the area of a primary ion unless a relative response factor is calculated using the secondary ion.

9.11.3. For the compounds, which are being calibrated using first order or higher calibration curves, the data system will calculate a concentration using the equation, generated to describe the curve.

9.11.4. An estimated concentration for noncalibrated compounds, such as Tentatively Identified Compounds (TIC's), shall be made if requested by the client. The areas A_X and A_{IS} shall be from the total ion chromatograms. Use the nearest internal standard free of interferences. The $\overline{RRF}$ for the compound shall be assumed to be 1.0.

9.11.5. Manual Integration: Manual integration must be performed by an analyst proficient in the interpretation of peak resolution. Integration must be performed in accordance with the peak integration as is appears in the calibration curve. Reference SOP QAD-006.02 - Manual Integrations for detailed procedures.

9.11.6. If the concentration of any compound in a sample exceeds the initial calibration range, that sample must be diluted and the sample reanalyzed. Guidelines for performing dilutions are given below.

9.11.6.1. Use the results of the original analysis to determine the approximate dilution factor required to get the largest analyte peak within the initial calibration range.

9.11.6.2. The dilution factor chosen should keep the responses of the largest peak for a target compound in the upper half of the initial calibration range of the instrument. However, if there are nontarget compounds that may cause harm to the GC column or MS, or if the sample appears to "foam" when being purged, a larger dilution may be made.

10. CALCULATIONS

10.1. Calculate the concentration of the target compound in the sample using the average response factor ($\overline{RRF}$) as determined previously and the following equation:

$$\text{Concentration } (\mu g/L) = \frac{(Ax)\,(Is)\,(Di)}{(A_{is})\,(RRF_{av})\,(Vo)}$$

Where:

A_x = Area of the characteristic ion for the compound to be measured
I_s = Amount of internal standard injected in nanograms
A_{is} = Area of the characteristic ion for the internal standard
RRF_{av} = Mean relative response factor for compound being measured
Vo = Volume of water purged (mL), taking into consideration any dilutions made
Di = Dilution factor used (for 1:10 dilution, Di = 10)

10.2. Dilutions: The final concentration of any sample requiring dilution can be calculated using the following equation:

$$\text{Concentration } (\mu g/L) = C_P * Di$$

Where:

C_P = Concentration
Di = Dilution factor (for 1:10 dilution, Di = 10)

10.3. Calculate percent recovery using the following equation:

10.4. Use equation below to calculate the RPD.

$$RPD = \frac{S\text{-}SD}{AVE} \times 100$$

Where:

S = Spike result
SD = Spike duplicate result
AVE = Average of S and SD

10.5. Standard deviation: Use Excel® program, *hp*® calculator or equivalent to determine the standard deviation. Alternatively, the standard deviation can be calculated using the following formula:

$$\text{Standard Deviation} = \sqrt{\frac{\sum (X - M)2}{N - 1}}$$

Where:

$\sum$ = The sum of all results
X = Individual results
M = The mean of all results
N = The number of samples

10.6. Calculate the relative standard deviation (RSD) using the equation below.

$$RSD = \frac{S}{X} \times 100$$

Where:

S = Standard deviation
X = Average results

11. MAINTENANCE

11.1. All maintenance done on the GC/MS will be documented in the Maintenance Logbook. The following maintenance procedures are done routinely on the GC/MS. Some procedures may be done more often than scheduled, if there is a problem in instrument performance.

11.1.1. Clean the MSD source as needed when indicated by instrument performance.

11.1.2. Replace the trap as needed when indicated by instrument performance.

11.1.3. Clean auto sampler syringe and replace o-ring as needed when indicated by instrument performance.

11.1.4. Change vacuum pump oil every year.

11.2. All maintenance performed on the instrument by a service company is documented in the Maintenance Logbook.

12. QUALITY CONTROL

12.1. Initial Calibration: An initial calibration must be evaluated using the criteria listed above. A new initial calibration curve must be analyzed after major instrument maintenance or if the CCV acceptance criteria cannot be met.

12.2. Continuing Calibration Verification: The curve must be verified after initial calibration prior to the analysis of samples and every 12 hours prior to the analysis of samples by running a CCV. The recovery of each reported compound must meet the acceptance limits. If recoveries do not meet acceptance criteria the CCV must be reanalyzed. If reanalysis confirms the original results the source of the error must be identified and corrected before samples are analyzed. All CCC compounds must meet criteria. The acceptance limits for non CCC compounds are either 100 ± 20% or determined from historical laboratory limits.

12.3. Method Blank: A method blank (MB) is analyzed in each batch of twenty or fewer matrix samples; at a minimum of once every 12 hour clock.

12.3.1. An MB is considered acceptable if no target analytes are detected at or above the method reporting limit. If the MB exceeds these criteria, the analyst must consider the analytical system to be contaminated. The contamination must be corrected and, if possible, the MB and associated samples should be reanalyzed. If reanalysis is not possible the data must be flagged accordingly.

12.4. Matrix Spike/Matrix Spike Duplicate(MS/MSD): If sufficient sample is given, a MS/MSD is analyzed for each batch of 20 matrix samples or less.

12.4.1. The recovery limits for the MS/MSD are either 100 ± 40% or derived from historical data.

12.4.2. The relative percent difference (RPD) limits are either ≤30% or determined from historical data.

12.5. Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD): A LCS/LCSD is analyzed for each batch of 20 matrix samples or less.

12.5.1. The recovery limits for the LCS/LCSD are either 100 ± 30% or derived from historical data.

12.5.2. The relative percent difference (RPD) limits are either ≤30% or determined from historical data.

12.6. Surrogates

12.6.1. The excel spreadsheet labeled "Custom Reports" will calculate the concentration of the surrogate.

12.6.2. Surrogate recovery limits are established from historical data using at least 20 analyses, and are updated at least every six months. If no historical data available, default limits will be 100 +/- 30.

12.7. Corrective Action

12.7.1. Corrective action process is initiated when data quality problems are observed or suspected. These cases include spike recovery falling out of the acceptability limits, lack of stability during calibration process, contamination of laboratory blanks, carryover, exceeded sample holding time, etc. All data quality problems should be written on all pages of the report, and the laboratory supervisor notified.

12.7.2. If the surrogate, internal standard or spiked target compound recovery results do not meet criteria, check to be sure that there are no errors in calculations, solutions, or internal standards. Also check instrument performance. If none of these items reveal a problem, corrective action must be taken and the sample or standard must be reanalyzed.

12.7.3. If the reanalysis of the sample or standard yields recoveries that are within limits, report the reanalysis.

12.7.3.1. If the reanalysis of the sample or standard does not yield recoveries within QC limits, then the problem was out of the laboratory's control. Therefore, submit data from the initial analysis and fill out an 'Out of Control Event' form.

12.7.3.2. If the surrogate recoveries of the sample associated with MS/MSD are not within the established control limits, it should be reanalyzed only if the MS/MSD recoveries are acceptable. If the sample and associated MS/MSD show the same pattern (i.e., recoveries outside control limits), then neither the sample, MS, nor MSD require reanalysis. Fill out and 'Out of Control Event ' form.

12.7.3.3. If any target compound is outside of the criteria in the MS/MSD, it must be flagged on all reports with samples associated with the spiked pair. Fill out and 'Out of Control Event ' form.

13. REFERENCES

13.1. Tekmar 2016/2032 Auto sampler Manual.

13.2. Tekmar 3100 Purge and Trap Concentrator Manual.

13.3. Agilent 6890 N GC, and 5975 MS Gas Chromatograph Manual.

13.4. "*Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)"*, Method 8260B, USEPA, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition, with integrated updates I, II, IIA, IIB, and III, June 1997

13.5. "*Purge and Trap for Aqueous Samples)"*, Method 5030B, USEPA, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition, with integrated updates I, II, IIA, IIB, and III, June 1997

13.6. *Determinative Chromatographic Separations,* Method 8000C, USEPA, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition, with integrated updates I, II, IIA, IIB, and III, June 1997.

13.7. ADHS administrative codes Title 9, Chapter 14 (a.k.a. Arizona Rules).

Table 1
PQLS for EPA Method 8260B

Compound	PQL (µg/L) Water
Acetone	20
Benzene	1
Bromobenzene	1
Bromochloromethane	1
Bromodichloromethane	2
Bromoform	5
Bromomethane	5
1,3-Butadiene	1
2-Butanone	5
n-Butylbenzene	1
Sec-Butylbenzene	1
Tert-Butylbenzene	1
Carbon Disulfide	5
Carbon tetrachloride	1
Chlorobenzene	1
Chloroethane	1
Chloroform	2
Chloromethane	5
2-Chlorotoluene	1
4-Chlorotoluene	1
Cyclohexane	1
Dibromochloromethane	1
1,2-Dibromo-3-Chloropropane	5
1,2-Dibromoethane	1
Dibromomethane	1
1,2-Dichlorobenzene	1
1,3-Dichlorobenzene	1
1,4-Dichlorobenzene	1
Dichlorodifluoromethane	1
1,1-Dichloroethane	1
1,2-Dichloroethane	1
1,1-Dichloroethene	1
Cis-1,2-Dichloroethene	1
Trans-1,2-Dichloroethene	1
1,2-Dichloropropane	1
1,3-Dichloropropane	1
2.2-Dichloropropane	2
1,1-Dichloropropene	1
Cis-1,3-Dichloropropene	1
Trans-1,3-Dichloropropene	1
Dicyclopentadiene	1
Ethylbenzene	1
Heptane	1
Hexachlorobutadiene	2
Hexane	1
2-Hexanone	5
Iodomethane	5
4-Isopropyltoluene	1
Isopropylbenzene	1

Table 1
PQLS for EPA Method 8260B
(Cont)

Compound	PQL (µg/L) Water
Methyl cyclohexane	1
Methylene Chloride	2
Methyl tert butyl ether	1
4-Methyl-2-pentanone	5
Naphthalene	5
Nonane	1
n-Propylbenzene	1
Styrene	1
1,1,2,2-Tetrachloroethane	1
1,1,1,2-Tetrachloroethane	1
Toluene	1
1,2,3-Trichlorobenzene	5
1,2,4-Trichlorobenzene	5
Trichloroethene	1
1,1,1-Trichloroethane	1
1,1,2-Trichloroethane	1
Tetrachloroethene	1
Trichlorofluoromethane	1
1,2,3-Trichloropropane	2
1,2,4-Trimethylbenzene	1
1,3,5-Trimethylbenzene	1
2,2,4-Trimethyl Pentane	1
Vinyl Acetate	2
Vinyl Chloride	2
m,p-Xylene	2
o-Xylene	1
Total Xylenes	3

Table 2

BFB KEY IONS AND ION ABUNDANCE CRITERIA FOR QUADRUPOLE MASS SPECTROMETERS

Mass	Ion Abundance Criteria
50	15 to 40% of mass 95
75	30 to 60% of mass 95
95	base peak, 100% relative abundance
96	5 to 9% of mass 95
173	less than 2% of mass 174
174	greater than 50% of mass 95
175	5 to 9% of mass 174
176	greater than 95% but less than 101% of mass 174
177	5 to 9% of mass 176

Note: Alternate tuning criteria may be used (e.g. CLP, Method 524.2 or manufacturers' instructions), provided that method performance is not adversely affected.

TABLE 3

VOLATILE INTERNAL STANDARDS WITH CORRESPONDING TARGET COMPOUNDS AND SURROGATES ASSIGNED FOR QUANTITATION

Pentafluorobenzene	1,4-Difluorobenzene	Chlorobenzene-d_5	1,4-Dichlorobenzene-d4
Dichlorodifluoromethane	Trichloroethylene	Chlorobenzene	Bromobezene
Chloromethane	Methyl Cyclohexane	1,1,1,2-Tetrachloroethane	1,1,2,2-Tetrachloroethane
Vinyl chloride	1,2-Dichloropropane	Ethylbenzene	1,2,3-Trichloropropane
1,3-Butadiene	Dibromomethane	m,p-Xylene	n-Propylbenzene
Bromomethane	Bromodichloromethane	Nonane	2-Chlorotoluene
Chloroethane	2-Chloroethylvinyl ether	o-Xylene	4-Chlorotoluene
Trichlorofluoromethane	cis-1,3-Dichloropropene	Styrene	1,3,5-Trimethylbenzene
1,1-Dichloroethene	4-Methyl-2-pentanone	Bromoform	tert-Butylbenzene
Acetone	Toluene	Isopropylbenzene	1,2,4-Trimethylbenzene
Iodomethane	trans-1,3-Dichloropropene	*Toluene-d8	sec-Butylbenzene
Carbon Disulfide	1,1,2-Trichloroethane		1,3-Dichlorobenzene
Methylene Chloride	Tetrachloroethene		4-Isopropyltoluene
trans-1,2-Dichloroethene	1,3-Dichloropropane		1,4-Dichlorobenzene
Methyl tert-butyl ether	2-Hexanone		Dicyclopentadiene
Hexane	Dibromochloromethane		1,2-Dichlorobenzene
1,1-Dichloroethane	1,2-Dibromoethane		n-Butylbenzene
Vinyl Acetate	*1,2-Dichlorothane-d4		1,2-Dibromo-3-chloropropane
2,2-Dichloropropane			1,2,4-Trichlorobenzene
cis-1,2-Dichloroethene			Hexachlorobutadiene
2-Butanone			Naphthalene
Bromochloromethane			1,2,3-Trichlorobenzene
Chloroform			*4-Bromofluorobenzene
1,1,1-Trichloroethane			
Cyclohexane			
Carbon Tetrachloride			
1,1-Dichloropropene			
Benzene			
1,2-Dichloroethane			
2,2,4-Trimethyl Pentane			
Heptane			
*Pentafluorobenzene			

*Surrogate

TABLE 4

CHARACTERISTIC IONS FOR VOLATILE INTERNAL STANDARDS

INTERNAL STANDARDS	PRIMARY ION	SECONDARY IONS
1,4-Difluorobenzene	114	63, 88
Chlorobenzene-d_5	117	82*, 119
Pentafluorobenzene	168	-
1,4-Dichlorobenzene-d_4	152	115, 150

*The secondary ion 82 is used to quantitate due to interference of the primary ion 117.

TABLE 5
CHARACTERISTIC IONS FOR VOLATILE COMPOUNDS AND SURROGATES

Compound	Primary Ion	Secondary Ion(s)
Pentafluorobenzene	168	99,137
Dichlorodifluoromethane	85	87, 50
Chloromethane	50	52, 33
Vinyl Chloride	62	64, 44
1,3-Butadiene	39	54, 28
Bromomethane	94	96,93
Chloroethane	64	66,49
Trichlorofluoromethane	101	103,66
1,1-Dichloroethene	61	96,98
Acetone	58	43
Iodomethane	142	127
Carbon Disulfide	76	44
Methylene Chloride	49	84,86,51
trans-1,2-Dichloroethene	61	96,98
Methyl tert-butyl ether	73	43,41
Hexane	57	41,42
1,1-Dichloroethane	63	65,83
Vinyl acetate	43	86
2,2-Dichloropropane	77	41,39
cis-1,2-Dichloroethene	61	96,98
2-Butanone	43	72
Bromochloromethane	49	128
Chloroform	83	85,87
1,1,1-Trichloroethane	97	99
Dibromofluoroethane	111	113/192
Cyclohexane	56	84,69
Carbon Tetrachloride	117	119,121
1,1-Dichloropropene	75	39,110
1,2-Dichloroethane-d4	65	67,51
Benzene	78	52,77
1,2-Dichloroethane	62	64,98
2,2,4-Trimethyl Penatne	57	56,29
Heptane	43	71,56
1,4-Difluorobenzene	114	63,88
Trichloroethene	130	97,132
Methyl Cyclohexane	83	55,42
1,2-Dichloropropane	63	62,76
Dibromomethane	174	93,172
Bromodichloromethane	83	85,129
2-Chloroethylvinylether	63	43

TABLE 5 (continued)
CHARACTERISTIC IONS FOR VOLATILE COMPOUNDS AND SURROGATES

Compound	Primary Ion	Secondary Ion(s)
cis-1,3-Dichloropropene	75	77,39
4-Methyl-2-pentanone	43	68,86,100
Toluene-d8	98	70,100
Toluene	91	92,65
trans-1,3-Dichloropropene	75	77,39
1,1,2-Trichloroethane	97	83,99
Tetrachloroethene	164	129,131,166
1,3-Dichloropropane	76	41,39
2-Hexanone	43	58,100
Dibromochloromethane	129	127,131,79
1,2-Dibromoethane	107	109,81
Chlorobenzene-d5	117	82,119
Chlorobenzene	112	114,77
1,1,1,2-Tetrachloroethane	131	135,95,133
Ethylbenzene	91	106
m,p-Xylene	91	106
Nonane	43	57,71
o-Xylene	91	106
Styrene	104	78,103
Bromoform	173	171,175,255
Isopropylbenzene	105	120,77
4-Bromofluorobenzene	95	176
1,4-Dichlorobenzene-d4	150	152,115
Bromobenzene	77	156,158
1,1,2,2-Tetrachloroethane	83	85,131,133
1,2,3-Trichloropropane	75	77,110
n-Propylbenzene	91	120,92
2-Chlorotoluene	91	126,90
4-Chlorotoluene	91	126,63
1,3,5-Trimethylbenzene	105	120,77
tert-Butylbenzene	119	91,134
1,2,4-Trimethylbenzene	105	120,46
sec-Butylbenzene	105	134,19
1,3-Dichlorobenzene	146	148,111
4-Isopropylbenzene	119	146,91
1,4-Dichlorobenzene-d4	152	115,150
1,4-Dichlorobenzene	146	148,111
Dicyclopentadiene	66	39,67
1,2-Dichlorobenzene	146	148,111
n-Butylbenzene	91	92,134
1,2-Dibromo-3-chloropropane	41	39,155
1,2,4-Trichlorobenzene	179	182,97
Hexachlorobutadiene	224	227,223
Napthalene	128	127,129
1,2,3-Trichlorobenzene	180	182,145

APPENDIX J

Weekly Operation and Maintenance Inspection Form

WEEKLY OPERATION AND MAINTENANCE INSPECTION FORM

RID Wellhead Treatment Systems

Rev. - 10/2014

Operator/Engineer: _____ Time In: _____ Weather: _____

Date: _____ Time Out: _____

WELLHEAD TREATMENT SYSTEMS OPERATIONS DATA

RID-89

Site Conditions/Security: _____

Pressure @ Well (P_{IN})	____ psi	**Totalizer**			P_{MID} (Skid 1)	____ psi			
Total Flow Rate	____ gpm	____ AF			P_{MID} (Skid 2)	____ psi			
Bypass Flow Rate	____ gpm	____ AF			P_{MID} (Skid 3)	____ psi			
Flow Rate (Skid 1)	____ gpm	____ AF	Lead Vessel	____	P_{OUT} (Skid 1)	____ psi	ΔP (Skid 1)	____	psi
Flow Rate (Skid 2)	____ gpm	____ AF	Lead Vessel	____	P_{OUT} (Skid 2)	____ psi	ΔP (Skid 2)	____	psi
Flow Rate (Skid 3)	____ gpm	____ AF	Lead Vessel	____	P_{OUT} (Skid 3)	____ psi	ΔP (Skid 3)	____	psi

Carbon change-out conducted?: Y / N Notes: _____

Water present in sumps?: Y / N Notes: _____

Inspection of wellhead and discharge structure?: Y / N Notes: _____

Check sump pumps/switches, exercise valves (monthly)?: Y / N Notes: _____

RID-92

Site Conditions/Security: _____

Pressure @ Well (P_{IN})	____ psi	**Totalizer**							
Total Flow Rate	____ gpm	____ AF							
Bypass Flow Rate	____ gpm	____ AF			P_{MID} (Skid 1)	____ psi			
Flow Rate (Skid 1)	____ gpm	____ AF	Lead Vessel	____	P_{OUT} (Skid 1)	____ psi	ΔP (Skid 1)	____	psi

Carbon change-out conducted?: Y / N Notes: _____

Water present in sumps?: Y / N Notes: _____

Inspection of wellhead and discharge structure?: Y / N Notes: _____

Check sump pumps/switches, exercise valves (monthly)?: Y / N Notes: _____

RID-95

Site Conditions/Security: _____

Pressure @ Well (P_{IN})	____ psi	**Totalizer**							
Total Flow Rate	____ gpm	____ AF			P_{MID} (Skid 1)	____ psi			
Bypass Flow Rate	____ gpm	____ AF			P_{MID} (Skid 2)	____ psi			
Flow Rate (Skid 1)	____ gpm	____ AF	Lead Vessel	____	P_{OUT} (Skid 1)	____ psi	ΔP (Skid 1)	____	psi
Flow Rate (Skid 2)	____ gpm	____ AF	Lead Vessel	____	P_{OUT} (Skid 2)	____ psi	ΔP (Skid 2)	____	psi

Carbon change-out conducted?: Y / N Notes: _____

Water present in sumps?: Y / N Notes: _____

Inspection of wellhead and discharge structure?: Y / N Notes: _____

Check sump pumps/switches, exercise valves (monthly)?: Y / N Notes: _____

RID-114

Site Conditions/Security: _____

Pressure @ Well (P_{IN})	____ psi	**Totalizer**			P_{MID} (Skid 1)	____ psi			
Total Flow Rate	____ gpm	____ AF			P_{MID} (Skid 2)	____ psi			
Bypass Flow Rate	____ gpm	____ AF			P_{MID} (Skid 3)	____ psi			
Flow Rate (Skid 1)	____ gpm	____ AF	Lead Vessel	____	P_{OUT} (Skid 1)	____ psi	ΔP (Skid 1)	____	psi
Flow Rate (Skid 2)	____ gpm	____ AF	Lead Vessel	____	P_{OUT} (Skid 2)	____ psi	ΔP (Skid 2)	____	psi
Flow Rate (Skid 3)	____ gpm	____ AF	Lead Vessel	____	P_{OUT} (Skid 3)	____ psi	ΔP (Skid 3)	____	psi

Carbon change-out conducted?: Y / N Notes: _____

Water present in sumps?: Y / N Notes: _____

Inspection of wellhead and discharge structure?: Y / N Notes: _____

Check sump pumps/switches, exercise valves (monthly)?: Y / N Notes: _____

SAMPLING AND ANALYSIS

Sampling conducted?: Y / N COC form attached?: Y / N

Duplicate collected?: Y / N Duplicate Sample ID: _____

SYNERGY ENVIRONMENTAL, LLC

SYNERGY ENVIRONMENTAL, LLC

APPENDIX K

Example Chain-of-Custody Form

Airtech Environmental Laboratories (AEL) Chain of Custody

4620 E.Elwood Street, Suite 13, Phoenix, AZ 85040 480-968-5888 (phone) 480-966-1888 (fax)

Customer :	**Page_____ of _____**		**AEL Lab #**
Address:	**Sampler:**	**Phone:**	
	Project Name:	**Project Number:**	
City, State, Zip:	**Project location:**		
Contact:	**P.O. Number:**		
Phone: **Fax:**	**Fax Results:**	**Y** **N**	
E-Mail Address:	**E-Mail Results:**	**Y** **N**	

Sample Receipt	**Turn Around Request**	***Please fill the information below:***
Temperature_____ °C	_____ 24 Hours _____ 48 Hours	**Sample Type**
Custody Seals: Yes_____ No_____	_____ 72 Hours	**A**: ambient air **WW**: waste water
Custody Seals Intact: Yes_____ No_____	_____ 5 working Day	**I**: indoor air
Total # of Containers:_____	_____ Standard 10 Working Days	**S**: soil extraction vapor
		GW: ground water

Sample Information

AEL	Serial #		Canister	Client's	Sampled		Number of	Sample	Analyses Requested									
Lab #	Canister	Regulator	Model (L)	Sample Identification	Date	Time	containers	Type	TO-15 full list	TO-15 BTEX	TO-15 TPH(GRO)	8260B AZ Vapor full list	8260B AZ Vapor BTEX	8015 GRO	8260B Water			
			6, 1, bag															
			6, 1, bag															
			6, 1, bag															
			6, 1, bag															
			6, 1, bag															
			6, 1, bag															
			6, 1, bag															
			6, 1, bag															
			6, 1, bag															
			6, 1, bag															

Instructions / Special Requirements:

Date:	Time:	Samples Relinquished By:	Received By:

SYNERGY ENVIRONMENTAL, LLC

APPENDIX L

Monthly Progress Report Example

SYNERGY ENVIRONMENTAL, LLC

September 13, 2012

Mr. Kevin Snyder
Project Manager, West Van Buren Area WQARF Site
Remedial Projects Unit
Arizona Department of Environmental Quality
1011 West Washington Street
Phoenix, AZ 85007

Re: August 2012 Monthly Progress Report - RID-95 Wellhead Pilot Treatment Systems

Dear Mr. Snyder:

This August 2012 Monthly Progress Report for the RID-95 Wellhead Pilot Treatment Systems is provided for your review. This Monthly Progress Report, consistent with Section 8 of the *RID-95 Wellhead Pilot Treatment System Proposol*, dated August 18, 2011, provides information regarding wellhead treatment systems currently operating at RID-95, RID-89, RID-92 and RID-114.

This Monthly Progress Report includes:

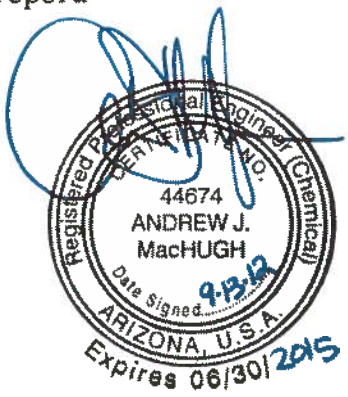
- Narrative summary of operational status including malfunctions, if any, and the actions taken to correct the malfunction.
- Operational data including: hours/percentage of operating time during the reporting period, volume of groundwater treated, approximate mass of target contaminants of concern (COCs) removed, and cumulative mass of target COCs removed since system start-up.
- Tabular summary of water quality samples collected and analytical results.
- Copies of final laboratory reports.

Please contact me by phone at 602-430-2785 or by email at andrew.machugh@syn-env.com, should you have any questions or comments regarding this report.

Best Regards,

SYNERGY Environmental, LLC

Andrew MacHugh, PE



cc: Donovan Neese, Roosevelt Irrigation District
David Kimball, Gallagher & Kennedy

SYNERGY ENVIRONMENTAL, LLC

Summary of Operational Status

RID-95 Pilot Wellhead Treatment System

The RID-95 Wellhead Treatment System (WTS) operated continuously during the reporting period except when the system was changed to bypass mode (intermittently for approximately 1 hour) in an effort to balance flow rates between the treatment skids. When operating in treatment mode, the WTS processed flow from the well at approximately 1,600 gallons per minute (gpm). Additional operational data and estimated mass of target COCs removed are provided in **Table 1**. A summary of water quality data is provided in **Table 2**.

RID-89 Wellhead Treatment System

The RID-89 WTS operated continuously during the reporting period except for approximately 6 hours due to a power surge/outage at the site that caused the system to automatically shut down. When operating, the WTS processed flow from the well at approximately 2,910 gpm. Additional operational data and estimated mass of target COCs removed are provided in **Table 1**. A summary of water quality data is provided in **Table 3**.

RID-92 Wellhead Treatment System

The RID-92 WTS operated only about 17% of the time during the month because the system was shut down to allow for well investigation activities. When operating, the WTS processed flow from the well at approximately 1,230 gpm. Additional operational data and estimated mass of target COCs removed are provided in **Table 1**. A summary of water quality data is provided in **Table 4**.

RID-114 Wellhead Treatment System

RID-114 WTS operated continuously during the reporting period except for approximately 1 hour for routine maintenance activities. When operating, the WTS processed flow from the well at approximately 2,380 gpm. Additional operational data and estimated mass of target COCs removed are provided in **Table 1**. A summary of water quality data is provided in **Table 5**.

TABLE 1. RID WELLHEAD TREATMENT SYSTEMS OPERATIONAL STATUS

West Van Buren Area WQARF Registry Site

Reporting Period: **August 2012**

WELLHEAD TREATMENT SYSTEMS DATA							
RID-95 Pilot	Volume of GW Treated:	218	acre-feet	Estimated Mass of Target COCs Removed:	43	pounds
	Volume of GW Treated, Since Start-up:	1503	acre-feet	Mass of Target COCs Removed, Since Start-up:	262	pounds
	Operational Hours:	743	**99.9%**			
RID-89	Volume of GW Treated:	397	acre-feet	Estimated Mass of Target COCs Removed:	44	pounds
	Volume of GW Treated, Since Start-up:	1296	acre-feet	Mass of Target COCs Removed, Since Start-up:	144	pounds
	Operational Hours:	739	**99.3%**			
RID-92	Volume of GW Treated:	29	acre-feet	Estimated Mass of Target COCs Removed:	7	pounds
	Volume of GW Treated, Since Start-up:	408	acre-feet	Mass of Target COCs Removed, Since Start-up:	96	pounds
	Operational Hours:	126	**16.9%**			
RID-114	Volume of GW Treated:	326	acre-feet	Estimated Mass of Target COCs Removed:	44	pounds
	Volume of GW Treated, Since Start-up:	992	acre-feet	Mass of Target COCs Removed, Since Start-up:	135	pounds
	Operational Hours:	743	**99.9%**			
TOTALS (all sites):	Volume of GW Treated:	**970**	acre-feet	Estimated Mass of Target COCs Removed:	**138**	pounds
	Volume of GW Treated, Since Start-Up:	**4,198**	acre-feet	Mass of Target COCs Removed, Since Start-up:	**637**	pounds

MAINTENANCE REPORT

RID-95 WTS operated in bypass mode for approximately 1 hour intermittently during the reporting period in an effort to balance skid flows.

RID-89 WTS was offline (or in bypass mode) for almost 6 hours due to a power surge/outage that caused the system to automatically shut down.

RID-92 WTS was offline for over 83% of the time during the month to allow for well investigation activities as requested by ADEQ.

RID-114 WTS was in bypass mode for approximately 1 hour during the month to allow for routine maintenance activities.

Alarms: None.

Actions: N/A.

Attachments:
1) Table 2. RID-95 Pilot System Data Summary
2) Table 3. RID-89 Wellhead Treatment System Data Summary
3) Table 4. RID-92 Wellhead Treatment System Data Summary
4) Table 5. RID-114 Wellhead Treatment System Data Summary
5) Copies of Final Analytical Reports

SYNERGY ENVIRONMENTAL, LLC

TABLE 2. RID-95 PILOT SYSTEM DATA SUMMARY
WEST VAN BUREN AREA WQARF REGISTRY SITE
(results presented in micrograms per liter, µg/L)

					TARGET COCs					
SAMPLE LOCATION	SAMPLE ID*	DATE	LEAD VESSEL	SAMPLE TYPE	TCE	PCE	1,1-DCE	TCM	1,1-DCA	cis-1,2-DCE
EPA MAXIMUM CONTAMINANT LEVELS (MCL), as µg/L:					5	5	7	none	none	70
INFLUENT	95-Influent	8/7/12	--	Primary	**61**	**4.1**	**8.2**	**1.3**	**4.4**	**11**
	95-Influent	8/13/12	--	Primary	**63**	**4.3**	**7.2**	**1.2**	**4.5**	**11**
	95-Influent	8/20/12	--	Primary	**62**	**4.4**	**7.6**	**1.2**	**4.3**	**11**
	082012-01	8/20/12	--	Duplicate	**62**	**4.4**	**7.8**	**1.2**	**4.5**	**11**
	95-Influent	8/29/12	--	Primary	**67**	**4.6**	**7.7**	**1.3**	**4.7**	**11**
POINT OF COMPLIANCE	95-POC	8/7/12	--	Primary	<0.5	<0.5	**1.1**	**1.1**	**5.1**	**2.6**
	95-POC	8/13/12	--	Primary	<0.5	<0.5	**1.4**	**1.4**	**6.4**	**3.6**
	95-POC	8/20/12	--	Primary	<0.5	<0.5	**2.4**	**1.4**	**5.9**	**5.5**
	95-POC	8/29/12	--	Primary	<0.5	<0.5	**3.6**	**1.6**	**6.1**	**7.7**
TREATMENT SKID #1 (SOUTH, REACTIVATED CARBON)										
MID-SKID (EFFLUENT OF LEAD VESSEL)	95-MID-1	8/7/12	A	Primary	<0.5	<0.5	**5.3**	**1.6**	**5.9**	**9.7**
	95-MID-1	8/13/12	A	Primary	**0.6**	<0.5	**6.4**	**1.6**	**5.8**	**11**
	95-MID-1	8/20/12	A	Primary	**0.9**	<0.5	**7.3**	**1.7**	**5.9**	**12**
	95-MID-1	8/29/12	A	Primary	**2.0**	<0.5	**8.5**	**1.5**	**5.3**	**12**
TREATMENT SKID #2 (NORTH, REACTIVATED CARBON)										
MID-SKID (EFFLUENT OF LEAD VESSEL)	95-MID-2	8/7/12	A	Primary	**5.4**	<0.5	**6.7**	**1.4**	**5.2**	**11**
	95-MID-2	8/13/12	A	Primary	**6.2**	<0.5	**8.1**	**1.7**	**5.8**	**12**
	95-MID-2	8/20/12	A	Primary	**12**	<0.5	**8.0**	**1.5**	**5.3**	**12**
	95-MID-2	8/29/12	A	Primary	**12**	<0.5	**8.8**	**1.4**	**5.3**	**13**

EXPLANATION:

COC = Contaminant of Concern
TCE = Trichloroethene
PCE = Tetrachloroethene
1,1-DCE = 1,1-Dichloroethene
TCM = Chloroform
1,1-DCA = 1,1-Dichloroethane
cis-1,2-DCE = cis-1,2-Dichloroethene

* All samples analyzed by Airtech Environmental Laboratories following EPA Test Method 8260B.
<0.5 = Result is less than laboratory method reporting limit (MRL).
All other volatile organic compounds (VOCs) are below the MRL/detection limit.

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TABLE 3. RID-89 WELLHEAD TREATMENT SYSTEM DATA SUMMARY
WEST VAN BUREN AREA WQARF REGISTRY SITE
(results presented in micrograms per liter, µg/L)

					TARGET COCs					
SAMPLE LOCATION	SAMPLE ID*	DATE	LEAD VESSEL	SAMPLE TYPE	TCE	PCE	1,1-DCE	TCM	1,1-DCA	cis-1,2-DCE
EPA MAXIMUM CONTAMINANT LEVELS (MCL), as µg/L					5	5	7	none	none	70
INFLUENT	89-Influent	8/7/12	--	Primary	**31**	**9.0**	**2.1**	**2.9**	**0.7**	**2.8**
	080712-01	8/7/12	--	Duplicate	**30**	**8.7**	**2.2**	**3.1**	**0.7**	**3.0**
	89-Influent	8/13/12	--	Primary	**30**	**9.1**	**2.2**	**3.1**	**0.7**	**2.8**
	89-Influent	8/20/12	--	Primary	**30**	**9.2**	**2.2**	**3.1**	**0.7**	**2.7**
	89-Influent	8/29/12	--	Primary	**29**	**9.1**	**2.0**	**3.0**	**0.6**	**2.6**
	082912-01	8/29/12	--	Duplicate	**28**	**8.8**	**2.2**	**3.0**	**0.6**	**2.7**
POINT OF COMPLIANCE	89-POC	8/7/12	--	Primary	<0.5	<0.5	<0.5	**1.8**	**0.7**	<0.5
	89-POC	8/13/12	--	Primary	<0.5	<0.5	<0.5	**2.3**	**0.8**	<0.5
	89-POC	8/20/12	--	Primary	<0.5	<0.5	<0.5	**2.8**	**0.8**	**0.7**
	89-POC	8/29/12	--	Primary	<0.5	<0.5	<0.5	**3.2**	**0.9**	**1.1**
TREATMENT SKID #1 (NORTH, REACTIVATED CARBON)										
MID-SKID (EFFLUENT OF LEAD VESSEL)	89-MID-1	8/7/12	A	Primary	**1.7**	<0.5	**1.3**	**3.1**	**0.8**	**2.0**
	89-MID-1	8/13/12	A	Primary	**1.9**	<0.5	**1.4**	**3.4**	**0.8**	**2.3**
	89-MID-1	8/20/12	A	Primary	**3.1**	<0.5	**1.7**	**3.7**	**0.9**	**2.6**
	89-MID-1	8/29/12	A	Primary	**3.6**	<0.5	**1.9**	**3.7**	**0.9**	**2.7**
TREATMENT SKID #2 (MIDDLE, REACTIVATED CARBON)										
MID-SKID (EFFLUENT OF LEAD VESSEL)	89-MID-2	8/7/12	A	Primary	**3.1**	<0.5	**1.4**	**3.2**	**0.9**	**2.2**
	89-MID-2	8/13/12	A	Primary	**3.4**	<0.5	**1.8**	**3.5**	**0.9**	**2.6**
	89-MID-2	8/20/12	A	Primary	**4.7**	<0.5	**2.0**	**3.4**	**0.8**	**2.6**
	89-MID-2	8/29/12	A	Primary	**5.4**	<0.5	**2.1**	**3.7**	**0.9**	**3.2**
TREATMENT SKID #3 (SOUTH, REACTIVATED CARBON)										
MID-SKID (EFFLUENT OF LEAD VESSEL)	89-MID-3	8/7/12	A	Primary	**3.6**	<0.5	**1.5**	**3.2**	**0.9**	**2.3**
	89-MID-3	8/13/12	A	Primary	**4.1**	<0.5	**1.7**	**3.4**	**0.9**	**2.5**
	89-MID-3	8/20/12	A	Primary	**6.3**	<0.5	**1.9**	**3.7**	**0.9**	**3.0**
	89-MID-3	8/29/12	A	Primary	**6.7**	<0.5	**2.5**	**3.9**	**0.9**	**3.2**

EXPLANATION:

COC = Contaminant of Concern
TCE = Trichloroethene
PCE = Tetrachloroethene
1,1-DCE = 1,1-Dichloroethene
TCM = Chloroform
1,1-DCA = 1,1-Dichloroethane
cis-1,2-DCE = cis-1,2-Dichloroethene

* All samples analyzed by Airtech Environmental Laboratories following EPA Test Method 8260B.
<0.5 = Result is less than laboratory method reporting limit (MRL).
All other volatile organic compounds (VOCs) are below the MRL/detection limit.

SYNERGY ENVIRONMENTAL, LLC

TABLE 4. RID-92 WELLHEAD TREATMENT SYSTEM DATA SUMMARY
WEST VAN BUREN AREA WQARF REGISTRY SITE
(results presented in micrograms per liter, µg/L)

					TARGET COCs					
SAMPLE LOCATION	SAMPLE ID*	DATE	LEAD VESSEL	SAMPLE TYPE	TCE	PCE	1,1-DCE	TCM	1,1-DCA	cis-1,2-DCE
EPA MAXIMUM CONTAMINANT LEVELS (MCL), as µg/L					5	5	7	none	none	70
INFLUENT	92-Influent	8/7/12	--	Primary	NS	NS	NS	NS	NS	NS
	92-Influent	8/13/12	--	Primary	NS	NS	NS	NS	NS	NS
	92-Influent	8/20/12	--	Primary	NS	NS	NS	NS	NS	NS
	92-Influent	8/29/12	--	Primary	NS	NS	NS	NS	NS	NS
POINT OF COMPLIANCE	92-POC	8/7/12	--	Primary	NS	NS	NS	NS	NS	NS
	92-POC	8/13/12	--	Primary	NS	NS	NS	NS	NS	NS
	92-POC	8/20/12	--	Primary	NS	NS	NS	NS	NS	NS
	92-POC	8/29/12	--	Primary	NS	NS	NS	NS	NS	NS
TREATMENT SKID #1 (REACTIVATED CARBON)										
MID-SKID (EFFLUENT OF LEAD VESSEL)	92-MID-1	8/7/12	A	Primary	NS	NS	NS	NS	NS	NS
	92-MID-1	8/13/12	A	Primary	NS	NS	NS	NS	NS	NS
	92-MID-1	8/20/12	A	Primary	NS	NS	NS	NS	NS	NS
	92-MID-1	8/29/12	A	Primary	NS	NS	NS	NS	NS	NS

EXPLANATION:

COC = Contaminant of Concern
TCE = Trichloroethene
PCE = Tetrachloroethene
1,1-DCE = 1,1-Dichloroethene
TCM = Chloroform
1,1-DCA = 1,1-Dichloroethane
cis-1,2-DCE = cis-1,2-Dichloroethene

* All samples analyzed by Airtech Environmental Laboratories following EPA Test Method 8260B.
<0.5 = Result is less than laboratory method reporting limit (MRL).
All other volatile organic compounds (VOCs) are below the MRL/detection limit.
NS = Not sampled as treatment system was in bypass mode for well investigation activities.

TABLE 5. RID-114 WELLHEAD TREATMENT SYSTEM DATA SUMMARY
WEST VAN BUREN AREA WQARF REGISTRY SITE
(results presented in micrograms per liter, µg/L)

					TARGET COCs					
SAMPLE LOCATION	SAMPLE ID*	DATE	LEAD VESSEL	SAMPLE TYPE	TCE	PCE	1,1-DCE	TCM	1,1-DCA	cis-1,2-DCE
EPA MAXIMUM CONTAMINANT LEVELS (MCL), as µg/L:					5	5	7	none	none	70
INFLUENT	114-Influent	8/7/12	--	Primary	45	2.8	2.7	1.9	2.0	7.7
	114-Influent	8/13/12	--	Primary	44	2.8	2.5	1.9	1.9	7.3
	081312-01	8/13/12	--	Duplicate	45	2.8	2.7	2.0	2.1	7.8
	114-Influent	8/20/12	--	Primary	45	3.0	2.7	2.0	2.0	7.7
	114-Influent	8/27/12	--	Primary	41	2.6	2.4	1.7	1.8	6.7
POINT OF COMPLIANCE	114-POC	8/7/12	--	Primary	<0.5	<0.5	<0.5	0.7	1.3	<0.5
	114-POC	8/13/12	--	Primary	<0.5	<0.5	<0.5	0.9	1.7	0.5
	114-POC	8/20/12	--	Primary	<0.5	<0.5	<0.5	1.3	2.3	1.0
	114-POC	8/27/12	--	Primary	<0.5	<0.5	<0.5	1.5	2.3	1.5
TREATMENT SKID #1 (NORTH, REACTIVATED CARBON)										
MID-SKID (EFFLUENT OF LEAD VESSEL)	114-MID-1	8/7/12	A	Primary	<0.5	<0.5	1.1	1.9	2.3	4.2
	114-MID-1	8/13/12	A	Primary	<0.5	<0.5	1.3	2.0	2.5	5.0
	114-MID-1	8/20/12	A	Primary	0.5	<0.5	1.6	2.4	2.7	6.2
	114-MID-1	8/29/12	A	Primary	0.9	<0.5	2.2	2.4	2.4	7.1
TREATMENT SKID #2 (MIDDLE, REACTIVATED CARBON)										
MID-SKID (EFFLUENT OF LEAD VESSEL)	114-MID-2	8/7/12	A	Primary	1.5	<0.5	1.7	2.2	2.5	6.1
	114-MID-2	8/13/12	A	Primary	2.2	<0.5	2.0	2.3	2.5	6.4
	114-MID-2	8/20/12	A	Primary	3.2	<0.5	2.5	2.4	2.7	7.8
	114-MID-2	8/29/12	A	Primary	3.8	<0.5	2.6	2.3	2.4	7.7
TREATMENT SKID #3 (SOUTH, REACTIVATED CARBON)										
25% BED SAMPLE	114-3A-25	8/7/12	A	Primary	31	0.9	2.9	2.1	2.0	8.7
	114-3A-25	8/13/12	A	Primary	34	0.9	2.9	2.0	2.1	8.5
	114-3A-25	8/20/12	A	Primary	38	1.2	3.1	2.5	2.1	8.4
	114-3A-25	8/29/12	A	Primary	37	1.2	2.8	2.0	2.0	8.0
50% BED SAMPLE	114-3A-50	8/7/12	A	Primary	8.4	<0.5	2.9	2.1	2.2	8.8
	114-3A-50	8/13/12	A	Primary	15	<0.5	3.2	2.2	2.2	9.8
	114-3A-50	8/20/12	A	Primary	18	<0.5	3.2	2.4	2.1	8.7
	114-3A-50	8/29/12	A	Primary	21	<0.5	3.3	2.2	2.1	9.2
75% BED SAMPLE	114-3A-75	8/7/12	A	Primary	<0.5	<0.5	2.0	2.3	2.6	7.5
	114-3A-75	8/13/12	A	Primary	<0.5	<0.5	2.6	2.3	2.5	8.5
	114-3A-75	8/20/12	A	Primary	1.3	<0.5	3.2	3.2	2.4	9.5
	114-3A-75	8/29/12	A	Primary	2.9	<0.5	3.7	2.5	2.4	10
MID-SKID (EFFLUENT OF LEAD VESSEL)	114-MID-3	8/7/12	A	Primary	<0.5	<0.5	1.2	2.2	2.6	4.9
	114-MID-3	8/13/12	A	Primary	<0.5	<0.5	1.5	2.3	2.4	5.9
	114-MID-3	8/20/12	A	Primary	0.8	<0.5	2.3	2.6	2.8	8.1
	114-MID-3	8/29/12	A	Primary	1.2	<0.5	2.1	2.5	2.6	8.4

EXPLANATION:

COC = Contaminant of Concern
TCE = Trichloroethene
PCE = Tetrachloroethene
1,1-DCE = 1,1-Dichloroethene
TCM = Chloroform
1,1-DCA = 1,1-Dichloroethane
cis-1,2-DCE = cis-1,2-Dichloroethene
* All samples analyzed by Airtech Environmental Laboratories following EPA Test Method 8260B.
<0.5 = Result is less than laboratory method reporting limit (MRL).
All other volatile organic compounds (VOCs) are below the MRL/detection limit.

SYNERGY ENVIRONMENTAL, LLC