

REMOVAL ACTION REPORT

**EXPOSURE CONTROL ACTION
FORMER FIRE TRAINING AREA - MARSHALL ARMY AIRFIELD
FORT RILEY, KANSAS**



Prepared By
Bay West, Inc.

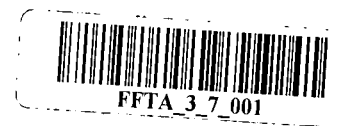


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April 10, 2003



CREDITS

This report was originally prepared by Bay West under contract number DACW41-95-D-0022, Task Order 0012 with the U.S Army Corps of Engineers, Kansas City District (USACE,KCD). As required under that contract, the report was written as a Final Report of work associated with the installation of the alternate water supply between off-site wells and distribution points, Former Fire Training Area - Marshall Army Airfield, Fort Riley, Kansas. The work was performed as an interim removal action for that site. Bay West prepared sections 2, 4, 5, 6, 7 and the appendices of this report. To provide additional information for a Removal Action Report, USACE, KCD edited and added additional information to the sections prepared by Bay West and prepared sections 1, 3, 8 and 9.

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LIST OF ACRONYMS

1,2 DCE	1,2-Dichlorethylene
ASME	American Society for Mechanical Engineers
ASTM	American Society for Testing and Materials
CADD	Computer Aided Design and Drafting
CERCLA	Comprehensive Response, Compensation and Liability Act of 1980
CERCLIS	Comprehensive Response, Compensation and Liability Information System
CQCP	Contractor Quality Control Plan
DA	Department of the Army
EE/CA	Engineering Evaluation/Cost Analysis
FDA	Federal Drug Administration
FFA	Federal Facilities Agreement
FFTA	Former Fire Training Area
GPM	gallons per minute
HDPE	High Density Polyethylene
HP (hp)	horsepower
IAG	Inter-Agency Agreement
IWSA	Installation Wide Site Assessment
KCD	Kansas City District
KDHE	Kansas Department of Health and Environment
MAAF	Marshall Army Airfield
MCL	Maximum Contaminant Level as established by USEPA under the Safe Drinking Water Act
MEK	Methyl ethyl ketone (2-Butanone)
MOGAS	Motor Gasoline
NCP	National Contingency Plan
NPL	National Priorities List
NSF	National Science Foundation

PCE	Tetrachloroethylene or Perchloroethylene
PSI (psi)	Pounds per Square Inch
PVC	Poly Vinyl Chloride
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
SAP	Sampling and Analysis Plan
SSHP	Site Safety and Health Plan
TCE	Trichloroethylene
USACE	United States Army Corps of Engineers
USAEHA	United States Army Environmental Health Agency
USEPA	United States Environmental Protection Agency
USATHMA	United States Army Toxic and Hazardous Material Agency
V	Volt
VOC	Volatile Organic Compound
m/l	milligrams per liter
ug/l	micrograms per liter

1.0 INTRODUCTION

1.1 PURPOSE

This Removal Action Report has been prepared to document an exposure control removal action accomplished at Operable Unit 003, the Former Fire Training Area – Marshall Army Airfield (FFTA-MAAF), Fort Riley, Kansas. The action was taken as an interim measure to reduce the potential for human exposure to contaminated ground water. An on-going Remedial Investigation/Feasibility Study will determine the final remedy for this site. An evaluation of possible actions and a recommended action were presented in the report entitled “Exposure Control Action Engineering Evaluation/Cost Analysis for the Former Fire Training Area, Marshall Army Airfield, Fort Riley, Kansas,” dated December, 1997 (hereinafter referred to as the Exposure Control EE/CA). This document was made available for public review during the period of January 20, 1998 through February 21, 1998. The selection of the removal action to be implemented was documented in the “Action Memorandum – Exposure Control – FFTA-MAAF” dated March 16, 1998. The United States Army Corps of Engineers (USAEC), Kansas City District (KCD) contracted with Bay West, Inc to prepare the plans and specifications and perform the Removal Action (USACE contract No. DACW41-95-D-022, Task Order 0012).

1.2 SITE BACKGROUND

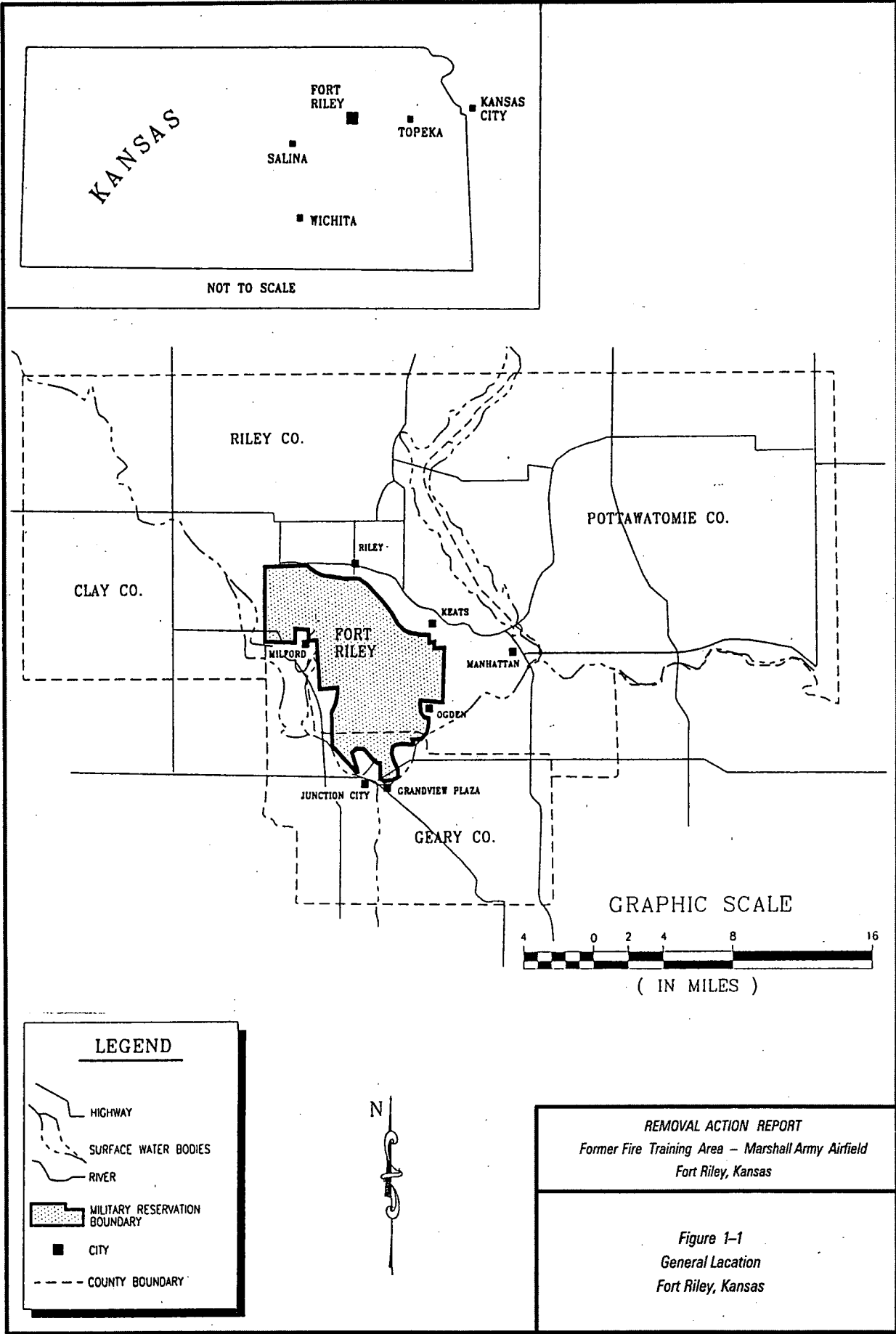
1.2.1 Site Description

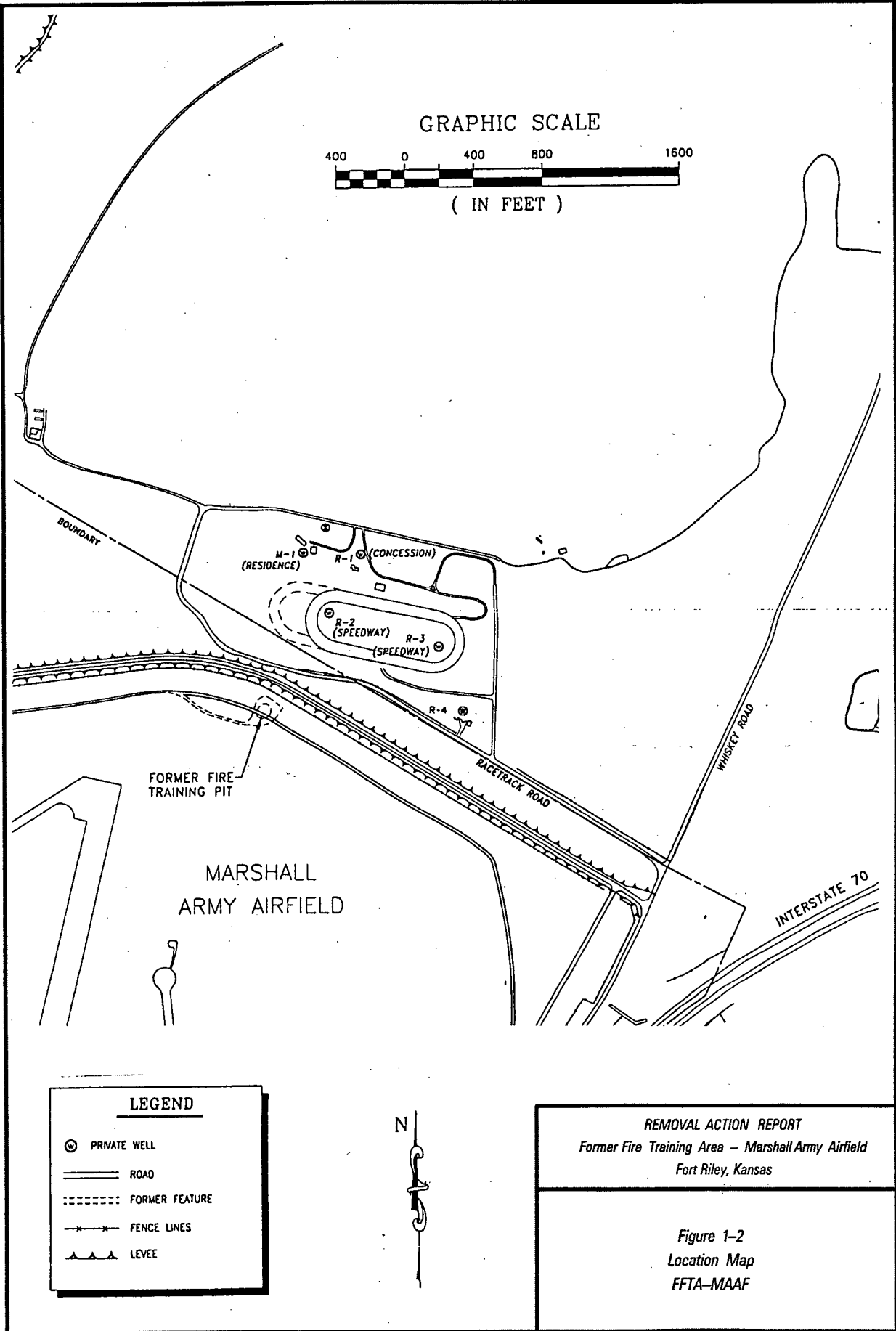
Fort Riley is located in central Kansas in Geary and Riley Counties as depicted in Figure 1-1. The FFTA is located along the MAAF northern boundary, approximately 1000 feet from the northeast end of the airfield north-south runway (Figure 1-2). The FFTA-MAAF burn pit is approximately 300 feet south of the Fort Riley reservation boundary.

1.2.2 Site History

The FFTA-MAAF was operated from the mid-1960s through 1984 to conduct fire-training exercises (USAEHA, 1979 and USATHMA, 1984). During this period, the FFTA-MAAF burn pit consisted of a crushed stone pad (approximately 200 feet by 200 feet) with no subsurface liner. Flammable liquids were temporarily stored in drums near the burn pit for use during training exercises.

During fire training exercises, flammable liquids were dumped into the burn pit, ignited, then extinguished. The predominant fuels used for the fire training exercises were petroleum hydrocarbons, including JP-4, diesel, and MOGAS (a generic term for motor gasoline often used to refer to gasolines with lead alkyls, and gasoline). In August 1982, reportedly 55 gallons of tetrachloroethene (PCE) were inadvertently poured into the fire training pit. The next day it was pumped out of the pit and contained in 55-gallon drums.





Hay was spread over any remaining liquid in the pit, and subsequently removed and placed in drums. The drums were then properly disposed of.

1.2.2.1 Past and Current Land Uses

The area of the FFTA-MAAF is within the boundaries of the airfield and is separated from the properties to the north by a levee and an 8-foot, continuous chain-link fence that surrounds the airfield. The nearest airfield building is over 2000 feet to the southwest. The FFTA-MAAF was operated from the mid-1960s through 1984 (USAEHA, 1979 and USATHMA, 1984). No fire fighting training has been conducted at the FFTA-MAAF since 1984.

Property use north of the FFTA-MAAF includes residential, agricultural, and commercial (auto racing). In this area, private wells are located within approximately one-half mile to the north of the installation boundary. Four properties with a total of ten private wells have been identified. These private wells are depicted on Figure 1-1:

- Wells M-1 and N-1 reportedly supply water to residences for domestic use.
- Wells F-1 and F-2 are located at an abandoned trailer house. One of these wells is reported to supply water for livestock.
- Wells R-1, R-2, R-3, and R-4 are located at the racetrack. Wells R-1 and R-2 are used for utility reasons. Wells R-3 and R-4 are not used.
- Well I-1 is an irrigation well that was placed into service in the spring of 1994.
- Well B-1 is a domestic well located at a residence approximately 6000 feet northeast of the FFTA near the edge of the river valley.

The property immediately north of the FFTA-MAAF has been used as an automobile racetrack for standard and mini-sized automobiles since the early 1980s. A 1992 cursory inspection of the speedway identified approximately fifty 55-gallon drums stored just north of the track (*FFTA-MAAF SI, 1995*). These drums were subsequently scattered throughout the area as a result of the July 1993 flooding of the area. A former driver at the speedway indicated that blue drums located on the property were used for spectator and crew trash (non-hazardous, solid waste) [*FFTA-MAAF SI, 1995*]. The majority of drums observed scattered at the speedway were blue, with some other black and yellow drums. The former driver also indicated that some of the drums, not colored blue, were used for the storage of fuel to be used by the racers. The exact contents of the yellow and black drums is unknown. The drums containing fuel were reportedly stored in the center of the speedway or in the vehicle maintenance pit area.

1.2.2.2 Regulatory History

Fort Riley was established in 1853 and has been owned and operated by the Department of the Army (DA) since that time. Environmental investigations and sampling events were performed at Fort Riley during the 1970s and 1980s. These investigations identified

activities and facilities where hazardous substances had been released or had the potential to be released to the environment. Potential sources of contamination included landfills; printing, dry cleaning, and furniture shops; and pesticide storage facilities. On July 14, 1989, the United States Environmental Protection Agency (USEPA) proposed inclusion of Fort Riley on the National Priorities List (NPL) pursuant to the Comprehensive Environmental response, Compensation and Liability Act (CERCLA). USEPA inclusion of the Site on the National Priorities List (NPL) was promulgated in August 1990. Fort Riley is identified by USEPA as Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Site KS6214020756.

Effective June 1991, the DA entered into a Federal Facility Agreement (FFA) with the State of Kansas Department of Health and Environment (KDHE) and USEPA Region VII to address environmental pollution subject to the Resource Conservation and Recovery Act (RCRA) and/or CERCLA (FFA, 1991). This agreement is also referred to as the Interagency Agreement (IAG). Pursuant to the IAG, Fort Riley conducted an Installation Wide Site Assessment (*IWSA*) in 1992 to identify sites having the potential to release hazardous substances to the environment. The *IWSA* identified the FFTA-MAAF as one of the sites where releases of hazardous substances to the environment either have occurred or were likely to have occurred (*IWSA*, 1992). Subsequent to the *IWSA*, site investigations were planned for three groupings of sites. A Site Investigation (*SI*) for the first group, the Sensitive-Receptor Lead Sites, was initiated in June 1993. The Sensitive-Receptor Lead Sites were later incorporated into a second group, the High Priority Sites. The *SI* for the High Priority Sites was initiated in September 1993, and included the FFTA-MAAF as one of the High Priority Sites (*SIHPS*, 1994). The remaining sites, known as "Other Sites", identified in the *IWSA* as requiring further investigation, were included in an *SI* initiated in March 1994 (*SIOS*, 1995).

SI results for the FFTA-MAAF Site indicated that concentrations of organic compounds had been released to groundwater at concentrations exceeding federal and state drinking water standards. The groundwater data indicated of the ten private wells downgradient of the FFTA-MAAF three, R-1, R-2 and M-1, contained detectable concentrations of Tetrachloroethylene (PCE), Trichloroethylene (TCE) and 1,2-Dichloroethylene (1,2-DCE). The range of detections (minimum and maximum) recorded between October 1993 and the start of the EE/CA in August 1996 are summarized in Table 1-1. Based on observed site conditions, it was concluded that chemical exposure was possible through ingestion or contact with groundwater and inhalation of vapors.

1.3 EE/CA BACKGROUND

Because of the identified potential threat, Fort Riley began the process of implementing an interim action at FFTA-MAAF to control exposures of humans to the groundwater containing Site-related compounds. The resulting *Exposure Control Action Engineering Evaluation/Cost Analysis (ECA, 1997)* recommended the installation of two new supply wells within the aquifer in areas that had not been influenced by the groundwater plume. These supply wells were designed to replace three existing private water wells designated M-1, R-1 and R-2.

Table 1-1
Range in Chemical Concentrations in Groundwater
October 1993 through August 1996

Well	PCE <u>MCL=5.0ug/l</u>	TCE <u>MCL=5.0 ug/l</u>	1,2-DCE <u>MCL=70 ug/l</u>
M-1	<1.1	<0.6	<0.5 – 19
R-1	29 - 330	11 - 76	10 – 290
R-3	24-230	18 – 96	21 - 150

2.0 CHRONOLOGY

The following is a chronology of events that led to the successful implementation of the exposure control removal action at Operable Unit 003, FFTA-MAAF:

- 1996 – Fort Riley began the process of implementing a non-time critical removal action at FFTA-MAAF to control exposure of humans to groundwater containing site related compounds.
- December 1997 - The Exposure Control EE/CA Report is finalized.
- January 20 through February 21, 1998 – The Exposure Control EE/CA is presented for public review and comment.
- March 16, 1998 – The Action Memorandum documenting the selected exposure control action is finalized.
- April 22, 1998 – The Action Memorandum is signed by the Fort Riley Garrison Commander.
- May 1998- Project activities suspended due to legal action taken by one of the property owners against the U.S. Army. The property owner refused to grant access to his property to install the alternate water supply.
- April 12, 2001 – A decision is rendered by the United States District Court for the District of Kansas finding in favor of the plaintiff, Plaza Speedway, Inc.
- December 17, 2001- Representatives from Fort Riley, USACE and the contractor meet with the owner of Plaza Speedway to determine site conditions and design requirements for the alternate water supply.
- January 2, 2002- The contractor receives notice to proceed with the redesign of the alternate water supply.
- April 29, 2002- The contractor submits redesign documents to Fort Riley and USACE with full scale drawings, proposed equipment and materials.
- May 30, 2002 – The contractor submits final redesign submittals for the project incorporating all requested Fort Riley and USACE revisions and comments.
- June 3, 2002 – The Department of Justice enters into a Settlement Agreement with the owner of Plaza Speedway, Inc. to permit access to the property to install the alternate water supply.

- June 6, 2002 – USACE approves the design.
- July 11, 2002- Bay West submits project Work Plan, Site Safety and Health Plan, Sampling Analysis Plan, and Contractor Quality Control Plan.
- July 17, 2002 – Pre-Construction meeting and mobilization of field activities. Pre-construction meeting held at the Ft. Riley USACE Resident Engineer's Offices.
- July 18, 2002 - Oct 18-2002- Field activities completed. Primary construction activities completed on Aug 30, 2002. Final completion delayed until Flint Hills Rural Electric Cooperative installed 3-phase - 480V power to the racetrack replacement well on October 17, 2002.
- October 22, 2002- Final Inspection completed.

3.0 REMOVAL ACTION SUMMARY

3.1 REMOVAL ACTION OBJECTIVES

The stated objective of this interim removal action as documented in the Action Memorandum was to control exposure to contaminated groundwater in private wells down gradient of the FFTA-MAAF. Because the cleanup of the contaminated groundwater would require long-term remedial action and was being actively assessed by Fort Riley under a CERCLA Remedial Investigation/Feasibility Study, the cleanup of groundwater was not an objective of this interim removal action. This removal action focused on control of point-of-use exposure and alternatives for preventing or controlling the exposures that could occur through the use of contaminated wells.

Of the ten private wells located down gradient from the FFTA-MAAF, site investigations revealed that the use of groundwater from three wells (M1, R-1 and R-2) could result in potential harmful exposure to hazardous substances. The EE/CA focused on evaluating methods to control exposure of users to groundwater from these wells. The alternatives selected were designed to prevent harmful exposures to humans based on the following exposure scenarios: water used for drinking and other ingestion (cooking); water used for bathing and washing; and inhalation of vapors emitted from water.

3.2 ATTAINMENT OF REMOVAL ACTION OBJECTIVES

The selected removal action achieved the objectives by implementing three actions to insure that humans are not exposed to the contaminated groundwater. First, wells M1, R-1 and R-2 were closed in a method approved by the Kansas Department of Health and Environment. In addition, although not used and not impacted by the groundwater contamination, wells R-3 and R-4 which are in close proximity to the contaminated groundwater were also closed to prevent their potential use in the future. The closure of these well insured that an individual unaware of the groundwater contamination could not be exposed to it. Second, two new wells were installed at a safe distance from the contaminated groundwater to replace the wells which were closed. Analysis of samples from those wells as reported in Section 5 of this report verified that the water was below all Clean Water Act Maximum Contaminant Levels (MCLs). This insures that current users of the new wells are not exposed to the groundwater contamination. Third, Fort Riley is committed to continue sampling these wells on at least an annual basis for a period of 10 years. If a well becomes contaminated, the Army will provide a alternative water supply to replace that well. This insures that future users of the new wells will not be exposed to the contaminated groundwater.

4.0 CONSTRUCTION ACTIVITIES

4.1 MOBILIZATION

Project on site activities commenced on July 17, 2002, following the Pre-Construction Meeting. On site personnel staged the Bay West equipment trailer and project equipment, surveyed and staked the water pipeline run, truck water fill station location, two replacement water well locations, and the location of the hydropneumatic tank building. On site personnel also oversaw the delivery of required construction materials including High Density Polyethylene (HDPE) piping, lumber, vaults, and pipe fittings. Project personnel were briefed on required project activities such as health and safety requirements and reporting protocols. City construction and craft permits were obtained from Junction City during mobilization activities. Permits were posted at the site equipment trailer. Excavation and compaction equipment were received from Hertz Rental and RSC Inc. on July 22, 2002. Mobilization activities were completed on July 22, 2002.

4.2 TRENCHING, PIPE, AND WELL INSTALLATION

Trenching activities commenced on July 23, 2002 with the excavation of a test pit for performance of a Proctor Test and grading and form setting for the concrete pad at the Truck Water Fill Station. Field activities and dates are summarized below:

- 7/24/02 – excavated 200 feet of pipeline trench at the racetrack parking lot area in the vicinity of the racetrack replacement well. The support structure for the 3-inch diameter piping of the truck water fill station was constructed of 6-inch by 6-inch cedar posts and set in concrete in a 4 foot deep, post hole. The pit for the vault for the piping connections at the parking lot area concession stand and restrooms was excavated.
- 7/25/02- Subcontractor J&K Construction tried unsuccessfully to perform a horizontal boring under the dirt race track surface. It became apparent after several attempts that the horizontal boring could not be kept open due to caving sands. A slurry mix was unsuccessfully tried to keep the boring open but this proved unsuccessful as well.
- 7/29/02- Excavated and prepared 265 feet of trench in racetrack parking area in the vicinity of the concession stand building. Encountered septic lines and discontinued trenching activities until USACE made determination as to where to relocate / reposition the pipe run.
- 7/30/02- Excavated and prepared 175 feet of trench in the parking lot area of the racetrack facility. Completed forming concrete pad for building to be built to house the 528-gallon hydro-pneumatic tank located adjacent to the concession

stand in the racetrack pit area. Excavated 350 foot trench run from installed vault in pit area to water truck fill station.

Initiated discussions with USACE Resident Engineer's Office representatives to allow for utilizing a Ditch Witch to trench 70 feet across the dirt racetrack surface as a modification to scope of work. It was decided that the USACE would submit a written request to the property owner to allow for this type of excavation across the racetrack surface. Layne Western, subcontracted water well installer arrives on site to begin pilot borings for the racetrack replacement well and the M-1 replacement well. Drill rig completes pilot hole at the racetrack replacement well to a depth of 72.5 feet. Last split spoon soil sample collected at a depth of 60 feet due to encountering phreatic zone. Water sample collected and submitted for VOC analysis by EPA Method 8260. 24-hour turn-around time was requested.

Layne Western drilling team advanced pilot well at M-1 replacement well location to a depth of 61.5 feet Water sample collected and submitted for VOC analysis by EPA Method 8260. 24-hour turn-around time was requested.

- 7/31/02- Excavated and prepared 300 feet of trench in upper part of racetrack. 140 feet of HDPE pipe welded and placed in trench. 7 cubic yards of Portland Cement delivered on site and placed in the 10'x 10' building pad and 10'x 20' water truck fill pad. Sample collected of concrete delivered and submitted to Kaw Valley Engineering for 28-day compression test.
- 8/1/02- All 4-inch HDPE piping welded and placed in trench. Installed 2-inch HDPE piping in racetrack pit area. Trenches were back filled and soil compaction completed in 6-inch lifts. Compaction test performed as required. Initiated well abandonment activities for existing wells R2 and R3.
- 8/2/02- Received official authorization from the owner of the racetrack to excavate across the racetrack. Completed compaction of pipe run from racetrack pit area to water truck fill station. Compaction test indicates 96.1 % density. Electricians subcontracted to repair 3 sets of buried electrical lines located between pit area restroom and racetrack oval. Lines damaged during excavation of trench for water truck fill station line. Additional 2 feet of fill added to correct surface grade in parking lot area of racetrack near the racetrack replacement well.
- 8/5/02- Installed plumbing fittings for water line installed to supply water to concession stand building located in racetrack parking area. Electrical conduit installed for pipe run in this location.
- 8/6/02- Tee installed on 4-inch HDPE line for water supply to racetrack parking area concession stand. Construction activities initiated for hydropneumatic tank building.

- 8/7/02- Backfilled upper portion of trench in racetrack parking area. Performed preliminary pressure test on the installed 4-inch HDPE primary water line. Pressure in water line remained constant at 98 PSI for over 3 hours. USACE Ft. Riley Resident Engineer's Technical Representative approved test results. Larson Construction subcontracted to trench with Ditch Witch across dirt racetrack for installation of 4-inch water line. Trench prepared for installation of 4-inch HDPE pipe. Piping connected to the recently placed 4-inch water line to complete installation of the primary 4-inch water line of new distribution system.
- 8/8/02- Excavated and prepared water line trench from M-1 replacement well to trailer home and machine shop. 1.5 – inch HDPE pipe welded and placed for M-1 replacement well pipe run in trench.
- 8/9/02- Installed electrical conduit per Junction City Building Code and installed locator tape in trench run per project plans. Trench backfilled utilizing 6-inch lifts with compaction at each lift interval.
- 8/12/02- Completed backfilling and compaction of M-1 replacement well trench/pipe run. Additional lumber delivered for construction of hydropneumatic tank building.
- 8/13/02- Continue construction of hydropneumatic tank building. Site activities shut down in afternoon due to thunderstorm activity.
- 8/14/02- Flushed M-1 water distribution system line with potable water. Installed pipe hangers on wood support system for water truck fill station piping. Continued construction of building for hydropneumatic tank.
- 8/15/02- Completed framing for hydropneumatic tank building. Performed additional grading over backfilled trench areas.
- 8/16/02- Completed construction of hydropneumatic tank building with exception of painting exterior cedar panels/siding. Completed pressure test on racetrack replacement well water distribution line. Pressure held at 100 psi for over 2 hours. USACE oversaw pressure test. Field crew demobilized from site due to delay in Layne Western returning to site to install replacement water wells and delay in Flint Hills Energy in delivering 3-phase 480 V power lines to racetrack replacement well location as scheduled.
- 8/17/02 – 8/27/02. No on site project activities completed due to delay in Layne Western in returning to install replacement wells and completing well abandonments. On 8 /23/02, Bay West Kansas City Office Manager and Bay West Site Supervisor met with USACE Ft Riley Resident Engineer's Office representative on site to perform site walk to review completed construction activities to date. No issues noted for completed activities. It was discovered at this time that the water line that was expected to provide water to the racetrack

Grandstand Area terminated approximately 6 feet from the existing vault box. Based on this discovery and differing site condition a change order was requested to install an additional 250 feet of 2-inch water line.

- 8/28/02- Installation of upper valve box at racetrack parking area concession stand is completed with final compaction of soil around vault. Layne Western returns to site and commences drilling racetrack replacement well.
- 8/29/02- Racetrack replacement well completed with exception of installation of concrete pad and well controls. Drill rig mobilized to M-1 replacement well location and well drilling initiated.
- 8/30/02- M-1 replacement well completed with installation of concrete pad and well controls. Well tests performed on the two replacement wells as preliminary characterization testing prior to performing pump tests.
- 9/3/02- Layne Western performs well development and pump test of racetrack replacement well. Subcontracted electricians connect M-1 replacement well to electrical meter.
- 9/4/02- Pump test of M-1 replacement well completed. Final grouting of M-1 and racetrack replacement wells completed. Water distribution system at the M-1 replacement well nearly complete. Water supply line connected to new hydropneumatic tank in Machine Shop at M-1 replacement well.
- 9/5/02- Layne Western performs disinfection of both replacement wells utilizing Calcium Hypochlorite. Merrill pitless adapters installed on both replacement wells. Water samples collected from both wells for volatile organic compound analysis by EPA Method 8260.
- 9/6/02- Permanent well pumps installed in replacement wells. A Goulds Pumps Inc. Model 5THC, 4-inch, 5 stage, 3-phase, 15 hp, 235 GPM submersible pump was installed in the racetrack replacement well. A Goulds Pumps Inc. Model 10GS, 60 Hz, 4 inch, ¾ hp, 10 GPM submersible pump was installed in the M-1 replacement well. Detailed well information and equipment specifications are included in Appendix 1 of this report.

Completed applying first coat of paint to 528-gallon hydropneumatic tank building.

- 9/9/02- Performed pressure test on 1.5-inch water line on completed M-1 replacement well water system at the More property. Water line held at 100 psi for over 2 hours. Test witnessed by USACE. Final connections and inspection performed by Connell Plumbing Inc. County building inspector passed system based on local building code requirements.

- 9/10/02- M-1 replacement well and distribution system allowed to pump several hours to flush disinfectant from system
- 9/11/02- Repaired fence on the M-1 property. Fence section was removed earlier during trenching operations to allow access to property for well abandonment and trench excavation. Completed the final trim work on 528-gallon hydropneumatic tank building. Unable to complete flushing of M-1 distribution system as electric power was cut off by Flint Hills Energy so they could install 3 phase power lines to the racetrack replacement well.
- 9/12/02- Layne Western initiates well abandonment activities of existing wells R-1, R-4, and M-1 per KDHE requirements for in-place abandonment. Well casings were cut off 3 feet below grade and grouted in place. M-1 replacement well was sampled for lead per EPA Method 6010B and total fecal coliform per EPA Method 9133. A sample was also collected for volatile organic analysis and submitted for EPA Method 8260 analysis. This sample was recollected as the previous sample collected on 9/5/02 was not usable because holding times were exceeded due to the failure of Federal Express to deliver the sample priority overnight as subcontracted.
- 9/13/02- Completed abandonment of existing well R-1. Applied second coat of white paint to exterior of 528-gallon hydropneumatic tank building.
- 9/16/02 – 9/22/02 – Demobilized from site. Waiting for Flint Hills Energy to complete installation of 3-phase power line to the racetrack replacement well.
- 9/23/02- Remobilized to site and initiated trenching and installation of additional 250 feet of HDPE water line to grandstand concession and restroom area. The new line was tied into the vault box at the pit area concession stand. Layne Western completed well abandonment for existing well R-2, R-3, R-4, and M-1 (More Trailer Home) per KDHE well plugging and abandonment requirements.
- 9/24/02- Continued installation of 250 feet of HDPE water line to grandstand concession and restroom area.
- 9/25/02- Completed installation of 250 feet of HDPE water line to grandstand concession and restroom area. Pressure test completed on entire racetrack water distribution system from racetrack replacement well to new lines servicing the parking area concession stand and restrooms, the pit area concession stand and restrooms, the truck water fill station, the 528-gallon hydropneumatic tank, and the grandstand area concession stand and restroom area. Pressure test was successful with water lines holding 100 psi for over 2 hours. Pressure test witnessed by USACE representative.

- 9/26/02- Plumbing subcontractor, Connell Plumbing completed final connections to water lines at the Plaza Raceway. Junction City building inspectors inspect and approve connections and grant permission to backfill remaining open excavations.
- 9/27/02- Concrete pad at racetrack replacement well completed. Compaction tests over excavated areas across racetrack conducted. 90% + density achieved. Ft Riley Directorate of Environment and Safety representative visited site to inspect well abandonments. Demobilize equipment from site. Final connections to the racetrack replacement well can not be completed until Flint Hills Energy completes installation of 3 phase power line and 480 V transformers at site.
- 9/28/02-10/6/02 No work performed.
- 10/7/02- Received notification from Flint Hills Energy that 3 phase electrical power has been installed, the power meter installed and activated.
- 10/10/02 – Bay West Site Supervisor returns to site to perform final well connections at the racetrack replacement well and turn on system to allow the water system to purge disinfectant and sediment from water lines. It was learned at this time that Flint Hills Energy had installed 240 V transformers instead of the required 480 V transformers needed to power the 15 hp well pump. Flint Hills Energy notified as well as USACE project personnel.
- 10/17/02- Flint Hills Energy installs correct transformers.
- 10/18/02- Layne Western, and Davis Electric arrive on site and perform final electrical connections and adjustment of well pump. Pump allowed to run for several hours to purge system of any sediment and well disinfectant.
- 10/22/02- Bay West Site Supervisor arrives on site to collect samples from the racetrack replacement well. Samples collected and submitted for volatile organic analysis and submitted for EPA Method 8260 analysis, for lead per EPA Method 6010B, and total fecal coliform per EPA Method 9133. Final Inspection of the site completed with inspector from USACE Ft. Riley Resident Engineer's Office. No deficiencies were noted. Final site demobilization completed.

Note: Project activities performed during August 2002 completed in extreme heat conditions with daily temperatures exceeding 95 degrees Fahrenheit with several days exceeding 100 degrees Fahrenheit. Drought conditions necessitated that potable water be brought to the site via water tank trucks to add moisture to backfill material in order to compact backfill to required densities.

5.0 QUALITY ASSURANCE/QUALITY CONTROL

5.1 PROJECT PLANS

As required by the scope of work for this project, the contractor developed and submitted for Fort Riley and USACE review and approval, four plans to ensure the quality and safety of the work performed. The Project Work Plan (WP, 2002) outlined all requirements for the installation and testing of the water distribution system. The Site Safety and Health Plan (SSHP, 2002) defined criteria to ensure a safe and healthy work environment. The Sampling and Analysis Plan (SAP, 2002) provided information and guidance to field and laboratory personnel concerning the acquisition of chemical data during sampling and analysis activities. The Contractor Quality Control Plan (CQCP, 2002) established the project quality control system to ensure that all activities conformed to the project specifications.

5.2 CONSTRUCTION QUALITY CONTROL IMPLEMENTATION

5.2.1 Water Line Pressure Testing

All installed water lines comprising the newly installed well water distribution network for the two replacement wells were pressure tested at approximately 100 psi. All tested lines held pressure without any variation in pressure for over 2 hours. All pressure tests were witnessed by the USACE Ft. Riley Resident Engineer's Office technical representative. Testing requirements as outlined by CP Chem Performance Pipe, manufacturer of the HDPE piping were followed. Details regarding testing are included in Appendix 1. Each pressure test required that each line be filled with potable water and then connected to an air compressor. The line was then placed under 100 psi for a period of at least two hours. A pressure gauge was observed during this test period for loss of line pressure. Line pressure during all tests held at 98 and 100 psi indicating no pressure leaks in the installed HDPE lines. Pressure tests are summarized as:

Date of Test	Water Line Tested	Results
8/7/02	Initial test of main 4-inch water line from racetrack replacement well to racetrack pit area.	98 PSI 3+ hours
8/16/02	Second test of main 4-inch water line from racetrack replacement well	100 PSI 2+ hours
9/9/02	M-1 replacement well distribution system	100 PSI 2+ hours
9/25/02	Test of additional 250 feet of racetrack distribution system and entire racetrack water distribution system.	100 PSI 2+ hours

5.2.2 Pump Tests: Racetrack Replacement Well and M-1 Replacement Well

A pump test was completed on the racetrack replacement well on September 4, 2002. The well was pumped at a rate of 261 gallons per minute for 240 minutes with a recorded draw down of 2 inches. The well recovered within a 5 minute period after cessation of pumping the well.

The M-1 replacement well was pump tested on September 3, 2002. The well was pumped at a constant rate of 50 gallons per minute for 240 minutes with a recorded draw down 0.25 inches. The well recovered within 5 minutes after cessation of pumping the well.

Complete well data is included in Appendix 4 of this report.

5.2.3 Concrete Testing

A sample was collected of the concrete delivered on site for construction of the water truck fill station pad and the slab foundation and vault for the hydropneumatic tank building. The concrete sample was collected by Kaw Valley Engineering for testing. Results for compressive strength of the collected concrete cylinder per ASTM Methods C31, C39, C1064, C78, C143, C138, C231, C172, and C617 are summarized as:

Specimen #	Date Made	Date Tested	Date to Lab	Age (days)	Unit Strength PSI
7-31-A	7/31/02	8/7/02	8/1/02	7	3212
7-31-B	7/31/02	8/28/02	8/1/02	28	4206
7-31-C	7/31/02	8/28/02	8/1/02	28	4191

A compressive strength of 4000 PSI at a 28-day cure period was achieved as required for the material used on site.

5.3 CHEMICAL DATA QUALITY CONTROL IMPLEMENTATION

5.3.1 July 30, 2002 Sampling Event

The racetrack replacement well was sampled as part of the initial well installation activity to insure that the selected well location was in a contaminant free area and produced a suitable potable water supply. The sample collected and designated as "Well R-1" was free from the target VOCs per EPA Method 8260B with all target analytes being below method detection limits.

A water sample was also collected from the M-1 replacement well with the same intent to insure that the selected replacement well location would provide a potable water supply. The sample designated as "Well M-1" was free from the target volatile organic compounds per EPA Method 8260B as was the case for sample "Well R-1".

The complete analytical results are included as Appendix 3 of this report and are summarized in Tables -1 and 2.

5.3.2 September 12, 2002 Sampling Event

The M-1 Replacement well was brought on line on September 3, 2002 and connected to the existing plumbing connections at the Machine Shed and Trailer at this property. The system was then disinfected per KDHE requirements. It should be noted that the property owner had installed a new hydropneumatic tank prior to connecting his water system to the new well. Samples were originally collected on September 5, 2002 after completion of the disinfection process. Due to exceedence of the required holding times for VOC analysis and the samples arriving at the subcontracted lab at temperatures in excess of the required 4 degrees Celsius these samples were discarded. Federal Express failed to deliver the samples on time. Samples were re-collected and submitted for VOC, Lead, and fecal coliform analysis on September 12, 2002. Complete analytical results are included as Appendix 3 and are also summarized in Tables 1 and 2.

Volatile Organic Analysis

Analytical results indicated the presence of three volatile organic compounds: Bromodichloromethane at a concentration of 0.0014 mg/l, Chloroform at a concentration of 0.067 mg/l and 2-Butanone (MEK) at a concentration of 0.26 mg/l. The concentrations of the VOCs detected did not exceed their established Maximum Contaminant Level (MCL) per promulgated drinking water standards.

The presence of these compounds are attributed to residual compounds from Hypochlorite which was used to disinfect the new well and from the solvent used by the property owner's subcontracted plumber to install PVC piping for the new hydropneumatic tank. It is anticipated that these compounds will be rapidly flushed from the water supply system. It should be noted that the resident of the trailer home supplied by the M-1 Replacement well consumes bottled water and uses the well water for cleaning and bathing.

Lead

Water samples were collected from the trailer kitchen sink and bathroom sink and analyzed for lead. A nalytical results indicated lead levels from the kitchen sink were 0.012 mg/l and 0.013 mg/l. for the bathroom sink. Lead levels detected were below the MCL for lead of 0.015 mg/l.

Fecal Coliform

A water sample was collected from the kitchen sink faucet of the trailer home on September 12, 2002 and submitted for fecal coliform analysis. Analytical results indicated the value was below the method detection limit of 1.0 coliform bacteria/100 ml.

5.3.3 October 22, 2002 Sampling Event

Final samples from the racetrack replacement well were collected on October 22, 2002. Eight samples were collected from the pit area concession stand and restrooms as representative samples of the water quality from the racetrack replacement well and distribution system. Samples were collected from this location in the distribution system because it was the only racetrack facility with plumbing fixtures in operational order. Toluene was detected in sample RM-W at a concentration of 0.20 mg/l. Toluene was also observed in the duplicate sample of RM-W at a concentration of 0.011mg/l. These toluene levels are below the established MCL for toluene of 1 mg/l. The occurrence of this contaminant may be attributed to laboratory contamination of the samples or a residual volatile organic compound introduced during well completion activities.

Chloroform was detected in the duplicate sample RM-W at a concentration of 0.0050 mg/l. This concentration is below the established MCL for chloroform of 0.10 mg/l. The presence of chloroform in this sample is attributed to the disinfection process of the racetrack replacement well.

Benzene was detected in the trip blank prepared by the subcontracted laboratory, Environmental Services Inc. The presence of benzene in this sample is attributed to its introduction to the sample during preparation of the trip blank by the lab.

Lead or coliform bacteria were not detected in any of the samples collected.

Table 1: Summary of Detected Analytes in M-1 Replacement Wells

Sample ID and Sample Date	Detected Analyte	Concentration	MCL	Comments
Well M-1 / 7/30/02	No reported VOCs			Water samples submitted for analysis by EPA Method 8260B. No concentrations reported.
Trailer Kitchen Faucet. M-1 003/ 9/12/02	Bromodichloromethane	0.0014 mg/l	0.10 mg/l	By product of drinking water disinfection
	Chloroform	0.067 mg/l	0.10 mg/l	By product of drinking water disinfection
	2-butanone (MEK)	0.26 mg/l	None listed	Attributed to use of MEK as solvent for preparation of gluing PVC piping at hydropneumatic tank.
Trailer Kitchen Faucet M-1 003 Dup / 9/12/02	Bromodichloromethane	0.0014 mg/l	0.10 mg/l	By product of drinking water disinfection
	Chloroform	0.066 mg/l	0.10 mg/l	By product of drinking water disinfection
	2-butanone (MEK)	0.26 mg/l	None listed	Attributed to use of MEK as solvent for preparation of gluing PVC piping at hydropneumatic tank.
Trailer Kitchen 9/12/02	Lead (Pb)	0.012 mg/l	0.015 mg/l	Due to corrosion of household plumbing
Trailer Kitchen Duplicate 9/12/02	Lead (Pb)	0.010 mg/l	0.015 mg/l	Due to corrosion of household plumbing
Trailer Bath Sink Faucet 9/12/02	Lead (Pb)	0.013 mg/l	0.015 mg/l	Due to corrosion of household plumbing
Trailer Bath Sink Faucet Duplicate 9/12/02	Lead (Pb)	0.010 mg/l	0.015 mg/l	Due to corrosion of household plumbing
M-1 Trailer Kitchen Faucet	Coliform	BDL of 1.0 coliform bacteria/100 ml (1%)	5.0%	Coliforms are naturally present in the environment. Not a health threat in itself it is used to indicate whether other harmful bacteria may be present.

Table 2: Summary of Detected Analytes in Racetrack Replacement Well

Sample ID and Sample Date	Detected Analyte	Concentration	MCL	Comments
Well R-1 / 7/30/02	No reported VOCs			Water samples submitted for analysis by EPA Method 8260B. No concentrations reported.
Racetrack Replacement Well Pit Area RM-W 10/22/02	Toluene	0.20 mg/l	1 mg/l	Water samples submitted for analysis by EPA Method 8260B. Potential lab contaminate
Racetrack Replacement Well Pit Area RM-W Duplicate 10/22/02	Chloroform	0.0050 mg/l	0.10 mg/l	By product of drinking water disinfection
Racetrack Replacement Well Pit Area RM-W Duplicate 10/22/02	Toluene	0.011 mg/l	1 mg/l	Water samples submitted for analysis by EPA Method 8260B. Potential lab contaminate
Racetrack Replacement Well Pit Area Trip Blank 10/22/02	Benzene	0.0014 mg/l	0.005 mg/l	Lab Contaminant
Racetrack Replacement Well Pit Area RM-E 10/22/02	Lead (Pb)	BDL	0.015 mg/l	Detection Limit 0.0050 mg/l
Racetrack Replacement Well Pit Area RM-E Duplicate 10/22/02	Lead (Pb)	BDL	0.015 mg/l	Detection Limit 0.0050 mg/l
Racetrack Replacement Well Pit Area RM-W 10/22/02	Lead (Pb)	BDL	0.015 mg/l	Detection Limit 0.0050 mg/l
Racetrack Replacement Well Pit Area RM-W 10/22/02	Coliform	BDL of 1.0 coliform bacteria/100 ml (1%)	5.0%	Coliforms are naturally present in the environment. Not a health threat in itself it is used to indicate whether other harmful bacteria may be present.

BDL=Below Detection Limit

Summary of Results

The analytical results for lead from water samples collected at the trailer home kitchen faucet are below EPA action levels. Under EPA Drinking Water Standards, lead is regulated by a Treatment Technique that requires systems to control corrosiveness of their water. If more than 10% of tap water samples exceed the action level (lead = 0.015mg/l), water systems must take additional steps. The lead levels identified during this sampling effort indicate the source may be due to corrosion of the household plumbing system (i.e. solder in existing piping system). Lead was not detected in samples collected from the racetrack replacement well distribution system.

Levels of chloroform and bromodichloromethane indicate that the source may be a by-product of the drinking water disinfection process.

Levels of 2-Butanone indicate that the source may be directly attributed to the use of PVC pipe cleaning solvent and PVC pipe adhesive used by the trailer home owners subcontracted plumber in installing the new hydropneumatic tank and ancillary equipment.

Toluene in samples collected from the racetrack replacement well distribution system were below EPA Drinking Water Standards and may be attributed to well construction activities or may be present due to laboratory contamination. Benzene noted in the trip blank prepared in support of project QA/QC protocols is the result of laboratory contamination.

It should be noted that the contaminants of concern identified for the FFTA-MAAF site (PCE and its associated daughter products as identified in Table 1-1) were not detected and overall the water meets all federal and state drinking water quality standards. These results support the conclusion that the removal action objectives were met by this action and annual monitoring will serve as the basis for future evaluations of the long term success in meeting those objectives.

6.0 INSTALLED EQUIPMENT

Primary prices of equipment used in the installation of the Alternate Water Supply are summarized below. Detailed equipment specifications are provided in Appendix 1 of this report.

- John Woods/Reintjes & Hiter hydropneumatic tank. ASME bag type hydropneumatic tank, 528 gallon capacity, maximum operating pressure 125 psi. Field set at 80 psi, FDA approved for potable systems.
- Goulds Pumps and Franklin Electric Motors
 - Racetrack Replacement Well/460V, 3 phase power rated at 250 GPM, 4-inch submersible pump equipped with 15 HP Franklin electric motor.
 - M-1 Replacement Well/230V, single phase power rated at 10 GPM. 4-inch submersible pump equipped with Franklin electric motor rated at ¾ HP.
- CP Chem Performance Pipe. High Density Polyethylene Piping (HDPE) for water distribution and transmission. Piping sizes included 4-inch diameter, 2-inch diameter, and 1.5 inch diameter piping. Piping FDA and NSF approved for potable water supply.
- Siemens Well Pump Controllers- Heavy duty pump controllers class 87 fusible pump panels.

7.0 FINAL INSPECTION

The final inspection of the alternate water supply system was conducted on October 22, 2002. The final inspection was attended by the Bay West Site Supervisor and the project engineer from the USACE Ft. Riley Resident Engineer's Office. Inspected items included all pipe run locations to check for settling, installed wells, well controls, hydropneumatic tank and building, water truck fill station, abandoned well locations, newly installed power lines and transformers, water line connections to the five racetrack areas: parking area concessions and restrooms, pit area restrooms and concession, hydropneumatic tank, water truck fill station, and the Grandstand concession and restroom area. In addition the distribution system connections installed at the M-1 property were inspected. The installed water distribution produced good quality potable water at adequate pressures to service all areas.

Work performed and the water systems installed by Bay West were certified by the USACE project engineer as acceptable.

In addition, the Bay West Site Supervisor met with the residents of the M-1 property and the owner of the Plaza Raceway to review operation of the water wells and routine Operation and Maintenance of the system. The Plaza Raceway owner was briefed on winterization of the water distribution system.

8.0 SUMMARY OF PROJECT COSTS

Prepare EE/CA and Action Memorandum	\$142,123
PREPARE PLANS AND SPECIFICATIONS	\$31,603
Prepare Project Plans and Final Report	\$22,102
Install Two New Wells and Close Five Wells	\$163,705
Install Water Distribution Piping	<u>\$83,157</u>
TOTAL PROJECT COST	\$442,690

9.0 REFERENCES

- AM, *Action Memorandum, Exposure Control, Former Fire Training Area Marshall Army Airfield, Fort Riley, Kansas, March 16, 1998.*
- CQCP, *Contractor Quality Control Plan for the Water Distribution System between Off-Post Wells and Distribution Points, Former Fire Training Area at Marshall Army Airfield, Fort Riley Kansas, July 2002.*
- ECA, *Exposure Control Action Engineering Evaluation/Cost Analysis for the Former Fire Training Area, Marshall Army Airfield, Fort Riley, Kansas, December 1997.*
- FFA, *Federal Facilities Agreement, Docket No. VII-90-F-0015, March 1991.*
- FFTA-MAAF SI, *Site Investigation for Former Fire Training Area, Marshall Army Airfield, Fort Riley, Kansas, August 1995.*
- IWSA, *Installation Wide Site Assessment for Fort Riley, Kansas, December 7, 1992.*
- SAP, *Sampling and Analysis Plan for the Water Distribution System between Off-Post Wells and Distribution Points, Former Fire Training Area at Marshall Army Airfield, Fort Riley Kansas, July 2002.*
- SIHPS, *Site Investigation Report for High Priority Sites at Fort Riley, Kansas, June 20 1994.*
- SIOS, *Site Investigation Report for "Other Sites" at Fort Riley, Kansas, April 19, 1995.*
- SSHP, *Site Safety and Health Plan for the Water Distribution System between Off-Post Wells and Distribution Points, Former Fire Training Area at Marshall Army Airfield, Fort Riley Kansas, July 2002.*
- USAEHA, U.S. Army Environment Hygiene Agency, *Industrial Hygiene Comprehensive Survey Report, May 9, 1979.*
- USATHMA, U.S. Army Toxic and Hazardous Materials Agency Report, *Installation Assessment of the Headquarters, 1st Infantry Division (Mechanized) and Fort Riley, Kansas, December 1984.*
- WP, *Work Plan for the Water Distribution System between Off-Post Wells and Distribution Points, Former Fire Training Area at Marshall Army Airfield, Fort Riley Kansas, July 2002.*

Appendix 1: Equipment Specifications and Warranties

- John Woods Hydropneumatic Tank
- Merrill Pitless Adapter
- Gould Pumps
- CP CHEM Performance Pipe
- Franklin Electrical Motors
- Siemens Pump Controllers

REINTJES & HITER CO., INC.

101 SUNSHINE ROAD
KANSAS CITY, KANSAS 66115-1300
1-800-800-4670 / 913-371-1872
FAX: 913-342-7893

FAX NO. 663 3067

DATE: 10-15-02

COMPANY: Ray West Corp

FROM: DENNIS

ATTN: KEITH

PAGES: 2

COMMENTS/MESSAGE:

Attached please find copy of The John Wood
Company warranty.

NO RESPONSE REQUIRED ()

RESPOND BY _____

JOHN WOOD COMPANY

-  HOME
-  OUR MISSION
-  HISTORY
-  ENGINEERING EXPERTISE
-  OUR PEOPLE
-  TANKS & PRESSURE VESSELS
-  MODULAR SYSTEMS
-  CONTACT US

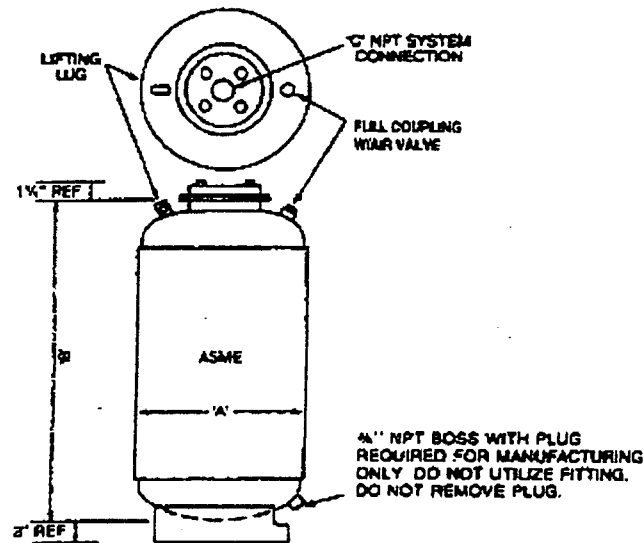


ASME Hydro-pneumatic Tanks (158 – 528 gallon)

FORM NO. 616

June 1, 1999

**Type I Series
ASME Bag Type Hydro-Pneumatic Tank**



Specifications

- Type Design & Construction: ASME Section VIII Division I
- Maximum Working Pressure: 125 PSI
- Maximum Operating Temperature: 160° F
- Factory Precharge: 12 PSI - Adjustable in the field to a maximum of 80 PSI. For higher precharge pressure - consult factory..
- Finish: Gray Primer
- For Vertical Installation Only
- Full Coupling Added to Protect Charging Valve

Applications

- For use in hydropneumatic applications
- FDA approved potable material
- For sizing tank - please refer to Technical Bulletin 002.
- For hydronic expansion and non-potable hydro-pneumatic applications, use JBER Series - Specification Sheet 615.
- For higher temperature potable hydro-pneumatic tank, use JWTA Series - Specification Sheet 699B.

Part Number	Tank Capacity		Diameter A	Height B	NPT C	Est. Ship Wt.
	Gallon	Liters	Inches	Inches	Inches	Lbs.
JBPR-22-011	158	600	30	58	1 1/2	375
JBPR-22-012	211	800	30	76	1 1/2	447
JBPR-22-013	264	1,000	36	67	2	551
JBPR-22-014	317	1,200	36	78 1/2	2	615
JBPR-22-015	370	1,400	36	91	2	694
JBPR-22-016	422	1,600	48	63 1/2	2	1,098
JBPR-22-017	528	2,000	48	77 1/4	2	1,239

Features

Options

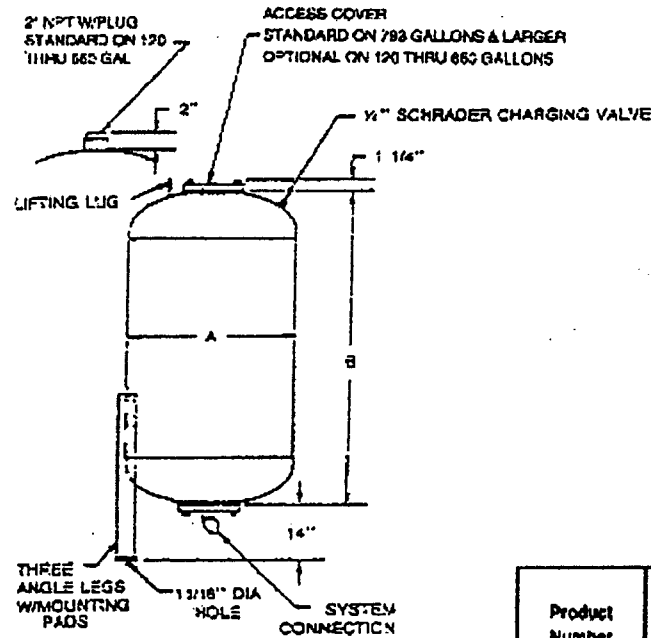
- Full Volume Flexible Elastomer Bag
- Bag Easily Replaceable
- Water and Air Separation Eliminates Corrosion
- Eliminates Water Logging
- Smaller Tank Saves Space & Installation Costs
- Carbon Steel Construction
- Bag Design Tested to 60,000 Cycles
- Higher Working Pressures
- Stainless Steel Wetted Parts
- Seismic Mounting Clips
- California Code Sight Glass
- Special Exterior Finish
- Special Design for Precharge Requirements Higher than 80 PSI
- For Options Specifications and Pricing: Consult Factory
- Horizontal Models Available

Refer to Technical Bulletin 002 to determine drawdown capacities for different system operating conditions.
 All sizes normally in stock for prompt shipment.
 For smaller stock sizes refer to JAPR Series - Specification Sheet 621.
 For pricing refer to Form 716.

FORM NO. 635

June 1, 1999

ASME Bottom Outlet Hydro-Pneumatic Tank



Specifications

- Type Design & Construction: ASME Section VIII Division I
- Available Working Pressure: 125 PSI / 200 / 250
- Maximum Operating Temperature: 140° F
- Factory Precharge: 12 PSI - Adjustable in the field to a maximum of 80 PSI. For higher precharge pressure - consult factory.
- Finish: Gray Primer
- For Vertical Installation Only

Applications

Product Number	WP	Capacity		Size		System Connection C		Weight	
		Gal.	Liter	Inches	mm	Inches	mm	Lbs.	Kg.
1000-22-000	125	120	456	24 x 67 7/8	608 x 1721	1 1/2	38	245	111

- For use in hydro-pneumatic applications
- FDA approved potable material
- For sizing tank - please refer to Technical Bulletin 002.

Features

- Full Volume Flexible Elastomer Bag
- Bag Easily Replaceable
- Water and Air Separation Eliminates Corrosion
- Eliminates Water Logging
- Carbon Steel Construction

Options

- Stainless Steel Wetted Parts
- Brass System Connection
- California Code Sight Glass
- Special Exterior Finish
- Other Bladder Materials Available
- Larger Sizes Available - Up To 3,000 Gallons
- Horizontal Design Available

For pricing refer to Form 735.

JOPR-22-011	125	158	600	30 x 58	760 x 1457	1 1/2	38	375	170
JOPR-22-012	125	211	800	30 x 76	760 x 1923	1 1/2	38	447	203
JOPR-22-013	125	264	1000	35 x 67	915 x 1595	2	50	551	250
JOPR-22-014	125	317	1200	36 x 78 1/2	915 x 1966	2	50	615	289
JOPR-22-015	125	370	1400	38 x 91	915 x 2302	2	50	694	315
JOPR-22-016	125	422	1600	48 x 63 1/2	1220 x 1607	2	50	1098	499
JOPR-22-017	125	528	2000	48 x 77 1/4	1220 x 1967	2	50	1239	563
JOPR-22-018	125	660	2508	48 x 94	1220 x 2397	2	50	1500	682
JOPR-22-019	125	793	3013	48 x 122	1220 x 3110	2	50	1825	739
JOPR-22-020	125	1056	4019	54 x 132	1368 x 3355	2 1/2	63	2300	1045
JOPR-22-021	125	1320	5016	54 x 151	1368 x 3849	2 1/2	63	2570	1168

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FORM NO. 5133421003 11 02/02

SUBMITTAL DATA

Date : 11-20-02
Submitted by: BAY WEST INC.
Project : PLAZA SUPERWAY
SUNBELT CITY, MS 382
John Wood Product Number: _____
Special Instructions: _____
Architect : _____
Engineer : USACE - KC DISTRICT
Contractor : BAY WEST INC.

TYPICAL SPECIFICATION

Furnish and install as shown on plans a tangential air separation unit consisting of a steel tank _____" diameter x _____" long.
The unit shall have _____" (NPT/flanged) tangential inlet and outlet connections.
A blowdown connection shall be provided to facilitate routine cleaning of the unit.
Unit must be constructed in accordance with ASME boiler and pressure vessel code and "U" stamped for 150 PSIG design pressure.
Each air separator shall be John Wood product no. _____ or equal.

LIMITED WARRANTY

All noncode tanks and pressure vessels and ASME air receivers manufactured by The John Wood Company (hereafter "Wood") are warranted to be free from defects in workmanship and material up to the time of initial installation and test only, unless some other warranty is particularly stated on Wood's product specification or Wood's order acknowledgement document.

All ASME tanks and pressure vessels (except air receivers and bladder tanks) manufactured by Wood are warranted to be free from defects in workmanship and material for a period of one year from the date of installation and test, unless some other warranty is particularly stated on Wood's product specification or Wood's order acknowledgement document. All ASME Bladder Type tanks manufactured by The John Wood Company are warranted to be free from defects in workmanship and material for a period of 12 months from the date of installation and test, or 18 months from the date of purchase, (from Wood) whichever occurs first.

In the event of a claim under this limited warranty, Wood's obligation and liability are strictly limited to the repair or replacement (Wood shall determine which) of the product at Wood's plant in Valley Forge, Pennsylvania, and specifically does not include consequential damages of any sort, loss of use of this product or the facility in which it is installed, property damage, or personal injury. All costs of removal, handling, transportation to Wood and back to jobsite, and re-installation shall be paid by purchaser.

This limited warranty is given in lieu of all other warranties, expressed or implied, and applies only to the person or business organization to whom Wood sells this product, and no one else.



THE JOHN WOOD COMPANY



MERRILL SP PITLESS UNITS



Protect your precious water supply with a Merrill Pitless Unit. The highest quality installation plus the best for water safety and sanitation. They save the contractor installation and servicing headaches, and give the well owner years and years of long trouble-free service.

FEATURES/BENEFITS

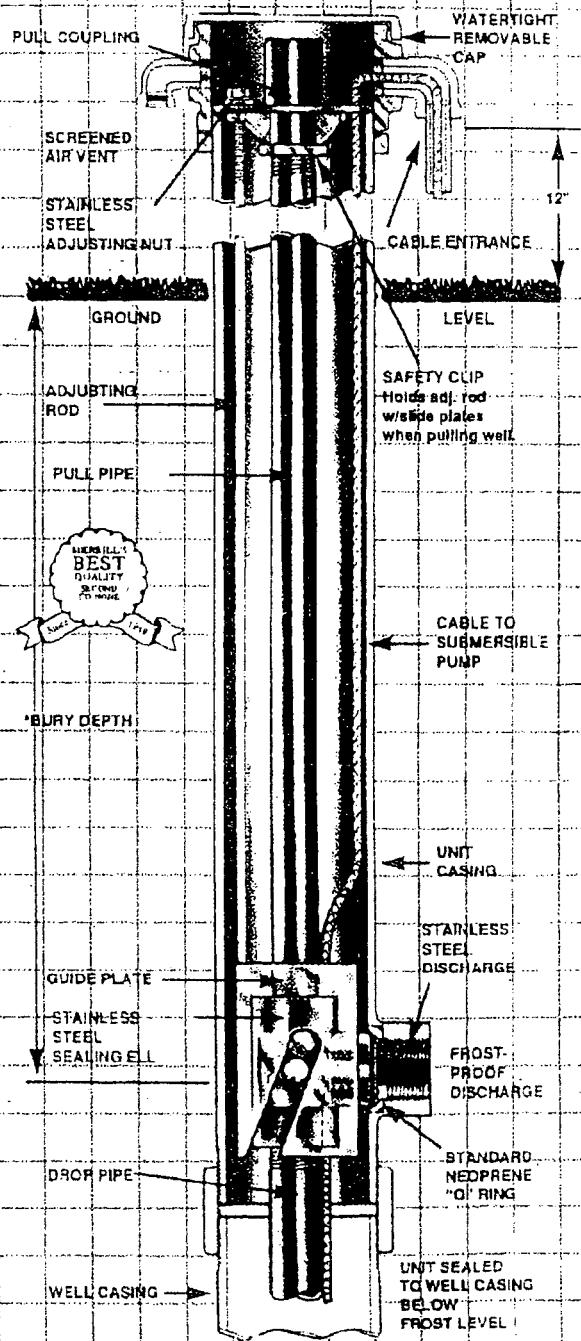
- (1) **CERTIFIED WATERTIGHT PITLESS UNITS & CAPS** - and approved by Pitless Adapter Standard PAS-07 PAS-97 plus Illinois Code.
BENEFIT - Approved by all stringent state well codes.
- (2) **POSITIVE MECHANICAL SEAL** by simply adjusting the stainless steel adjusting nut at the top of the well and simply wrench available from the factory.
BENEFIT - Easy to work on and will not rust.
- (3) **FULL DIAMETER ACCESS TO WELL** No other adapters may need to be jammed before working on well, common adapters.
BENEFIT - Needed when reworking or drilling well.
- (4) **RECESSED SEALING SURFACE** in discharge outlet to insure an undamaged sealing surface when pumps are pulled or reworked. Pitless units by OTHER companies do not have recessed sealing surface and use carbon steel or heavy brass which corrodes and deteriorates. Merrill uses stainless steel.
BENEFIT - Recessed out of well so cannot be damaged.
- (5) **STAINLESS STEEL DISCHARGE AND STAINLESS STEEL ELBOW** to insure a long life and easy disengagement for work on pump or well. Outside of pitless casing is same standard with other companies.
BENEFIT - Long service life, easy service, years of service.
- (6) **ONE STANDARD O-RING** to assure safety and long life and easy servicing.
BENEFIT - Can be found in most local stores.
- (7) **MALE THREAD, PLAIN END, OR COMPRESSION END** available on end of pitless casing for connection to well.
BENEFIT - Easy connection to well casing, connection.
- (8) **SUPPORT PLATE HOLDS WEIGHT** to minimize pump hose down well.
BENEFIT - Will support more weight.
- (9) **CABLE SLOT IN SUPPORT PLATE** allows for the removal of a pump without a splice. Submersible pump cable.
BENEFIT - Splice in cable could be eliminated.
- (10) **GROUND SCREW IN SUPPORT PLATE** provides an easily accessible connection for the electrical ground on pump cable.
BENEFIT - Easy connection to ground wire.
- (11) **SIMPLE DISENGAGEMENT FOR SERVICE** by simply adjusting the stainless steel adjusting nut. The entire water level in the well can be checked in 10 MIN. pulling the pump up or down.
BENEFIT - Simple answer for pumping trouble.
- (12) **WATERTIGHT OR VENTILATED CAPS ARE AVAILABLE**.
BENEFIT - A well cap for all well codes.

Exclusive Merrill Quality Features

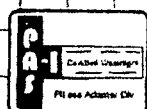
SPECIFICATIONS - All units are made of stainless steel. Complete with pump and vent cap. Vent cap is available in 1/2" and 1" sizes. All units are made of stainless steel. All units are made of stainless steel. All units are made of stainless steel.

NOTE: Custom wrench for stainless steel adjusting nut available from Merrill.

MERRILL SP Pitless Unit



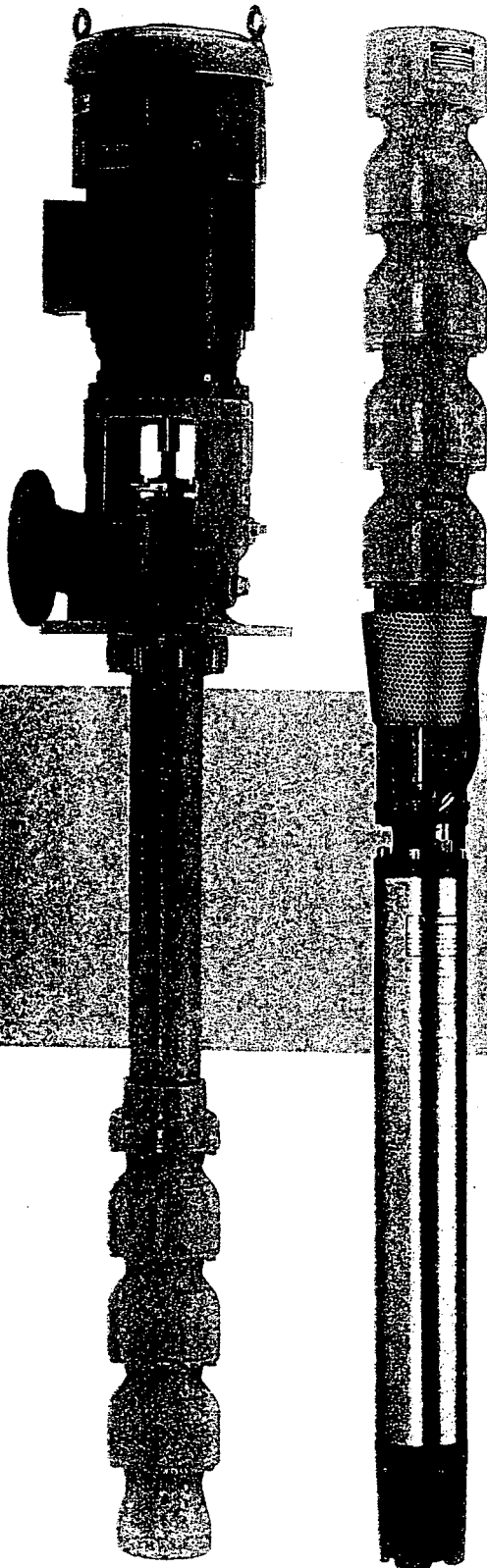
NOTE: Length of internal parts are bury depth plus 12 inches for well codes, on 4 ft. bury is approximately 5 ft. long.





Goulds Pumps

Turbine Pumps



LINE SHAFT

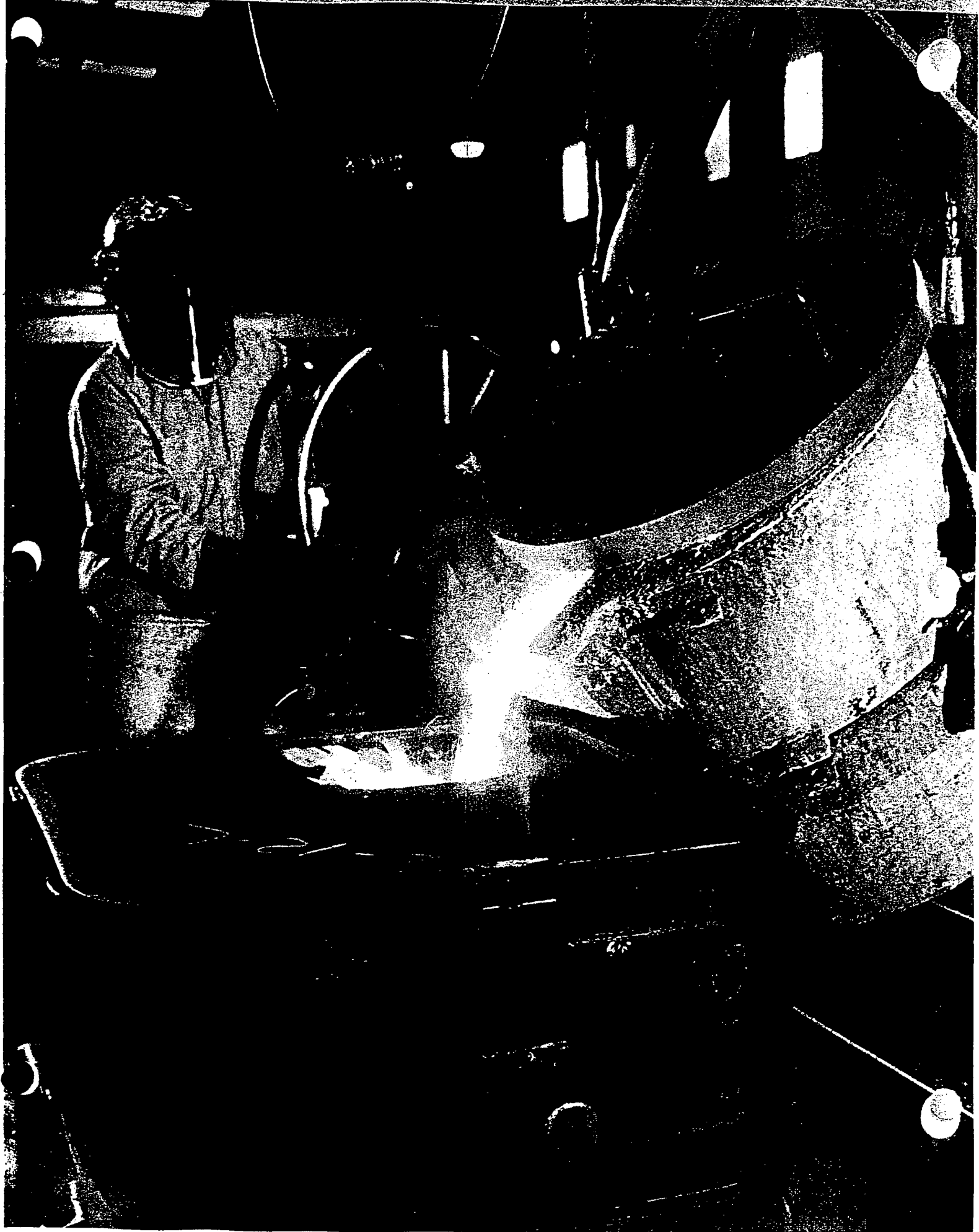
SUBMERSIBLE

Goulds Pumps



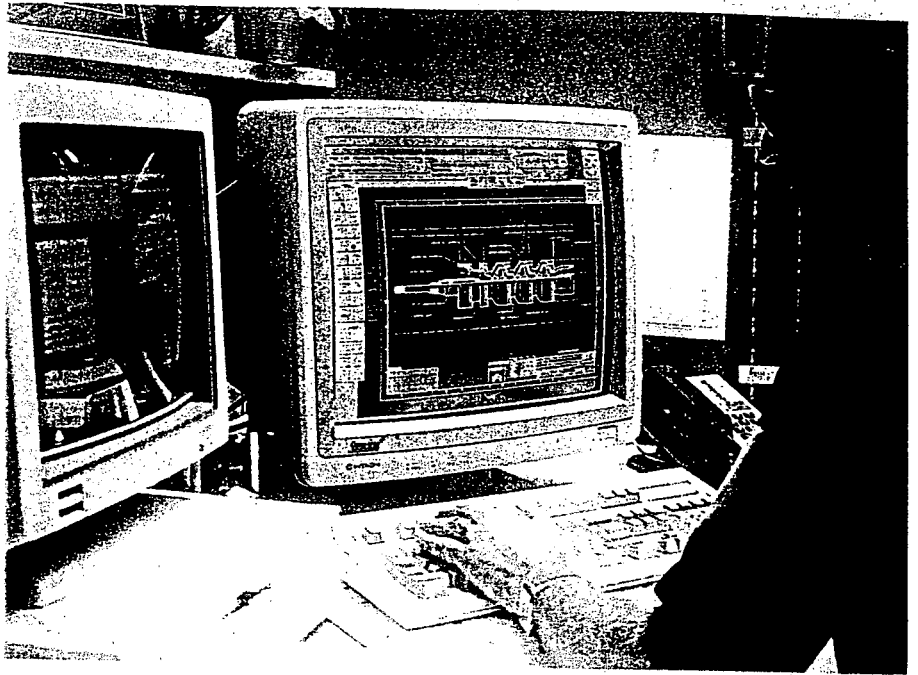
ITT Industries

GOULDS TURBINE PUMP PRODUCTION

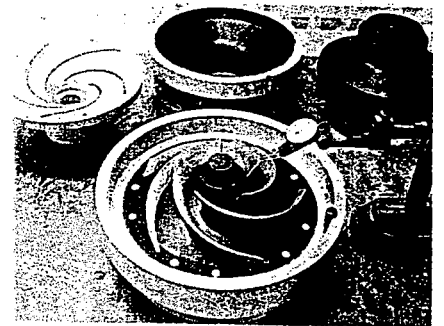


You not only get the latest in pump design and technology from Goulds, you get more than 100 years of pump manufacturing know-how that includes most of the major innovations in pump engineering and materials. All our products reflect the engineering design advances for top efficiency and head generation.

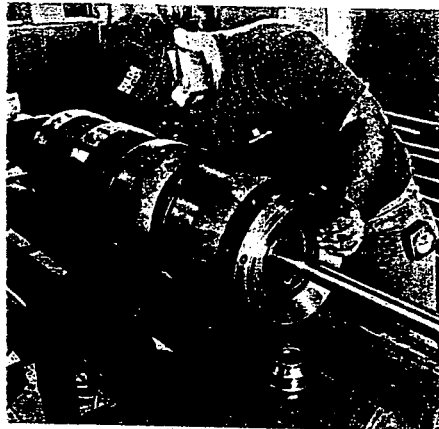
Our engineers are specialists, using computer assisted design and extensive test and research facilities. They develop the specifications that guide our in-house pattern shop technicians in the development of precision turbine pattern equipment. The result is consistent casting accuracy, close tolerances, and the quality needed to maintain water passage shape and pump efficiencies.



Our modern manufacturing facilities assure dimensionally consistent, high quality, fully machined parts, produced on a volume basis to bring down costs. Every impeller is precision balanced on a micro processor balance analyzer. Goulds is one of the largest manufacturers in the turbine industry.



Goulds further controls the quality of its products in its own foundries. Here the molding, core work and Vitra-Glass enameling are closely supervised for tight quality standards.

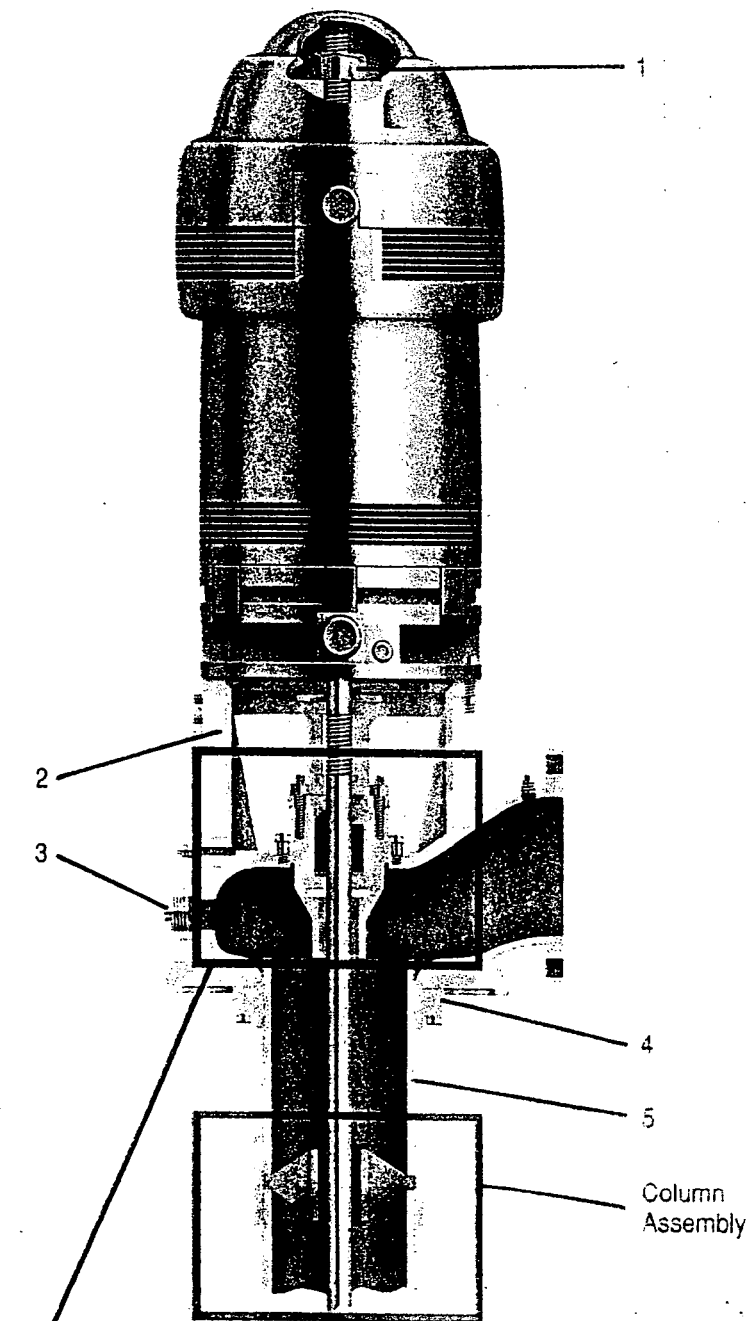


turbine pumps and submersible and centrifugal pumps.

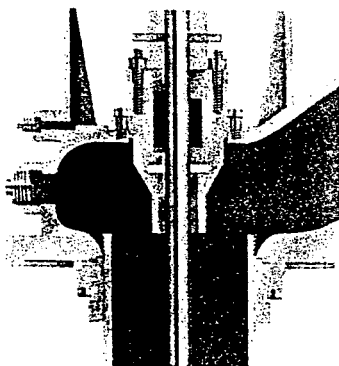
We are committed to service. We offer ready availability of complete pumps, repair parts and service. We are continually improving and expanding our turbine products warehouse network with locations in key areas.

From design to pattern shop to foundry to manufacturing to warehousing—Goulds is a completely integrated producer. Our network of turbine warehouses brings pumps and same day service to you. We offer full service on new units. Rebowling, rebuilding and repair on

LINESHAFT



Packing Box Assembly



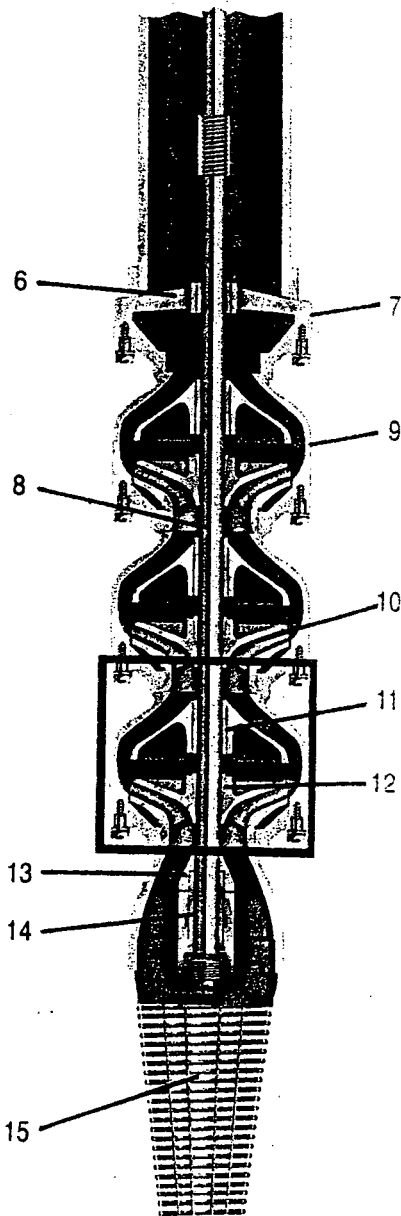
Headshaft
Stainless steel.

Bronze Packing Gland
Cast Iron Box

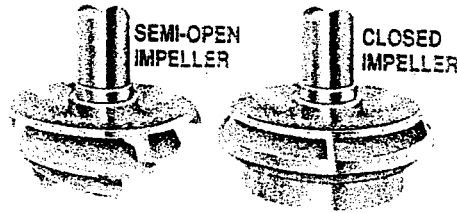
Throttle Bushing
Extra length bronze for better shaft
support, longer packing life.

Water Lubrication

- 1 Adjusting Nut**
Permits exact impeller adjustment for maximum performance.
- 2 Discharge Head**
Heavy duty head provides maximum accessibility to service packing box assembly. Two piece head shaft is standard.
- 3 Prelube Connection**
- 4 Column Adapter**
Accepts threaded or flanged column.
- 5 Adjusting Nipple**
Threads directly into column adapter. Headshaft stickup set exactly by threading head on column as required.
- 6 Discharge Bowl Bearing**
Bronze.
- 7 Discharge Bowl**
Close grained cast iron.
- 8 Pump Shaft**
Oversized high strength polished stainless steel.
- 9 Intermediate Bowls**
Close grained cast iron. Waterways glass lined for maximum efficiency.
- 10 Impellers**
Silicon bronze, designed for maximum efficiency. Precision balanced for smooth operation.
- 11 Intermediate Bowl Bearings**
Bronze or rubber for long pump life under any well conditions.
- 12 Lock Collets**
Steel construction secures impeller to pump shaft.
- 13 Sand Collar**
Accurately located at suction bowl bearing to eliminate possible sand buildup.
- 14 Suction Bowl Bearing**
Bronze. Grease packed for long trouble-free life.
- 15 Tail Pipe or Strainer—Optional**
Optional tail pipe cut to desired length for best suction conditions. Strainer provides protection from large solids.

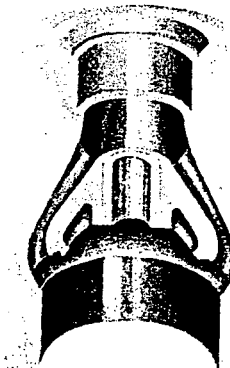


Impellers



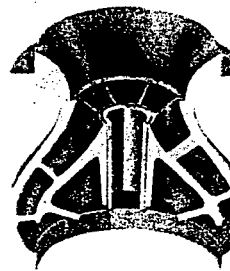
Optional Long Lateral

Long lateral adjustment on some models for maximum setting capabilities.

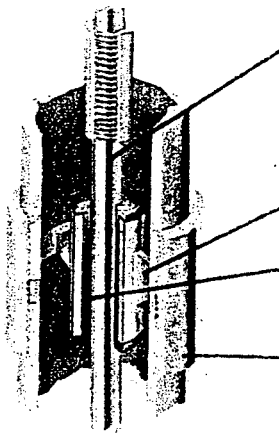


Glass Lined Bowls

Heavy duty Class 30 cast iron intermediate bowls with standard feature of vitra-glass lined waterways for maximum efficiency and wear protection.



Column Assembly



Lineshaft
High strength steel with chrome spots. Ground and polished for exact bearing fit. Available in carbon steel or stainless steel.

Bearing Retainer
Bronze.

Lineshaft Bearings
Fluted rubber, designed to flush sand and grit rapidly.

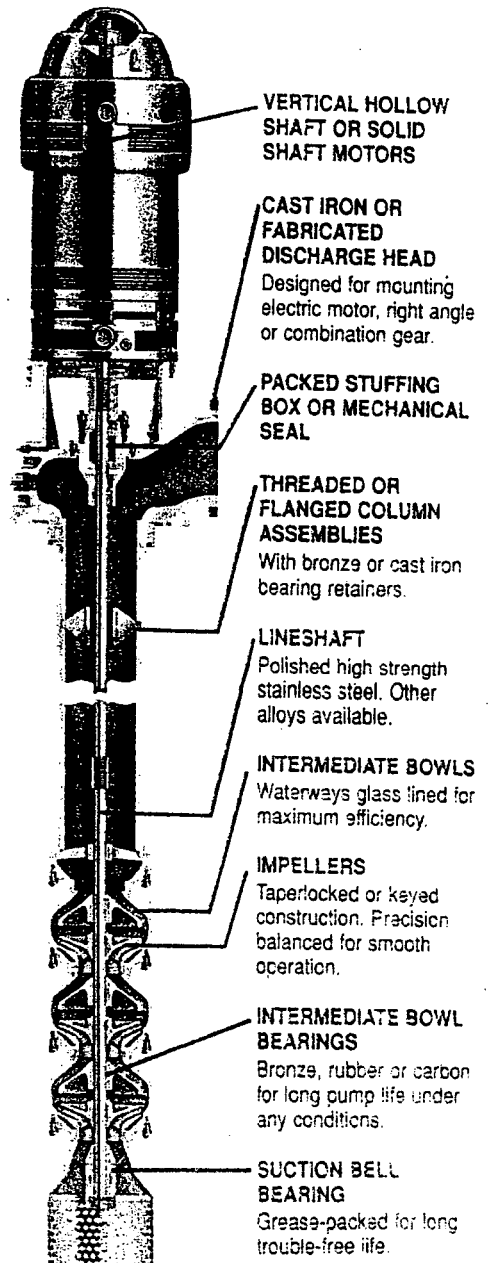
Column Pipe and Couplings
Parallel thread, accurately machined for easy installation, accurate alignment.

LINESHAFT SHORT SET TURBINE

- Capacities to 9000 GPM (2043 m³/h)
- Heads to 1400 feet (427 m)

Design Flexibility

Goulds offers a wide variety of design options to suit most any short set turbine applications.



VERTICAL HOLLOW SHAFT OR SOLID SHAFT MOTORS

CAST IRON OR FABRICATED DISCHARGE HEAD

Designed for mounting electric motor, right angle or combination gear.

PACKED STUFFING BOX OR MECHANICAL SEAL

THREADED OR FLANGED COLUMN ASSEMBLIES

With bronze or cast iron bearing retainers.

LINESHAFT

Polished high strength stainless steel. Other alloys available.

INTERMEDIATE BOWLS

Waterways glass lined for maximum efficiency.

IMPELLERS

Taperlocked or keyed construction. Precision balanced for smooth operation.

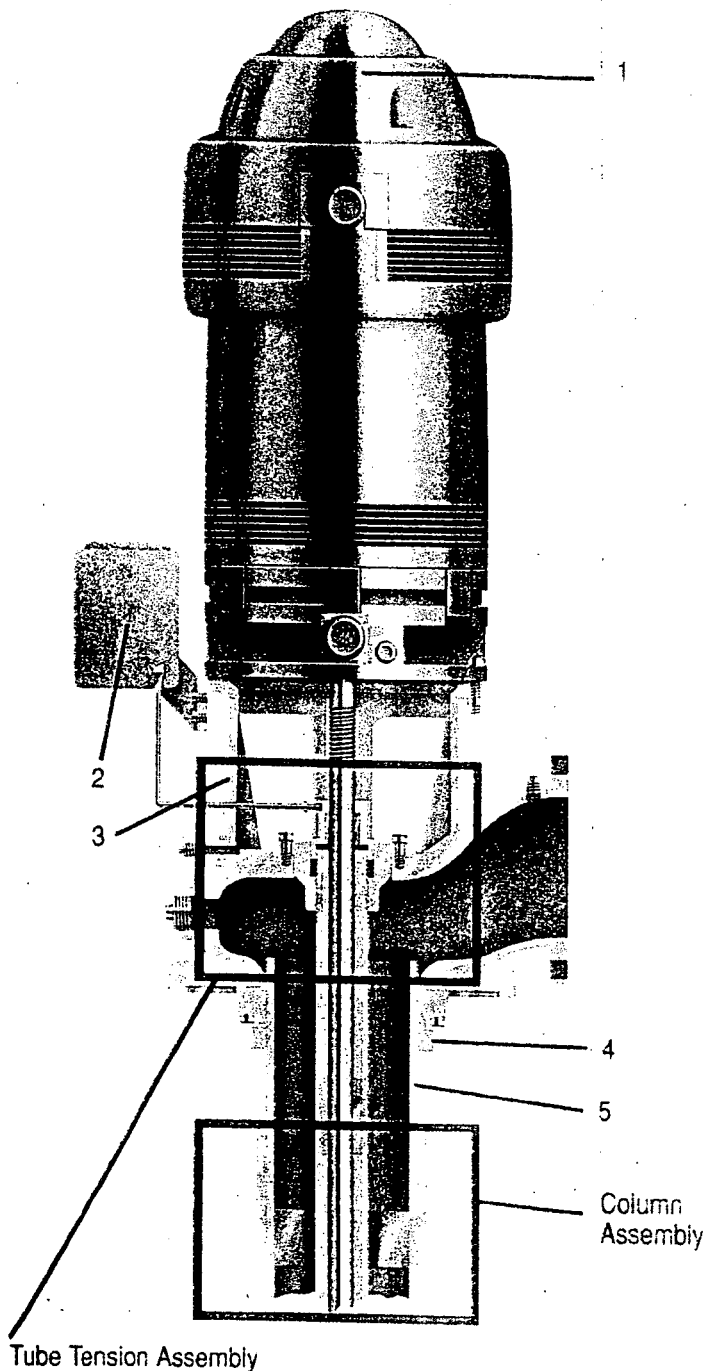
INTERMEDIATE BOWL BEARINGS

Bronze, rubber or carbon for long pump life under any conditions.

SUCTION BELL BEARING

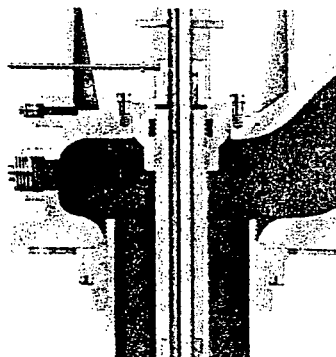
Grease-packed for long trouble-free life.

LINESHAFT

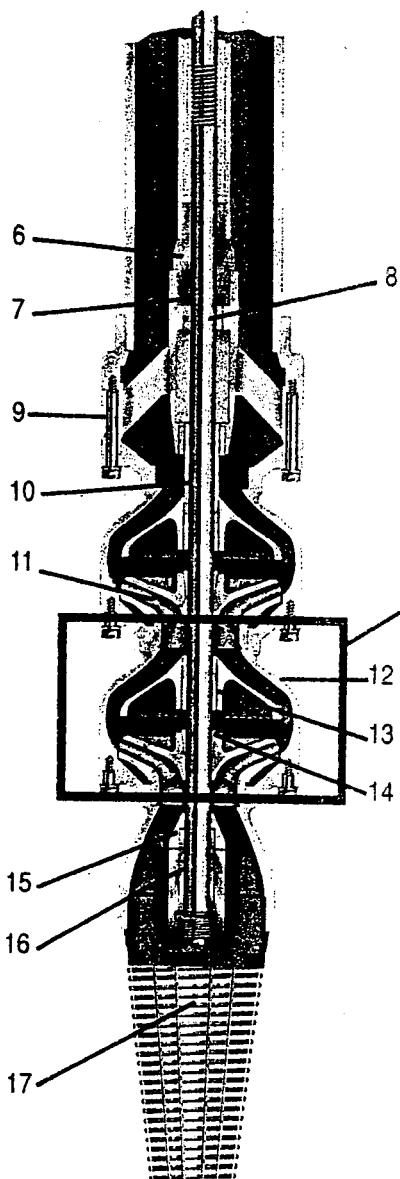


Oil Lubrication

- 1 Adjusting Nut**
Permits exact impeller adjustment for maximum performance.
- 2 Large Capacity Manual or Solenoid Oiler**
Assures constant oil supply.
- 3 Discharge Head**
Heavy duty head provides maximum accessibility to service tube tension assembly. Two piece headshaft is standard.
- 4 Lock Ring**
Positively locks adjusting nipple to discharge head.
- 5 Adjusting Nipple**
Threads directly into column adapter. Head shaft stickup set exactly by threading head on column as required.
- 6 Tube Adapter Bushing**
Bronze.
- 7 Double Bowl Seal—Optional**
Provides positive sealing of developed head.
- 8 Pump Shaft**
Oversized high strength polished stainless steel.
- 9 Discharge Bowl**
Close grained cast iron. Relief ports insure positive bearing lubrication.
- 10 Discharge Bowl Bearing**
Bronze. Close tolerance fit for minimum leakage.
- 11 Impellers**
Silicon bronze. Designed for maximum efficiency. Precision balanced for smooth operation.
- 12 Intermediate Bowls**
Close grained cast iron. Waterways glass lined for maximum efficiency.
- 13 Intermediate Bowl Bearings**
Bronze or rubber for long pump life under any well conditions.
- 14 Lock Collets**
Steel construction secures impeller to pump shaft.
- 15 Sand Collar**
Accurately located at suction bowl bearing to eliminate possible sand buildup.
- 16 Suction Bowl Bearing**
Bronze. Grease packed for long trouble-free life.
- 17 Tail Pipe or Strainer—Optional**
Tail pipe cut to desired length for best suction conditions. Strainer provides protection from large solids.



- Headshaft**
Steel.
- Tube Tension Nut**
Heavy duty cast iron.
- Tension Nut Bushing**
Bronze construction. Spiral groove insures positive lubrication to lineshaft bearings.
- Heavy Duty Tension Plate**
For positive alignment of lineshaft bearings.

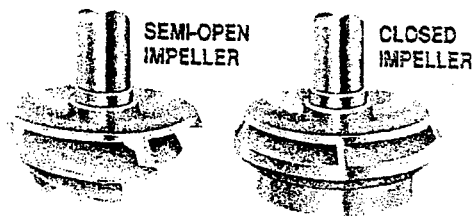


Glass Lined Bowls

Heavy duty Class 30 cast iron intermediate bowls with standard feature of lined waterways for maximum efficiency and wear protection.

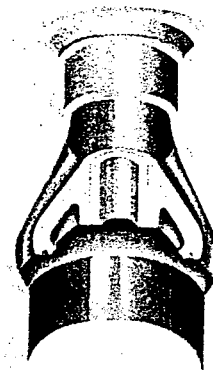


Impellers

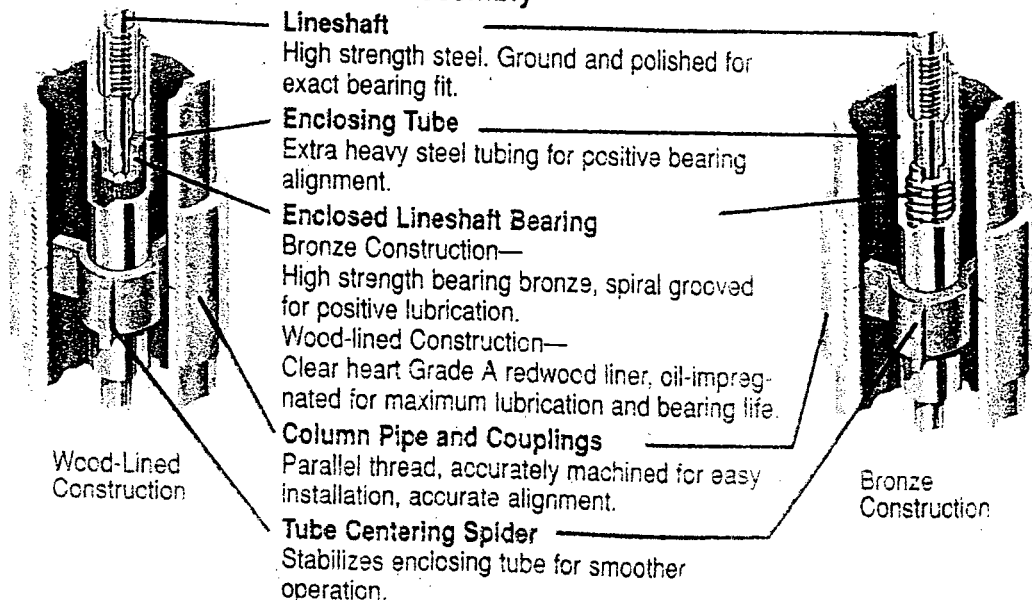


Optional Long Lateral

Long lateral adjustment for maximum setting capabilities. Available in some sizes.



Column Assembly



Lineshaft

High strength steel. Ground and polished for exact bearing fit.

Enclosing Tube

Extra heavy steel tubing for positive bearing alignment.

Enclosed Lineshaft Bearing

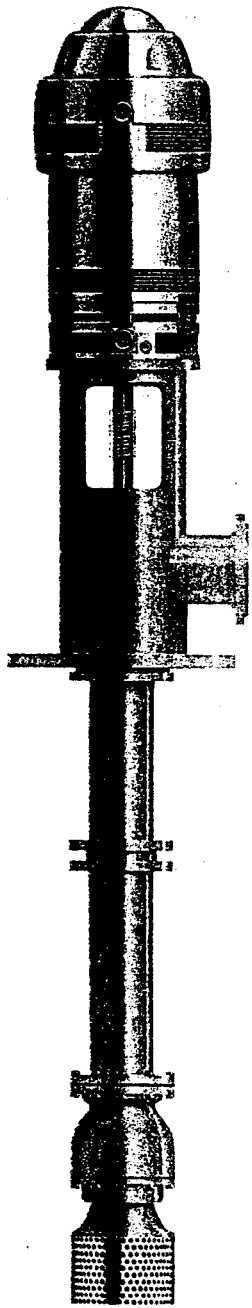
Bronze Construction—
High strength bearing bronze, spiral grooved for positive lubrication.
Wood-lined Construction—
Clear heart Grade A redwood liner, oil-impregnated for maximum lubrication and bearing life.

Column Pipe and Couplings

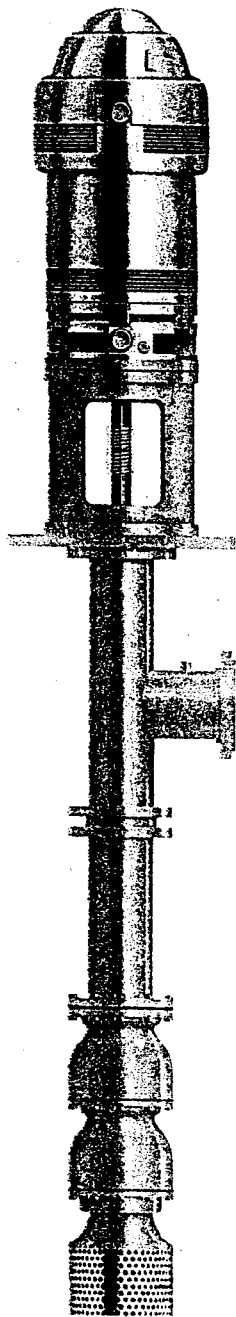
Parallel thread, accurately machined for easy installation, accurate alignment.

Tube Centering Spider

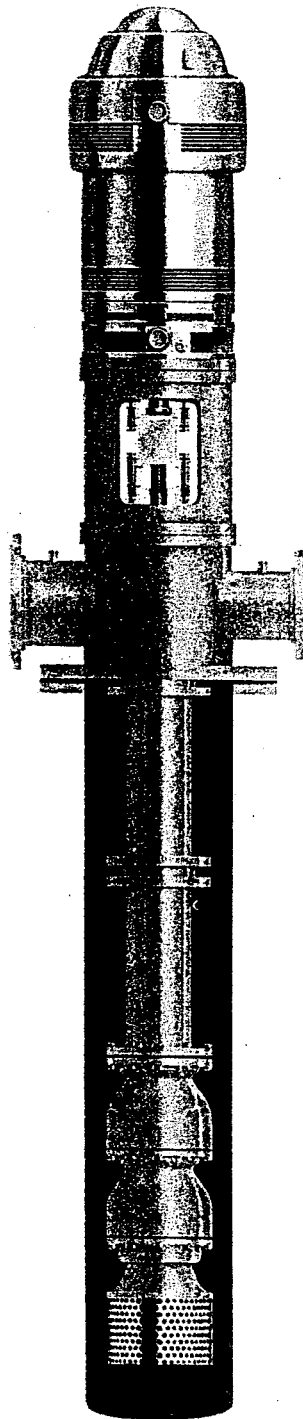
Stabilizes enclosing tube for smoother operation.



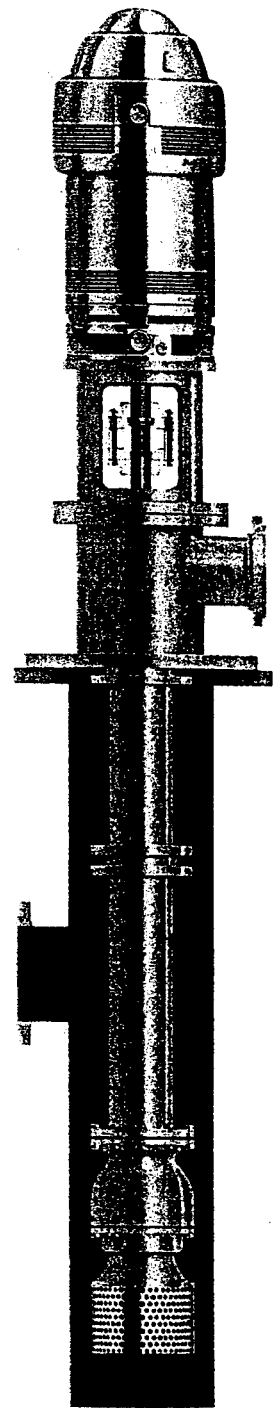
Type "F"
Head



Type "U"
Discharge
Located
Underground



Type "T"
Suction Inlet
Located in the
Head

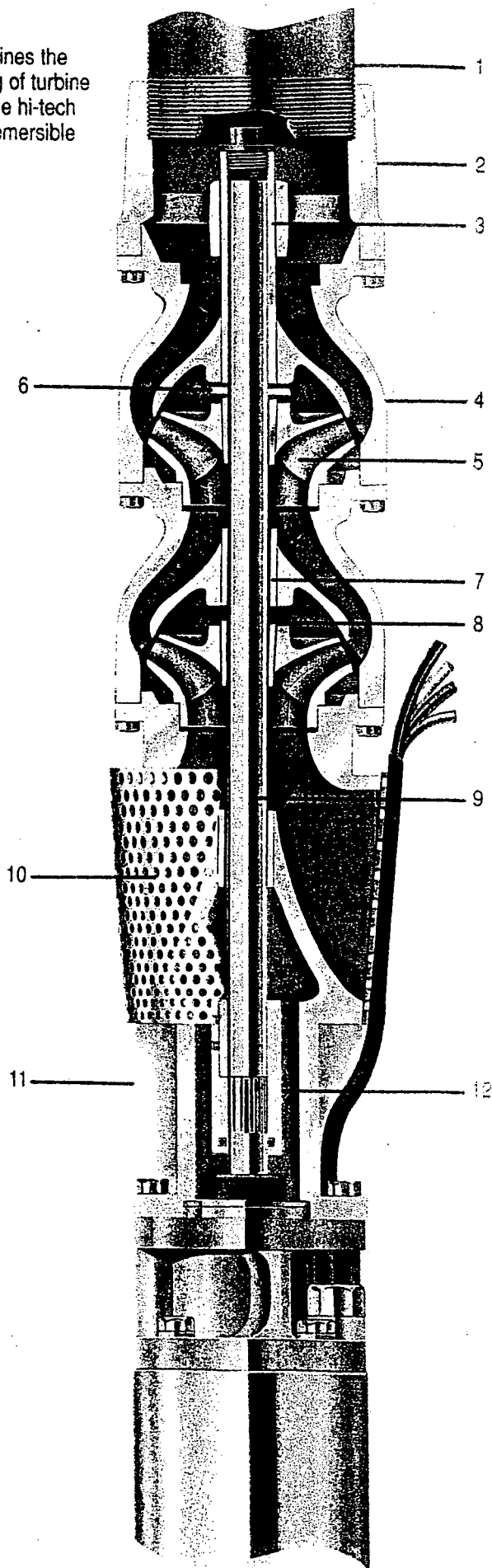


Type "L"
(Can)
Suction Inlet
Located in the
Can

SUBMERSIBLE

Applications

Goulds Pumps combines the hydraulic engineering of turbine pumps matched to the hi-tech design of electric submersible motors.



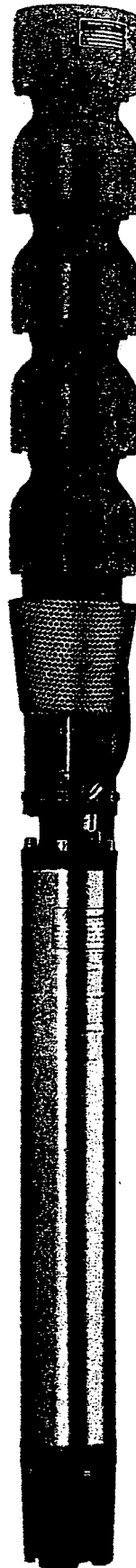
Features

- 1 Discharge Pipe**
Properly sized for optimum water velocities to insure peak hydraulic performance.
- 2 Discharge Bowl**
Several discharge sizes available for NPT or flanged pipe.
- 3 Discharge Bearing**
Extra long top protected bronze bearing insures positive shaft alignment and stabilization for extended life.
- 4 Intermediate Bowl**
Close grained Class 30 cast iron. Water passage glassed for maximum efficiency and abrasion resistance.
- 5 Impellers**
Designed for maximum efficiency with wide range hydraulic coverage. Precision balanced for smooth operation.
- 6 Upthrust Collar**
Designed for extra margin of safety against possible momentary upthrust occurring at startup.
- 7 Intermediate Bowl Bearings**
Reliable long life bronze or rubber bearing.
- 8 Lock Collets**
Accurately machined to insure positive locking of impeller to pump shaft.
- 9 Pump Shaft**
100,000 PSI high tensile stainless steel provides strength and excellent corrosion resistance. Ground and polished for smooth bearing surface.
- 10 Suction Inlet**
Contoured for smooth flow entrance. Protected by an oversized stainless steel strainer to prevent entrance of damaging solids.
- 11 Suction Adapter**
Ductile iron provides for increased strength and positive motor alignment. Open area permits easy access to pump/motor coupling.
- 12 Pump/Motor Coupling**
Large stainless steel coupling accurately machined for perfect alignment, balance, and power transmission.

Submersible pumps and motors provide an extensive list of options versus other deep well pumping equipment systems. Advanced engineering designs and experience now assure units for long term pumping service. Water well applications provide the perfect opportunity to evaluate features and benefits of submersible equipment.

Hermetically Sealed Type

A Hermetically Sealed Type motor utilizes windings of standard construction and insulation thickness. The windings are encased and Hermetically Sealed within the external shell casing on the outside and an internal tube or liner inside the bore. The Hermetically Sealed enclosure eliminates the possibility of water leakage into the winding. The liquid medium circulates between the rotor and stator liner providing lubrication and cooling to the bearings.



Wet Winding Type

A Wet Winding Type motor is one in which the motor windings are in direct contact with a liquid medium. The medium is clean, clear water. A pressure balancing system prevents exchange of the motor liquid medium and well water due to thermal expansion and contraction when the motor is operating. The liquid medium fills the inside of the motor and surrounds both the stator windings and the rotor. A completely waterproof insulation is used on the magnet wire used for the stator windings. The liquid medium inside the motor air gap and coils acts as a heat transfer device by circulating through the windings and transferring heat to the external casing. Dissipation of this heat occurs as the well water flows at a required velocity over the external case. As is the case in all submersible type motors, the internal liquid medium is also used for bearing lubrication.

Submersible Options:

Goulds Pumps can provide several options in pump and motor combinations to meet the exacting conditions of your applications:

- High temperature wells
- High horsepower, limited well diameters
- Motor sensing devices
- Water level indicators
- Special materials
- Special voltage motors

Consult Goulds Turbine Customer Service Dept. for details.

Submersible Accessories:

- Valves
 - Check Valves
 - Flow Control
 - Gate Valves
 - Ball Valves
- Electrical Panels
 - F. E. Subtrol
 - Furnas Panels
 - V.F.D. Drives
- Pitless Adapters
- Wire
 - 12 to 0000
- Heat Shrinks
- Splice Kits
- Tanks
- Well Heads
 - Submersible Discharge Head
- Torque Arrestors
- Gauges
- Motor Shrouds

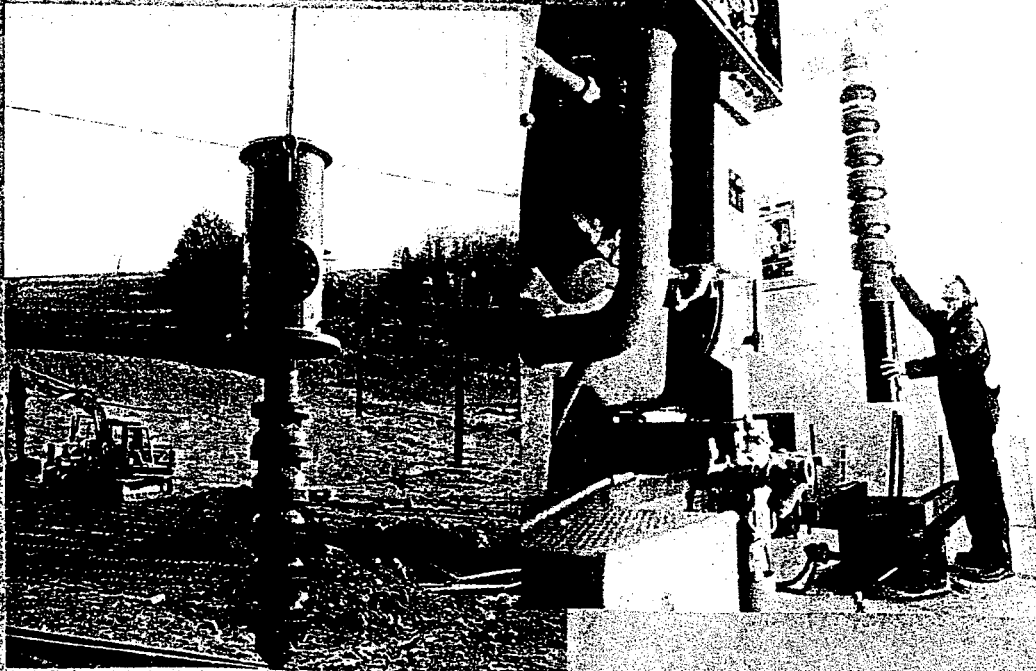
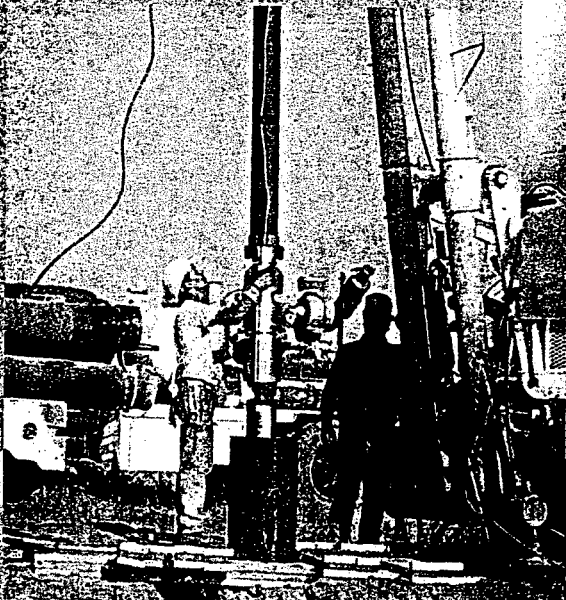
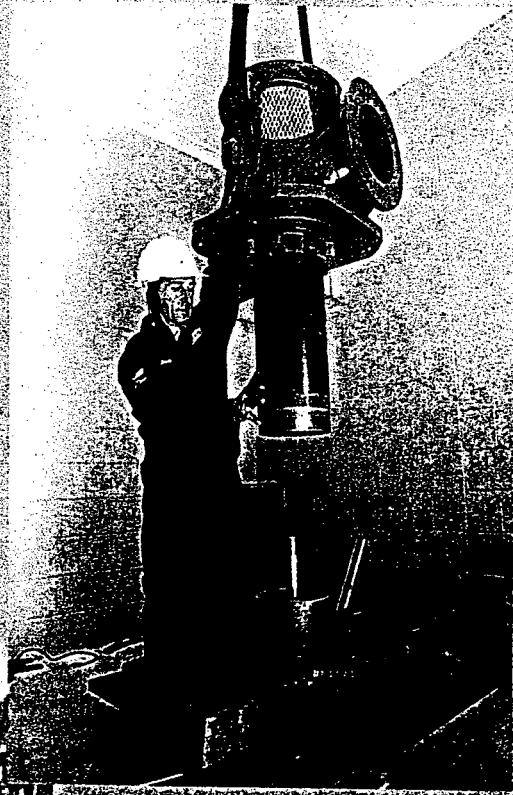
Lineshaft/Submersibles

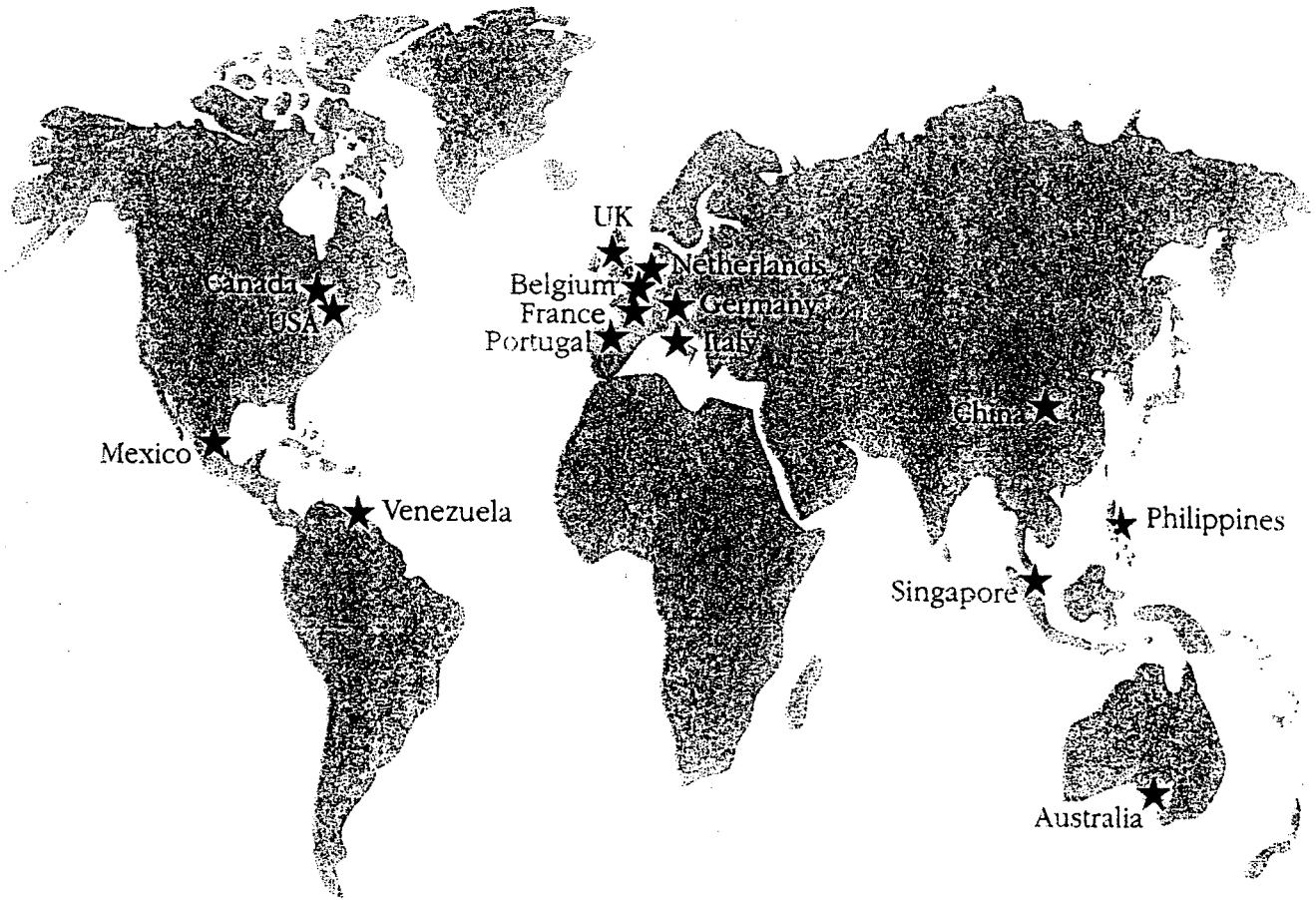
Parts List Standard Materials of Construction

No.	Description	Material	
		Goulds No.	Description
1	Discharge Head	1003	C.I. ASTM A48, CL 30B
2	HeadShaft	2227	Water Lube Stainless—ASTM A582, Type 416
		2205	Oil Lube Steel—AISI C1045
3	Adjusting Nut	1018	Ductile Iron—ASTM A536, Gr. 65-45-12
4	Gib Key	2242	Mild Steel—ASTM A108, Gr. 1018
5	Tension Nut	1003	Oil Lube Only Cast Iron—ASTM A48, CL 30B
6	Tension Nut Bushing	1109	Oil Lube Only Bronze—ASTM B584 C903
7	Tension Plate	1003	Oil Lube Only Cast Iron—ASTM A48, CL 30B
8	Oiler Body	1425	Oil Lube Only Aluminum—SAE 329 or Steel
9	Stuffing Box	1003	Water Lube Cast Iron—ASTM A48, CL 30B
10	Stuffing Box Bushing	1109	Water Lube Bronze—ASTM B584 C903
11	Stuffing Box Stud	2229	Water Lube Stainless—ASTM A276 Type 316
12	Stuffing Box Stud Nut	2229	Water Lube Stainless—ASTM A276 Type 316
13	Stuffing Box Washer	3217	Water Lube Stainless—ASTM A240, Type 304
14	Stuffing Box Gasket	5136	Water Lube Garlock Brand Blue Guard
15	Stuffing Box Split Gland	1193	Water Lube Aluminum Bronze—ASTM B148HT
16	Stuffing Box Slinger	5121	Water Lube Rubber
17	Packing	5026	Graphited Acrylic Yarn
18	Column Nipple	6501	Pipe—ASTM A53
19	Lock Ring	1018	Ductile—ASTM A536, Gr. 65-45-12
20	Reducer-Bushing	1003	Cast Iron—ASTM A48, CL 30B
21	Companion Flange	1003	Cast Iron—ASTM A48, CL 30B
22	Companion Flange Gasket	5136	Garlock Brand Blue Guard
23	Nameplate	3211	Stainless—ASTM A240, Type 316
24	Sole Plate	3201	Steel Plate—ASTM A283, Gr. D
25	Column Pipe	6501	Pipe—ASTM A53
26	Column Coupling	6501	Pipe—ASTM A53
27	Tube Nipple	6521	Pipe—ASTM A120
28	Enclosing Tube	6521	Bronze Construction Steel—SCH80, ASTM A120, Gr. B
		6521	Wood-lined Construction Steel—SCH40, ASTM A120
29	Oil Tube Coupling	6521	Wood-lined Only Steel—ASTM A120
30	Lineshaft Bearing	1109	Bronze Construction Bronze—ASTM B584 C903
			Wood-lined Construction Clear Heart Redwood—Grade A
31	Lineshaft	2205	WL—Chrome Spot Steel—AISI C1045
		2227	WL—Stainless Stainless—ASTM A582, Type 416
		2205	Oil Lube Steel—AISI C1045
32	Lineshaft Chrome Spot		Water Lube Only Chrome Facing—Rockwell #76
33	Lineshaft Coupling	2242	Water Lube Mild Steel—ASTM A108, Gr. 1018
		2218	Stainless Stainless—ASTM A582, Type 416
34	Water Lube Retainer	1102	Retainer Silicon Brass—ASTM B584 C875
		5121	Insert Rubber
35	Tube Centering Spider	5121	Rubber
36	Discharge Bowl	1003	Cast Iron—ASTM A48, CL 30B
37	Discharge Bushing	1109	Water Lube Bronze—ASTM B584 C903
38	Throttle Bushing	1109	Oil Lube Bronze—ASTM B584 C903
39	Intermediate Bowl	6911	Cast Iron—ASTM A48, CL 30B, Enameled
40	Top Inter Bowl	6911	Cast Iron—ASTM A48, CL 30B, Enameled
41	Inter Bowl Bushing	1109	Bronze Bronze—ASTM B584 C903
		5121	Rubber Rubber
42	Wear Rings—Optical	1109	Inter Bowl Bronze—ASTM B584 C903
43	Impeller	1109	Impeller Bronze—ASTM B584 C903
44	Taper Lock	1102	Silicon Brass—ASTM B584 C875
45	Suction Bowl	2242	Mild Steel—ASTM A108, Gr. 1018
46	Suction Bushing	1003	Cast Iron—ASTM A48, CL 30B
47	Sand Collar	1109	Bronze—ASTM B584 C903
48	Suction Strainer	1109	Bronze—ASTM B584 C903
49	Plug	5552	Hct Galvanized—ASTM A123
50	Screw Bearing	2210	Steel—ASTM A108, Gr. 1211
		1109	Bronze Construction Bronze—ASTM B584 C903
51	Bowl Shaft	2242	Wood-lined Construction Mild Steel—ASTM A108, Gr. 1018
52	Hex Bolt	2227	Stainless—ASTM A582, Type 416
53	Lock Washer	2298	Steel—SAEJ 429, Gr. 8
54	Suction Adapter	2242	Steel—ASTM A108, Gr. 10180
		1018 or 1056	Ductile Iron—ASTM A536, Gr. 65-45-12 Cast Iron—ASTM A48 CL 40B
55	Adapter Plate	1018	Ductile Iron—ASTM A536, Gr. 65-45-12
56	Motor Coupling	2213	Submersible Only Stainless Steel—ASTM A582, Type 416
57	Motor Mounting Bolts	2229	Submersible Only Stainless—ASTM A276, Type 316
58	Suction Screen	3215	Submersible Only AISI 304 Stainless
59	Cable Guard	3215	Submersible Only AISI 304 Stainless
60	Discharge Bearing	1109	Submersible Only Bronze—ASTM B584 C903
61	Discharge Bearing Plug	2242	Submersible Only Mild Steel—ASTM A108, Gr. 1018
62	Uphrust Washer	2227	Submersible Only Stainless Steel—ASTM A582, Type 416

Services

- Municipal
- Wastewater Plants
- Commercial/Industrial
- Golf Courses/Turf Irrigation
- Agricultural Irrigation
- Dewatering
- Mining
- Cooling Tower
- Water Parks
- Snowmaking
- Flood Control





Turbine Distribution Centers:	Phone	Fax
LUBBOCK, TX N. Quaker & Clovis Rds., Lubbock, TX 79415	1-806-743-5700	1-800-453-4749
MEMPHIS, TN 5815 Shelby Drive, Memphis, TN 38141	1-901-366-4010	1-800-848-9793
ORLANDO, FL 2105 N. Orange Blossom Trail, Orlando, FL 32804	1-407-422-6183	1-800-453-4748
FRESNO, CA 3878 S. Willow Ave., #104, Fresno, CA 93725	1-559-265-4730	1-800-453-7523 1-559-265-4740
Specifications & Special Projects:		
LUBBOCK CUSTOMER SERVICE CENTER	1-806-743-5700	1-800-453-4749

visit our website at www.goulds.com



CALCULATING AXIAL THRUST

Under normal circumstances Vertical Turbine Pumps have a thrust load acting parallel to the pump shaft. This load is due to unbalanced pressure, dead weight and liquid direction change. Optimum selection of the motor bearing and correct determination of required bowl lateral for deep setting pumps require accurate knowledge of both the magnitude and direction (usually down) of the resultant of these forces. In addition, but with a less significant role thrust influences shaft H.P. rating and shaft critical speeds.

IMPELLER THRUST

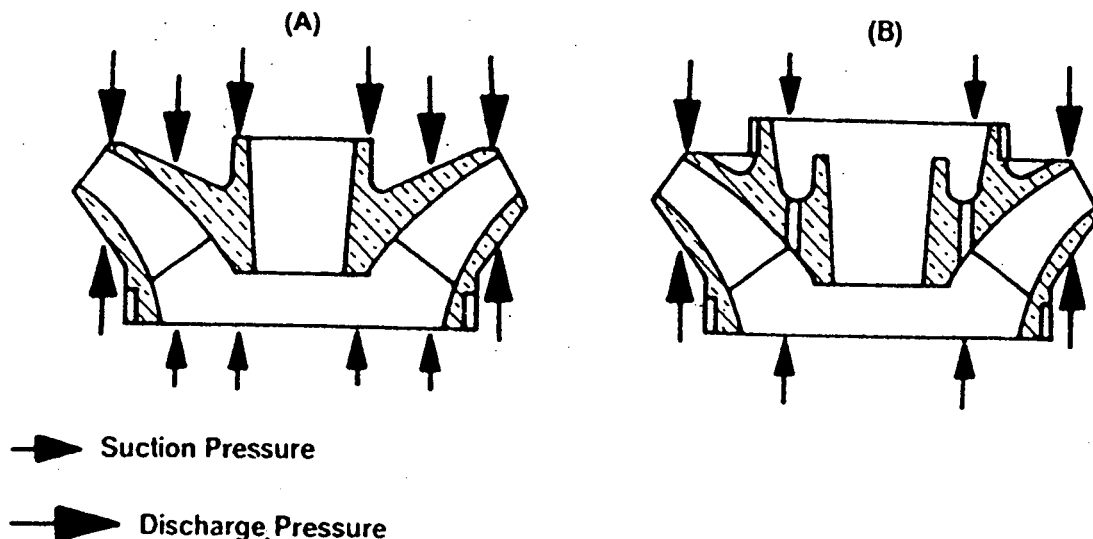
Impeller Thrust in the downward direction is due to the unbalanced discharge pressure across the eye area of the impeller. See diagram A.

Counteracting this load is an upward force primarily due to the change in direction of the the liquid passing through the impeller. The resultant of these two forces constitutes impeller thrust. Calculating this thrust using a thrust constant (K) will often produce only an approximate thrust value because a single constant cannot express the upthrust component which varies with capacity.

To accurately determine impeller thrust, thrust-capacity curves based on actual tests are required. Such curves now exist for the "A" Line. To determine thrust, the thrust factor "K" is read from the thrust-capacity curve at the required capacity and given RPM. "K" is then multiplied by the Total Pump Head (Final Lab Head) times Specific Gravity of the pumped liquid.

If impeller thrust is excessively high, the impeller can usually be hydraulically balanced. This reduces the value of "K". Balancing is achieved by reducing the discharge pressure above the impeller eye area by use of balancing holes and rings. See diagram B.

Although hydraulic balancing reduces impeller thrust, it also decreases efficiency by 1 to 5 points by providing an additional path for liquid recirculation.



CALCULATING AXIAL THRUST (CON'T.)

DEAD WEIGHT

In addition to the impeller force, dead weight (shaft plus impeller weight less the weight of the liquid displaced) acts downward. On pumps with settings less than 50 feet, dead weight may be neglected on all but the most critical applications as it represents only a small part of the total force. On deeper setting pumps, dead weight becomes significant and must be taken into account.

NOTE: We normally only take shaft weight into consideration as dead weight, the reason being that impeller weight less its liquid displacement weight is usually a small part of the total.

SHAFT SLEEVES

Finally, there can be an upward force across a head shaft sleeve or mechanical seal sleeve. In the case of can pumps with suction pressure there can be an additional upward force across the impeller shaft area. Again for most applications, these forces are small and can be neglected; however, when there is a danger of upthrusts or when there is high discharge pressure (above 600 psi) or high suction pressure (above 400 psi) these forces should be considered.

MOTOR BEARING SIZING

Generally speaking a motor for a normal thrust application has as standard, a bearing adequate for shutoff thrust. When practical, motor bearings rated for shutoff conditions are preferred.

For high thrust applications (when shutoff thrust exceeds the standard motor bearing rating) the motor bearing may be sized for the maximum anticipated operating range of the pump.

Should the pump operate to the left of this range for a short period of time, anti-friction bearings such as angular contact or spherical roller can handle the overload. It should be remembered, however, that bearing life is approximately inversely proportional to the cube of the load. Should the load double, motor bearing life will be cut to $\frac{1}{8}$ of its original value. Although down thrust overloading is possible, the pump must never be allowed to operate in a continuous up thrust condition even for a short interval without a special motor bearing equipped to handle it. Such up thrust will fail the motor bearing.



MOTOR BEARING SIZING
CALCULATING MOTOR BEARING LOAD

As previously stated, for short setting non-hydraulic balanced pumps below 50 feet with discharge pressures below 600 psi and can pumps with suction pressures below 100 psi, only impeller thrust need be considered.

Under these conditions:

$$\text{Motor Bearing Load (lbs.) } T_{imp} = K \times H_L \times SG$$

Where:

Impeller Thrust (lbs.)

K = Thrust factors (lbs./ft.)

H_L = Lab Head (ft.)

SG = Specific Gravity

For more demanding applications, the forces which should be considered are impeller thrust plus dead weight minus any sleeve or shaft area force.

In equation form:

$$\text{Motor Bearing Load} = T_{imp} + Wt^{(1)} - \text{sleeve force}^{(2)} - \text{shaft area force}^{(3)}$$

Shaft Dia. (in.)	Shaft Dead Wt. (lbs./ft.)		Shaft Area (in ²)	Sleeve Area (in)
	Open Lineshaft	Closed Lineshaft		
1	2.3	2.6	.78	1.0
1 ³ / ₁₆	3.3	3.8	1.1	1.1
1 ¹ / ₂	5.3	6.0	1.8	1.1
1 ¹¹ / ₁₆	6.7	7.6	2.2	1.5
1 ¹⁵ / ₁₆	8.8	10.0	2.9	1.8
2 ³ / ₁₆	11.2	12.8	3.7	2.0

(1) Wt. = Shaft Dead Wt. x Setting In Ft.

(2) Sleeve Force = Sleeve area x Discharge pressure

(3) Shaft Area Force = Shaft area x Suction pressure

NOTE: Also see complete weight chart on Page 200.B2

*Oil Lube shaft does not displace liquid above the pumping water level and therefore has a greater net weight.

CALCULATING BOWL LATERAL REQUIREMENT

When determining the bowl lateral required, shaft and impeller weight are not considered. When the impeller is correctly positioned prior to start up, any stretch due to the shaft and impeller weight has already occurred. Also, Head Shaft or Mechanical Seal Sleeve force is not considered as this force affects only the elongation of the line shaft above the sleeve. Impeller thrust then is the only force normally affecting lateral.

Bowl lateral requirement may be calculated by determining impeller thrust and then referring to Shaft Elongation Charts 2 or 2a. The impeller thrust equation is:

$$T_{imp} = K \times H_L \times SG$$

NOTE: For bowl lateral calculations, Lab Head and "K" value selected should be the maximum anticipated (example: if unit operates near shut-off, the Lab Head and "K" value corresponding to this flow should be selected.)

EXAMPLE

What is the load carried by the motor bearing at design conditions when:

Capacity	400 GPM	Bowl Model	10 AHC
Head	1800 ft.	Speed	3550 RPM
SpGr	1.03	Head Shaft Dia.	1 1/16
Discharge Pressure	803 PSI	Setting (Product Lube)	100'
Suction Pressure	Flooded		

From the 10 AHC thrust capacity curve, Pg. 2J.3, the "K" factor at design is 2.6.

Impeller Thrust: $T_{imp} = K \times H_L \times SG$
 $= 2.6 \times 1800 \times 1.03$
 $= 4820 \text{ lbs.}$

Dead Weight: $Wt. = \text{Shaft wt. per ft.} \times \text{Setting}$
 $= 6.7 \times 100$
 $= 670 \text{ lbs.}$

Shaft Area Force: $S.A.F. = \text{Shaft area} \times \text{Suction Pressure}$
 $= 2.2 \times 0.0$
 $= 0$

Seal Sleeve Force: $S.F. = \text{Sleeve area} \times \text{Discharge Pressure}$
 $= 1.5 \times 803$
 $= 1204 \text{ lbs.}$

Motor Bearing Load $= T_{imp} + wt. - \text{shaft area force} - \text{sleeve force}$
 $= 4820 + 670 - 0 - 1204$
 $= 4286 \text{ lbs.}$

NOTE: In addition to the design point, the motor bearing load should be calculated at shutoff and runout. Should these points indicate excessive down thrust or any upthrust, a simple plot of shutoff, design and runout thrust against capacity will establish the maximum allowable operating range of the pump.



GOULDS PUMPS

TEXTILE DIVISION STD. PRODUCTS GROUP



USEFUL FORMULAS

$\text{Water Horsepower} = \frac{\text{GPM} \times 8.33 \times \text{Head}}{33000} = \frac{\text{GPM} \times \text{Head}}{3960}$	<p>WHERE: GPM = Gallons per Minute. 8.33 = Pounds of water per gallon. 33000 = Ft. Lbs. per minute in one horsepower. Head = Difference in energy head in feet (field head).</p>
$\text{Laboratory BHP} = \frac{\text{Head} \times \text{GPM} \times \text{Sp. Gr.}}{3960 \times \text{Eff.}}$	<p>WHERE: GPM = Gallons per Minute. Head = Lab. Head (including column loss). Eff. = Lab. Eff. of Pump Bowls (from price book curves). Shaft Loss = HP Loss due to mechanical friction of Lineshaft Bearings. Thrust Bearing Loss = HP Loss in driver thrust bearings. (See (1) below)</p>
$\text{Field BHP} = \text{Laboratory BHP} + \text{Shaft Loss}$	
$\text{Total BHP} = \text{Field BHP} + \text{Thrust Bearing Loss}$	
$\text{Input Horsepower} = \frac{\text{Total BHP}}{\text{Motor Eff.}}$	<p>Motor Eff. from Motor mfg. (as a decimal).</p>
$\text{Field Efficiency} = \frac{\text{Water Horsepower}}{\text{Total BHP}}$	<p>Water HP as determined above. Total BHP as determined above.</p>
$\text{Overall Plant Efficiency} = \frac{\text{Water Horsepower}}{\text{Input Horsepower}}$	<p>Water HP as determined above. Input HP as determined above.</p>
<p>Electrical</p>	$\text{Input Horsepower} = \frac{\text{B.H.P.}}{\text{Mot. Eff.}} = \frac{4.826 \times K \times M \times R}{T} = \frac{1.732 \times E \times I \times \text{PF}}{746}$ <p>B.H.P. = Brake Horsepower as determined above. Mot. Eff. = Rated Motor Efficiency. K = Power Company Meter Constant M = Power Company Meter Multiplier, or Ratio of Current and Potential Transformers connected with meter. R = Revolutions of meter disk. T = Time in Sec. for R. E = Voltage per Leg applied to motor. I = Amperes per Leg applied to motor. PF = Power factor of motor. 1.732 = Factor for 3-phase motors. This reduces to 1 for single phase motors.</p>
	$\text{Kilowatt Input to Motor} = .746 \times 1 \text{ HP} = \frac{1.732 \times E \times I \times \text{PF}}{1000}$
	$\text{KW-Hrs. Per 1000 Gallons of Cold Water Pumped Per Hour} = \frac{\text{HD. in ft.} \times 0.00315}{\text{Pump Eff.} \times \text{Mot. Eff.}}$
<p>Misc.</p>	<p>(1) Thrust Bearing Loss = .0075 HP per 100 RPM per 1000 lbs. thrust *</p>
	<p>(2) Overall Plant Efficiency sometimes referred to as "Wire to Water" Efficiency.</p>
	<p>* Thrust (in lbs.) = (thrust constant (k) laboratory head) = (setting in feet x shaft wt. per ft.) NOTE: Obtain thrust constant from curve sheets.</p>
	$\text{Discharge Head (in feet of fluid pumped)} = \frac{\text{Discharge Pressure (PSI)} \times 2.31}{\text{Sp. Gr. of Fluid Pumped}}$
$\text{Velocity Head} = \frac{V^2}{2G}$ <p>V = Velocity of Water G = Acceleration due to gravity 32.2 ft./sec²</p>	





CONVERSION TABLES

Units of Flow

Units	U.S. Gallons Per Minute	Million U.S. Gallons Per Day	Cubic Feet Per Second	Cubic Meters Per Hour	Liters Per Second
1 U.S. Gallon Per Minute	1	.001440	.00223	.2270	.0631
1 Million U.S. Gallons Per Day	694.5	1	1.547	157.73	43.8
1 Cubic Foot Per Second	448.8	.646	1	101.9	28.32
1 Cubic Meter Per Hour	4.403	.00634	.00981	1	.2778
1 Liter Per Second	15.85	.0228	.0353	3.60	1

Units of Power

Unit	Horsepower	Ft.-Lbs. Per Minute	Watts	Kilowatts	Metric Horsepower	B.T.U. Per Minute
1 Horsepower	1	33,000	746	.746	1.014	42.4
1 Ft.-Lb. Per Minute	.0000303	1	.0226	.0000226	.0000307	.001285
1 Watt	.001340	44.2	1	.001	.001360	.0568
1 Kilowatt	1.341	44,250	1000	1	1.360	56.8
1 Metric Horsepower	.986	32,550	736	.736	1	41.8
1 BTU Per Minute	.0236	778.4	17.6	.0176	.0239	1

Units of Length

1 Inch = .0833 ft = .0278 yd. = 25.4 millimeters = 2.54 centimeters
 1 Ft = 12 inches = .333 yd. = 30.48 centimeters = .3048 meter
 1 Yd. = 36 inches = 3 feet = 91.44 centimeters = .9144 meter
 1 Mile = 5280 ft = 1760 yds. = 1.61 kilometer = 1609 meters
 1 Meter = 3.281 ft = 39.37 in. = .000622 miles = .001 kilometers
 1 Kilometer = 1000 meters = 1093.61 yds. = .62137 miles = 3281 feet



CONVERSION TABLES

Units of Pressure & Head

Units	Lbs. Per Square Inch	Feet of Water	Meters of Water	Inches of Mercury	Atmospheres	Kilograms Per Sq. C.M.
1 Lb. Per Sq. Inch	1	2.31	.704	2.04	.0681	.0703
1 Ft. of Water	.433	1	.305	.882	.02947	.0305
1 Meter of Water	1.421	3.28	1	2.89	.0967	.1
1 Inch of Mercury	.491	1.134	.3456	1	.0334	.0345
1 Atmosphere (at Sea Level)	14.70	33.93	10.34	29.92	1	1.033
1 Kilogram Per Sq. C.M.	14.22	32.8	10	28.96	.968	1

Equivalent units are based on density of fresh water at from 32 to 62 F.
 Equivalent units are based on density of mercury at from 32 to 62 F. sufficient accuracy.
 Each 1000 ft. of ascent decreases pressure about ½ lb./sq. in.

Units of Volume & Weight

Units	U.S. Gallons	Imperial Gallons	Cubic Inches	Cubic Feet	Acre Feet	Pounds	Cubic Meters	Liters
1 U.S. Gallon	1	.833	231	.1337	.00000307	8.35	.003785	3.785
1 Imperial Gal.	1.201	1	277.4	.1605	.00000369	10.02	.004546	4.546
1 Cubic Inch	.00433	.00360	1	.000579	—	.0361	—	.0164
1 Cubic Foot	7.48	6.23	1728	1	.0000230	62.4	.02832	28.32
1 Acre-Foot	325,850	271,335	—	43,560	1	—	1233.5	—
1 Pound*	.120	.0998	27.7	.0160	—	1	—	.454
1 Cubic Meter	264.2	220	61,023	35.314	.000811	2205	1	1000
1 Liter	.2642	.220	61.023	.0353	—	2.205	—	1

*Wts. shown based on maximum density of fresh water at 39° Fahrenheit.

Units of Area

Units	Square Inch	Square Feet	Square Yard	Acres	Square Miles	Square Centi-Meter	Square Meters	Hectares
1 Sq. Inch	1	.00694	.00077	—	—	6.452	—	—
1 Sq. Foot	144	1	.111	—	—	929	.0929	—
1 Sq. Yard	1296	9	1	.000207	—	8361	.0836	—
1 Acre	—	43,500	4840	1	.00156	—	4049	0.405
1 Sq. Mile	—	27.9 x 10 ⁶	3,097,600	640	1	—	2.58 x 10 ⁶	258
1 Sq. Centimeter	.155	.001076	—	—	—	1	.0001	1 x 10 ⁸
1 Sq. Meter	1549	10.76	1.196	.000247	—	10,000	1	.0001
1 Hectare	—	107.639	11,960	2.471	.00386	1 x 10 ⁸	10,000	1

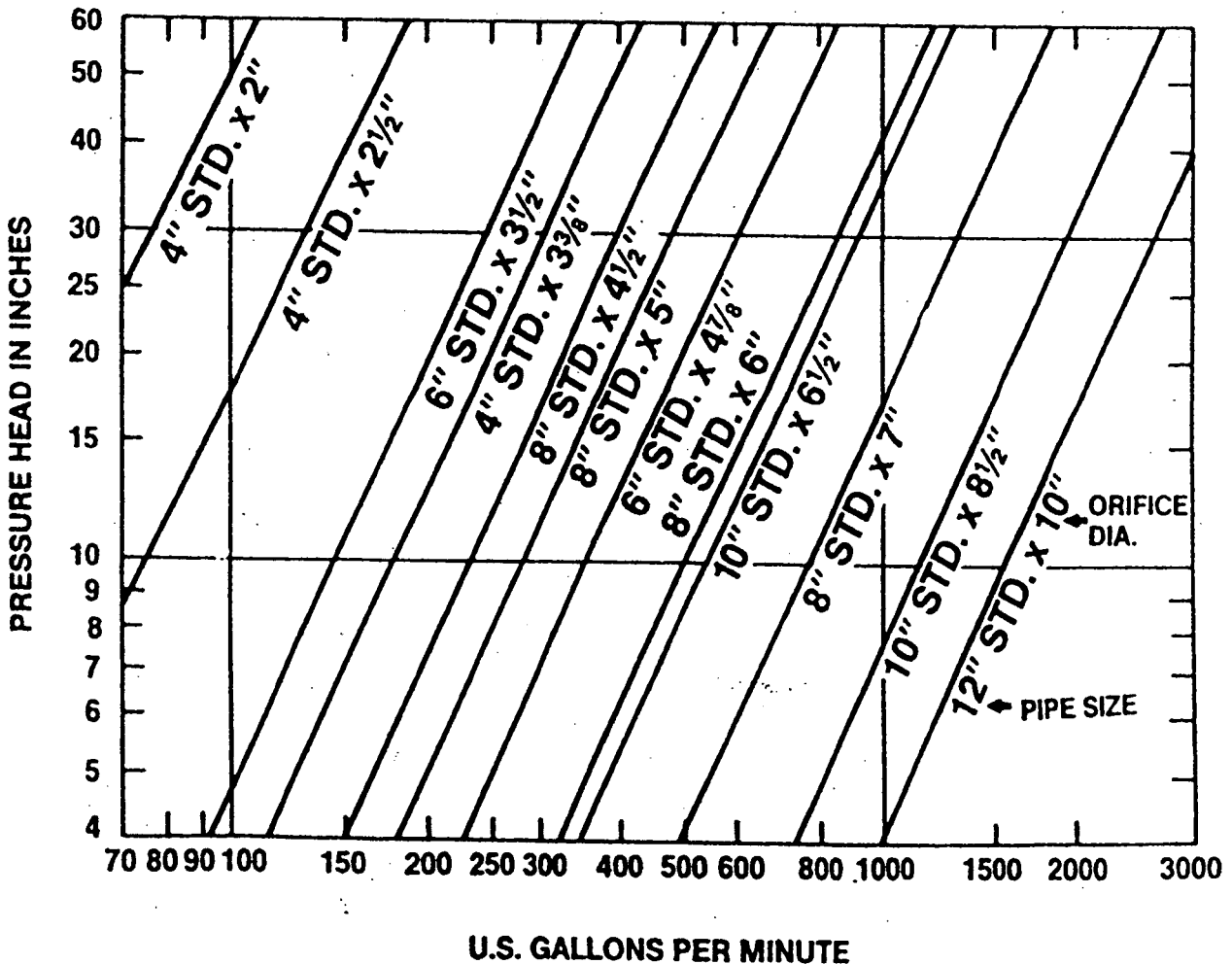
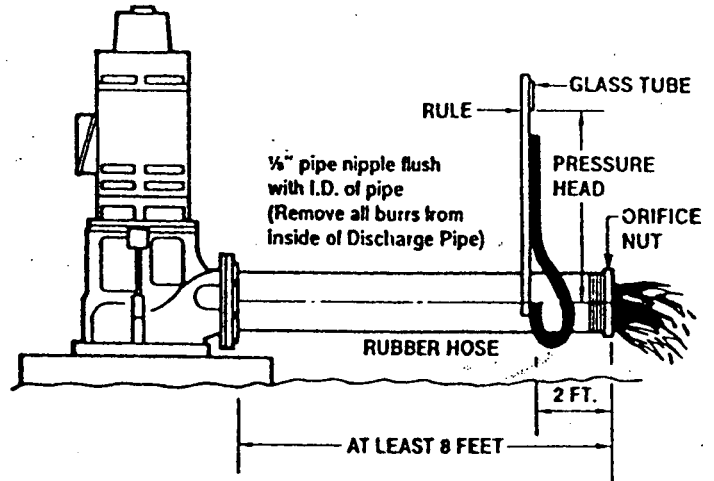


MEASURING FLOW Orifice Method

MEASURING WATER USING AN ORIFICE

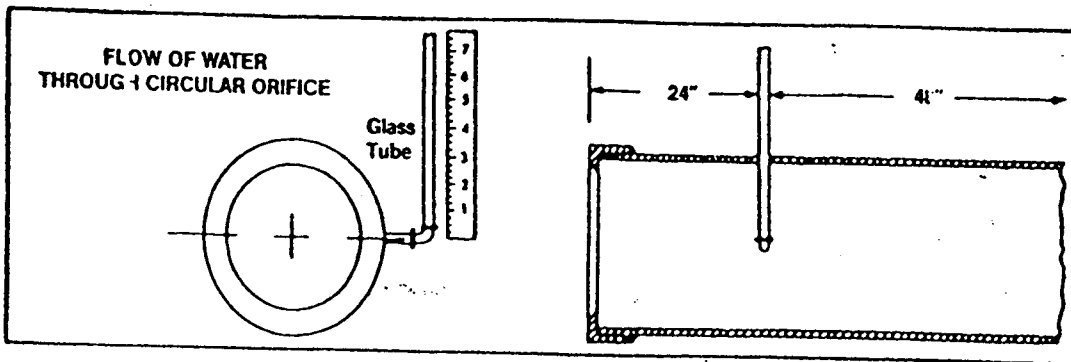
The use of an orifice is one of the simplest methods of accurately measuring the discharge from a vertical turbine pump in the field. The equipment and method is as illustrated.

- Discharge pipe must be horizontal and measuring tube connection in center of pipe.
- Pipe must be flowing full with clear water free of sand and air, with a minimum pressure head 2" above top of pipe.
- Pressure head is the vertical distance from the horizontal center line of the orifice to the level of the water in the measuring tube.
- Rubber hose and glass tube must be free of air bubbles.



MEASURING FLOW

Orifice Method for Water



FLOW IN GALLONS PER MIN.

Head in Inches	3,000" Orifice 4" Pipe	4,000" Orifice 6" Pipe	5,000" Orifice 6" Pipe	6,000" Orifice 8" Pipe	8,000" Orifice 10" Pipe	10,000" Orifice 12" Pipe
6	108	160	305	408	825	1200
6½	111	167	316	421	850	1250
7	115	172	328	433	878	1300
7½	119	179	339	446	906	1350
8	122	185	350	458	935	1400
8½	125	190	361	471	963	1440
9	128	195	372	483	992	1480
9½	130	200	383	495	1016	1520
10	133	205	393	508	1040	1560
10½	137	210	402	521	1060	1600
11	140	215	412	533	1080	1635
11½	143	220	421	545	1100	1670
12	146	225	430	556	1120	1705
12½	149	230	439	567	1139	1740
13	151	234	448	578	1158	1775
13½	154	239	457	589	1176	1810
14	157	243	465	599	1194	1845
14½	159	247	473	609	1212	1875
15	162	250	480	618	1230	1905
15½	164	254	488	637	1248	1940
16	167	257	495	636	1266	1970
16½	170	261	503	645	1284	2000
17	172	264	510	654	1302	2030
17½	175	268	517	663	1319	2060
18	178	271	524	672	1336	2089
18½	180	275	530	681	1353	2118
19	183	278	536	690	1370	2146
19½	185	282	542	699	1387	2175
20	187	285	548	708	1404	2204
20½	190	289	554	717	1421	2232
21	192	292	560	726	1438	2260
21½	195	295	566	735	1455	2288
22	197	299	572	744	1471	2316
22½	199	302	578	752	1486	2343
23	201	305	584	760	1500	2360
23½	203	307	590	768	1515	2382
24	205	310	596	776	1529	2409
24½	207	314	602	784	1543	2435
25	210	317	608	791	1557	2461
25½	212	320	614	798	1571	2487
26	214	323	620	805	1585	2513
26½	216	326	626	812	1599	2539
27	219	329	632	818	1613	2565
27½	221	332	638	825	1627	2590
28	222	335	644	831	1641	2610
28½	224	337	650	838	1655	2630
29	226	340	656	844	1669	2650
29½	228	343	662	851	1683	2670
30	230	346	668	857	1697	2690
30½	232	348	674	863	1711	2713
31	235	351	680	869	1725	2736
31½	236	354	686	876	1739	2759
32	239	357	692	882	1753	2782
32½	240	360	697	889	1767	2806
33	242	363	703	895	1781	2828

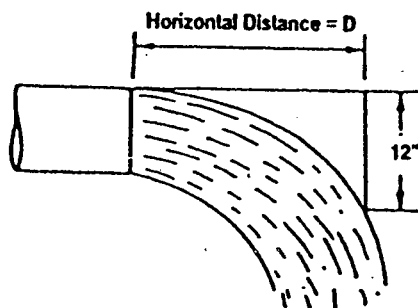
Head in Inches	3,000" Orifice 4" Pipe	4,000" Orifice 6" Pipe	5,000" Orifice 6" Pipe	6,000" Orifice 8" Pipe	8,000" Orifice 10" Pipe	10,000" Orifice 12" Pipe
33½	244	366	709	901	1795	2850
34	246	369	715	907	1809	2873
34½	248	372	720	913	1823	2896
35	250	375	726	919	1837	2919
35½	252	377	732	925	1851	2941
36	254	380	737	931	1865	2964
36½	256	383	743	937	1879	2980
37	257	385	748	943	1893	3002
37½	259	388	754	949	1904	3024
38	260	390	759	955	1915	3046
38½	262	393	765	961	1926	3068
39	263	396	770	967	1936	3088
39½	265	398	776	974	1948	3110
40	266	401	781	979	1960	3130
40½	267	403	786	985	1972	3146
41	269	406	790	990	1983	3160
41½	271	408	795	996	1994	3179
42	272	411	800	1001	2006	3199
42½	274	413	805	1007	2018	3219
43	275	415	810	1012	2030	3230
43½	277	418	815	1018	2041	3250
44	278	420	820	1023	2052	3263
44½	280	422	824	1029	2063	3280
45	281	425	828	1034	2074	3296
45½	283	427	832	1040	2085	3316
46	284	429	837	1045	2096	3334
46½	285	432	842	1051	2107	3351
47	287	434	847	1056	2118	3368
47½	289	437	851	1062	2129	3389
48	290	440	855	1067	2140	3405
48½	292	442	859	1073	2151	3426
49	293	444	863	1078	2162	3443
49½	294	446	868	1084	2172	3460
50	296	448	872	1089	2182	3477
50½	298	450	876	1095	2192	3494
51	300	453	880	1100	2202	3511
51½	301	455	884	1105	2212	3527
52	302	457	888	1110	2222	3544
52½	303	459	892	1115	2232	3560
53	304	461	896	1120	2242	3575
53½	305	463	900	1125	2252	3591
54	307	465	904	1130	2262	3602
54½	309	467	908	1135	2272	3618
55	310	469	912	1140	2282	3634
55½	311	471	915	1145	2291	3650
56	313	472	919	1150	2300	3667
56½	314	474	923	1155	2309	3684
57	315	476	927	1160	2318	3702
57½	316	478	930	1165	2326	3719
58	317	480	934	1170	2334	3736
58½	318	482	938	1175	2341	3752
59	320	485	942	1180	2348	3768
59½	321	487	945	1185	2355	3784
60	323	489	948	1190	2362	3800

CAUTION: Orifice pipe must be level. Piezometer tube must enter at center of pipe. Piezometer tube must be flush with inside of pipe. Orifice opening must be accurately sized. Edges of orifice must be sharp. Water must be free of any sand or silt.



FULL PIPE METHOD FOR WATER

Where no instruments are available to accurately measure the flow of water from a pump, the following method will serve as an approximation.



Flow from Full Horizontal Pipe

Flow (GPM) = $A \times D \times 1.105$
 Where: A = Area of pipe in square inches
 D = Horizontal distance in inches
 1.015 = Correction Factor

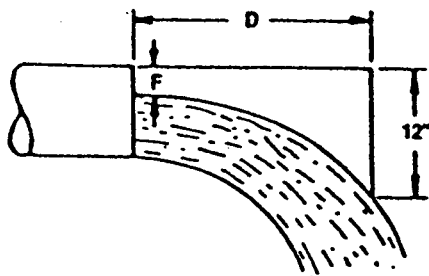
Using an ordinary rule or carpenter's square, measure the horizontal distance from the end of the discharge pipe to a point exactly 12 inches above the falling stream of water. The discharge pipe must be level and running full of water when the reading is taken. Multiply this distance (in inches) by the cross sectional area of the pipe in square inches and the answer will be the approximate capacity in gallons per minute. For example: assume that the horizontal distance from the end of an 8" discharge pipe is 20". Multiplying 20" by the cross sectional area of an 8" pipe (approximately 50 sq. in.) we obtain a capacity of 1000 GPM.

By checking this method of estimation using accurate flow meters it has been found a correction factor of 1.015 should be applied. The table below gives the approximate rates of flow for various conditions after applying this correction factor.

APPROXIMATE FLOW IN GALLONS PER MINUTE WITH PIPE RUNNING FULL

Dia. Pipe Inches	Horizontal Distance D in Inches									
	12	14	16	18	20	22	24	26	28	30
4	150	181	207	232	258	284	310	336	361	387
6	352	410	470	528	587	645	705	762	821	880
8	610	712	813	915	1017	1119	1221	1322	1425	1527
10	960	1120	1280	1440	1600	1760	1920	2080	2240	2400
12	1378	1607	1835	2032	2286	2521	2760	2980	3210	3430

MEASURING FLOW AREA FACTOR METHOD (PIPE NOT RUNNING FULL)



Flow From Horizontal Pipe (Not Full)

Flow (GPM) = $A \times D \times 1.039 \times F$
 A = Area of pipe in square inches
 D = Horizontal distance in inches
 F = Effective area factor shown below
 Area of pipe equals inside Dia. $^2 \times 0.7854$

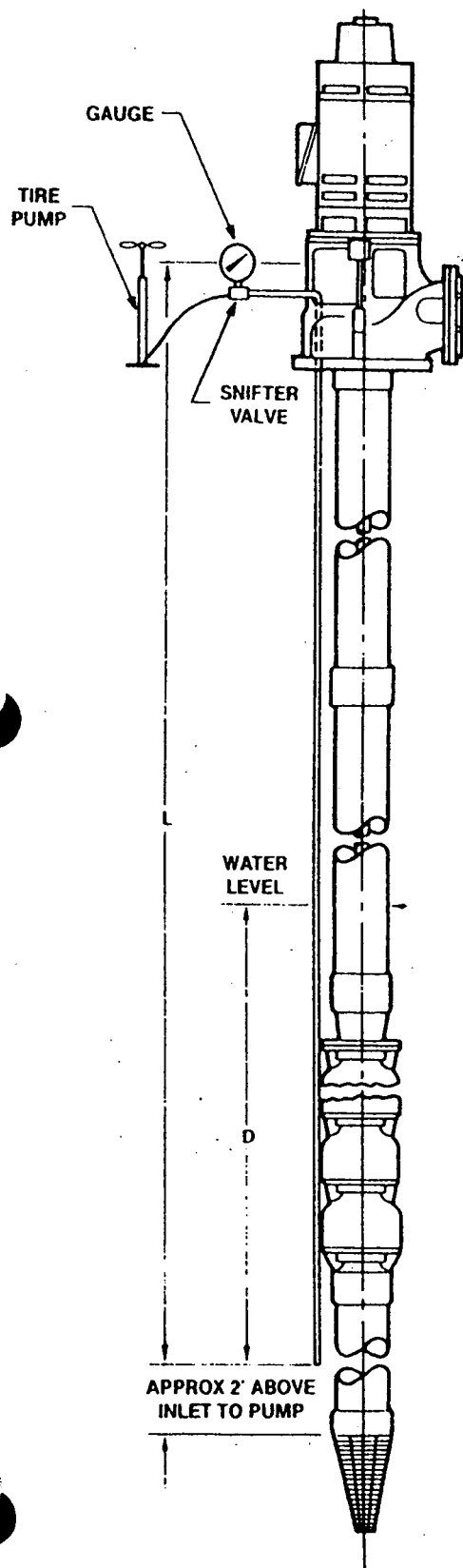
RATIO F/D = R %	EFF. AREA FACTOR F	RATIO F/D = R %	EFF. AREA FACTOR F
5	0.981	55	0.436
10	0.948	60	0.373
15	0.905	65	0.312
20	0.858	70	0.253
25	0.805	75	0.195
30	0.747	80	0.142
35	0.688	85	0.095
40	0.627	90	0.052
45	0.564	95	0.019
50	0.500	100	0.000

EXAMPLE: D = 20 inches — Pipe inside diameter = 10 inches —
 F = 2 1/2 inches.
 A = $10 \times 10 \times 0.7854 = 78.54$ square inches
 R = $2\frac{1}{2} / 10 = 25\%$
 F = 0.805
 Flow = $78.54 \times 20 \times 1.039 \times 0.805 = 1314$ GPM





WATER LEVEL TESTING



There are two commonly used methods to determine the water level in wells — airline and gauge, or an electric sounder.

AIRLINE METHOD:

The airline method can use a standard pressure gauge, indirect reading depth gauge, or direct reading depth gauge.

Installation: The airline is installed so that the lower end is near the bottom of the pump — for reliable readings the airline should extend 20' below low water level if possible. All airline joints must be air tight for proper operation. The upper end of the airline is connected to a gauge and snifter valve. Exact vertical length of the airline must be noted at time of installation, this length should be recorded on the face of the gauge.

Operation: A tire pump is used to expel all water from the airline, when this point is reached the gauge reading will remain constant. The maximum maintained pressure is equal to the height of water above the end of the airline (D).

Indirect Reading Depth Gauge (Fixed Dial): Pump up airline until maximum pressure (all water is expelled from airline) is reached, reading on gauge will be distance "D". Water level (below surface) is obtained by subtracting "D" from "L" (WL = L-D).

Direct Reading Depth Gauge (Movable Dial): Set the movable gauge dial so that the length of airline (L) is at the pin stop (gauge pointer position at 0 pressure). Pump airline to maximum pressure, gauge will read water level (L-D) direct.

Pressure Gauge: A pressure gauge can be used by converting PSI to feet of water as follows:

$$\text{Feet of Water} = \text{PSI} \times 2.31$$

Operation would be identical to indirect reading gauge.

ELECTRIC SOUNDER METHOD

The electric sounder consists essentially of a battery, a spool of well insulated waterproof wire and a millivolt meter. One terminal of the battery is connected to the pump head and the other through the potentiometer to one end of the spool of wire. The other end of the wire from the spool must be protected so that it will not close the circuit if it should bump against the pump in being lowered into the well, but at the same time so arranged that the circuit will be closed when the end of the wire contacts the water in the well. The wire from spool, then, is lowered into the well until the needle of the potentiometer deflects, indicating that the water level has been reached and the contact closed. The wire is then properly marked, pulled from the well and measured with a steel tape to determine the water level. (It is possible to calibrate the spool of wire so that it is direct reading.)





Submersible Cable Selection

House Well →

**SINGLE PHASE — MAXIMUM CABLE LENGTH
(MOTOR TO SERVICE ENTRANCE)**

MOTOR RATING		COPPER WIRE SIZE (A)										
VOLTS	HP	14	12	*10	8	6	4	2	0	00	000	0000
230	5			216	315	490	750	1142	1540			
	7½				270	362	553	842	1136	1420		
	10					250	425	650	875	1100		

Racetrack Well →

**THREE PHASE — MAXIMUM CABLE LENGTH
(MOTOR TO SERVICE ENTRANCE)**

MOTOR RATING		COPPER WIRE SIZE (A)										
VOLTS	HP	14	12	*10	8	6	4	2	0	00	000	0000
230	5		250	390	620	960	1470	2230				
	7½			290	450	700	1070	1630	2200			
	10				340	520	800	1220	1640	2050		
	15					360	550	830	1130	1410	1680	
	20						420	640	860	1070	1280	1510
	25						340	520	700	870	1040	1230
	30							420	570	710	850	1000
460	5	630	1000	1570	2470							
	7½	460	730	1150	1800	2810						
	10		550	850	1340	2090	3190					
	15			590	920	1430	2190	3340				
	20				700	1100	1670	2550	3440			
	25				570	890	1360	2070	2800	3500		
	30					730	1110	1690	2280	2850	3400	
	40						850	1300	1750	2190	2610	3070
	50						680	1040	1400	1750	2090	2450
	60							870	1180	1470	1760	2070
	75								950	1190	1420	1670
	100									890	1060	1240
	125										1475	1875
150											1525	

(A) For Aluminum Conductor Lengths — Multiply Lengths Above by 0.5. Maximum Allowable Length of Aluminum is Considerably Shorter Than Copper Wire of the Same Size.





Goulds Model VAS Supplemental Data

3B.1A3

January 1, 1983
(Sup. 3B.3W, 7/3/78)

Column Friction Loss Chart

SUBMERSIBLE PUMPS
Loss in Feet Per 100 ft. of Column
0-2000 GPM

U.S. Gallons/Min.	COLUMN SIZE — INCHES								U.S. Gallons/Min.
	2½	3	4	5	6	8	10	12	
25									25
30									30
35	1.15								35
40	1.47								40
45	1.84								45
50	2.23	.76							50
60	3.14	1.06							60
70	4.18	1.41							70
80	5.36	1.82							80
90	6.70	2.26							90
100	8.19	2.76	.72						100
120	11.5	3.88	1.1						120
140	15.5	5.19	1.35						140
160	20.0	6.69	1.71	.56					160
180	25.2	8.40	2.41	.70					180
200	30.7	10.25	2.61	.85					200
220	37.1	12.3	3.13	1.01	.41				220
240	43.8	14.5	3.69	1.19	.48				240
260		16.9	4.30	1.38	.56				260
280		19.5	4.95	1.55	.65				280
300		22.1	5.62	1.82	.73				300
350		30.0	7.54	2.43	.98				350
400			9.75	3.13	1.25	.32			400
450			12.25	3.91	1.56	.40			450
500			14.95	4.78	1.91	.48			500
600				6.76	2.69	.69			600
700				9.10	3.60	.92	.29		700
800				11.75	4.63	1.17	.38		800
900				14.82	5.81	1.46	.47	.20	900
1000				18.15	7.10	1.79	.58	.24	1000
1100					8.52	2.15	.69	.29	1100
1200					10.1	2.53	.81	.34	1200
1300					11.7	2.94	.94	.40	1300
1400					13.58	3.39	1.10	.46	1400
1500						3.88	1.23	.52	1500
1600						4.39	1.39	.59	1600
1700						4.93	1.56	.66	1700
1800						5.51	1.75	.73	1800
1900						6.10	1.93	.81	1900
2000						6.73	2.14	.89	2000

(Over)

3B.1A3January 1, 1983
(Sup. 3B.3W, 7/3/78)**Goulds Model VAS
Supplemental Data****FRICION LOSS PER 100' OF PLASTIC PIPE**

GPM	3"		4"		6"		8"		10"	
	Fl.	Lbs.	Fl.	Lbs.	Fl.	Lbs.	Fl.	Lbs.	Fl.	Lbs.
1										
2										
3										
4										
5										
6										
8										
10										
15										
20	.13	.056								
25	.19	.083								
30	.26	.114								
35	.35	.151	.09	.041						
40	.44	.191	.12	.052						
45	.55	.239	.15	.064						
50	.66	.288	.17	.076						
60	.93	.406	.25	.107						
70	1.24	.540	.33	.143						
80	1.58	.687	.41	.180						
90	1.98	.861	.52	.224						
100	2.42	1.05	.63	.272	.08	.036				
125	3.80	1.65	.95	.415	.13	.055				
150	5.15	2.24	1.33	.580	.18	.077				
175	6.90	3.00	1.78	.774	.23	.102				
200	8.90	3.87	2.27	.985	.30	.130				
250			3.36	1.46	.45	.195	.12	.051		
300			4.85	2.11	.63	.275	.17	.072		
350			6.53	2.84	.84	.367	.22	.095		
400					1.08	.471	.28	.121		
500					1.66	.720	.42	.182	.14	.059
550					1.98	.861	.50	.219	.16	.071
600					2.35	1.02	.59	.258	.19	.083
700							.79	.343	.26	.112
800							1.02	.443	.33	.143
900							1.27	.554	.41	.179
950									.46	.198
1000									.50	.218

**GOULDS PUMPS, INC.**
TEXAS DIVISION

LITHO IN U.S.A.



STANDARD TERMS AND CONDITIONS
GOULDS PUMPS, INC., SENECA FALLS, N.Y., U.S.A.

(All Sales and Transactions with Goulds Pumps, Inc., are subject to its Standard Terms and Conditions.)

1. Warranty: The Company warrants that its pumps, when properly installed and cared for as stated in the appropriate instruction manual issued by the Company, will operate in accordance with its proposal.

Goulds Pumps are warranted to be made of first-class material, and in a skillful and workmanlike manner. They are additionally warranted against any defective material or workmanship and any part proven defective within one year from the date of shipment, after inspection by and to the satisfaction of the Company, will be replaced free of charge F.O.B. Shipping Point, on return of such defective part to the Company, transportation charges prepaid. No parts, however, shall be returned without the express authority of the Company so to do.

There are no warranties, express or implied, except such warranties as are definitely set forth herein. The Company shall not be liable for damage or wear to pump caused by abnormal conditions, vibration, failure to properly prime or to operate pump without flow or caused by corrosives, abrasives or foreign objects. No obligations other than those herein set forth shall be binding upon the Company. No warranties apply to other than the original user.

The Company shall in no event be held liable for damages or delay caused by defective material and no allowance will be made for repairs or alterations, unless made by its written consent or approval. In the event the pumps are altered or repaired by others without prior written approval by the Company all warranties are void. Equipment and accessories not manufactured by the Company are warranted only to the extent of and by the original manufacturer's warranty.

Under no circumstances shall the Company be held liable for any consequential or other damages, losses or expenses arising from installation, use, or any other causes, regardless of advices or recommendations that may have been rendered concerning such installation or use of its products, nor shall the Company be liable for penalties of any description.

2. Shipment: Promised shipping dates are approximate, and are from point of manufacture. Such dates are estimated from (a) the date of receipt of order with complete manufacturing information at Company's factory, an (b) the date of entry of such order by the Company. Shipping dates are subject to revision at the time of the entry of order and the shipping schedule then given is approximate and subject to any action Company must take in connection with priorities or other orders or regulations issued by the United States Government, or any department thereof.

The Company will not be liable for loss, damage, detention, or delay in manufacture or delivery or necessity to substitute materials, resulting from causes beyond its reasonable control, including but not limited to casting failures, war, fire, strikes, lockouts, or other labor difficulties, civil or military authority, insurrection or riot, embargoes, car or ship shortages, acts of government, wrecks or delays in transportation, including any delays caused by inability to obtain necessary labor, materials or manufacturing facilities due to such causes, or from action taken by the Company in connection with priorities or preference orders or other production permits issued by the United States Government or any department thereof, or from delay in obtaining or failure to obtain manufacturing, financing, export or other licenses required by the United States Government or any department thereof, or in any event for consequential damages.

Acceptance of material by common carrier constitutes a waiver of any claim against the Company for delay or damage in transit, or for lost goods.

When quotation includes equipment not of Company's manufacture, Company's promise of shipment is based on manufacturer's promise to Company and shipment is contingent on the fulfillment of their promise.

3. Prices: All prices are subject to change without notice and are subject to any increase which may be in effect on the date of shipment of the goods, such increase, if any, to be within any applicable government regulations. Prices are F.O.B. Shipping Point, unless otherwise specified. When price includes transportation and other charges pertaining to the shipment of the goods, any increase in transportation rates and other charges will be for the account of the purchaser. There will be an extra charge for any test other than that which may be normally run by the Company, or for any test performed to suit the convenience of the purchaser.

4. Terms of Payment: Terms and conditions of payment will be shown on invoices rendered by the company at time of shipment or as may be otherwise stated in writing by an officer of the company or his designee.

5. Orders: All illustrations and specifications are descriptive and are not intended as warranties. The acceptance of all orders taken by the Company's sales representatives or branches is subject to approval by an officer of the company of his designee.

- 6. Cancellation of Orders:** Orders once placed with and accepted by Company can be cancelled only with Company's consent and upon terms that will indemnify Company against loss.
- I. Company may forthwith cancel the order or contract without recourse:
 - (a) if conditions are such that shipment from Company's factory may be delayed beyond the date estimated at the time of entry of order or contract;
 - (b) if the Purchaser is in default with the Company on this or any other order or contract;
 - (c) if Purchaser is or becomes insolvent, or if at any time Company is not fully satisfied with the credit of Purchaser, it may at any time after the order has been entered, or during the manufacturing period, or at the time the goods are ready for shipment, require payment in advance of shipment regardless of original terms, or if after shipment has been made and before actual delivery and acceptance at destination, (regardless of F.O.B. point), it may recall the shipment and cancel this and all other orders and contracts which may be outstanding, and shall be entitled to receive reimbursement for its reasonable and proper cancellation charges.
 - (d) if the order or contract is for the direct account of one of its sales representatives, distributors or dealers, and Company terminates or alters such relationship.
 - II. The Company shall have at all times a right of set-off as to any and all accounts between it and Purchaser.
- 7. Claims:** No claims for allowances will be entertained unless presented immediately on receipt of goods; nor will Company be held responsible for breakage or shortage after goods are delivered to and accepted by the common carrier.
- 8. Equipment Returned:** Goods can be returned for credit only after receiving Company's authorization and shipping instructions. Consignor's name and address must be plainly written on the shipping tag.
- 9. Taxes:** All Federal, State, Local and Municipal taxes now in effect or hereafter enacted that are applicable to this transaction shall be paid for the account of the Purchaser, and if paid or required to be paid by the Company, the amount thereof shall be added to and become a part of the price payable by the Purchaser hereunder.
- 10. Minimum Charge:** Every order received by the Company is subject to the minimum charge in effect on the date of order acceptance.
- 11. General:** All sales and transactions are subject to Company's Standard Terms and Conditions, and they shall prevail in the event of any conflict or variance with those of the Purchaser's, unless otherwise agreed to in writing.

All previous agreements, either written or oral, which are subject matter hereof, are hereby cancelled.

Stenographic or clerical errors are subject to correction.

If this transaction involves EXPORT, the following additional terms and conditions shall apply:

- 12. Packing:** Equipment will be packed, boxed or crated in accordance with the Company's standard commercial practice, for underdeck export shipment, unless otherwise agreed.
- 13. Payment:** Unless otherwise specified in writing, payment shall be made by irrevocable letter of credit in form acceptable to Company, confirmed by a major USA bank, acceptable to the Company and providing for payment in full in United States dollars against presentation of United States inland shipping documents and invoices; such letter of credit to be established prior to Company's acceptance of the order. The letter of credit shall provide also that in the event Company is, for any reason beyond its control, prevented from making shipment from Company's factory or delivery at the port of embarkation, a certificate of manufacture of the whole or any part of the goods shall constitute delivery of such whole or any part of the goods and payment in full of any and all drafts drawn against the letter of credit for the goods so "delivered" shall be made upon presentation of such certificates of manufacture in lieu of United States inland shipping documents. In the event that Company is prevented by law, or otherwise, from making shipment from Company's factory or delivery at port of embarkation of the goods or any part thereof, on completion of manufacture, Company reserves the right to place the goods in storage for the Purchaser's account and risk. Any charges, incurred in this connection will be for the account of the Purchaser at cost and will be payable upon demand.
- 14. Company as Agent:** If Company makes or arranges for ocean shipment, Company shall act as agent for the Purchaser and reserves the right to procure full insurance coverage, including war risk insurance, at the expense of the Purchaser. All expenses incurred in this connection will be payable upon demand to the Company.
- If Company applies for or secures manufacturing, financing, exporting or other licenses required by the United States Government, or any department thereof, Company shall make such applications or secure such licenses solely as agent for the Purchaser, and assumes no responsibility therefor.



COMPANY POLICIES

Quoted Delivery and Price Escalation

Prices contained herein applying to items of Goulds' manufacture are firm for 30 days from the quotation date. We cannot guarantee prices beyond that time due to continual materials increases.

On all quotations which include outside purchased equipment, the following escalator clause must be used:

"The following outside equipment not of Goulds' manufacture is subject to the same percentage of price increase as may be made by our supplier to us." (List the items subject to price increase—Example: Motors, controls, engines, turbines, etc.)

Customer Requested Changes to Construction or Specifications:

Such orders are subject to review for charges. Normally there will be no charge for a change in cataloged construction. However, in some instances, a charge will be made for non-stock parts that cannot be utilized for inventory.

Cancellation Charges—15%

Cancellation of assembled units requiring dismantling or processing before returning to inventory.

- NOTES: (A) In addition to the above, cancellation will include any charges made to Goulds on special purchased equipment such as drivers, seals, castings, etc., that are not normal stock items.
(B) Cost of impellers, if trimmed, will be added to the regular cancellation charge, as these are never stocked.

Material Returned for Credit:

- (1) There will be a charge of 15% (not less than minimum billing) of the net invoice price for the return for credit of items which are returnable to inventory in the same condition as received.
- (2) All transportation charges on returned material must be prepaid. Any charges paid by the Company will be deducted from the credit allowed.
- (3) All material returned for credit is to be new and unused, and is subject to inspection and acceptance by the Company.

NOTES: The following materials are not returnable for credit:

- (a) Impellers of less than maximum diameter.
 - (b) Special items manufactured to order.
 - (c) Obsolete items not carried in inventory.
 - (d) Items shipped one year or more prior to date of request for permission to return.
- (4) Goods can be returned for credit only after receiving the Company's authorization and shipping instructions. This will usually be in the form of written authorization and/or a Return Material Tag with an identifying RMO number.
 - (5) Equipment and accessories not manufactured by the Company and not carried in the Company's inventory may be returned for credit or may be cancelled only if acceptable to, and subject to the conditions and handling charges of our supplier; and after shipping instructions have been furnished by the original manufacturer or supplier.

Terms of Payment:

Net 30 days from date of invoice.

CPChem™

PERFORMANCE PIPE

a division of Chevron Phillips Chemical Company LP

Polyethylene Piping for Water Distribution and Transmission



Bulletin PP 501

**Municipal Water Distribution
Industrial Water Distribution
Raw and Potable Water
Water Transmission
Potable Water Fire Main**

**High Density Polyethylene Piping For
Water Distribution and Transmission
Municipal Water Distribution
Industrial Water Distribution
Raw and Potable Water
Water Transmission
Potable Water Fire Main**

Performance Pipe

PERFORMANCE PIPE is the successor to Plexco¹ and Driscopipe². On July 1, 2000, Chevron Chemical Company and Phillips Chemical Company joined to form Chevron Phillips Chemical Company LP. Performance Pipe, a division of Chevron Phillips Chemical Company LP, succeeds Plexco and Driscopipe as North America's largest producer of polyethylene piping products for gas, industrial, municipal, mining, oilfield, and utility applications.

Performance Pipe offers more than forty years of polyethylene piping experience, twelve ISO Certified manufacturing facilities in nine states, and two manufacturing facilities in Mexico.

Performance Pipe manufactures 1/2" through 54" outside diameter controlled polyethylene pipe and tubing, 18" through 120" DriscoPlex™ 2000 Spirolite® inside diameter controlled polyethylene profile-wall pipe, molded fittings, fabricated fittings, manholes, tanks, and fabricated structures for domestic and international markets.

To enhance the outstanding quality and performance of Performance Pipe™ polyethylene piping, Chevron Phillips Chemical Company LP further strengthens Performance Pipe with over four decades of quality polyolefin plastic resin production.

DRISCOPLEX™ Piping for Water Distribution and Transmission

Polyethylene pressure pipe is used worldwide for water distribution and transmission systems as the preferred material of construction. DriscoPlex™ OD-controlled, high-density polyethylene pipe, fittings and connection components are a complete, integrated system developed specifically for water distribution and transmission. DriscoPlex™ 4000 and DriscoPlex™ 4100 high-density polyethylene piping components are made from pressure-rated PE 3408, extra-high molecular weight, high-density polyethylene material to provide an optimum balance of performance and properties to meet the stringent demands of today's municipal and industrial water distribution and transmission systems.

¹ Formerly - Plexco, a Division of Chevron Chemical Company

² Formerly - Phillips Driscopipe, A Division of Phillips Petroleum Company

NOTICE - This publication is intended for use as a guide to support the designer of piping systems. It is not intended to be used as installation instructions, and should not be used in place of the advice of a professional engineer. It does not constitute a guarantee or warranty for piping installations. Performance Pipe has made every reasonable effort to ensure the accuracy of this publication, but it may not provide all necessary information, particularly with respect to special or unusual applications. This publication may be changed from time to time without notice. Contact Performance Pipe to determine if you have the most current edition.

Why Polyethylene Piping is Preferred for Water Distribution

DriscoPlex™ 4000 and DriscoPlex™ 4100 PE 3408 piping products for water distribution have outstanding performance features for municipal and industrial water distribution.

- High strength and stiffness to withstand long-term internal pressure and external loads.
- Long-term strength for extended life and performance.
- Resilience for enhanced resistance to recurrent and intermittent surge and water hammer.
- Flexible, tough, lightweight and impact resistant for lower cost installation, narrower trenches (reduced excavation)
- Fewer fittings required - Flexible PE pipe can be cold-bent in the field to follow contours and easements, reducing the need for fittings.
- DriscoPlex™ 4000 and DriscoPlex™ 4100 PE 3408 piping is the material of choice for horizontal directional drilling, plowing, river and water body crossings, pipe bursting, sliplining and other trenchless installation technologies.



- Chemical resistance to withstand corrosive chemicals (pH from 1 to 14), and aggressive soils.
- Does not rust, rot, corrode, tuberculate or support biological growth.
- Resistant to ultraviolet and thermal degradation.
- Can be connected using heat fusion, electrofusion, heat fusion saddles, mechanical couplings, flanges, mechanical-joint adapters and mechanical service and tapping saddles*.
- Leak-tight heat fusion joints are fully restrained and as strong as the pipe itself.
- Retains flexibility even in sub-freezing temperatures - water can freeze in the pipe without damaging the pipe.
- Retains low resistance to liquid flows for reduced pumping and operating costs.

*Performance Pipe recommended heat fusion procedures available upon request. Electrofusion devices should be installed in accordance with the device manufacturer's instructions. Stiffeners should be installed in the ID of the pipe end or plain-end fitting outlet when OD compression couplings are used. Install mechanical joining devices in accordance with the device manufacturer's instructions. Additional restraint may be required for mechanical joining devices that do not provide sufficient pullout resistance.

- Standard colors for water service identification:
- DriscoPlex™ 4000 and DriscoPlex™ 4100 pipe can be tapped with standard tapping equipment and mechanical tapping saddles for HDPE pipe.
- Safe - no extractable additives or compounds that could compromise water quality - NSF Certification available.
- DriscoPlex™ 4000 and DriscoPlex™ 4100 are manufactured in accordance with AWWA C906 and ASTM F 714 (Sizes > 4").

Table 1 DRISCOPLEX™ Color Identification

Series	IPS/DIPS	Standard Color Identification	Also Available
DRISCOPLEX™ 4000	DIPS	3 equally spaced pairs of blue stripes	Blue shell
DRISCOPLEX™ 4100	IPS	Black	4 equally spaced blue stripes or blue shell
DRISCOPLEX™ 1500	IPS	4 equally spaced red stripes (NSF approved)	4 equally spaced blue stripes (NSF approved)
DRISCOPLEX™ 1600	DIPS	3 equally spaced pairs of red strips (Not NSF approved)	3 equally spaced pairs of blue strips (NSF approved)

DriscoPlex™ 4000 4" DIPS through 48" DIPS pressure pipe sizes are OD compatible with ductile iron pipe. DriscoPlex™ 4100 3" IPS through 54" IPS pressure pipe sizes are OD compatible with steel pipe. DriscoPlex™ 4000 and DriscoPlex™ 4100 piping components are produced in four standard Pressure Classes - 80 psi, 100 psi, 130 psi and through 160 psi - for water at 73°F (23°C). Additional pressure classes below 80 psi and up to 255 psi are available depending upon pipe size. NSF Certification in accordance with NSF Standard 61 is available for potable water applications. DriscoPlex™ Series water piping products are summarized on the following page.



*3" pipe manufactured to AWWA C901 and ASTM F714; pipe < 3" manufactured to AWWA C901 and ASTM D3035.

Table 2 DRISCOPEX™ Products for Municipal and Industrial Applications

Typical Markets for Pipe and Fittings	DRISCOPEX™ Series	Typical Features	Previous Designations	
			Former Plasco Product	Former Driscopipe
Water Distribution	DRISCOPEX™ 4000	5, 6	BLUESTRIPE™ (DIPS)	4000 BLUESHELL (DIPS)
	DRISCOPEX™ 4100	1, 2, 8	BLUESTRIPE™ (IPS)	4100 BLUESHELL (IPS)
Water Service Tubing	DRISCOPEX™ 5100	7	BLUESTRIPE™	5100 ULTRA-LINE®
	DRISCOPEX™ 1500	3	BLUESTRIPE™ FM	—
FMR & NSF Approved Underground Fire Main	DRISCOPEX™ 1600	4	—	—

NOTICE. Capabilities vary from manufacturing plant to manufacturing plant. Contact Performance Pipe to determine the availability of specific products and for the availability of particular stripe or shell colors, striping patterns, and IPS or DIPS sizing.

Legend for Typical Features:

1. IPS sizing system. Blue color stripes or blue color shell available on special order. The IPS longitudinal color stripe pattern is four equally spaced single color stripes extruded into the pipe OD.
2. 3" IPS - 28" IPS DR 11, 13.5, 17, 21; 30" IPS - 36" IPS DR 13.5, 17, 21; 42" IPS DR 17, 21; 48" IPS - 54" IPS DR 21
3. FMR Approved, NSF Approved and made to ASTM F 714 (2" is made to D 3035). 2" IPS through 24" IPS Class 150 or Class 200. Blue color stripes standard. The IPS longitudinal color stripe pattern is four equally spaced single color stripes extruded into the pipe OD.
4. FMR Approved, NSF Approved and made to ASTM F 714. 4" DIPS through 24" DIPS Class 150 or Class 200. Blue color stripes standard. The DIPS longitudinal color stripe pattern is three equally spaced pairs of color stripes extruded into the pipe OD.
5. DIPS sizing system. Blue color stripes standard. The DIPS longitudinal color stripe pattern is three equally spaced pairs of color stripes extruded into the pipe OD.
6. 4" DIPS through 30" DIPS DR 11, 13.5, 17, 21; 36" DIPS through 40" DIPS DR 13.5, 17, 21; 48" DIPS DR 17, 21. All sizes made to ASTM F 714, AWWA C906 and NSF 61.
7. NSF Approved. CTS, IPS, and SIDR in 1/2" - 2" sizes. No color stripes.
8. 2" IPS and 3" IPS made to ASTM D 3035, AWWA C901 and NSF 61. 4" IPS and larger sizes made to ASTM F 714, AWWA C906 and NSF 61.

This bulletin primarily addresses DriscoPlex™ 4000 and DriscoPlex™ 4100 products. For information on DriscoPlex™ 5100 products, see Bulletin PP-503. For information on DriscoPlex™ 1500 and DriscoPlex™ 1600 FM Approved products, see Bulletin PP-504.

Table 3 DRISCOPEX™ 4000 - DIPS Pipe Sizing System

Size		DR 21 (80 psi PC†)		DR 17 (100 psi PC)		DR 13.5 (130 psi PC)		DR 11 (160 psi PC)	
DIPS Pipe Size	OD, in.	Minimum Wall, in.	Weight, lb/ft	Minimum Wall, in.	Weight, lb/ft	Minimum Wall, in.	Weight, lb/ft	Minimum Wall, in.	Weight, lb/ft
40	4.80	0.229	1.44	0.282	1.75	0.356	2.17	0.436	2.61
6	6.90	0.329	2.97	0.406	3.62	0.511	4.48	0.627	5.39
8	9.05	0.431	5.11	0.532	6.23	0.670	7.71	0.823	9.28
10	11.10	0.529	7.68	0.653	9.37	0.822	11.60	1.009	11.95
12	13.20	0.629	10.86	0.776	13.25	0.978	16.40	1.200	19.73
16	17.40	0.829	18.87	1.024	23.02	1.289	28.49	1.582	34.29
18	19.50	0.929	23.70	1.147	28.92	1.444	35.78	1.773	43.07
20	21.60	1.029	29.08	1.271	35.48	1.600	43.91	1.964	52.84
24	25.80	1.229	41.05	1.518	50.62	1.911	62.64	2.345	75.39
30††	32.00	1.524	63.83	1.882	77.86	2.370	96.36	2.909	115.99
36††	38.30	1.824	91.43	2.253	111.54	2.837	136.04		
42††	44.50	2.119	123.44	2.618	150.80	3.296	186.35		
48††	50.80	2.419	160.86	2.988	196.27				

† Pressure class ratings are for water at 80°F (27°C) or less. Pressure class ratings can vary for other fluids and service temperatures. †† OD size and minimum wall thickness per AWWA C906. For flow calculations, average ID may be estimated using: Avg. ID = OD Size - (2.12 x min. wall). For actual ID (for stiffeners, etc.), consult AWWA C906 for tolerances and other factors affecting pipe ID. ‡ Pipe weight calculated per PPI TR-7. †† 30" DIPS and larger sizes subject to minimum order quantities.

Table 4 DRISCOPLEX™ 4100 - IPS Pipe Sizing System

Size		DR 21 (80 psi PC†)		DR 17 (100 psi PC)		DR 13.5 (130 psi PC)		DR 11 (160 psi PC)	
DIPS Pipe Size	OD, in.	Minimum Wall, in.	Weight‡, lb/ft	Minimum Wall, in.	Weight, lb/ft	Minimum Wall, in.	Weight, lb/ft	Minimum Wall, in.	Weight, lb/ft
3"	3.500	0.167	0.77	0.206	0.93	0.259	1.15	0.318	1.39
4"	4.500	0.214	1.26	0.265	1.54	0.333	1.90	0.409	2.29
6"	6.625	0.315	2.73	0.390	3.34	0.491	4.13	0.602	4.97
8"	8.625	0.411	4.84	0.507	5.65	0.639	7.00	0.784	8.42
10"	10.750	0.512	7.21	0.632	8.78	0.796	10.87	0.977	13.09
12"	12.750	0.607	10.23	0.750	12.36	0.944	15.29	1.159	18.41
14"	14.000	0.667	12.22	0.824	14.91	1.037	18.44	1.273	22.20
16"	16.000	0.762	15.96	0.941	19.46	1.185	24.09	1.455	29.00
18"	18.000	0.857	20.19	1.059	24.64	1.333	30.48	1.636	36.69
20"	20.000	0.952	24.93	1.176	30.41	1.481	37.63	1.818	45.30
22"	22.000	1.048	30.18	1.294	36.80	1.630	45.56	2.000	54.82
24"	24.000	1.143	35.91	1.412	43.81	1.778	54.21	2.182	65.24
26††	26.000	1.238	42.14	1.529	51.39	1.926	63.62	2.364	76.55
28††	28.000	1.333	48.66	1.647	59.62	2.074	73.78	2.545	88.79
30††	30.000	1.429	56.12	1.765	68.45	2.222	84.69		
32††	32.000	1.524	63.84	1.882	77.66	2.370	96.35		
36††	36.000	1.714	80.78	2.118	98.57	2.667	121.98		
42††	42.000	2.000	109.97	2.470	134.15				
48††	48.000	2.288	143.65						
54††	54.000	2.571	181.80						

† Pressure class ratings are for water at 80°F (27°C) or less. Pressure class ratings can vary for other fluids and service temperatures. * 3" IPS OD and minimum wall thickness per AWWA C901. 4" IPS and larger OD and minimum wall thickness per AWWA C908. For flow calculations, Avg. ID may be estimated by: Avg. ID = OD Size - (2.12 x min. wall). Consult AWWA C908 for tolerances and other factors affecting actual pipe ID. ‡ Pipe weight calculated per PPI TR-7. †† 26" IPS and larger sizes subject to minimum order quantities.

Pressure Rating

Water system piping must be designed for the continuous internal pressure and for transient (surge) pressures imposed by the particular application. DriscoPlex™ PE 3408 high-density polyethylene pipe provides a unique balance of properties that are especially well suited for water distribution and transmission. DriscoPlex™ PE 3408 HDPE has outstanding long-term strength that provides durability for long-term continuous internal pressure service. DriscoPlex™ PE 3408 HDPE also provides exceptional ductile elastic properties that provide exceptional fatigue resistance and reserve strength necessary for recurrent or intermittent pressure surges.

Continuous Internal Pressure

The continuous internal pressure, exclusive of transient pressure surges, is defined as "working pressure". A pipe's working pressure capacity is a function of the allowable hoop stress and pipe thickness. Allowable hoop stress is determined by testing plastic pipe at various internal pressures, analyzing the test data, and categorizing the result. The categorized result is defined as the hydrostatic design basis (HDB). The HDB is used in the pressure rating equations that follow.

Table 5 HDB for Performance Pipe™ PE 3408

Service Temperature	Hydrostatic Design Basis, HDB
73°F (23°C)	1600 psi (11.03 MPa)
140°F (60°C)	800 psi (5.52 MPa)

Pressure Surge

When there is a sudden increase or decrease in water system flow velocity, a pressure surge will occur. Recurrent pressure surges, P_{RS} , are repetitive surge events that occur frequently such as during pump start-stop operation. Occasional pressure surges, P_{OS} , are irregularly occurring surges such as a sudden flow change due to firefighting or check valve operation. Surge pressure magnitude corresponds directly to velocity change; greater velocity change produces greater surge pressure. The magnitude of a pressure surge due to a rapid flow velocity change may be approximated by the following equations:

$$P_s = \frac{aV}{2.31g}$$

$$a = \frac{4660}{\sqrt{1 + \frac{K}{E}(DR - 2)}}$$

Where:

- P_s = pressure surge, lb/in²
- a = wave velocity, ft/s
- g = acceleration of gravity, 32.2 ft/s²
- V = flow velocity change, ft/s
- E = instantaneous elastic modulus for PE, lb/in² (150,000 lb/in² for PE 3408 at ≤80°F)
- K = liquid bulk modulus, lb/in² (300,000 lb/in² for water at ≤80°F)
- DR = pipe dimension ratio

$$DR = \frac{OD}{t_{min}}$$

- OD = pipe outside diameter, in
- t_{min} = pipe minimum wall thickness, in

With its unique ductile elastic properties, flexibility, resilience and superb fatigue resistance, DriscoPlex™ 4000 and DriscoPlex™ 4100 pipes have tremendous tolerance for surge cycles. Its low elastic modulus provides a dampening mechanism for shock loads. These short-term properties result in lower surge pressures compared to more rigid systems such as steel, ductile iron or PVC. For the same velocity change in water piping systems, surge pressures in DriscoPlex™ 4000 and DriscoPlex™ 4100 polyethylene pipe are about 86% less than in steel pipe, about 80% less than in ductile iron pipe and about 50% less than in PVC pipe.

Unlike other plastic and metal pipes, surge pressures in DriscoPlex™ 4000 and DriscoPlex™ 4100 polyethylene pipe are handled above the working pressure capacity of the pipe.

Pressure Class (PC)

AWWA uses the term "Pressure Class" to define the pressure capacity under a pre-defined set of operating conditions. For polyethylene, the PC denotes the maximum allowable working pressure for water with a predefined allowance for pressure surges and a maximum pipe operating temperature of 80 °F.

$$PC = \frac{2 \times HDB \times DF}{(DR - 1)}$$

Where terms are previously defined and:

- PC = pressure class, lb/in²
- HDB = hydrostatic design basis for PE 3408, lb/in² (Table 5)
- DF = design factor (0.50 for clean water)

Table 6 shows Pressure Class ratings, surge allowance and corresponding allowable sudden change in flow velocity for standard DR's of DriscoPlex™ 4000 and DriscoPlex™ 4100 water pipe.

Table 6 Pressure Class, Surge Allowance and Corresponding Sudden Velocity Change for Pipe Operating at 80 °F

DR	PC, psi	Recurring Surge Events - P _{RS}		Occasional Surge Events - P _{OS}	
		Surge Allowance, P _{RS} , lb/in ²	Corresponding Sudden Velocity Change, ft/s	Surge Allowance, P _{OS} , lb/in ²	Corresponding Sudden Velocity Change, ft/s
21	80	40.0	4.0	80	8.0
17	100	50.0	4.4	100	8.9
13.5	128	64.0	5.0	128	10.0
11	160	80.0	5.6	160	11.1

For the vast majority of municipal systems, DriscoPlex™ 4000 and DriscoPlex™ 4100 polyethylene water pipe have considerably more surge and velocity capabilities than necessary, even under temporary high flow conditions such as flushing or fire-fighting.

- Surge allowance and temperature effects vary from pipe material to pipe material and erroneous conclusions may be drawn when comparing the PC of two different piping materials. For instance, the PC defined by AWWA for C900 PVC pipe includes a surge allowance corresponding to a flow velocity of 2 ft/sec. At flow velocities greater than 2 ft/sec, C900 PVC pipe should be de-rated. When both working pressure capacity and surge capacity are accounted for at velocities approaching 5 ft/sec, virtually the same DR is required for C906 PE and C900 PVC.

Working Pressure Rating (WPR)

As described, a pipeline containing flowing liquid is periodically subjected to two modes of hydrostatic stress: sustained stress from working pressure and transient stress from sudden water velocity changes. The pipe must be designed to handle both stress modes. As defined in AWWA Standards, Working Pressure Rating (WPR) is the capacity to resist working pressure (WP) with sufficient capacity against the actual anticipated positive pressure surges above working pressure. The only "pressure rating" the water distribution system designer should consider is the Working Pressure Rating, WPR. The sustained operating pressure applied to the pipe (working pressure) must be no greater than the WPR. Pressure Class and Working Pressure Rating are closely related. Pressure Class is a rating based on operating conditions that are predefined in the AWWA Standard, where WPR is calculated based on the anticipated operating conditions of the actual application. The predetermined Pressure Class from the AWWA Standard may or may not be appropriate for the actual application.

The following relationship between WP, WPR, and PC applies:

$$WP \leq WPR \leq PC$$

Working Pressure Rating for Typical Operating Conditions

When expected flow velocities are within the limits given in Table 6, and the pipe operates at 80 °F or less, the following equation applies:

$$WPR = PC$$

Working Pressure Rating for Other Operating Conditions

In applications where the pipe operates at temperatures above 80 °F or where exceptionally high flow demands exceed the PC surge allowance, WPR must be calculated. WPR is equal to the lesser of the following three conditions:

Condition 1 The pipe's nominal PC adjusted for temperature when above 80°F:

$$WPR = (PC) F_T$$

or

Condition 2 One and one half times the pipe's PC adjusted for temperature less the maximum pressure resulting from recurring pressure surges (PRs):

$$WPR = 1.5 (PC) F_T - P_{RS}$$

or

Condition 3 Two times the pipe's PC adjusted for temperature less the maximum pressure resulting from occasional pressure surges (Pos):

$$WPR = 2.0 (PC) F_T - P_{OS}$$

Surge allowance, P_{RS} or P_{OS} , may be approximated using the equations in "Pressure Surge" above. As the equations show, operating at a working pressure less than the pipe's nominal PC provides additional surge pressure capacity.

Temperature reduction factors, F_T , are presented in Table 7. (See following page)

Table 7 Temperature Factor, F_T

Service Temperature, °F (°C)	≤ 80 (27)†	≤ 90 (32)	≤ 100 (38)	≤ 110 (43)	≤ 120 (49)	≤ 130 (54)	≤ 140 (60)‡
Temperature Factor, F_T	1.00	0.90	0.78	0.75	0.63	0.60	0.50

† Use 80°F (27°C) service factor for 80°F (27°C) and lower service temperatures. ‡ The maximum service temperature for DRISCOPLEX™ PE 3408 pressure pipe is 140°F (60°C).

Water Flow

DriscoPlex™ 4000 and DriscoPlex™ 4100 piping has unique surface properties that reduce flow resistance, and help retain reduced flow resistance properties over the long term. HDPE has a water repellent surface that does not rust, rot, corrode, tuberculate or support biological growth. Turbulence at moderate flow velocities helps prevent deposition and sedimentation to help retain long-term reduced flow resistance and reduce the need for maintenance flushing.

Designers use various methods to determine flow resistance. For traditional flow resistance equations developed by Darcy-Weisbach, Fanning, Colebrook, and Moody, an absolute roughness of 5×10^{-4} ft. (1×10^{-4} m) is typically used in design. For the empirical Hazen-Williams formula (given below), a C-Factor of 150-155 is typically used in design.

$$h_f = 0.002083 L \left(\frac{100}{C} \right)^{1.85} \left(\frac{Q}{d^{4.8655}} \right)$$

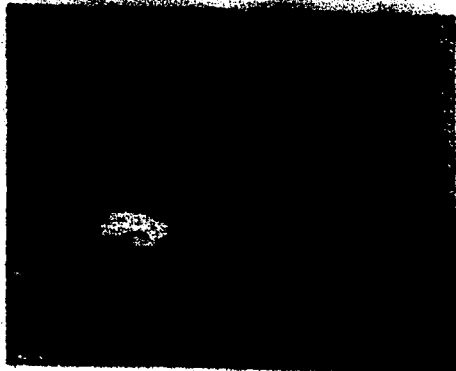
$$p_f = 0.0009015 L \left(\frac{100}{C} \right)^{1.85} \left(\frac{Q}{d^{4.8655}} \right)$$

- Where h_f = friction (head) loss for water, ft.
 L = pipe length, ft.
 C = C-Factor
 Q = flow, gal/min
 d = pipe inside diameter, in.
 p_f = friction loss for water, psi

Joining

DriscoPlex™ Series HDPE pipe and fittings are joined using heat fusion, flanges, mechanical connections that are designed for PE pipe, and electrofusion. Heat fusion is a simple, visual procedure that utilizes controlled temperature and pressure to melt and fusion-join PE pipe materials together. Butt fusion is used to join components end to end; saddle fusion to attach a branch outlet to a main pipe, and socket fusion to join smaller pipes to socket fittings. Heat fusion joints are reliable, leak-free, fully restrained, and as strong as the pipe itself. Contact Performance Pipe for recommended joining procedures.





With heat fusion, there are no gaskets to leak. Joint restraints are not required, and thrust blocks are necessary only under unusual circumstances. A leakage allowance common to gasketed-bell-and-spigot joined pressure pipes is unnecessary with the Performance Pipe™ PE 3408 pressure piping system. Heat fusion joints are fully restrained and as strong as the pipe itself. Because water flow pressure cannot push heat fusion joined off the pipe end, thrust blocks are not required. Thrust anchoring may be required to control Poisson effect forces where PE pipes are connected to bell and spigot piping.

Performance Pipe PE 3408 pipe and fittings may also be joined together or transitioned to other materials with flanges, mechanical connections that are designed for PE pipe, or electrofusion. These connections must be made in accordance with the connection manufacturer's instructions. Some connections such as mechanical OD compression couplings may require a stiffener in the pipe bore.

DriscoPlex™ Series HDPE piping products cannot be joined with adhesive or solvent cement. Threaded joining and joining by hot air (hot gas) or extrusion welding techniques are not recommended for pressure service.



Tapping

DriscoPlex™ 4000, DriscoPlex™ 4100, DriscoPlex™ 1500 and DriscoPlex™ 1600 may be tapped with conventional water main tapping equipment. The tapping operation is essentially the same as that used for any water main. A tapping sleeve for HDPE pipe is installed on the main, an open tapping valve is connected to the sleeve, and then a tapping machine is connected to the valve. A rotating shell cutter in the tapping machine is advanced through the pipe wall, and then retracted. The valve is closed and the tapping machine is removed. Branch line piping is then connected to the valve. When the main is not pressurized, the valve can be omitted. For HDPE piping, the tapping machine shell cutter has few teeth and large chip clearance between the teeth.

Installation

DriscoPlex™ 4000 and DriscoPlex™ 4100 piping materials are stabilized against UV degradation and can be permanently installed on or above the surface⁵. Surface and above grade applications must be properly supported, and must take thermal expansion and contraction into account. If the external environment subjects the line to freezing conditions, water in the pipe may freeze, however, the pipe will expand as the ice forms and will not break. To prevent freezing, the line may be insulated and may be heat traced if necessary. Heat tracing equipment should not exceed 120°F (49°C).

Although DriscoPlex™ 4000 and DriscoPlex™ 4100 piping can be installed on or above grade, most water applications are installed underground. (DriscoPlex™ 1500 and DriscoPlex™ 1600 piping must be installed underground.) Installation methods include direct burial, horizontal directional drilling, pulling, plowing and planting.



DriscoPlex™ 4000 and DriscoPlex™ 4100 are also used to rehabilitate existing pipelines. Rehabilitation techniques include sliplining, pipe bursting, and proprietary techniques for installing tight-fitting liners.

Direct Burial

Direct burial involves opening a trench, laying the pipe in the trench, then backfilling with appropriate materials. Pipes are joined into long strings before placing them in the trench. DriscoPlex™ 4000 and DriscoPlex™ 4100 pipes should be installed in accordance with ASTM D 2774 *Standard Practice for Underground Installation of Thermoplastic Pressure Piping*.



Like all piping materials, HDPE piping must be properly installed. HDPE is a flexible piping material that works together with its soil embedment to sustain the earthloads and live loads above it. Suitable embedment soils are required to provide support around the pipe, and embedment soils must be placed so that the pipe is properly surrounded in embedment materials. In general, coarse, angular sands and gravels are preferred, but other materials may be used under the direction of the design engineer. See ASTM D 2774 for embedment material size. Embedment materials must be placed in the haunch areas below the pipe springline and above the pipe so that the pipe is fully encapsulated without voids in the embedment. Compacted embedment is preferred. See the *Performance Pipe Engineering Manual* for information about the design of underground installations.

⁵DriscoPlex™ 4000 and DriscoPlex™ 4100 piping with a blue shell should not be used for on or above surface applications. These products are UV stabilized to allow unprotected outdoor storage for up to 18 months.

Horizontal Directional Drilling

Horizontal directional drilling is a technique for installing pipes and utility lines below ground using a surface-mounted drill rig that launches and places a drill string at a shallow angle to the surface and has tracking and steering capabilities. When the drill is advanced underground, it creates a borehole along its path. As the destination is reached, the drill string is angled upwards to penetrate the surface. After the borehole has been opened, a backreamer is attached to the head of the drill string, and the HDPE pipe is attached to the backreamer. The drill string is then retracted. During retraction, the borehole is expanded by the backreamer and the HDPE pipe is drawn into the borehole. To protect HDPE pipe against excessive pulling load, a weak-link or breakaway device should always be used at the head of the HDPE pipe. The allowable tensile load for setting weak-link devices is determined using ASTM F 1804 *Standard Practice for Determining Allowable Tensile Load for Polyethylene (PE) Gas Pipe During Pull-In Installation*. Horizontal Directional Drilling (HDD) applications should be installed in accordance with ASTM F1962 *Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit under Obstacle, Including river Crossings*, Plastic Pipe Institute (PPI) *Polyethylene Pipe for Horizontal Directional Drilling*, and the *Mini Horizontal Directional Drilling Manual* published by the North American Society of Trenchless Technology (NASTT). Additional information is available in Performance Pipe Technical Note PP-800 HDD - *Horizontal Directional Drilling*.

Planting, Plowing and Pulling

Planting and plowing are limited to suitable soils and site conditions. In planting, wheel or chain type trenchers are used to cut a narrow, round bottom trench. A long pipe string or pipe from a coil is fed over the trencher and directly into the trench. Backfilling follows after trenching and laying. In plowing, a plow rather than a trencher is used to open the trench. The plow may be fitted with a chute to feed pipe down through the plow into the trench bottom. See the Performance Pipe Engineering Manual for the minimum bend radius of the pipe feed plow chute. Flexible HDPE pipe is ideal for these installations.

Pulling involves opening a trench then pulling the pipe into the trench from one end. Sometimes a truck is fitted with an outrigger that extends over and down into the trench. The pipe is attached to the outrigger and then the truck is driven along the trench to drag the pipe into the trench. As with horizontal directional drilling, the pipe should always be protected with a weak-link or breakaway device at the leading end.



Rehabilitation

In sliplining, a slightly smaller pipe is pulled or pushed inside the old pipe. Typically, the new pipe must be at least 10% smaller in outside diameter than the inside diameter of the host pipe. The host pipe must be depressurized and cleaned, and tight bends removed. A sloped entrance pit is excavated, and a section of the top of the host pipe is removed. Then the new pipe is pushed or pulled or push-pulled into the host pipe. Once installed, the new pipe is connected to the system at both ends. In many cases,

the improved flow characteristics of DriscoPlex™ 4000 and DriscoPlex™ 4100 HDPE pipe can deliver flows comparable to the original capacity, even though the new pipe is smaller. See ASTM F 585 *Standard Practice for Insertion of Flexible Liners into Existing Sewers*.

In pipe bursting, preparations are similar to pull-in sliplining, but a bursting head is placed ahead of the new pipe. The bursting head breaks the host pipe into fragments so an equal size or larger new pipe can be pulled inside. Pipe bursting is limited to host pipes that can be fragmented.

Other rehabilitation techniques include tight-fitting liners where proprietary techniques are used to install liner inside the host pipe in intimate contact with the host pipe ID. These proprietary techniques typically use a mechanical procedure such as rollers, swaging or deformation into a u-shape to reduce the diameter of a liner. It is then installed inside the host pipe similar to sliplining, and then re-expanded against the host pipe ID using various means to revert the liner pipe to its original diameter⁶.

After Installation

Post installation procedures generally include leak testing and disinfecting for potable water lines.

Leak Testing

Take all necessary precautions to ensure the safety of persons and property while conducting leak tests. Leak tests should always be conducted using hydrostatic leak testing procedures. In general, the maximum allowable test pressure for leak testing is 150% of the pipe working pressure at the lowest elevation in the line; the maximum time allotted to conduct a leak test is eight (8) hours including bringing the line up to pressure, maintaining test pressure, and depressurizing; if leaks are found, depressurize the line before repairs are made; and if retesting is necessary, allow the line to relax for at least eight (8) hours before repressurizing the line. See Performance Pipe Technical Note PP-802 *Leak Testing for recommended leak testing procedures*.

WARNING - Correctly made fusion joints do not leak. When pressurized, leakage at a faulty fusion joint may immediately precede catastrophic separation and result in violent and dangerous movement of piping or parts and the release of pipeline contents under pressure. Never approach or attempt to repair or stop leaks while the pipeline is pressurized. Always depressurize the pipeline before making corrections. Faulty fusion joints cannot be repaired, they must be cut out and rejoined using proper heat fusion procedures.

Disinfecting

Applicable procedures for disinfecting new and repaired potable water mains are presented in standards such as ANSI/AWWA C651 *Disinfecting Water Mains*. ANSI/AWWA C651 uses liquid chlorine, sodium hypochlorite or calcium hypochlorite to chemically disinfect the main. Disinfecting solutions must not exceed 12% active chlorine because greater concentration can chemically attack and degrade polyethylene. After disinfecting, all disinfecting solution must be flushed from the system, especially from dead-end lines.

⁶Because some proprietary tight-fitting liner installation techniques can impose high stresses on a polyethylene liner, the installer should provide validation data and information, and should certify the long-term performance of the installed liner.

Repairs

Damage generally requires replacing the damaged section. With larger pipes, replacing the damaged section with a flanged section of pipe is usually necessary. Smaller pipes may be flexible enough to fuse a replacement pipe section at one end, and then deflect the other end to the side so a fully restrained mechanical coupling or electrofusion fitting can be installed.

Temporary repairs to seal minor leaks or punctures, or to reinforce damaged areas until permanent repairs can be performed typically employ a full encirclement repair clamp. Polyethylene pressure pipe cannot be repaired or restored to full service capacity using extrusion or hot air welding to fill or plug damaged areas.

Cautions

Observe all local, state and federal codes and regulations, and general handling, installation, construction and operating safety precautions. The following are some additional precautions that should be observed when using Performance Pipe polyethylene piping products.

Fusion and Joining

During heat fusion, equipment and products can exceed 400°F (204°C). Take care to prevent burns.

Do not bend pipes into alignment against open butt fusion machine clamps. The pipe may spring out and cause injury or damage.

Performance Pipe polyethylene piping products cannot be joined with adhesive or solvent cement. Pipe-thread joining and joining by hot air (gas) welding or extrusion welding techniques are not recommended for pressure service.

Liquid hydrocarbon permeation may occur when liquid hydrocarbons are present in the pipe, or where soil surrounding the pipe is contaminated with liquid hydrocarbons. Polyethylene pipe that has been permeated should be joined using suitable mechanical connections because fusion joining to liquid hydrocarbon permeated pipes may result in a low strength joint. Mechanical fittings must be installed in accordance with the fitting manufacturer's instructions. Obtain these instructions from the fitting manufacturer. See Performance Pipe Bulletin PP 750 and the *Performance Pipe Engineering Manual*.

Weight, Unloading and Handling

Although polyethylene piping is lightweight compared to some other piping products, significant weight may be involved. Move polyethylene piping with proper handling and lifting equipment. Use fabric slings. Do not use chains or wire ropes. Do not roll or drop pipe off the truck, or drag piping over sharp rocks or other abrasive objects. Improper handling or abuse can damage piping and compromise

system performance or cause injury or property damage. *Obtain and observe the handling instructions provided by the delivery driver.*

Striking the pipe with an instrument such as a hammer may result in uncontrolled rebound. Store DriscoPlex™ products so that the potential for damage or injury is minimized. See the *Performance Pipe Engineering Manual*.

Testing

When testing is required, observe all safety measures, restrain pipe against movement in the event of catastrophic failure, and observe limitations of temperature, test pressure, test duration and making repairs. See Performance Pipe Technical Note PP-802 *Leak Testing PE Piping Systems*.

Protection Against Shear and Bending Loads

Where a polyethylene branch or service pipe is joined to a branch fitting and where pipes enter or exit casings or walls, structural support such as properly placed, compacted backfill and a protective sleeve should be used. Whether or not a protective sleeve is installed, the area surrounding the connection must be structurally supported by embedment in properly placed compacted backfill or other means to protect the polyethylene pipe against shear and bending loads. See the *Performance Pipe Engineering Manual* and ASTM D 2774.

Subfreezing Temperatures

Water can be frozen solid in polyethylene pipe without damaging the pipe, but an ice plug in the pipe will stop flow. *Do not apply pressure to a frozen line that has an ice plug.* Allow ice plugging to thaw before applying pressure to the line. Severe water hammer (such as from an ice plug stopping suddenly at an obstruction) in a frozen, surface or above grade pipeline can rupture and possibly fragment the pipeline and cause injury or property damage.



a division of Chevron Phillips Chemical Company LP

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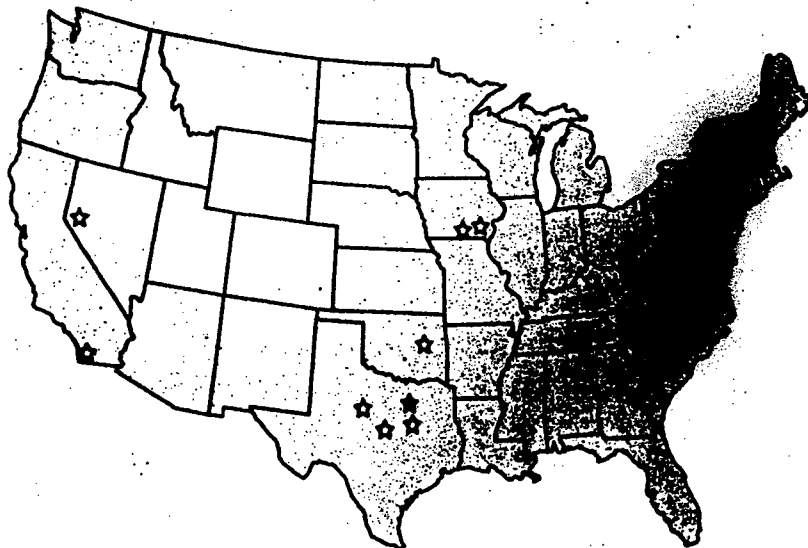
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or technical assistance:

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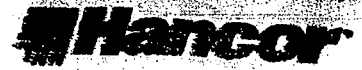


PERFORMANCE PIPE Product Literature

Technical Notes & Bulletins:

- | | |
|---------------------|-------------------------------------------------------------|
| Bulletin: PP 502 | Polyethylene Piping for Sewer Rehabilitation |
| Bulletin: PP 503 | Polyethylene Piping for Municipal & Industrial Applications |
| Bulletin: PP 109-DS | PE 3408 Data Sheet |
| Bulletin: PP 110-DS | Spirolite™ Data Sheet |
| Bulletin: PP 152 | Municipal & Industrial Size and Dimension Sheet - IPS |
| Bulletin: PP 153 | Municipal & Industrial Size and Dimension Sheet - DIPS |
| Bulletin: PP 750 | Performance Pipe General Fusion Brochure |
| Bulletin: PP 900 | Performance Pipe Engineering Manual |

* Additional product literature will be available upon completion. Visit Performance Pipe on the web for the latest completed literature.



More joined together.

BLUE SEAL PIPE, WATERTIGHT PERFORMANCE

THE PERFORMANCE YOU EXPECT. THE INNOVATIONS YOU NEED.

With over a century of experience, we're experts when it comes to drainage, providing innovative solutions for all kinds of applications. Our HDPE pipe delivers superior value while providing physical strength and structural design that just cannot be matched by metal or concrete.

Hancor's new patent pending, highly engineered composite pipe joining system, a unique combination of three different materials, is being described as the best watertight solution on the market.

BLUE SEAL is a gravity flow, watertight pipe ideal for storm sewers, detention systems, and cross, slope or edge drains. Other applications include golf courses, sports playing fields, or parking lot drainage, as well as irrigation ditch enclosures.

Available in a complete range of sizes from 12" - 60" (300-1500mm) diameters, this Hancor exclusive solution is 3rd party verified to meet 10.8 psi water and vacuum testing requirements and EPA Phase II Best Management Practices. Once again, Hancor leads the way in offering a 60" corrugated HDPE verified watertight joining system.

The unique feature that sets this system apart from any other is a highly engineered integral bell-and-spigot system that utilizes expanding structural foam technology for gasket support. This revolutionary coupling system maintains bell dimensions under pressurization providing uniform tolerances to ensure the highest consistent performance not found in the corrugated pipe industry. Hancor's multicomposite reinforced bell design is easily recognized by its blue product identification wrap.

5 YEAR WARRANTY

BLUE SEAL, Hancor's new highly engineered composite pipe joining system is backed by an industry exclusive 5 year limited warranty.

FEATURES

- Meets 10.8 psi water pressure and vacuum testing requirements.
- Addresses EPA Phase II Best Management Practices for long-term service reliability.
- Lightweight, high strength composite system requires less labor time for faster installations and reduced costs.
- Bell and gasket corrugation reinforcement provides uniform support not found in the corrugated polyethylene pipe industry.
- Fast bell-and-spigot joint assembly with unobstructed structural integrity.
- HDPE pipe provides superior resistance to prevent rusting, deterioration or crumbling.

BENEFITS

- Provides a visible commitment to better water quality, minimizing environmental impact.
- Prevents the contamination of soil and local waters from harmful substances such as sediment from construction run-off, toxic substances or nutrient emissions.
- Avoids possible joint infiltration of gases and fumes resulting in sinkholes and differential settlement to adjacent structures.
- Reduces the risk of blockage caused by water table infiltration into joints.
- Reduces soil migration.
- Exclusive 5 year limited warranty on pipe and joints.

Hancor Service: Hancor representatives and engineers are committed to providing you with the answers to all your questions, including specifications, installation, backfill recommendations and more.





BLUE SEAL™ PIPE SPECIFICATIONS

Diameter: 12"- 60" (300-1500mm)

Length:

- 20' (6m) for 12"- 30" (300-750mm) diameter pipe.
- 20.5' (6.24m) for 36"- 60" (900-1500mm) diameter pipe.

Specifications: AASHTO M294, Type S and AASHTO MP7, Type S.

Joint Performance: Watertight

Joining System: Bell-and-spigot

Gasket: Polyisoprene meeting ASTM F477

Fittings and Accessories: Hancor offers a full line of fittings for all diameters of Hancor pipe.

SCOPE

This specification describes 12"- 60" (300-1500mm) Hancor BLUE SEAL™ pipe for use in gravity flow applications.

PIPE REQUIREMENTS

BLUE SEAL pipe has a smooth interior and annular exterior corrugations.

- 12"- 48" (300-1500mm) meets AASHTO M294, Type S.
- 60" (1500mm) meets AASHTO MP7, Type S.
- Manning's "n" value for use in design not less than 0.010.

MATERIAL PROPERTIES

Pipe and fitting material are high density polyethylene, meeting ASTM D3350 minimum cell classification 335420C. The closed cell structural core must have a compressive strength no less than 20 lbs/in².

JOINT PERFORMANCE

Pipe is joined with the BLUE SEAL joint meeting the requirements of AASHTO M294 or AASHTO MP7. 12"- 60" (300-1500mm) joints are watertight according to the requirements of ASTM D3212. Gaskets are made of polyisoprene, meeting the requirements of ASTM F477. In addition the gaskets are free of visible cracking when tested according to ASTM D1149: 72 hours exposure in 50 PPHM ozone at 104° F. Gaskets are installed by the pipe manufacturer and covered with a removable wrap to remain debris-free. A joint lubricant available from the manufacturer is to be used on the gasket and bell during assembly.

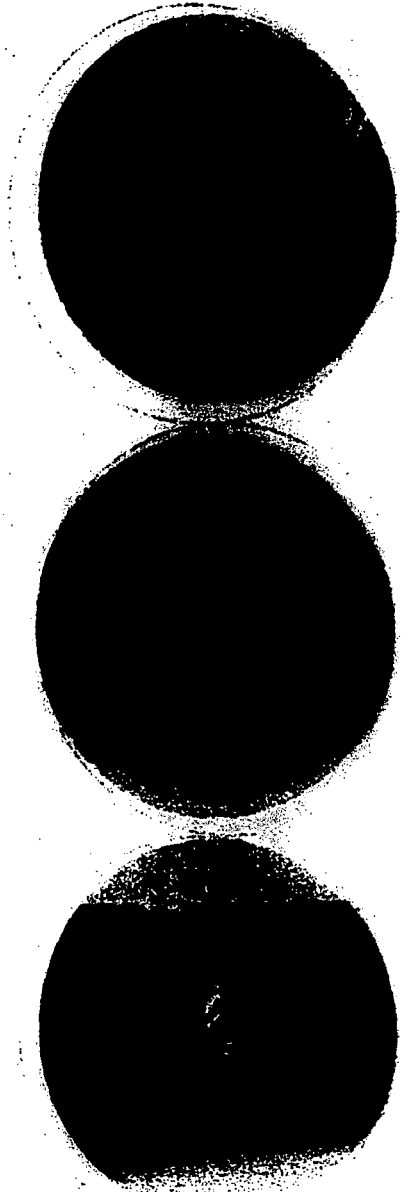
36"- 60" (900-1500mm) diameters have a reinforced bell-end-spigot, including a bell tolerance device and an axial reinforcing bridge plate between the bell and the first external corrugation. The bell, bridging and expansion resistance rings are covered with a protective wrap. The gasket corrugation is reinforced with a closed cell structural core.

FITTINGS

Fittings conform to AASHTO M294 or AASHTO MP7. Fabricated fittings are welded at all accessible interior and exterior junctions.

INSTALLATION

Installation should be in accordance with ASTM D2321, with the exception that minimum cover in trafficked areas for 12"- 48" (300-1200mm) diameters is 1 ft. (0.3m), and for 60" (1500mm) diameters, 1.5 ft. (0.5m).



12 (300)	15 (375)	18 (450)	24 (600)	30 (750)	36 (900)	42 (1060)	48 (1200)	60 (1500)
15.4	19.8	23.9	29.9	37.9	43.6	50.8	57.4	73.7
(391)	(498)	(607)	(759)	(963)	(1107)	(1290)	(1458)	(1872)
1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)
70	100	130	220	330	400	500	597	931
(33)	(48)	(60)	(100)	(150)	(182)	(227)	(260)	(315)

All sales of Hancor products are subject to a limited warranty and purchasers are solely responsible for installation and use of Hancor products and determining whether a product is suited for any specific needs. Please consult a full copy of Hancor's Terms and Conditions for Sale for further details.

Direct Contact

Customer Service

800 FOR PIPE (367-7478)

Monday - Friday 7 am - 8 pm EST
 614-844-8444 (toll-free) 9 am - 5 pm EST

Application Engineering

For technical questions, call
 614-844-8444 (toll-free) 9 am - 5 pm EST

Electronic Media

Web Site

Full Hancor product line information and details are available on our website at www.hancor.com

Sure-Lok® F477 Pipe Specifications

Scope

This specification describes 4" - 60" (100 - 1500mm) Sure-Lok F477 pipe for use in nonpressure drainage applications.

Pipe Requirements

Sure-Lok F477 pipe shall have a smooth interior and annular exterior corrugations.

- 4" - 10" (100 - 250mm) meets AASHTO M252, Type S.
- 12" - 48" (300 - 1200mm) meets AASHTO M294, Type S.
- 54" and 60" (1350 and 1500mm) meets AASHTO MP7-97.
- Manning's "n" value for use in design shall not be less than 0.010.

Joint Performance

Pipe shall be joined with the Sure-Lok (bell-and-spigot) joint meeting AASHTO M252 Type S, AASHTO M294 Type S or MP7-97. The joint shall be silt tight and leak resistant. Gaskets shall be made of polyisoprene meeting the requirements of ASTM F477 with the addition that the gaskets shall not have any visible cracking when tested according to ASTM D1149 after 72-hour exposure in 50 PPHM ozone at 104°F (40°C). Gaskets shall be installed by the pipe manufacturer and covered with a removable wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly.

Fittings

4" - 10" (100 - 250mm) fittings shall conform to AASHTO M252, 12" - 48" (300 - 1200mm) to AASHTO M294 while 54" (1350mm) and 60" (1500mm) shall conform to MP7-97.

Material Properties

Pipe and fitting material shall be high density polyethylene meeting ASTM D3350 minimum cell classification 324420C for 4" - 10" (100 - 250mm) diameters or 335420C for 12" - 60" (300 - 1500mm) diameters.

Installation

Installation shall be in accordance with ASTM D2321 with the exception that minimum cover in trafficked areas shall be one foot (0.3m) for 4" - 48" (100 - 1200mm) pipe and 18" (0.5m) for 54" (1350mm) and 60" (1500mm) pipe.

4 (100)	6 (150)	8 (200)	10 (250)	12 (300)	15 (375)	18 (450)	24 (600)	30 (750)	36 (900)	42 (1050)	48 (1200)	54 (1350)	60 (1500)
4.7 (119)	6.9 (175)	9.4 (239)	11.9 (303)	14.2 (361)	17.7 (450)	21.5 (546)	28.4 (721)	36.0 (914)	41.4 (1052)	48.0 (1219)	55.0 (1397)	61.0 (1549)	67.3 (1709)
0.6 (16)	0.7 (19)	1.0 (26)	1.7 (43)	2.0 (51)	2.4 (61)	3.0 (76)	4.0 (102)	4.0 (102)	4.6 (117)	5.3 (147)	5.8 (147)	7.8 (198)	7.8 (198)
10 (5)	20 (9)	30 (14)	42 (19)	70 (32)	100 (46)	130 (59)	220 (100)	330 (150)	400 (182)	500 (227)	590 (268)	709 (309)	861 (315)

All diameters available with or without perforations

* One stick is 20' (6m) for 4"-30" (100-750mm) diameter pipe and 30.5' (9.24m) for 36"-60" (900-1500mm) diameter pipe.

All sales of our product are subject to a buyer's agreement of purchase and are made on the basis of the information provided herein. It is the responsibility of the buyer to determine whether a product is suitable for any specific application. HANCOR PIPE PRODUCTS, INC. does not warrant the fitness of its products for any particular application.

DIRECT CONTACT

Customer Service
888-FOR PIPE (367-7174)

Fax 938-FAX PIPE (224-1419)
24 hours a day

Technical Engineering
For technical questions, call
BOB CHANDLER (216) 337-3701
ext. 300

Mondays - Fridays
8:00am - 5:00pm EST

ELECTRONIC MEDIA

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Find market and application
specific information and the
latest industry news at our
Online Pipeline -
www.hancor.com

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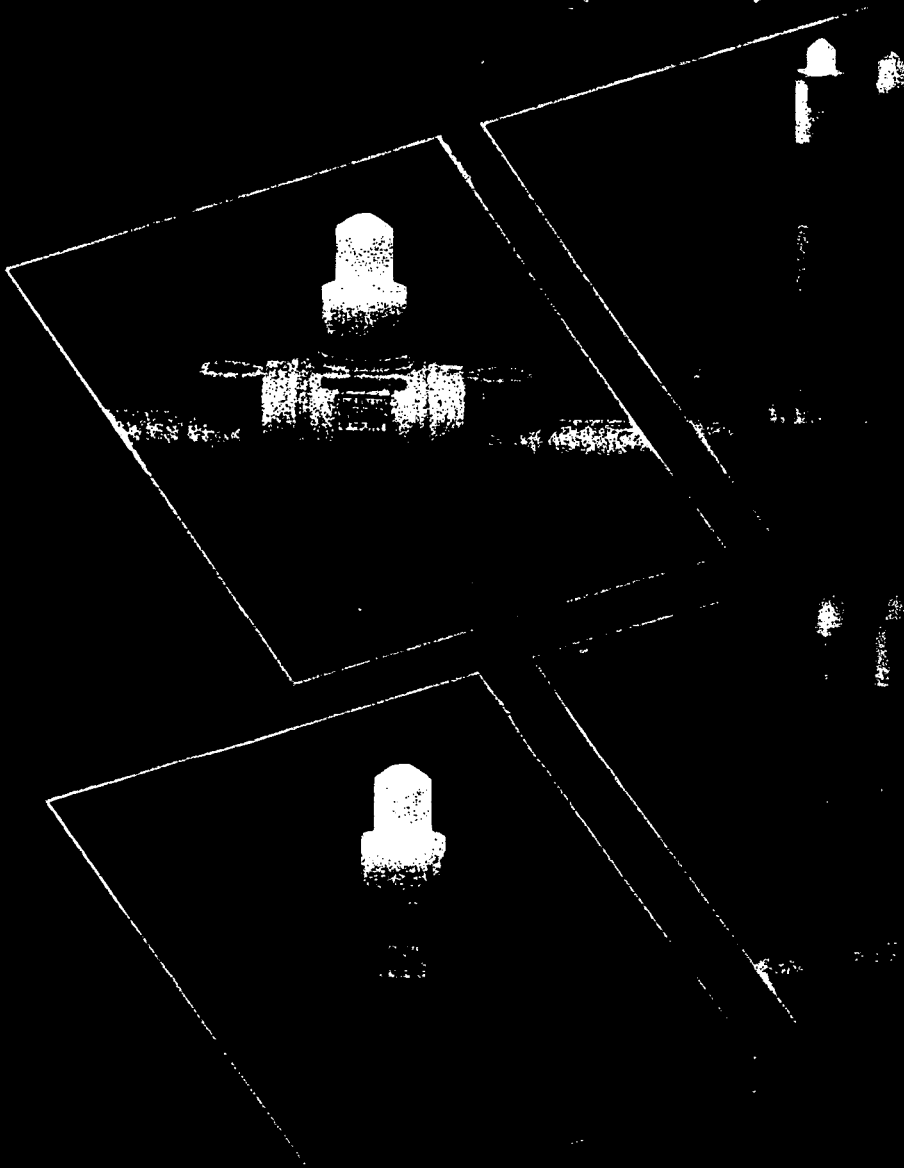
Hancor

401 Olive St., Findlay, OH 45840

KEROTEST

Distributed By:
INDUSTRIAL SALES COMPANY, INC
901 S. Kansas Olathe, KS 66061-4597
PHONE: 913-782-0473
WATS: 800-662-8750
FAX: 913-782-8047

Polyethylene Ball Valve



101

Kerostat Polytec polyethylene valves deliver all the advantages you've come to expect from polyethylene valves...and much more! These ruggedly built valves combine large flow bores with easy installation and operation, and are virtually maintenance free.

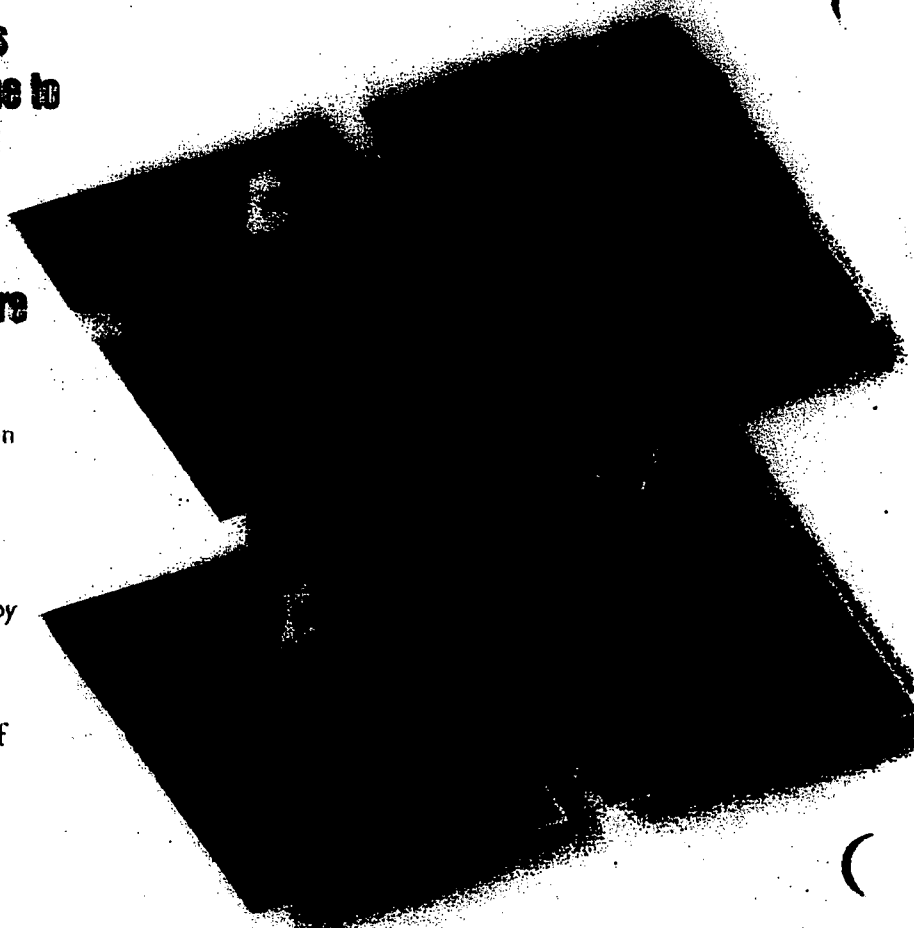
Now, with new refinements, the Kerostat Polytec line is an even better choice. We've:

- improved the design to surpass the requirements of ASME B16.40;
- simplified installation and reduced inventory needs by producing one large ported valve type per size;
- introduced a high-head design; and
- subjected our valves to the rigid testing procedures of AGA Research.

You can count on the Kerostat Polytec line to provide cost-effective, durable solutions to your polyethylene ball valve requirements.

Features and Benefits of the Kerostat Polytec Polyethylene (PE) Ball Valve:

1. Full Port Opening (2" - 8")
2. Reliable Construction
3. Easy Operation
4. Meets or Exceeds ASME B16.40
5. ISO 9001 Certified Manufacturer
6. Maintenance Free
7. Integral Purges - Easy Connection
8. High Head Extension Available
9. Independent, Third Party Tested



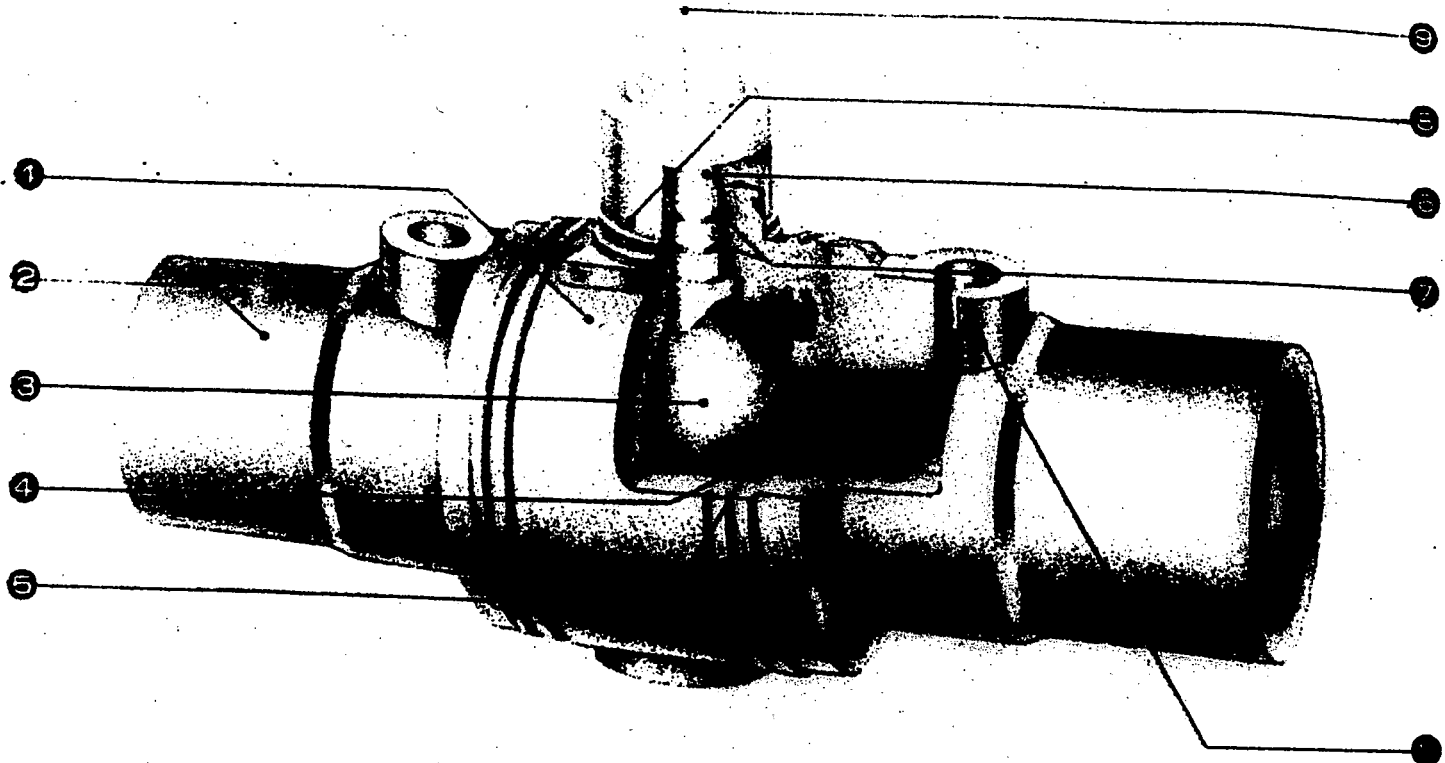
General Information

MATERIALS
PE 2406 : 80 psig (5.5 bar) PE 3408 : 100 psig (6.9 bar)
Medium Density Polyethylene (PE 2406) High Density Polyethylene (PE 3408)
From -20°F to 140°F (-29°C to 60°C)
Electrofusion or Butt Fusion
Full Port
Short Stem or Extended, as required
11, other SDR'S available





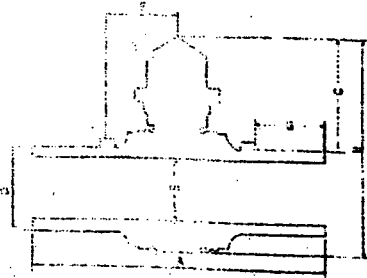
Materials of Construction



BODY	POLYETHYLENE	PE 2408; PE 3408
ENDS	POLYETHYLENE	PE 2406; PE 3408
BALL	POLYPROPYLENE	High strength, long life and low operating torque
RETAINER	POLYPROPYLENE	Positive seal under any condition, retains seat under high differential pressure
BALL SEAT	NITRILE	Reliable sealing from -20°F to 140°F
STEM	ACETAL	Excellent durability & strength
STEM SEAL	NITRILE	Redundant sealing with dual o-rings
WEATHER SEAL	NITRILE	Protects from ground water and dirt
OPERATOR	POLYPROPYLENE	2" (50mm) Operating Square
PURGE CONNECTOR	POLYETHYLENE	Integral easy purge connection



Standard and High Head Valves



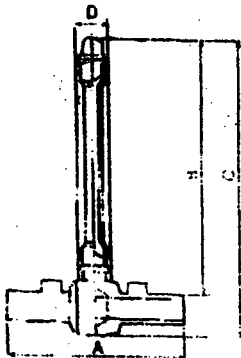
Valve Sizes and Dimensions, in. (mm)

Standard

11 (11)	23.7 (602)	9.6 (244)	5.6 (142)	2.375 (60.3)	2.48 (63)	1.8 (46)	5.7 (145)	4.7 (119)	170	5.3 (2.4)
11 (11)	23.2 (589)	11.9 (302)	6.7 (170)	3.5 (88.9)	3.543 (90)	2.5 (64)	5.7 (145)	4.7 (119)	390	10 (4.5)
11 (11)	24.1 (612)	14.9 (378)	8.1 (206)	4.5 (114.3)	4.331 (110)	3.8 (91)	5.7 (145)	4.7 (119)	730	20 (9)
11 (11)	30 (762)	19 (483)	9.7 (246)	6.625 (168.3)	6.299 (160)	4.8 (122)	8.9 (226)	4.7 (119)	1700	43 (20)
11 (11)	32 (813)	25 (635)	12.5 (318)	8.625 (219.1)	8.86 (225)	6.3 (160)	8.9 (226)	4.7 (119)	2400	100 (45)
11 (11)	32 (813)	25 (635)	11.2 (284)	10.75 (273)	11.02 (280)	6.7 (170)	8.9 (226)	5.7 (145)	2700	110 (50)
11 (11)	32 (813)	25 (635)	10.2 (259)	12.75 (323.8)	12.4 (315)	7 (178)	8.9 (226)	5.7 (145)	2800	118 (54)

Valve Sizes and Dimensions, in. (mm)

High Head

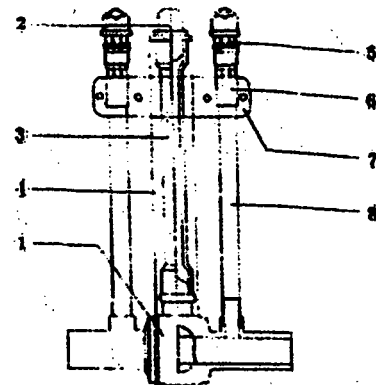
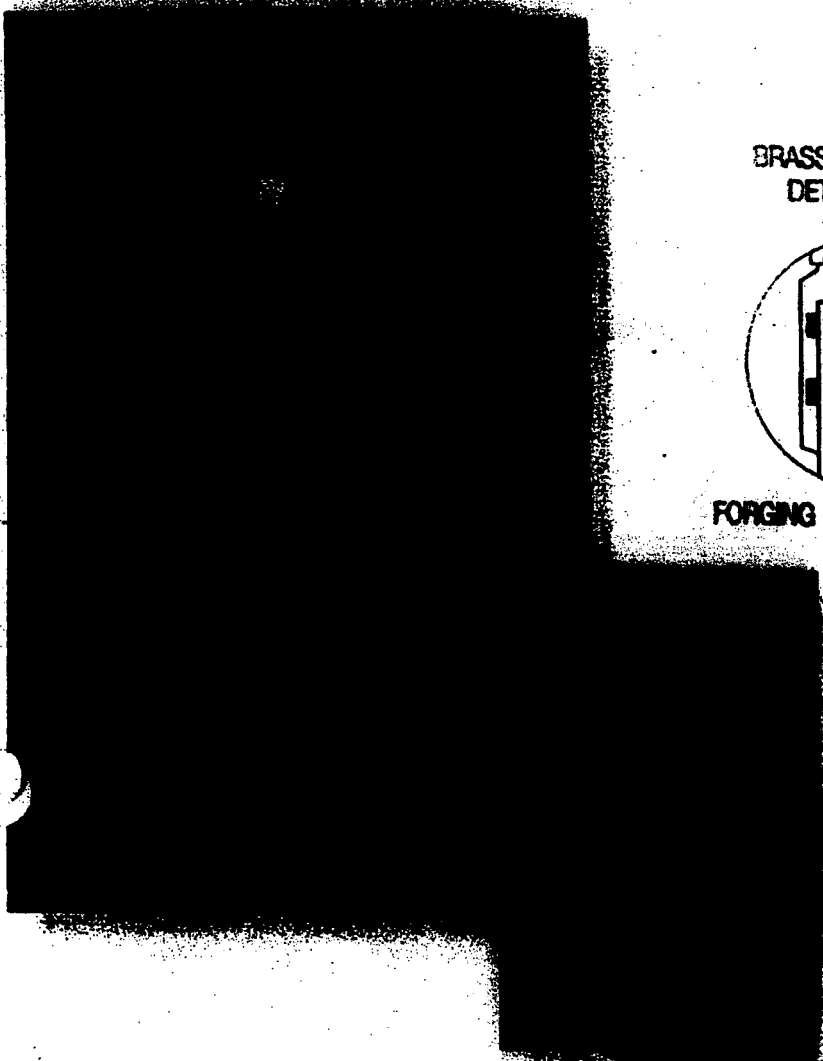


23.7 (602)	26.8 (681)	30.5 (775)	4.5 (114)	27.6 (701)	31.5 (800)	11.7 (5.3)
23.2 (589)	28 (711)	33.1 (841)	4.5 (114)	27.6 (701)	31.5 (800)	16.3 (7.4)
24.1 (612)	28.7 (729)	35.5 (902)	4.5 (114)	27.6 (701)	31.5 (800)	26.5 (12.0)
30 (762)	30.7 (780)	40 (1016)	6.5 (165)	27.6 (701)	31.5 (800)	52.5 (23.8)
32 (813)	33.5 (851)	46 (1168)	6.5 (165)	39.5 (1003)	39.5 (1003)	111 (50.5)

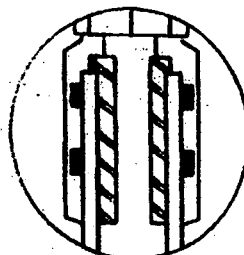
CALL FOR AVAILABILITY



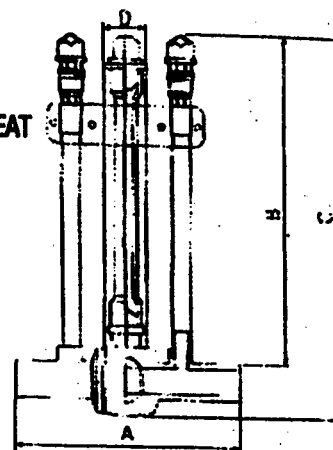
Single and Double Purge PE Valves



BRASS TRANSITION (C)
DETAILED FIGURE



FORGING BRASS, DUPLICATE SEAT



Materials of Construction

COMPONENT	MATERIAL
BODY	POLYETHYLENE (MDPE, HDPE)
OPERATING SQUARE	POLYPROPYLENE
STEM EXTENSION	ACETAL
STEM PROTECTOR	POLYETHYLENE
PURGE VALVE	BRASS BALL VALVE
TRANSITION PE/BRASS	BRASS
SUPPORT BRACKET	POLYETHYLENE S.S. BOLTS
PURGE PIPE	POLYETHYLENE

Valve Stem and Dimensions, in. (mm)

2.7 (69.2)	26.3 (668)	21.5 (775)	4.5 (114)	17.9 (8.1)	25 (10.5)
23.2 (589)	28 (711)	33.1 (841)	4.5 (114)	22.8 (10.4)	28 (12.7)
24.1 (612)	28.7 (729)	35.5 (902)	4.5 (114)	33 (15.0)	38 (17.3)
30 (762)	30.7 (780)	40 (1016)	6.5 (165)	61 (27.7)	67.5 (30.6)
32 (813)	33.5 (851)	46 (1168)	6.5 (165)	120 (54.5)	126 (57.3)

CALL FOR AVAILABILITY



Qualification Testing

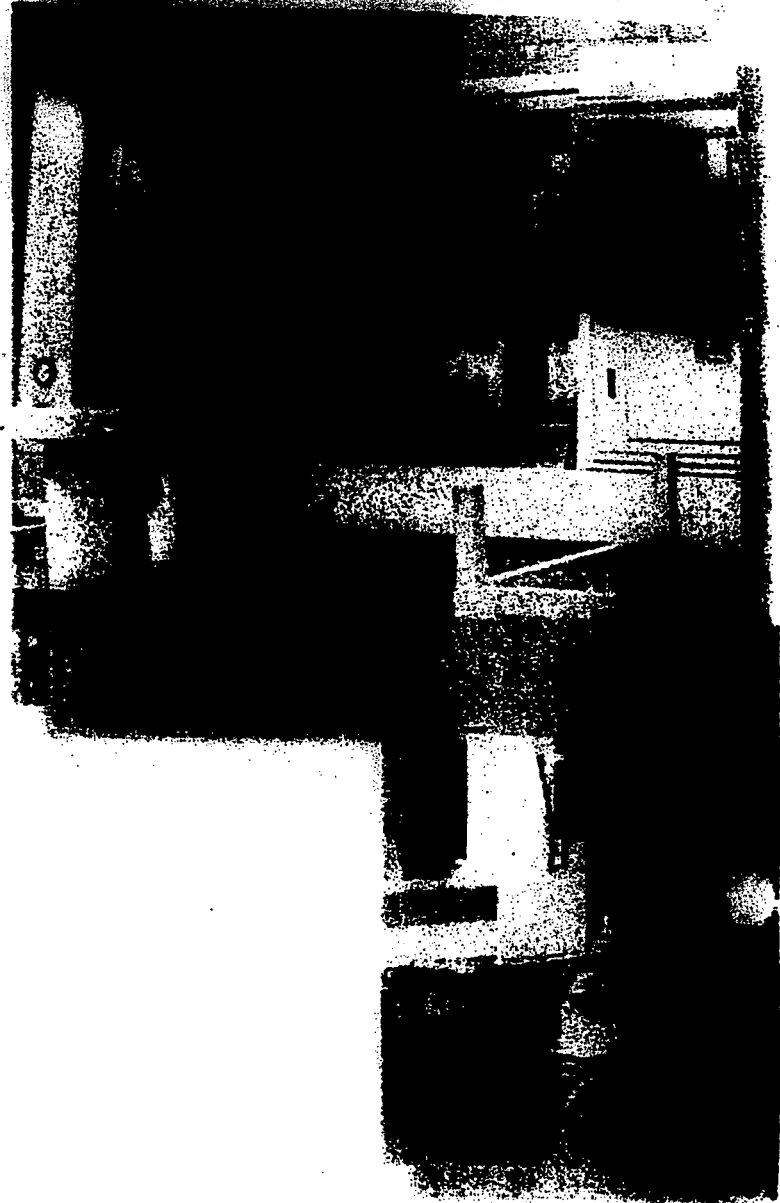
The Kerotest Polytec polyethylene valves meet the requirements set forth in ASME B16.40: **Manually Operated Thermoplastic Gas Shutoffs and Valves in Gas Distribution Systems.** The testing requirements of ASME B16.40 are that:

- the gas tightness of the valves be demonstrated through a Shell Test, Seat Test, and Temperature Resistance Test;
- the operating torque of the valves is shown to be within specified limits at ambient temperatures through an Operating Test, at extreme temperatures by a Temperature Resistance Test, and under sustained pressure via a Valve Closure Verification Test;
- the structural integrity of the valves be tested by subjecting them to high pressures over a period of time through a Pressure Boundary Verification Test;
- the flow through the valves not be restricted by meeting the head loss coefficient (Cv) requirements set forth in the Flow Capacity Test.

An independent third party evaluation was performed by AGA Research. Their complete report, demonstrating compliance with ASME B16.40 is available upon request.

All of the production and qualification tests were successfully completed and passed.

Additional tests performed by Kerotest beyond the B16.40 requirements include: Burst Test, Cycle Test, Impact Test, Bend Test and Tensile Test.

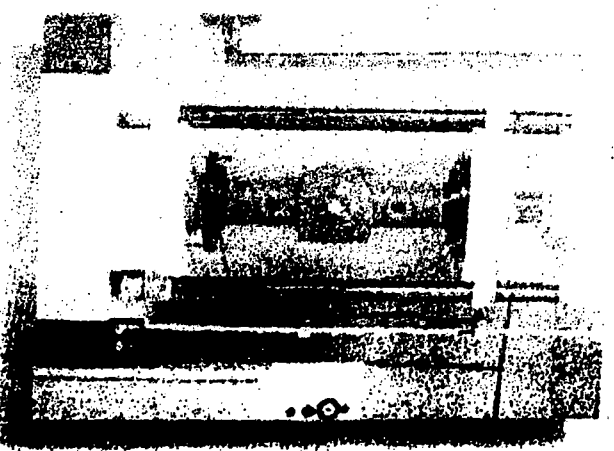
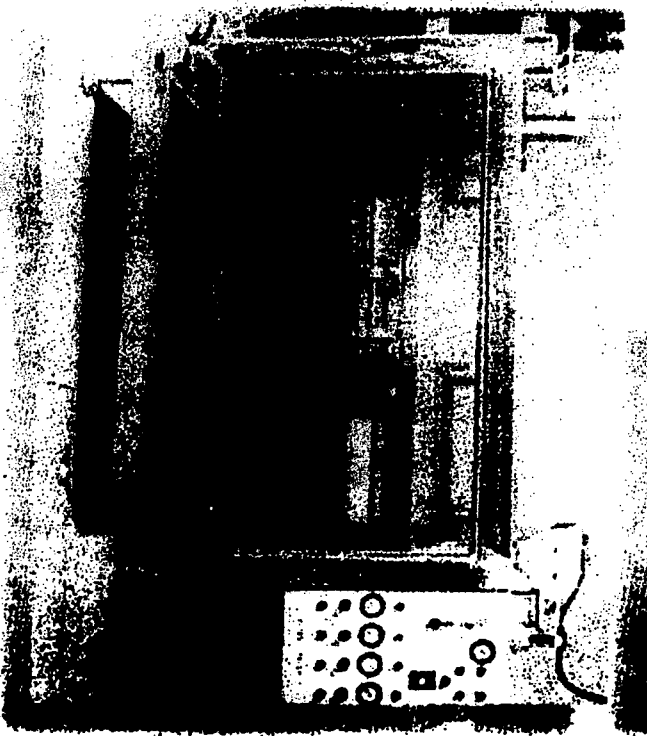
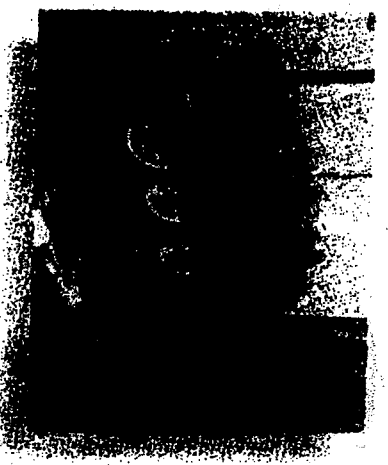


All valves in full compliance with ANSI/ASME B16.40 and other international standards.

Air seat test under water, both directions	4 psi (0.3 bar) 150 psi (10.4 bar)
Air test under water	4 psi (0.3 bar) 150 psi (10.4 bar)
Valve operated 10 times at full differential pressure at -20°F and 100°F (-29°C and 38°C)	4 psi (0.3 bar) 150 psi (10.4 bar)
20 pipe diameters bend radius at 58 & 116 psi (4 & 8 bar) differential pressure operation, seat leakage checked	58 psi (4.0 bar) 116 psi (8.0 bar)
Operating torque at -20°F to 100°F (-29°C to 38°C)	100 psi (6.9 bar)
Tested at 74°F, 100°F, and 176°F (23°C, 38°C and 80°C)	260 psi (18.3 bar) 215 psi (14.8 bar) 134 psi (9.2 bar)
High pressure Shell Test	580 psi (40.0 bar)

Production Testing

Keroset Petyac polyethylene valves are produced within an ISO 9001 certified manufacturing facility and fully tested to insure the highest level of quality. The Petyac valve is the result of extensive research and has been designed and manufactured for long-term reliability, safe operation, and ease of maintenance in gas distribution applications.



Quality is our business.

When it comes to product development, engineering, manufacturing and customer service, you have our full support. Since 1909, Kerotest Manufacturing Corporation has been building a reputation for producing highly reliable products for the valve industry. Our reputation is the result of a commitment to you, our valued customer, that we've maintained for over 85 years.

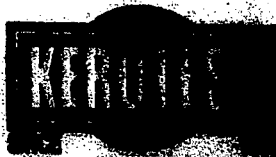
The success we've achieved in valve development, sales and service reflects our continuous quest for quality. This focus on quality is further emphasized by our company-wide commitment to the philosophies of Total Quality Management (TQM).

As an employee-owned, Total Quality Management company, we continually strive to improve our products, services and everyday operating functions. This dedication to quality is shared by every employee. From the development of work-teams, through the empowerment of all employees, to the vital partnerships we build with our suppliers and customers, we recognize that customer satisfaction is the most important objective of Kerotest.

KEROTEST MANUFACTURING CORP.

QUALITY PRODUCTS SINCE 1909

- 1909 Kerotest is incorporated as Pittsburgh Reinforced Brazing & Machine Company.
- 1917 The FIRST American manufactured cast steel gate valve for the oil industry is introduced.
- 1921 Testing of high pressure valves with kerosene is introduced.
- 1927 "Kerotest" meaning "kerosene tested" is adopted as the new company name.
- 1930 Kerotest introduces the FIRST packless metal diaphragm valve to the refrigeration market.
- 1963 Kerotest enters the gas distribution industry with "The Model 1".
The FIRST steel gate valve designed for natural gas service.
- 1971 Kerotest introduces the FIRST Packless Metal Diaphragm valve, receives the "N" stamp, and becomes a leading nuclear valve supplier worldwide.
- 1983 Kerotest becomes an employee owned company with the development of an ESOP.
- 1985 Kerotest introduces its Innogaz electrofusion system to the natural gas market.
- 1987 Kerotest becomes the first approved Polyethylene Valve supplier to British Gas (86 PS/V7).
- 1988 Kerotest introduces its Class 150 Weldball valve line to the natural gas market.
- 1991 Kerotest's dedication to providing quality products and service is further enhanced with its commitment to the TOTAL QUALITY MANAGEMENT philosophy.
- 1995 Kerotest introduces its line of Composite and Transition Ball Valves for large polyethylene pipe.
- 1995 Kerotest is awarded ISO-9001 and API-6D certifications.
- 1995 Kerotest invests \$7 million in new facilities and equipment and moves to the Glenwood neighborhood of Pittsburgh.
- 1996 Kerotest introduces the first universal electrofusion control box to the natural gas market.
- 1998 Kerotest introduces its line of Polytec ball valves to the natural gas market.



An Employee Owned Total Quality Management Company

KEROTEST MANUFACTURING CORP.

5500 Second Avenue • Pittsburgh, PA 15207

**Franklin
Electric**

PAGE: II
DATE Sept. 1, 1996
SUPERSEDES: 3-8-89
OLD PAGE: 010.101

General Sales Policy

TERMS AND CONDITIONS OF SALE, ALL MOTORS

A. CONTROLLING TERMS AND CONDITIONS

1. The terms and conditions appearing in this document, together with Franklin Electric's standard or custom product specifications (if applicable), constitute the entire agreement between Franklin Electric and Purchaser. FRANKLIN ELECTRIC objects to, and shall not be bound by, any additional or different terms, whether printed or otherwise and whether in Purchaser's purchase order or in any other communication from Purchaser to Franklin Electric, unless Franklin Electric has specifically agreed in writing to those additional or different items. Prior courses of dealing, trade usage and verbal agreements not reduced to a writing signed by Franklin Electric, to the extent they differ from, modify, add to or detract from, the Contract, shall not be binding upon Franklin Electric. There are no agreements, promises or understandings, either verbal or written, that are not fully expressed in this Contract. No statements, recommendations or assistance by either party have been relied upon by either party or shall constitute a waiver by either party of any of the provisions hereof.

2. This Contract may be amended or altered only if agreed to in writing, signed by the party against which any such amendment or alteration is asserted.

B. PRICE

1. All prices and discounts are subject to change by Franklin Electric, without prior notice, effective with Franklin Electric's publication of its revised price list or discount schedule applicable thereto, or, in lieu thereof, written notification by Franklin Electric to Purchaser. Prices and discounts applicable to unshipped quantities of existing orders, as well as to new orders, shall be those in effect at the time of shipment.

2. A representation by Purchaser of facts, upon which Franklin Electric relies in basing an applicable discount or term of sale, shall be taken as a representation that such facts are true; and Franklin Electric shall have the right to revise any price or discount, including products already shipped, invoiced, or paid, should such representations be untrue.

3. All prices are Ex-Factory and are net of, and do not include, any federal, state, or local income, property, sales, use, excise, value added, or other taxes, all of which shall be the responsibility of Purchaser.

C. TERMS OF PAYMENT

The due date of payment shall be measured from the shipment date.

D. DELIVERY

1. Shipments shall be made by common carrier,

unless otherwise stated in divisional sales policies. Special arrangements, such as air freight, UPS, or overnight delivery and special packaging requirements, should be specifically requested by Purchaser and, if agreed to in writing by Franklin Electric, will be at Purchaser's expense.

2. The shipping dates shown on the face of the contract are based upon conditions existing at the present time and reasonably anticipated through each shipping date. Subject to the further limitation on damages described in section G, Franklin Electric shall not, under any circumstances, be liable for any loss, cost, expense, delay, damage, inconvenience, or consequential damages for failure (however caused) to meet a specific shipping date, or for any delay, loss, or damage in transit, or due to the unavailability of sufficient products to fill the order. Franklin Electric reserves the right to allocate available inventories among its customers, including Purchaser, in the event that such inventories are inadequate to meet demand.

3. Title to the product shipped shall pass to Purchaser when Franklin Electric delivers such goods to the carrier for delivery to Purchaser, and all risks of damage, loss, or delay shall thereupon pass to Purchaser. Franklin Electric shall promptly, after shipment, notify Purchaser that the goods have been delivered to the carrier and shall furnish Purchaser with all documents, if any be required, to enable Purchaser to obtain possession of the product when delivered.

E. WARRANTIES AND LIMITATIONS

1. Franklin Electric warrants that its products will be free from defects in workmanship and material at the time of shipment, will perform consistently with samples previously supplied and will conform to the specifications published or agreed to between Purchaser and Franklin Electric for a period of (1) year from the date of installation (but in no event beyond two (2) years from the date of manufacture), or for a period of 3 years from date of installation (but in no event beyond 4 years from date of manufacture) for Subtrol-Plus protected submersible water well motors.

2. Any Franklin Electric product which Franklin Electric determines to be defective within the warranty period shall be repaired, replaced, or the purchase price

continued on next page



Franklin Electric
Bluffton, Indiana 48714

therefore paid refunded, at Franklin Electric's sole election. No allegedly defective product shall be returned to Franklin Electric, however, without Franklin Electric's prior written authorization and shipping instructions.

3. THE WARRANTY STATED IN THIS SECTION E IS IN LIEU OF ALL OTHER WARRANTIES WRITTEN OR ORAL, STATUTORY, EXPRESS, OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

4. Without limiting the generality of the foregoing exclusion, if the products are made according to purchaser's specifications, Franklin Electric does not warrant the adequacy of such specifications or that the product will perform in accordance with such specifications.

5. The warranty stated in this Section E does not apply to products that have been subject to misuse (including use in a manner inconsistent with the design of the product), abuse, neglect, accident or improper installation or maintenance, or to products that have been altered or repaired by anyone other than Franklin Electric or its authorized representative.

F. FREIGHT

1,000 pounds or more will be shipped from a Franklin facility to a location within the continental United States at Franklin Electric's expense, unless otherwise stated in divisional sales policies.

G. REMEDIES

1. FRANKLIN ELECTRIC'S REMEDIES

In addition to and not withstanding any other remedy to which Franklin Electric may be entitled by law in the event of Purchaser's breach of its obligations hereunder, or if Purchaser should cancel this Contract, whole or in part, or refuse to accept the products shipped hereunder, or wrongfully rejects or revokes its acceptance of products shipped that conform to the Contract, Franklin Electric, shall be entitled to recover all special engineering, design, tooling, manufacturing, storage, or transportation costs incurred in connection with Franklin Electric's performance of this Contract.

2. PURCHASER'S REMEDIES

a. Purchaser shall be entitled to reject any products that fail to conform to the Contract, or, after acceptance, to revoke its acceptance with respect to non-conforming goods, upon giving Franklin Electric timely notice thereof (including a concise but accurate statement of the nonconformity) and holding the nonconforming product for Franklin Electric's further instruction.

b. PURCHASER'S SOLE AND EXCLUSIVE REMEDY FOR FRANKLIN ELECTRIC'S BREACH OF ITS OBLIGATIONS HEREUNDER, INCLUDING BREACH OF ANY EXPRESS OR IMPLIED WARRANTY OR OTHERWISE, unless provided on the face hereof or in a written instrument made part of this contract, SHALL BE FOR THE REPAYMENT OF ANY MONIES THERETOFORE PAID TO FRANKLIN ELECTRIC OR FOR THE REPAIR OR REPLACEMENT OF NONCONFORMING OR DEFECTIVE PRODUCTS, AT FRANKLIN ELECTRIC'S ELECTION. FRANKLIN ELECTRIC SHALL IN NO EVENT BE LIABLE FOR ANY OF PURCHASER'S INCIDENTAL EXPENSES (INCLUDING COSTS OF INSPECTION, TESTING, STORAGE, OR TRANSPORTATION), ANY OTHER CHARGES, COSTS, OR EXPENSE, OR CONSE-

QUENTIAL DAMAGES INCURRED BY PURCHASER OR BY ANY THIRD PARTY (INCLUDING LOST PROFITS, LOST BUSINESS OPPORTUNITIES, LIABILITY TO THIRD PARTIES, OR FAILURE TO MEET PURCHASER'S OR ANY THIRD PARTIES REQUIREMENTS), REGARDLESS OF WHETHER FRANKLIN ELECTRIC IS SHOWN TO BE AT FAULT, AND REGARDLESS OF WHETHER THERE IS SHOWN TO HAVE BEEN A DEFECT IN MATERIALS OR WORKMANSHIP, NEGLIGENCE IN MANUFACTURE OR DESIGN, OR FAILURE TO WARN.

C. Franklin Electric's liability arising out of the sale and delivery of its products, or their use, whether based upon warranty, contract, negligence, or otherwise, shall not in any case exceed the cost of repair or replacement of the product and, upon expiration of any applicable warranty period, all such liability shall terminate.

H. INFRINGEMENT

1. With respect to Franklin Electric's own standard designs and specifications, or specialty products which it has engineered and designed, Franklin Electric shall defend, indemnify and hold Purchaser harmless from and against any loss, damage, costs or expenses arising out of any third party claims of patent or trademark infringement relating to such products, so long as Purchaser promptly notifies Franklin Electric in writing of any such claim and gives Franklin Electric such authority, information and assistance as it may request in connection with the defense thereof.

2. Purchaser shall defend, indemnify and hold Franklin Electric harmless from and against any loss, damage, costs, or expenses arising out of any claims of patent or trademark infringement relating to products manufactured by Franklin Electric according to designs or specifications furnished by Purchaser.

I. SPECIAL TOOLING

Any special tools, dies, jigs, molds, or other equipment manufactured or purchased by Franklin Electric for this Contract, regardless of whether included as part of Franklin Electric's pricing, shall remain Franklin Electric's exclusive property, unless otherwise provided herein.

J. FORCE MAJEURE

Franklin Electric shall not be liable for failure to deliver or to perform its contractual responsibilities if due to causes beyond its reasonable control or the reasonable control of its suppliers, or due to acts of God, acts of civil or military authority, judicial action, fires, strikes, floods, wars, transportation delays, or inability due to causes beyond its reasonable control to obtain necessary labor, materials or manufacturing facilities.

K. APPLICABLE LAW

This contract shall be construed and its performance governed by the laws of the State of Indiana.



Franklin Electric
Bluffton, Indiana 46714

CONDITIONS OF SALE

CONDITIONS OF SALE: All orders for products or services of Furnas Electric Company are subject to these conditions of sale. No modifications of, or additions to, these terms will be recognized by the company unless specifically agreed to in writing by an authorized officer of Furnas Electric Company. Failure of Furnas Electric Company to object to revisions herein or any provisions in conflict with any part of this instrument, contained in any prior or subsequent order or communication from a purchaser shall not be construed as a waiver of these conditions nor an acceptance of any such provision.

PRICES: PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE. Published prices shown in Furnas Electric catalogs and price bulletins provide a price and catalog number guide for the selection and application of a specific control. All prices are subject to confirmation by quotation from authorized personnel of Furnas Electric Company.

In the event of a net price change, the price of equipment on order but unshipped will be adjusted to the price in effect at the time of shipment. Downward adjustment of prices shall only apply to unshipped portions of outstanding orders.

Written quotations must be for specific quantities, catalog number, price and delivery date(s). In lieu of a catalog number, complete specifications must be included in the quotation.

Unless noted otherwise on the written quotation, they are conditioned upon acceptance by purchaser within thirty (30) days from date issued and shall be considered as offers by Furnas to sell during such thirty (30) day period unless sooner terminated by notice.

Motor Control Center Price(s) quoted are firm for a period of nine (9) months from date of the quotation. Any order resulting from the quotation will be invoiced at the quoted price(s), or revised price resulting from changes in requirements, provided the equipment ordered is to be shipped within the nine (9) month period from date of the quotation. Shipments requested to be made in excess of the nine (9) month period, but not exceeding twelve (12) months additional (total of twenty-one (21) months from date of the quotation), will be invoiced to include a price escalation amount of 1/2 of 1% per month on the unpaid balance.

WEIGHTS & DIMENSIONS: Catalog weights and dimensions are carefully calculated estimates but are not guaranteed.

TAXES: Published or quoted prices do not include sales, excise, use or similar taxes. Applicable taxes must be paid by the Purchaser.

MINIMUM BILLING: Orders amounting to less than \$50.00 net will be billed at \$50.00.

ORDERS: All orders must be bonafide commitments showing definite prices, mutually agreed upon delivery dates, stipulated quantities and complete item descriptions.

PENALTIES AND DELAYS: No penalty clause of any kind will be effective unless approved in writing by an authorized officer of Furnas Electric Company. The company will not be liable for any damages caused by delays beyond Furnas Electric Company's reasonable control including, without limitation, fire, strike, act of the Purchaser, restrictions by civil or military authority, act of God, transportation failures or inability to obtain labor, materials or manufacturing facilities. In the event of any such delay, the date of delivery shall be extended for a period equal to the time less by reason of the delay.

ACCEPTANCE: No order or commitment is binding upon the company until accepted at a point of shipment by an authorized official of Furnas Electric.

CANCELLATION AND ALTERATION: Any order or contract may be cancelled or altered by the Purchaser only upon payment of reasonable charges based upon expenses already incurred and commitments made by Furnas Electric Company. Furnas Electric reserves the right to manufacture ahead of the shipping schedule whenever it is deemed necessary, and such advance manufacture shall not void buyer's responsibility for cancellation or alteration.

DELIVERY: Except for Class 70 Enclosures and Parts and Class 73 Safety Switches, Prices are F.A.B. Furnas Electric Company plant or point of shipment with transportation prepaid to a specific destination or to any common carrier free delivery point within the Continental United States, via the carrier selected by Furnas Electric Company to be the most economical and dependable. Prices for Class 70 enclosures and Class 73 Safety Switches are F.A.B. Furnas Electric Company plant or point of shipment with transportation prepaid based on a single order containing 250 lbs. (Class 73) or 500 lbs. (Class 70) or more routed in one shipment to a single destination or to any common carrier free delivery point within the Continental United States via the carrier selected by Furnas Electric Company to be the most economical and dependable. Orders for shipment to the Western States of Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming, and to any part of export in those Western States, Freight will be prepaid and allowed but a surcharge of \$5.00 per hundred weight will be added to the invoice. Additional cost of shipping by a more expensive carrier requested by the Purchaser will be billed to the Purchaser. No credit or rebate will be allowed the Purchaser for the difference between prepaid shipping cost of a carrier which charges less and the charges of the carrier normally selected by Furnas Electric Company. No shipping allowance or credit for factory pickups.

Shipments to Alaska, Hawaii and to other destinations outside of the contiguous states of the United States will be absorbed to any designated point of embarkation from the Continental United States. Overland shipments to Alaska will be prepaid to the designated point of entry into Canada via carrier selected by Furnas Electric Company.

Special handling, insurance or other above normal costs at or beyond the

port of embarkation or point of entry will be charged to the Purchaser. Special packaging for marine shipping or required in transport across foreign territory will be billed to the Purchaser.

DAMAGE AND LOSS: Furnas Electric products are packed in specially designed cartons to protect the devices from damage during shipment. Upon delivery to the carrier and his receipt for the merchandise, responsibility for the delivery intact to the destination rests with the carrier.

All shipments should be inspected upon receipt at the destination for visible or concealed damage. Claims for loss or damage should be filed with the carrier immediately. A concealed damage claim is required when damage is not externally visible. Furnas Electric will assist insofar as is practical in securing satisfactory adjustment of claims, however, all claims for loss and damage must be made by the Purchaser to the carrier.

TERMS OF PAYMENT AND RESERVATION OF TITLE: Terms to buyers of satisfactory credit are as follows:

1. Schedule "MP" pressure switches sold on net price schedule — net 30 days
2. Schedule "DP" definite purpose controls sold on net price schedule — net 30 days
3. Schedule "MA" motor control centers — net 30 days
4. Service or engineering charges — net 30 days
5. All other products — 2% 10 days — net 30 days

Furnas Electric Company reserves the right to require full or partial payment in advance of shipment where the financial condition of the Purchaser does not justify continuance of production or shipment on the terms of payment specified. Orders from Purchasers with unapproved credit ratings may be shipped C.O.D. after Purchaser's approval and goods shipped will be subject to reservation of title in Furnas until the purchase price shall be paid in full.

RESPONSIBILITY: Furnas Electric Company is not responsible for misuse or misapplication of its products, intentional or otherwise. Improper application, installation, failure to provide safety devices for protective measures, or operation above the rated capacity are all beyond the control and responsibility of the Furnas Electric Company. **UNDER NO SUCH CIRCUMSTANCES** will Furnas Electric Company be liable for consequential or contingent damages.

RETURN OF EQUIPMENT UNDER NO CIRCUMSTANCES IS EQUIPMENT TO BE RETURNED WITHOUT FIRST OBTAINING FURNAS ELECTRIC COMPANY'S PERMISSION AND A RETURNED MATERIAL IDENTIFICATION TAG.

Unless authority has been granted for return, shipment will be refused. Apparatus built to a customer's specifications cannot be returned for credit under any condition.

Equipment must be properly packed to protect against physical damage during shipment and must be shipped prepaid. Transportation charges are borne by the customer on all returned goods.

Credit will be allowed on returned goods on the following basis — Only unused items as currently manufactured which have been inventoried to the customer within one year will be considered. Material ordinarily carried in stock will be accepted for return subject to a minimum service charge of \$50.00 or 10% if the billing invoice is more than \$500.00 net. All material must be returned in perfect condition. Any cost incurred by Furnas Electric Company to put returned goods in perfect condition will be charged to the Purchaser. Items built to order are not subject to return. No credit memo will be issued where any amount less than \$50.00 is involved except to correct errors made by Furnas Electric Company. If return is the fault of Furnas Electric Company, full credit will be allowed including all transportation charges.

WARRANTY: Furnas Electric Company warrants the equipment manufactured by it to be free from defects in materials or workmanship under normal use and service, its obligations under this warranty being limited to replacing at its factory any product, part, or parts thereof which shall, within one year after delivery of such equipment to the original purchaser, be returned to it with transportation charges prepaid, and which Furnas Electric Company's examination shall disclose to its satisfaction to have been thus defective. Except for the warranty hereinbefore stated, **FURNAS ELECTRIC MAKES NO WARRANTY EXPRESSED OR IMPLIED; AND ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE IS HEREBY DISCLAIMED BY FURNAS ELECTRIC AND EXCLUDED FROM ANY AGREEMENT MADE BY ACCEPTANCE OF ANY ORDER PURSUANT TO THIS QUOTATION. THERE ARE NO WARRANTIES, EITHER EXPRESSED OR IMPLIED, WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF.** Furnas Electric Company neither assumes nor authorizes any person to assume for it any other liability in connection with the sale of its equipment. This warranty will not apply to any equipment which shall have been repaired or altered outside of Furnas Electric Company's factory in any way so as, in Furnas Electric Company's judgment, to affect its stability, or reliability, nor which has been subject to misuse, negligence, or accident or to improper operation or storage, or to other than normal use or service. Furnas Electric Company shall not be liable for damages, direct or consequential, or delays, if such occur on account of defective materials, or workmanship, or delays in shipment. Furnas Electric Company will not grant any allowance for any repairs or alterations made without written consent of an executive officer of the Furnas Electric Company. Furnas Electric Company shall in no way be liable or responsible for injuries or damages to persons or property, arising from or out of the use or operation of the equipment within described. Furnas Electric Company reserves the right to make changes in design, or to make additions to, or improvements in, its product without incurring any obligations upon itself to install them on its products previously manufactured. No further guarantee given by Distributor to its customers shall be binding upon Furnas Electric Company.

Furnas

Conditions of Sale

CONDITIONS OF SALE: All orders for products or services of Furnas Electric Company ("Furnas") are subject to these conditions of sale. No modifications or additions to these terms will be recognized by Furnas unless specifically agreed to in writing by an authorized officer of Furnas. Failure of Furnas to object to revisions herein or any provisions in conflict with any part of this instrument, contained in any prior or subsequent order or communication from a purchaser shall not be construed as a waiver of these conditions nor an acceptance of any such provisions. In the event purchaser issues his own purchase order or prepares a contract based upon this proposal, the terms and conditions stated herein shall be deemed to be incorporated in the said purchase order or contract and further, in areas of conflict or questions, Furnas' terms and conditions shall take precedence.

PRICES: PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE. Furnas reserves the right to increase or decrease any price without notice. Published prices shown in Furnas catalogs and price bulletins provide a price and catalog number guide for the selection and application of a specific product. All prices are subject to confirmation by quotation from authorized personnel of Furnas.

In the event of a net price change, the price of equipment on order but unshipped will be adjusted to the price in effect at the time of shipment. Downward adjustment of prices shall only apply to unshipped portions of outstanding orders.

Written quotations to be binding must be for specific products, quantities, catalog numbers, price and delivery date(s). In lieu of a catalog number, complete specifications must be included in the quotation. All stenographic and clerical errors are subject to correction.

Unless noted otherwise on the written quotations, written quotations are conditioned upon written acceptance by purchaser within thirty (30) days from date issued and shall be considered as offers by Furnas to sell during such thirty (30) day period unless Furnas terminates by written notice. All written quotations automatically expire unless accepted within thirty (30) days of the date quoted. Any extension of the thirty (30) days written quote shall be in writing and signed by authorized personnel of Furnas.

Verbal quotations expire same day they are made.

Motor Control Center price(s) quoted are firm for a period of six (6) months from date of the order. Any order resulting from the quotation will be invoiced at the quoted price(s), or revised price resulting from changes in requirements, provided the product ordered is shipped within six (6) months from the date of the order. If the product ordered is shipped more than six (6) months from the date of order, but before eighteen (18) months from the date of the order, the invoice will include a price escalation amount of 1% per month on the unshipped product(s). On orders shipped after eighteen (18) months from date of order, Furnas reserves the right to re-quote prices to present pricing levels.

CATALOG PRICES: Prices shown in any Furnas publication are subject to change without notice and are not to be construed as a definite quotation or offer to sell by Furnas. Such publications are maintained only as a source of general information, and any prices shown therein are subject to confirmation with a specific quotation.

WEIGHTS & DIMENSIONS: Catalog weights and dimensions are carefully calculated estimates but are not guaranteed. Weights and dimensions shown in catalog are approximate only.

TAXES: Published or quoted prices do not include sales, excise, use or similar taxes. Applicable taxes must be paid by the purchaser or in lieu thereof, purchaser shall furnish Furnas, at the time of order, with an acceptable tax exempt certificate.

MINIMUM BILLING: Orders amounting to less than \$100.00 net will be billed at \$100.00.

ORDERS: All orders must be bonafide commitments showing definite prices, mutually agreed upon delivery dates, stipulated quantities and complete product descriptions.

ACCEPTANCE: No order or commitment is binding upon Furnas until accepted at a point of shipment by authorized personnel of Furnas.

PENALTIES AND DELAYS: No penalty clause of any kind will be effective unless approved in writing by an authorized officer of Furnas. Furnas will not be liable for any damages caused by delays beyond Furnas' reasonable control including, without limitation, fire, war, strike, act of the purchaser, restrictions by civil or military authority, act of God, transportation failures, breakage of equipment, or inability to obtain labor, products or manufacturing facilities. In the event of any such delay, the date of delivery shall be extended for a period equal to the time lost by reason of the delay. Furnas shall not be liable for liquidated, incidental, or consequential damages for delays for products or components caused beyond Furnas' reasonable control.

CANCELLATION AND ALTERATION: Any order or contract may be cancelled or altered by the purchaser only upon payment of reasonable charges based upon expenses already incurred and commitments made by Furnas. Furnas reserves the right to manufacture ahead of the shipping schedule whenever it is deemed necessary, and such advance manufacture shall not void purchaser's responsibility for cancellation or alteration.

DELIVERY: Prices are f.o.b. Furnas point of shipment with freight and handling prepaid and allowed (except motor control centers and custom control panel orders) to a specific destination or to any common carrier free delivery point within the Continental United States, via the carrier selected by Furnas to be the most economical and dependable.

On motor control centers and custom panel orders, for orders \$2,000.00 net or greater, a freight and handling charge of 2% (\$120.00 net minimum) will be added to the order as a separate item. For orders less than \$2,000.00 net, a freight and handling charge of 6% (\$20.00 net minimum) will be added to the order as a separate item.

Additional cost of shipping by a more expensive carrier requested by the purchaser will be at purchaser's expense. No credit or rebate will be allowed the purchaser for the difference between prepaid shipping cost of a carrier which charges less and the charges of the carrier normally selected by Furnas. No shipping allowance or credit for factory pickups.

Shipments to Alaska, Hawaii and to other destinations outside of the contiguous states of the United States will be prepaid and allowed to the first specified destination within the Continental United States. Overland shipments to Alaska will be prepaid to the designated point of entry into Canada via carrier selected by Furnas.

Special handling, insurance or other above normal costs at or beyond the port of embarkation or point of entry will be at purchaser's expense. Special packaging for marine shipping or required in transport across foreign territory will be at purchaser's expense. Quoted shipment dates are estimates, are not guaranteed by Furnas and it assumes no liability for delay.

DAMAGE AND LOSS: Furnas products are packed in specially designed cartons to protect the product from damage during shipment. Upon delivery to the carrier and his receipt for the merchandise, responsibility for the delivery intact to the destination rests with the carrier.

All shipments shall be inspected upon receipt at the destination for visible or concealed damage. Claims for loss or damage should be filed with the carrier immediately. A concealed damage claim is required when damage is not externally visible. Furnas will assist insofar as is practical in securing satisfactory adjustment of claims, however, all claims for loss and damage must be made by the purchaser to the carrier.

TERMS OF PAYMENT AND RESERVATION OF TITLE: Terms to purchaser of satisfactory credit are as follows:

1. Schedule "P" pressure switches sold on net price schedule - net 30 days from date of invoice.
2. Schedule "DP" definite purpose controls sold on net price schedule - net 30 days from date of invoice.
3. Schedule "M" motor control centers - net 30 days from date of invoice.
4. Service or engineering charges - net 30 days from date of invoice.
5. All other products - 2% 10 days - net 30 days from date of invoice.

Furnas reserves the right to require full or partial payment in advance of shipment, and if this is required, no cash discount is allowed. Orders from purchasers may be shipped C.O.D. after purchaser's approval and product shipped will be subject to reservation of title in Furnas until the purchase price shall be paid in full.

TERMS OF PAYMENT OF DISTRIBUTORS: Refer to the Marketing Partner's Guide File No. D4-A

RESPONSIBILITY: Furnas is not responsible for misuse or misapplication of its products, intentional or otherwise. Improper storage, application, installation, failure to provide safety devices for protective measures, or operation above the rated capacity are all beyond the control and responsibility of Furnas. Under no such circumstances will Furnas be liable for consequential or contingent damages.

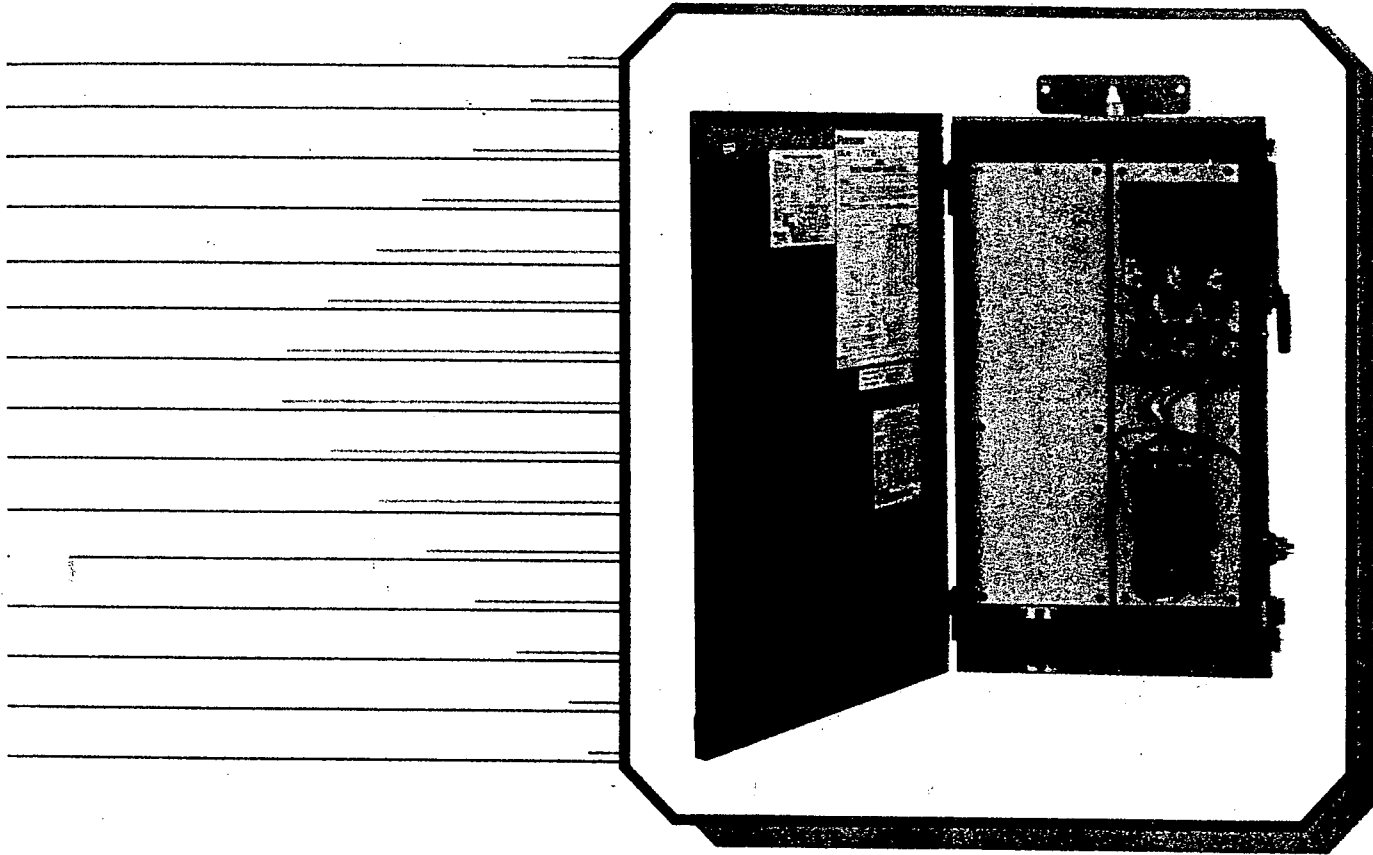
RETURN OF PRODUCT: Under no circumstances is product to be returned without first obtaining Furnas' permission and a return goods authorization. Unless authority has been granted for return, shipment will be refused. Apparatus built to purchaser's specifications cannot be returned for credit under any condition.

Returned product must be properly packed to protect against physical damage during shipment and must be shipped prepaid. Transportation charges, which include freight and handling, on all returned products will be at purchaser's expense.

Credit will be allowed on returned products on the following basis - Only unused items as currently manufactured which have been invoiced to the purchaser within one year will be considered. Products ordinarily carried in stock will be accepted for return subject to a minimum service charge of \$100.00, or 10% of the billing invoice if the billing invoice is more than \$1,000.00 net. All products must be returned in original factory condition. Any cost incurred by Furnas to put returned products in original factory condition will be charged to the purchaser. Products built to order are not subject to return. No credit memo will be issued where any amount less than \$100.00 is involved except to correct errors made by Furnas. If return is the fault of Furnas, full credit will be allowed including all transportation charges.

WARRANTY: Furnas warrants the product manufactured by it to be free from defects in materials or workmanship under normal use and service. Its obligations under this warranty being limited to replacing at its factory any product, part, or parts thereof which shall, within one year after delivery of such product to the original purchaser, be returned to it with transportation charges prepaid, and which Furnas' examination shall disclose to its satisfaction to have been thus defective. Except for the warranty hereinbefore stated, FURNAS MAKES NO WARRANTY EXPRESSED OR IMPLIED; AND ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE IS HEREBY DISCLAIMED BY FURNAS AND EXCLUDED FROM ANY AGREEMENT MADE BY ACCEPTANCE OF ANY ORDER PURSUANT TO THIS QUOTATION. THERE ARE NO WARRANTIES, EITHER EXPRESSED OR IMPLIED, WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. Furnas neither assumes nor authorizes any person to assume for it any other liability in connection with the sale of its product. This warranty will not apply to any product which shall have been repaired or altered outside of Furnas' factory in any way so as, in Furnas' judgment, to affect its stability or reliability, nor which have been subject to misuse, negligence, accident, improper operation or storage, or subject to other than normal use or service. FURNAS SHALL NOT BE LIABLE FOR DAMAGES, DIRECT OR CONSEQUENTIAL OR DELAYS, IF SUCH OCCUR ON ACCOUNT OF DEFECTIVE MATERIALS, OR WORKMANSHIP, OR DELAYS IN SHIPMENT. Furnas will not grant any allowance for any repairs or alterations made without written consent of authorized personnel. Furnas shall in no way be liable or responsible for injuries or damages to persons or property, arising from or out of the use or operation of the product within described. Furnas reserves the right to make changes in design, or to make additions to, or improvements in, its products without imposing any obligations upon itself to install them on its products previously manufactured. No further guarantee given by Distributor to its customers shall be binding upon Furnas.

745 6664



**Pump Controllers with ESP100
Overload and Phase Loss Protection**

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Features

- Heavy Duty NEMA Starters
- Solid State or Thermal Overload Relays
- Fusible or MCP
- Heavy Duty Disconnect Handle
- Flexibility with Field Modifications
- Alternator Transfer on De-energization
- UL Listed for Outdoor Use and Service Equipment File #E14900
- CSA Certified File #LR6535

Application

Duplex pump controls are designed to perform either or both of two distinct functions: **duplexing** and **alternation**. The duplexing function provides capacity for system peaking or above normal demand without having the full motor capacity spinning at all times. It also provides standby capacity for use when one of the motors or pumps is disabled. The duplexing function is also referred to as lead/lag or main/standby. When

two pumps or compressors are controlled by a duplex controller, they are started in sequence as necessary to attain preset values of pressure, flow or liquid level.

Two pilot devices such as pressure switches or float switches provide electrical signals to the duplex controller. One pilot device is set to initiate the starting of the lead motor. This motor is rated to handle normal system demand. The second motor is usually the same rating and is referred to as the lag motor. It is only energized when the system demand is greater than the capacity of the lead motor. The lag motor is started when the second pilot device is signalling for more output than the lead motor can produce.

The alternation function reverses the lead and lag mode for the two motors in a duplex system. Upon alternation the first motor as described above becomes the lag motor and the second motor assumes the lead function.

The alternation is usually programmed to occur at any time both pumps come to rest. The alternation function equalizes wear on the two machines and extends the life of seals and bearings.

Features

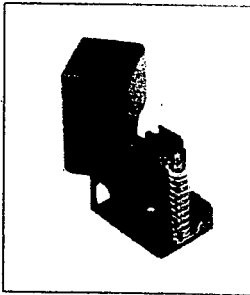
Two control transformers may be provided for low voltage control to safeguard personnel from high voltage. One transformer is required for each starter to provide independent control circuits.

A Hand-Off-Auto selector switch for each starter may be assembled in the enclosure door or furnished separately for remote control. Test push buttons or pilot lights may also be installed on the enclosure.

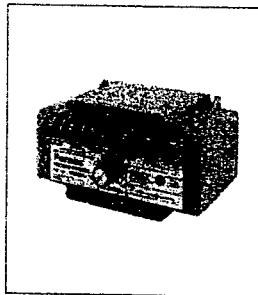
Solid-state or melting alloy overload relays are supplied as standard. Ambient compensated bimetal overload relays are offered as an option.

Auxiliary Equipment

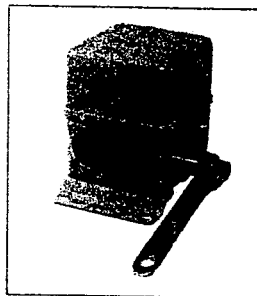
- Furnas Controls has an extensive line of water and air pressure switches. If pilot duty requires a pressure switch see pages 460-461, in PC6000.
- For applications which require a float switch see page 461, in PC6000.
- For undervoltage and phase sensing relays see pages 652-653, in PC6000.



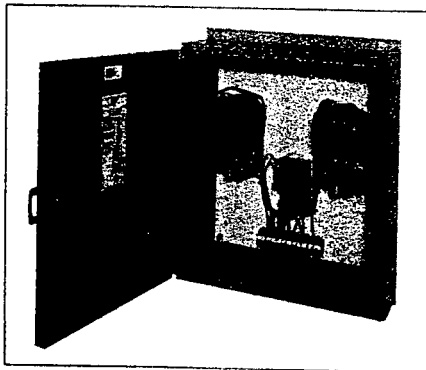
Pressure Switch



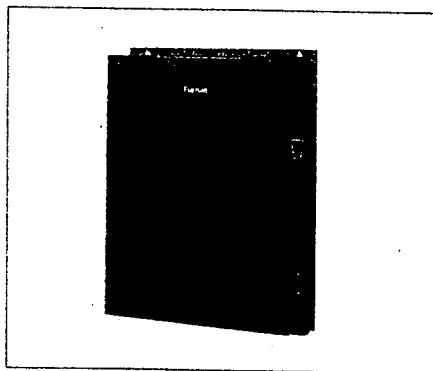
Voltage Monitor



Float Switch



Class 83 Controller Only



Class 84 Combination Controller with 2 MCPs

Duplex Heavy Duty Controllers

Selection

Solid-State and Melting Alloy Overload Class 83

Ordering Instructions	Coil Table	Overload Table	Additional References																																																				
<ul style="list-style-type: none"> ▶ Use complete catalog number. Replace the (*) with letter from the coil table. ▶ Use complete catalog number. For controllers with solid state overloads replace the (†) with the letter that corresponds to the correct FLA in the overload table. ▶ For single phase controllers with thermal overload, add suffix SP1 for 115V or SP2 for 230V. No price adder. 	<table border="1"> <thead> <tr> <th>60Hz Voltage</th> <th>Letter</th> </tr> </thead> <tbody> <tr><td>24 Separate Control</td><td>J</td></tr> <tr><td>120 Separate Control</td><td>F</td></tr> <tr><td>200-208</td><td>D</td></tr> <tr><td>220-240</td><td>G</td></tr> <tr><td>277</td><td>L</td></tr> <tr><td>440-480</td><td>H</td></tr> <tr><td>550-600</td><td>E</td></tr> </tbody> </table>	60Hz Voltage	Letter	24 Separate Control	J	120 Separate Control	F	200-208	D	220-240	G	277	L	440-480	H	550-600	E	<table border="1"> <thead> <tr> <th>Size</th> <th>FLA</th> <th>†</th> </tr> </thead> <tbody> <tr><td>0, 1</td><td>0.25-1</td><td>A</td></tr> <tr><td>0, 1</td><td>0.75-3</td><td>B</td></tr> <tr><td>0, 1</td><td>2.5-10</td><td>D</td></tr> <tr><td>0-1¼</td><td>9-18</td><td>E</td></tr> <tr><td>1-4</td><td>13-27</td><td>F</td></tr> <tr><td>1¼</td><td>20-40</td><td>G</td></tr> <tr><td>2-4</td><td>22-45</td><td>H</td></tr> <tr><td>2½-4</td><td>30-60</td><td>J</td></tr> <tr><td>3-4</td><td>45-90</td><td>K</td></tr> <tr><td>3½-4</td><td>57-115</td><td>L</td></tr> <tr><td>4</td><td>67-135</td><td>M</td></tr> </tbody> </table>	Size	FLA	†	0, 1	0.25-1	A	0, 1	0.75-3	B	0, 1	2.5-10	D	0-1¼	9-18	E	1-4	13-27	F	1¼	20-40	G	2-4	22-45	H	2½-4	30-60	J	3-4	45-90	K	3½-4	57-115	L	4	67-135	M	<ul style="list-style-type: none"> ▶ Field modification kits see page 8. ▶ Factory modifications see pages 9-10. ▶ For 380 volt 50 hertz information see page 129 in PC6000. ▶ Dimensions see page 11. ▶ Wiring diagrams see pages 12-13. ▶ Replacement parts see pages 37-38. ▶ Hubs available for NEMA 4 see page 438 in PC6000.
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For other voltages and frequencies see page 124, in PC6000.																																																							

Non-Combination (with Solid-State Overload)

Max Hp						Enclosure					
200 Volts	230 Volts	460 Volts	575 Volts	NEMA Size	Half Size	NEMA 1 General Purpose		NEMA 4/4X [Ⓞ] Watertight Painted		NEMA 12 NEMA 3/3R [Ⓞ] Industrial Use Weatherproof	
						Catalog No	Price \$	Catalog No	Price \$	Catalog No	Price \$
3	3	5	5	0	—	83CS192B*	1032	83CS192E*	1362	83CS1920*	1134
7½	7½	10	10	1	—	83DS192B*	1098	83DS192E*	1440	83DS1920*	1200
10	10	15		—	1¼	83ES192B*	1278	83ES192E*	1620	83ES1920*	1380
10	15	25	25	2	—	83FS192B*	1626	83FS192E*	2340	83FS1920*	1890
15	20	30		—	2½	83GS192B*	1944	83GS192E*	3288	83GS1920*	2286
25	30	50	50	3	—	83HS192B*	2208	83HS192E*	3552	83HS1920*	2550
30	40	75		—	3½	83IS192B*	3972	83IS192E*	6264	83IS1920*	5106
40	50	100	100	4	—	83JS192B*	4452	83JS192E*	6744	83JS1920*	5586

on-Combination (with Melting Alloy Overload)

Max Hp						Enclosure					
200 Volts	230 Volts	460 Volts	575 Volts	NEMA Size	Half Size	NEMA 1 General Purpose		NEMA 4/4X [Ⓞ] Watertight Painted		NEMA 12 NEMA 3/3R [Ⓞ] Industrial Use Weatherproof	
						Catalog No	Price \$	Catalog No	Price \$	Catalog No	Price \$
3	3	5	5	0	—	83CP92B*	978	83CP92E*	1308	83CP920*	1080
7½	7½	10	10	1	—	83DP92B*	1044	83DP92E*	1386	83DP920*	1146
10	10	15	15	—	1¼	83EP92B*	1224	83EP92E*	1566	83EP920*	1326
10	15	25	25	2	—	83FP92B*	1572	83FP92E*	2286	83FP920*	1836
15	20	30	30	—	2½	83GP92B*	1890	83GP92E*	3234	83GP920*	2232
25	30	50	50	3	—	83HP92B*	2154	83HP92E*	3498	83HP920*	2496
30	40	75	75	—	3½	83IP92B*	3918	83IP92E*	6210	83IP920*	5052
40	50	100	100	4	—	83JP92B*	4398	83JP92E*	6690	83JP920*	5532

ⓄNEMA 12 may be field modified for NEMA 3/3R, see page 119, in PC6000.

ⓄFor NEMA 4X enclosures see factory modifications on page 439, in PC6000.

Combination Duplex Heavy Duty Controllers

Selection

Disconnect Type, Non-Fusible with Solid State or Melting Alloy Overload Class 84

Ordering Instructions	Coil Table	Overload Table	Additional References																																																				
<ul style="list-style-type: none"> ▶ Use complete catalog number. Replace the (*) with letter from the coil table. ▶ Use complete catalog number. For controllers with solid state overloads replace the (†) with the letter that corresponds to the correct FLA in the overload table. ▶ For single phase controllers with thermal overload, add suffix SP1 for 115V or SP2 for 230V. No price adder. 	<table border="1"> <thead> <tr> <th>60Hz Voltage</th> <th>Letter</th> </tr> </thead> <tbody> <tr><td>24 Separate Control</td><td>J</td></tr> <tr><td>120 Separate Control</td><td>F</td></tr> <tr><td>200-208</td><td>D</td></tr> <tr><td>220-240</td><td>G</td></tr> <tr><td>277</td><td>L</td></tr> <tr><td>440-480</td><td>H</td></tr> <tr><td>550-600</td><td>E</td></tr> </tbody> </table>	60Hz Voltage	Letter	24 Separate Control	J	120 Separate Control	F	200-208	D	220-240	G	277	L	440-480	H	550-600	E	<table border="1"> <thead> <tr> <th>Size</th> <th>FLA</th> <th>†</th> </tr> </thead> <tbody> <tr><td>0, 1</td><td>0.25-1</td><td>A</td></tr> <tr><td>0, 1</td><td>0.75-3</td><td>B</td></tr> <tr><td>0, 1</td><td>2.5-10</td><td>D</td></tr> <tr><td>0-1¼</td><td>9-18</td><td>E</td></tr> <tr><td>1-4</td><td>13-27</td><td>F</td></tr> <tr><td>1¼</td><td>20-40</td><td>G</td></tr> <tr><td>2-4</td><td>22-45</td><td>H</td></tr> <tr><td>2½-4</td><td>30-60</td><td>J</td></tr> <tr><td>3-4</td><td>45-90</td><td>K</td></tr> <tr><td>3½-4</td><td>57-115</td><td>L</td></tr> <tr><td>4</td><td>67-135</td><td>M</td></tr> </tbody> </table>	Size	FLA	†	0, 1	0.25-1	A	0, 1	0.75-3	B	0, 1	2.5-10	D	0-1¼	9-18	E	1-4	13-27	F	1¼	20-40	G	2-4	22-45	H	2½-4	30-60	J	3-4	45-90	K	3½-4	57-115	L	4	67-135	M	<ul style="list-style-type: none"> ▶ Field modification kits see page 8. ▶ Factory modifications see pages 9-10. ▶ For 380 volt 50 hertz information see page 129 in PC6000. ▶ Dimensions see page 11. ▶ Wiring diagrams see pages 12-13. ▶ Replacement parts see pages 37-38. ▶ Hubs available for NEMA 4 see page 438 in PC6000.
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With Two Non Fusible Disconnect Switches Field Convertible to Fusible Disconnects and Solid-State Overload

Max Hp				NEMA Size	Half Size	Disc Amp Rating	Enclosure					
200 Volts	230 Volts	460 Volts	575 Volts				NEMA 1 General Purpose		NEMA 4/4X [Ⓞ] Watertight Painted		NEMA 12 NEMA 3/3R [Ⓞ] Industrial Use Weatherproof	
							Catalog No	Price \$	Catalog No	Price \$	Catalog No	Price \$
3	3	5	5	0		30	84CS192BD*	1626	84CS192ED*	2892	84CS1920D*	1944
7½	7½	10	10	1		30	84DS192BD*	1692	84DS192ED*	2958	84DS1920D*	2010
10	10	15	15		1¼	60	84ES192BD*	1872	84ES192ED*	3138	84ES1920D*	2190
10	15	25	25	2		60	84FS192BD*	2430	84FS192ED*	4386	84FS1920D*	2880
15	20	30	30		2½	60	84GS192BD*	3498	84GS192ED*	6906	84GS1920D*	4080
25	30	50	50	3		100	84HS192BD*	3762	84HS192ED*	7170	84HS1920D*	4344
30	40	75	75		3½	200	84IS192BD*	6384	84IS192ED*	10740	84IS1920D*	7998
40	50	100	100	4		200	84JS192BD*	6864	84JS192ED*	11220	84JS1920D*	8478

With Two Non Fusible Disconnect Switches Field Convertible to Fusible Disconnects and Melting Alloy Overload

Max Hp				NEMA Size	Half Size	Disc Amp Rating	Enclosure					
200 Volts	230 Volts	460 Volts	575 Volts				NEMA 1 General Purpose		NEMA 4/4X [Ⓞ] Watertight Painted		NEMA 12 NEMA 3/3R [Ⓞ] Industrial Use Weatherproof	
							Catalog No	Price \$	Catalog No	Price \$	Catalog No	Price \$
3	3	5	5	0		30	84CP92BD*	1572	84CP92ED*	2838	84CP920D*	1890
7½	7½	10	10	1		30	84DP92BD*	1638	84DP92ED*	2904	84DP920D*	1956
10	10	15	15		1¼	60	84EP92BD*	1818	84EP92ED*	3084	84EP920D*	2136
10	15	25	25	2		60	84FP92BD*	2376	84FP92ED*	4332	84FP920D*	2826
15	20	30	30		2½	60	84GP92BD*	3444	84GP92ED*	6852	84GP920D*	4026
25	30	50	50	3		100	84HP92BD*	3708	84HP92ED*	7116	84HP920D*	4290
30	40	75	75		3½	200	84IP92BD*	6330	84IP92ED*	10686	84IP920D*	7944
40	50	100	100	4		200	84JP92BD*	6810	84JP92ED*	11166	84JP920D*	8424

ⓄNEMA 12 may be field modified for NEMA 3/3R, see page 119, in PC6000.

ⓄFor NEMA 4X enclosures see factory modifications on page 439, in PC6000.

Combination Duplex Heavy Duty Controllers

Selection

Circuit Breaker Type, with Solid State or Melting Alloy Overload Class 84

Ordering Instructions	Coil Table		Overload Table			Additional References	
	60Hz Voltage	Letter	Size	FLA	†		
<ul style="list-style-type: none"> ▶ Use complete catalog number. Replace the (*) with letter from the coil table. ▶ Use complete catalog number. For controllers with solid state overloads replace the (†) with the letter that corresponds to the correct FLA in the overload table. ▶ For single phase controllers with thermal overload, add suffix SP1 for 115V or SP2 for 230V. No price adder. 	24 Separate Control	J	0, 1	0.25-1	A	<ul style="list-style-type: none"> ▶ Field modification kits see page 8. ▶ Factory modifications see pages 9-10. ▶ For 380 volt 50 hertz information see page 129 in PC6000. ▶ Dimensions see page 11. ▶ Wiring diagrams see pages 12-13. ▶ Replacement parts see pages 37-38. ▶ Hubs available for NEMA 4 see page 438 in PC6000. 	
	120 Separate Control	F	0, 1	0.75-3	B		
	200-208	D	0, 1	2.5-10	D		
	220-240	G	0-1½	9-18	E		
	277	L	1-4	13-27	F		
	440-480	H	1½	20-40	G		
	550-600	E	2-4	22-45	H		
	For other voltages and frequencies see page 124, in PC6000.			2½-4	30-60		J
				3-4	45-90		K
				3½-4	57-115		L
			4	67-135	M		

2 Motor Circuit Protectors with Solid-State Overload

Max Hp				NEMA Size	Half Size	Enclosure					
200 Volts	230 Volts	460 Volts	575 Volts			NEMA 1 General Purpose		NEMA 4/4X [Ⓞ] Watertight Painted		NEMA 12 NEMA 3/3R [Ⓞ] Industrial Use Weatherproof	
						Catalog No	Price \$	Catalog No	Price \$	Catalog No	Price \$
½	½	1	1	0	---	84CS192BM*	2100.	84CS192EM*	3366.	84CS192OM*	2418.
1½	1½	3	3	0	---	84CS192BM*	2100.	84CS192EM*	3366.	84CS192OM*	2418.
3	3	5	5	0	---	84CS192BM*	2100.	84CS192EM*	3366.	84CS192OM*	2418.
5	5	7½	10	1	---	84DS192BM*	2166.	84DS192EM*	3432.	84DS192OM*	2484.
7½	7½	10	10	1	---	84DS192BM*	2166.	84DS192EM*	3432.	84DS192OM*	2484.
10	10	15	15	---	1¾	84ES192BM*	2346.	84ES192EM*	3612.	84ES192OM*	2664.
10	15	25	25	2	---	84FS192BM*	2892.	84FS192EM*	4848.	84FS192OM*	3342.
15	20	30	30	---	2½	84GS192BM*	3750.	84GS192EM*	7158.	84GS192OM*	4332.
25	30	50	50	3	---	84HS192BM*	4014.	84HS192EM*	7422.	84HS192OM*	4596.
30	40	60	75	---	3½	84IS192BM*	7824.	84IS192EM*	12180.	84IS192OM*	9432.
---	---	75	75	---	3½	84IS192BM*	7824.	84IS192EM*	12180.	84IS192OM*	9432.
40	50	100	100	4	---	84JS192BM*	8304.	84JS192EM*	12660.	84JS192OM*	9912.

2 Motor Circuit Protectors with Melting Alloy Overload

Max Hp				NEMA Size	Half Size	Enclosure					
200 Volts	230 Volts	460 Volts	575 Volts			NEMA 1 General Purpose		NEMA 4/4X [Ⓞ] Watertight Painted		NEMA 12 NEMA 3/3R [Ⓞ] Industrial Use Weatherproof	
						Catalog No	Price \$	Catalog No	Price \$	Catalog No	Price \$
½	½	1	1	0	---	84CPA92BM*	2046.	84CPA92EM*	3312.	84CPA92OM*	2364.
1	1	3	3	0	---	84CPB92BM*	2046.	84CPB92EM*	3312.	84CPB92OM*	2364.
3	3	5	5	0	---	84CPC92BM*	2046.	84CPC92EM*	3312.	84CPC92OM*	2364.
½	½	1	1	1	---	84DPC92BM*	2112.	84DPA92EM*	3378.	84DPA92OM*	2430.
1	1	3	3	1	---	84DPB92BM*	2112.	84DPB92EM*	3378.	84DPB92OM*	2430.
3	3	7½	7½	1	---	84DPD92BM*	2112.	84DPD92EM*	3378.	84DPD92OM*	2430.
7½	7½	10	10	1	---	84DPE92BM*	2112.	84DPE92EM*	3378.	84DPE92OM*	2430.
10	10	---	---	---	1¾	84EPG92BM*	2292.	84EPG92EM*	3558.	84EPG92OM*	2610.
---	---	15	15	---	1¾	84EPF92BM*	2292.	84EPF92EM*	3558.	84EPF92OM*	2610.
7½	10	20	20	2	---	84FPH92BM*	2838.	84FPH92EM*	4794.	84FPH92OM*	3288.
10	15	25	25	2	---	84FPJ92BM*	2838.	84FPJ92EM*	4794.	84FPJ92OM*	3288.
---	---	30	30	---	2½	84GPK92BM*	3696.	84GPK92EM*	7104.	84GPK92OM*	4278.
15	20	---	---	---	2½	84GPL92BM*	3696.	84GPL92EM*	7104.	84GPL92OM*	4278.
---	---	30	30	3	---	84HPM92BM*	3960.	84HPM92EM*	7368.	84HPM92OM*	4542.
25	30	50	50	3	---	84HPN92BM*	3960.	84HPN92EM*	7368.	84HPN92OM*	4542.
30	40	75	75	---	3½	84IPP92BM*	7770.	84IPP92EM*	12126.	84IPP92OM*	9378.
40	50	100	100	---	4	84JPR92BM*	8250.	84JPR92EM*	12606.	84JPR92OM*	9858.


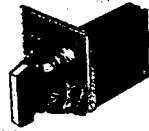
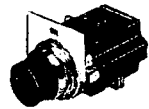

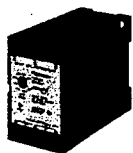

ⓄNEMA 12 may be field modified for NEMA 3/3R, see page 119, in PC6000.

ⓄFor NEMA 4X enclosures see factory modifications on page 439, in PC6000.

Duplex Heavy Duty Controllers

Selection

Field Modifications

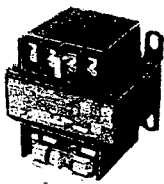
Description				Controller Size	Catalog No	Price \$
	Push Button	NEMA A600	Start, Stop	All	49SAPD5	48.
	Selector Switch	NEMA A600	Hand-Off-Auto Off-On	All All	49SASO1 49SASO4	48. 48.
	Pilot Light Red Lens	—	120VAC 120VAC Push to Test	All	49SPLOBRF 49SPLPBRF	90. 180.
	Auxiliary Contact Max additional Per Contactor 4 on Size 0-1 1/4 3 on Size 2-4	Front Mtg SPST NEMA A600	NO NC	0-4	49AAFO 49AAFC	36. 36.
	Voltage & Phase Monitor	3 Phase Open		All	208V 240V 380V 415V 480V 600V 47TA32DX1 47TA32GX1 47TA32PX1 47TA32KX1 47TA32HX1 47TA32EX1	282. 282. 297. 297. 297. 297.
	Anti Backspin Timer [®]			All		

Fuse Clip Field Kits

Disc Size Amps	Fuse Clip Amps	Volts	Kit No	Price \$
30/60	30	250	75P1045	12.
	30	600	75P1046	15.
	60	250	75P1046	15.
	60	600	75P1047	18.
	100	250/600	75P1038	63.
100	100	250/600	75P1048	63.
100	200	Factory Assembled Only	—	96.
200	200	Factory Assembled Only	—	96.

Note: Two Fuse Clip Kits required per Duplex Controller.

Control Power Transformer Kits

Description	Transformer Table			VA Rating	Catalog No	Price \$
	Primary Volts	Secondary Volts	Code			
Transformer 50/60HZ 	120	24	1	45 VA	KT1050	108.
	208	24	G	50 VA	KT1050P	144.
	208	120	H	100 VA	KT1100	150.
	240/480	24	4	150 VA	KT1150	201.
	240/480	120	8	200 VA	KT1200	225.
	277	24	5	300 VA	KT1300	277.
	277	120	7	500 VA	KT1500	330.
	600	24	6			
	600	120	9			

Recommended Transformer Size				
Control Size	0-2 1/2	3, 3 1/4	4	4 1/2, 5
Transformer VA	45 or 50	100	150	250

Discount Schedule AC-10 (FURN)

Siemens & Furnas Control Products

Duplex Heavy Duty Controllers

Selection

Factory Modifications


Control Circuit

Description	Modification	Catalog No Suffix	Enclosure Type	Controller Size/Price \$			
				0-1 1/4	2, 2 1/2	3, 3 1/2	4
2 Push Buttons	Start, Stop	A1	1, 3, 4, 12	264.	264.	264.	264.
2 Selector Switches	Hand-Off-Auto	A3	1	120.	120.	120.	120.
	Auto-Off	A6	3, 4, 12	264.	264.	264.	264.
	On-Off	A4					
Test Push Buttons	One per each starter	K1	1 3, 4, 12	96. 132.	96. 132.	96. 132.	96. 132.
Voltage Monitor	Class 47VA	R1	1, 3, 4, 12	1500.	1500.	1500.	1500.
Over Voltage Relay (Class 83 and 84 may require 2 Relays)		R4		1200.	1200.	1200.	1200.
Phase Failure and Reverse Relay	Class 47TA	R6	All	1056.	1056.	1056.	1056.

2 Pilot Lights, Transformer Type

Description	Lens Color	Legend	Catalog No Suffix	Enclosure Type	Controller Size/Price \$			
					0-1 1/4	2, 2 1/2	3, 3 1/2	4
1 per starter. Order other colors by description.	Red	On	FA	1, 3, 4, 12	324.	324.	324.	324.
	Green	On	FB					

Auxiliary Contact Starter or Contactor

Description	Catalog No Suffix	Controller Size/Price \$					
		0-1 1/4	2, 2 1/2	3, 3 1/2	4		
	NO SPST Innova Series	1 NO SPST Ea. Starter	G10	132.	132.	132.	132.
	NC SPST	1 NC SPST Ea. Starter	G01	132.	132.	132.	132.

Overload Relay (Substitute for each starter)

Description	Trip Class	Phase	Contacts	Catalog No Suffix	Controller Size/Price \$			
					0-1 1/4	2, 2 1/2	3, 3 1/2	4
Ambient Compensated Bimetal	10 or 20	3 Phase	NC	81	NC	NC	NC	NC
			NC & NO SPDT	91	72.	72.	—	—
		1 Phase	NC	8	NC	NC	—	—

Overload Relay (Substitute for each starter)

Description	Catalog No Change	Catalog No Suffix	Controller Size/Price \$				
			0-1 1/4	2, 2 1/2	3, 3 1/2	4	
Alternations [Ⓞ]							
Automatic with Isolated Control (Using Class 46 relay)	Change 92 to 93	—	NC	NC	NC	NC	NC
Manual with Isolated Control (Using Lead Pump Transfer Selector Switch)	Change 92 to 94	—	NC	NC	NC	NC	NC
Omissions							
Omit Automatic Alternator	Change 92 to 95	—	Deduct 366.	366.	366.	366.	366.
Enclosure							
Deadfront with padlockable door	—	Y100	540.	540.	NA	NA	NA
Stainless steel enclosure (price increase to NEMA 4 painted) Change 7th character from E to W Change 8th character ESP100 from E to W	—	—	1050.	1050.	NA	NA	NA

[Ⓞ]See wiring diagrams on pages 12 and 13.

Duplex Heavy Duty Controllers

Selection

Factory Modifications

Ordering Instructions	Transformer Table		
<ul style="list-style-type: none"> ▶ Replace (t) with letter from transformer table. ▶ Multiple modification suffixes are added in numerical, alphabetical sequence. 	Primary Volts	Secondary Volts	Letter
	120	24	B
	208	24	S
	208	120	T
	240	24	J
	240	120	F
	277	24	N
	277	120	P
	480/240	24	D
	480/240	120	A
	600	24	E
600	120	C	

Control Power Transformers (2 Supplied Per Controller)

Description	Catalog No Suffix	Enclosure Type	Controller Size			
			0-1/4	2, 2 1/2	3	3 1/2, 4
			Price Addition \$			
Standard Capacity [Ⓣ] with 1-Secondary Fuse	Bt	All	324.	324.	—	—
Standard Capacity with 2-Primary and 1-Secondary Fuse	Dt	All	588.	588.	936.	1080.
100VA Extra Capacity with 2-Primary and 1-Secondary Fuse	Ct	All	840.	840.	1200.	1200.
150VA Extra Capacity with 2-Primary and 1-Secondary Fuse	Ct1	All	1044.	1044.	1428.	1548.
Dual Voltage on Secondary of Transformer	Contact Siemens & Furnas Sales Office					

Factory Assembled Fuse Clips for both Disconnect Switches

Fuse Clip Amps	Volts	Rejection Clip Suffix	Price Addition \$
30	250	10	36.
30	600	11	60.
60	250	12	60.
60	600	13	84.
100	250	14	192.
100	600	15	192.
200	250	16	432.
200	600	17	432.

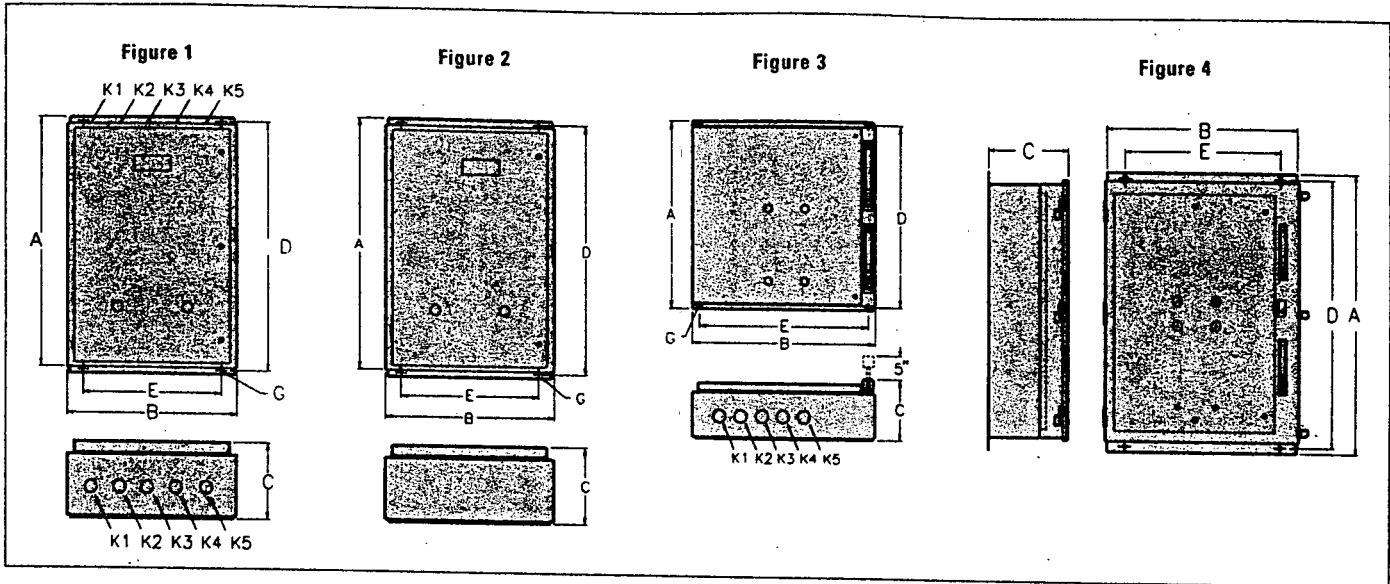
Factory will furnish the same voltage coils as transformer secondary voltage. Extra capacity transformers may require larger enclosures, contact factory for dimensions. Size 6 starters standard with 100VA transformer for DC rectifier circuit.

ⓉThe standard control transformer supplied for starter sizes 0 through 2 1/2 with be rated 45VA and have the appropriate secondary fuse. Primary fuses will not be supplied as standard. For primary fuse option select appropriate suffix from table. According to NEC 430-72, 450-3, and UL 508, section 32, primary fuses are not required for control transformers rated less than 50VA and are inherently protected.

Duplex Heavy Duty Controllers

Dimensions

Class 83, 84



NEMA 1 General Purpose Enclosures—Non Combination Type

Size	Fig	Outline Dimensions			Mtg Dimensions		Mtg Screw	Conduit Size					Approx Ship Wt Lbs (Kg)
		A	B	C	D	E		K1	K2	K3	K4	K5	
0-1½	1	19½ (495)	16½ (410)	6½ (165)	18¾ (476)	13 (330)	¼	1½-1½	½-¾	½	½-¾	1½-1½	20 (9)
2, 2½	1	25½ (637)	17¾ (437)	7¾ (187)	24¾ (618)	14 (356)	¼	1½-1½	½-¾	½-¾	1½-1½	57 (26)	
3	1	29½ (738)	23¾ (589)	9¼ (235)	27¾ (700)	20 (508)	⅝	2-2½	1½-1½	½-¾	1½-1½	93 (42)	
3½, 4	1	38¼ (966)	23¾ (589)	9¼ (235)	37¾ (948)	20 (508)	⅝	2-2½	1½-1½	½-¾	1½-1½	127 (58)	

NEMA 12 Industrial Use Enclosures—Non Combination Type

Size	Fig	A	B	C	D	E	Mtg Screw	K1	K2	K3	K4	K5	Approx Ship Wt Lbs (Kg)
0-1½	2	19½ (495)	16½ (410)	6½ (165)	18¾ (476)	13 (330)	¼	—	—	—	—	—	20 (9)
2, 2½	2	25½ (637)	17¾ (437)	7¾ (187)	24¾ (618)	14 (356)	¼	—	—	—	—	—	57 (26)
3	2	29½ (738)	23¾ (589)	11¼ (286)	27¾ (700)	20 (508)	⅝	—	—	—	—	—	93 (42)
3½, 4	2	38¼ (966)	23¾ (589)	11¼ (286)	37¾ (948)	20 (508)	⅝	—	—	—	—	—	127 (58)

NEMA 4 Watertight Enclosures—Non Combination Type

Size	Fig	A	B	C	D	E	Mtg Screw	K1	K2	K3	K4	K5	Approx Ship Wt Lbs (Kg)
0-1½	2	19½ (495)	16½ (410)	6½ (165)	18¾ (476)	13 (330)	¼	—	—	—	—	—	20 (9)
2, 2½	2	25½ (637)	17¾ (437)	7¾ (187)	24¾ (618)	14 (356)	¼	—	—	—	—	—	57 (26)
3	2	29½ (738)	23¾ (589)	9¼ (235)	27¾ (700)	20 (508)	⅝	—	—	—	—	—	93 (42)
3½, 4	2	38¼ (966)	23¾ (589)	9¼ (235)	37¾ (948)	20 (508)	⅝	—	—	—	—	—	127 (58)

NEMA 1 General Purpose Enclosures—Combination Type

Size	Fig	Outline Dimensions			Mtg Dimensions		Mtg. Screw	Conduit Size					Approx Ship Wt Lbs (Kg)
		A	B	C	D	E		K1	K2	K3	K4	K5	
0-2½	3	34¼ (865)	25 (635)	10¾ (264)	33 (838)	20 (508)	¾	¾-1½	¾-1½	1½-1¾	1½-1¾	1¾-1¾	70 (32)

NEMA 4, 4X and 12 Enclosures—Combination Type

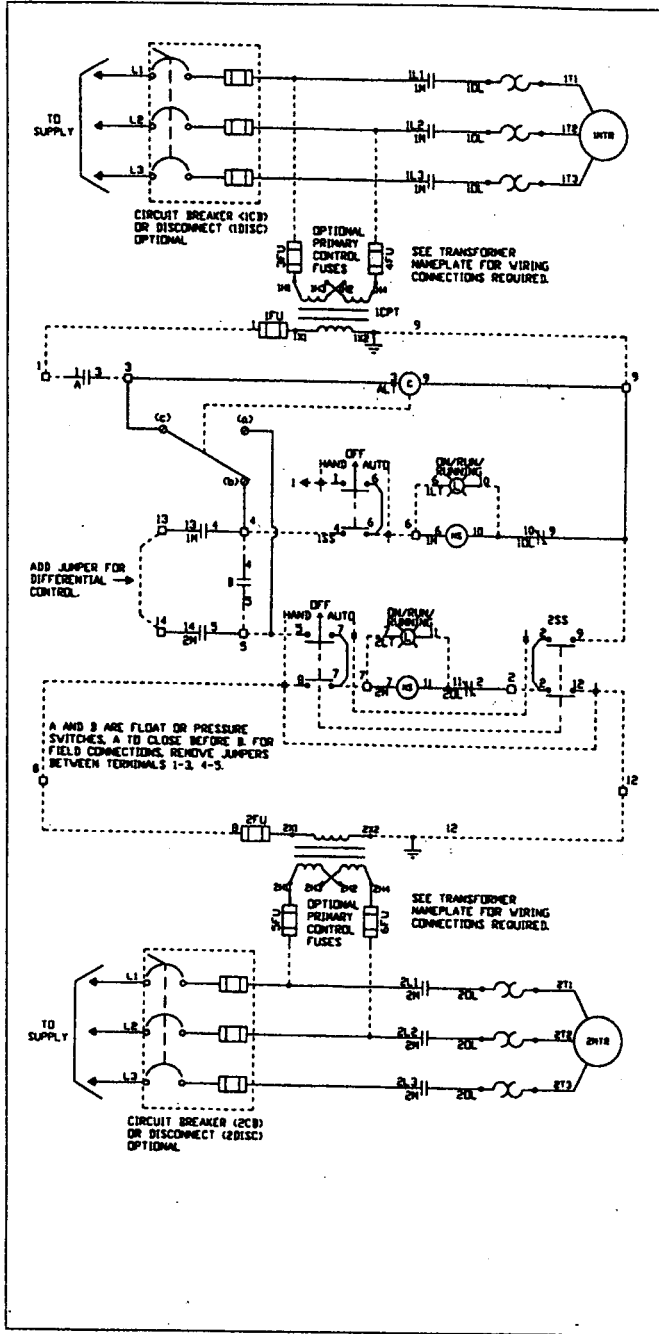
0-2½	3	34¼ (865)	24¾ (625)	7¾ (192)	33 (838)	20 (508)	¾	¾-1½	¾-1½	1½-1¾	1½-1¾	1¾-1¾	—
0-2½	3	34¼ (865)	24¾ (625)	7¾ (192)	33 (838)	20 (508)	¾	¾-1½	¾-1½	1½-1¾	1½-1¾	1¾-1¾	—

NEMA 3, 4, 12 Deadfront Enclosures With Padlockable Door—Combination Type

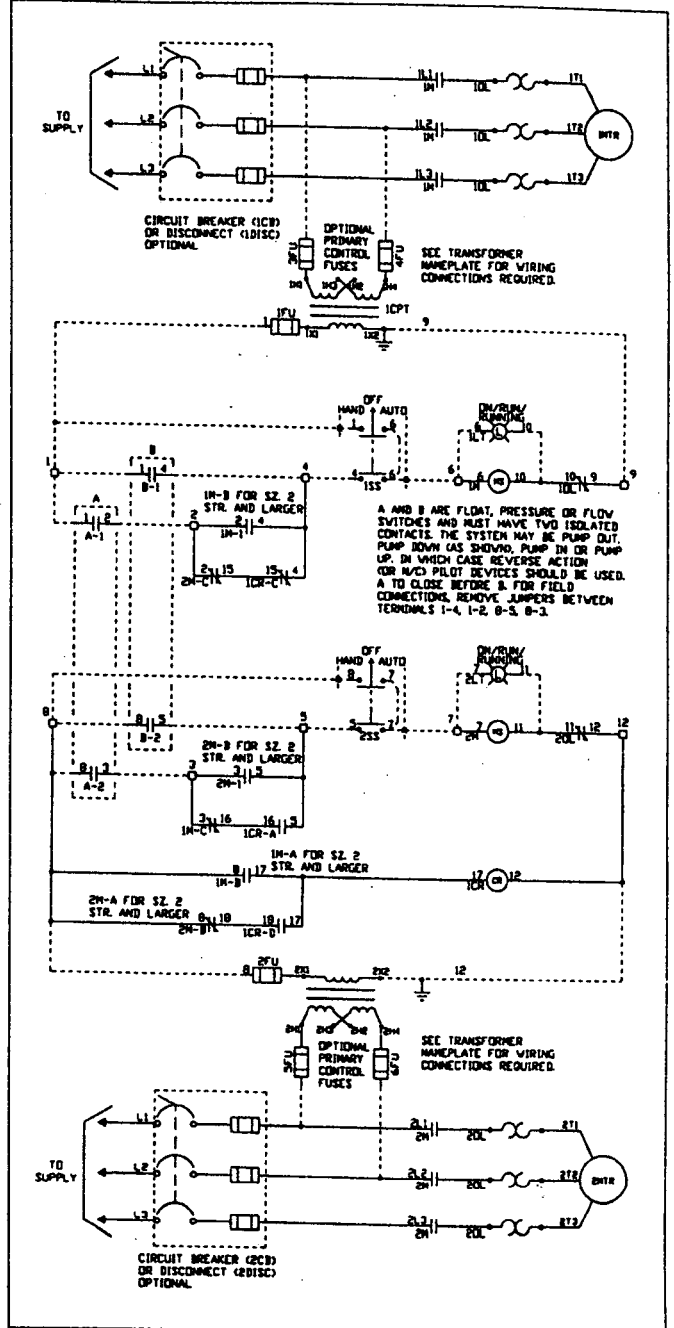
0-2½	4	34¼ (865)	25 (635)	10¾ (264)	33 (838)	20.00 (508)	¾	—	—	—	—	—	—
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Class 83, 84

Duplex with Auto Alternation



Duplex with Relay Alternation

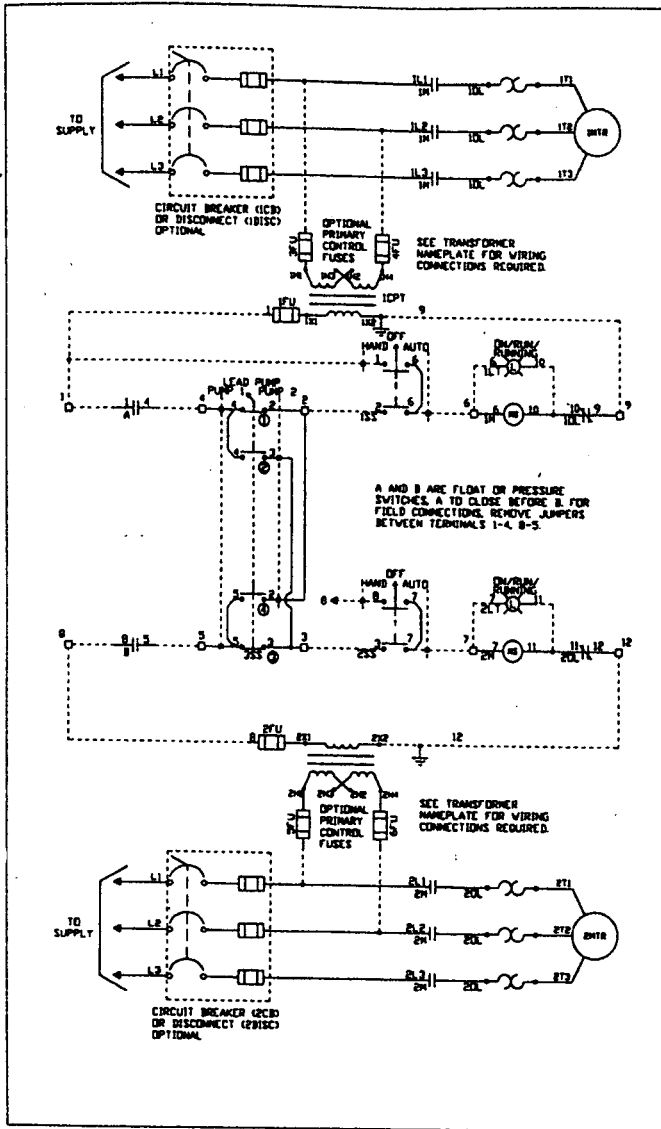


Duplex Heavy Duty Controllers

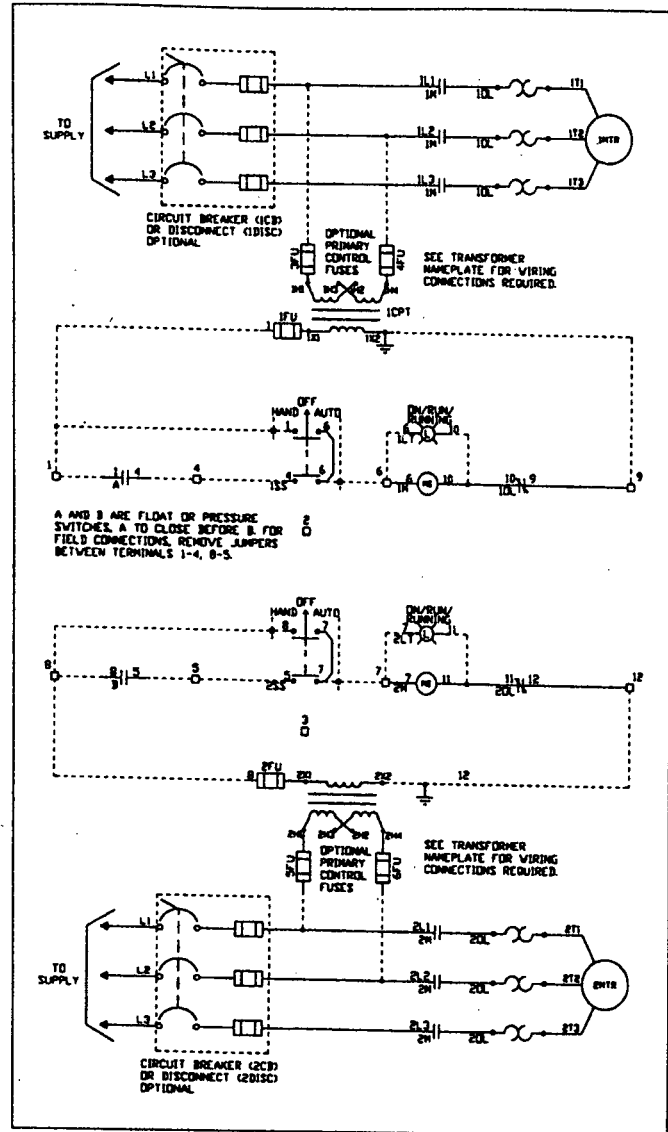
Wiring

Class 83, 84

Duplex with Manual Alternation



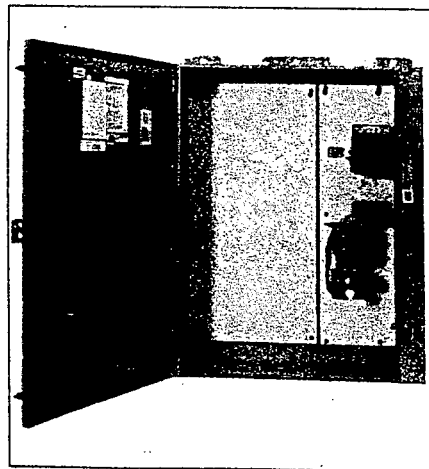
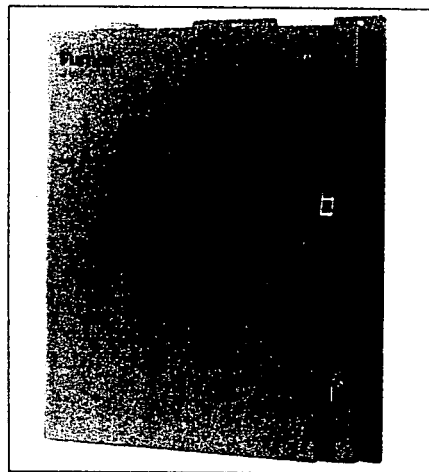
Duplex with Lead Transfer Switch Size



NEMA 3R Rainproof Extra Large Outdoor Use Enclosures

Features

- 100,000 Amp Interrupting Capacity
- NEMA 3R Enclosure with Rain Gutter
- Heavy Duty NEMA Starters
- Wide Selection of Overload Relays Including:
 - 958L Solid State for Oilwell 4 Torque and High Slip Motor Protection
 - Bimetal Ambient Compensated
 - Class 10 Quick Trip Solid State
- Heavy Duty Non-Metallic Disconnect Handle
- Extra Large Auxiliary Panel
- Thumb Hold Quarter Turn Latches
- White Panels for Added Visibility
- Padlock Has on Door
- External Reset Button
- UL Listed for Outdoor Used and Service Equipment File #E14900
- CSA Certified File #LR6535



Application

Heavy duty oil well pump control panels are designed to withstand the most demanding environments. Typical applications include petro-chemical users and wherever motor control is challenged by harsh elements.

Rugged oil well pump control panels are seam welded, rain proof, sleet, dust and ice resistant. There are no lapped surfaces to invite rust.

Installation is simple. Panels are factory wired to provide flexible control and protect against short circuits and overloads. Ample space is provided for field modifications and installation of accessories.

Features

Specified by Fortune 500 companies, ESP100 of Innova Plus starters offer prolonged service under severe duty conditions. Made in the USA in NEMA rated and exclusive Motor Matched M-M sizes, these starters utilize large silver cadmium oxide contacts and wide copper heat sinks to ensure rapid heat dissipation and maximum electrical life.

The Class 958L solid state overload relay is a current averaging overload designed for the oil market. It was designed to protect the die cast or fabricated rotor during stall conditions. During motor stall, the rotor can be damaged in 8–15 seconds if power is not removed. The 958L trip curve (see Fig. 1) shows that power will be removed within seven seconds starting at 250% locked rotor current. The 958L overload provides maximum electrical protection for all standard and oil well pump motors, multi torque connections and high slip motors. 958L overload features include:

Phase loss Protection—Trips within 3 seconds under phase loss conditions.

Thermal Memory Circuitry—“Remembers” heat buildup in frequent start and stop of hot motors to help prevent damage.

Self-Powered—Generates its own low voltage control power through the same sensors that read motor current.

Short Circuit Self-Protection—During a short circuit, current sensors reach “saturation” and block all harmful

currents from reaching the electronic circuitry.

Operating Range—(–30°C to +70°C) (–22°F to +159°F)

Ambient Insensitive—Solid state electronics detect only the current actually going to the motor, and its effect in heating motor windings. The overload is unaffected by changes in ambient temperature.

Simple Installation—The best protection in the world is meaningless if you cannot use it. The 958L requires no complicated installation procedures.

Wide FLA Adjustment Range—Adjustable over a basic FLA range of 2 to 1. The 958L overload can replace thermal overload relays and their associated heater elements.

Heaterless Construction—The 958L heaterless solid state design means there is no need to stock heaters.

Repeat Tripping Accuracy—±2%

High Accuracy Trip Curve Settings—Solid state electronic precision replaces mechanical approximation and variability.

UL Listed and CSA Certified.

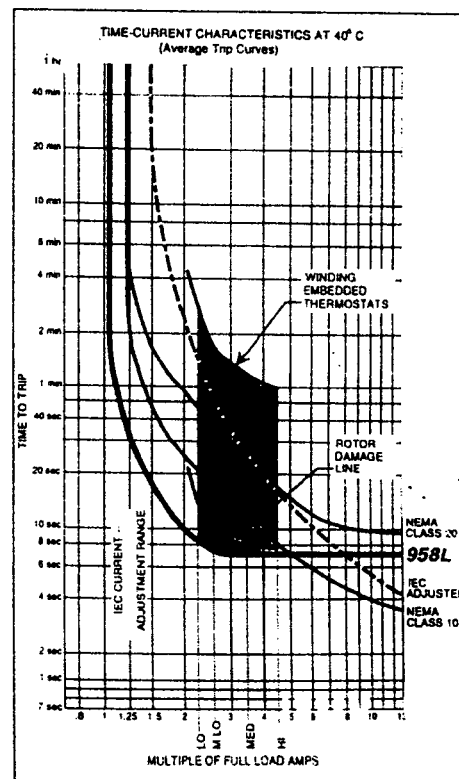


Figure 1

Oil Well Pump Control Panels

NEMA 3R Rainproof

Ordering Information	Auxiliary Equipment
<ul style="list-style-type: none">▶ Heater Elements see page 870 in the PC600.▶ Field Modification Kits see page 20.▶ Factory Assembled Modifications see page 21.▶ Replacement Parts see pages 37-38.	<ul style="list-style-type: none">▶ Pilot Lights easily installed on the enclosure, Oil Tight and Heavy Duty, they meet NEMA A600 requirements, see section 9 in the PC6000 for 30mm devices.▶ Lightning Arrester protects the control panel from lightning induced surges, see page 21.▶ Undervoltage and Phase Sensing Relays protect the pump against low voltage, voltage imbalance, loss of phase and phase reversal, see page 21.

The ESP100 Solid State Overload Relay has the same features as the 958L overload except its trip curve is designed to match the requirements of standard industrial and pump motors.

Ambient Compensated Bimetal Overload Relays are designed to parallel thermal characteristics of typical pump motors. They prevent nuisance trips that may result from operation of the control in a higher ambient temperatures than that at the pump. These relays are trip free tamperproof and can be set to reset automatically or manually.

Heavy Duty Fusible Disconnect Switch—These versions offer visible blades that provide positive indication of switch status. Contacts operate with a snap action for a quick make and quick break. A shield guards personnel from contact with live parts.

Motor Circuit Protector—The motor circuit protector provides fast, accurate fault clearing that will minimize damage to the motor and control apparatus and protect branch circuit conductors. Continuous current ratings and adjustable trip ranges meet NEC requirements for full load and locked rotor currents. The adjustable instantaneous trip point can be set precisely to assure fault protection and eliminate nuisance tripping.

Large NEMA 3R Outdoor Use Enclosure—The control, disconnecting means and accessories are all assembled in a rainproof and sleet resistant enclosure. This enclosure is constructed of heavy gauge sheet metal and equipped with a full door gasket. A removable backplate allows for easy field installation of modifications.

Removable Door—Enclosure door may be lifted off to make wiring easier.

Mounting Flanges—Convenient flanges at top and bottom of the enclosure provide easy mounting. They fit pole or flat surfaces using keyhole slots.

Safety Disconnect Handle—Up to three padlocks can be used to lock the safety handle in the OFF position. Maintenance work can be performed without hazard to personnel.

External Reset—The overload relays may be quickly reset by means of a button on the front of the enclosure.

Welded Seams—Helps prevent rust.

Ground Bar—Insures proper connection of ground wires and lightning arresters.

UL Listed—Assures proper construction throughout control panel.

Oil Well Pump Control Panels

Selection

ESP100 Solid-State Quick Trip Overload Relay

Ordering Instructions	Coil Table	Overload Table	Additional References
<p>► Use complete catalog number. Replace (*) with letter from coil table. Dual voltage coils wired high unless specified on order.</p> <p>► Replace the (t) with the letter from table 1 that corresponds to correct FLA in the overload table.</p>	<p>60Hz Voltage Letter</p> <p>24 Separate Control J</p> <p>120 Separate Control F</p> <p>110-120/220-240 A</p> <p>200-208 D</p> <p>220-240 G</p> <p>220-240/440-480 C</p> <p>440-480 H</p> <p>For other voltages and frequencies see Factories Modifications.</p>	<p>FLA †</p> <p>0.25-1 A</p> <p>0.75-3 B</p> <p>2.5-10 D</p> <p>9-18 E</p> <p>13-27 F</p> <p>20-40 G</p> <p>22-45 H</p> <p>30-60 J</p> <p>45-90 K</p> <p>57-115 L</p> <p>67-135 M</p> <p>100-200 S</p> <p>108-270 U</p>	<p>► Field Modification Kits see page 20.</p> <p>► Factory Modifications see page 21.</p> <p>► Dimensions see page 22.</p> <p>► Replacement Parts see pages 37-38.</p> <p>► For 380V 50 Hertz Information see page 129 in the PC6000.</p>

200/230V Max HP 3 Phase

Max Hp				Disconnect	Fuse Clip Amps	NEMA 3R			
200 Volts	230 Volts	NEMA Size	Half Size			Fusible Disconnect		MCP	
						Catalog No	Price \$	Catalog No	Price \$
1	1	1	—	30	30	—	—	85DS14M*	996.
7½	7½	1	—	30	30	85DS14L*	780.	85DS14M*	996.
10	10	—	1¼	60	60	85ES14L*	930.	85ES14M*	1116.
10	15	2	—	60	60	85FS14L*	1050.	85FS14M*	1236.
15	20	—	2½	100	100	85GS14L*	1554.	85GS14M*	1614.
25	30	3	—	100	100	85HS14L*	1686.	85HS14M*	1746.
30	40	—	3½	200	200	85IS14L*	2904.	85IS14M*	3456.
40	50	4	—	200	200	85JS14L*	3144.	85JS14M*	3696.
50	75	—	4½	400	400	85RS14L*	6324.	85RS14M*	7986.
75	100	5	—	400	400	85KS14L*	6744.	85KS14M*	8406.
100	125	6	—	—	—	—	—	85MSW4M*	18225.
150	200	6	—	—	—	—	—	85MSX4M*	20952.

460/575V Max HP 3 Phase

Max Hp				Disconnect	Fuse Clip Amps	NEMA 3R			
460 Volts	575 Volts	NEMA Size	Half Size			Fusible Disconnect		MCP	
						Catalog No	Price \$	Catalog No	Price \$
3	3	1	—	30	30	—	—	85DS14M*	996.
10	10	1	—	30	30	85DS14F*	792.	85DS14M*	996.
15	15	—	1¼	30	30	85ES14F*	930.	85ES14M*	1116.
25	25	2	—	60	60	85FS14F*	1068.	85FS14M*	1236.
30	30	—	2½	60	60	85GS14F*	1524.	85GS14M*	1614.
50	50	3	—	100	100	85HS14F*	1722.	85HS14M*	1746.
75	75	—	3½	200	200	85IS14F*	2928.	85IS14M*	3456.
100	100	4	—	200	200	85JS14F*	3168.	85JS14M*	3696.
150	150	—	4½	400	400	85RS14F*	6468.	85RS14M*	7986.
200	200	5	—	400	400	85KS14F*	6888.	85KS14M*	8406.
250	250	6	—	600	600	85MS14F*	17391.	—	—
250	300	6	—	—	600	—	—	85MSW4M*	18225.
400	400	6	—	—	600	—	—	85MSX4M*	20952.

Oil Well Pump Control Panels

Selection

Ambient Compensated Bimetal Overload Relay

Ordering Instructions	Coil Table	Additional References
<p>► Use complete catalog number. Replace (*) with letter from coil table. Dual voltage coils wired high unless specified on order.</p> <p>► Replace (†) with letter from table 1 that corresponds to correct FLA.</p>	<p>60Hz Voltage Letter</p> <p>24 Separate Control J</p> <p>120 Separate Control F</p> <p>110-120/220-240 A</p> <p>200-208 D</p> <p>220-240 G</p> <p>220-240/440-480 C</p> <p>440-480 H</p>	<p>► Field Modification Kits see page 20.</p> <p>► Factory Modifications see page 21.</p> <p>► Dimensions see page 22.</p> <p>► Replacement Parts see pages 37-38.</p> <p>► For 380V 50 Hertz Information see page 129 in the PC6000.</p>
	<p>For other voltages and frequencies see Factory Modifications.</p>	

200/230V Max HP 3 Phase

Max Hp				Disconnect	Fuse Clip Amps	NEMA 3R			
200 Volts	230 Volts	NEMA Size	Half Size			Fusible Disconnect		MCP	
						Catalog No	Price \$	Catalog No	Price \$
7½	7½	1	—	30	30	85DAE4L*	753.	85DAE4M*	969.
10	10	—	1¼	60	60	85EAG4L*	903.	85EAG4M*	1089.
10	15	2	—	60	60	85FAJ4L*	1023.	85FAJ4M*	1209.
15	20	—	2½	100	100	85GAL4L*	1527.	85GAL4M*	1587.
25	30	3	—	100	100	85HAN4L*	1659.	85HAN4M*	1719.
30	40	—	3½	200	200	85IAP4L*	2877.	85IAP4M*	3429.
40	50	4	—	200	200	85JAR4L*	3117.	85JAR4M*	3669.
50	75	—	4½	400	400	85RAS4L*	6297.	85RAS4M*	7959.
75	100	5	—	400	400	85KAU4L*	6717.	85KAU4M*	8379.
100	125	6	—	—	—	—	—	85MAW4M*	18198.
150	200	6	—	—	—	—	—	85MAX4M*	20925.

460/575V Max HP 3 Phase

Max Hp				Disconnect	Fuse Clip Amps	NEMA 3R			
460 Volts	575 Volts	NEMA Size	Half Size			Fusible Disconnect		MCP	
						Catalog No	Price \$	Catalog No	Price \$
10	10	1	—	30	30	85DAE4F*	765.	85DAE4M*	969.
15	15	—	1¼	30	30	85EAF4F*	903.	85EAF4M*	1089.
25	25	2	—	60	60	85FAJ4F*	1041.	85FAJ4M*	1209.
30	30	—	2½	60	60	85GAK4F*	1497.	85GAK4M*	1587.
50	50	3	—	100	100	85HAN4F*	1695.	85HAN4M*	1719.
75	75	—	3½	200	200	85IA4PF*	2901.	85IA4PM*	3429.
100	100	4	—	200	200	85JA4RF*	3141.	85JAR4M*	3669.
150	150	—	4½	400	400	85RA4SF*	6441.	85RAS4M*	7959.
150	200	5	—	—	—	—	—	85KAT4M*	8379.
200	N/A	5	—	400	400	85KAU4F*	6861.	85KAU4M*	8379.
250	250	6	—	600	600	85MAV4F*	17364.	—	—
250	300	6	—	—	—	—	—	85MAW4M*	18198.
400	400	6	—	—	—	—	—	85MAX4M*	20925.

Oil Well Pump Control Panels

Selection

958L Solid-State Overload Relay

Ordering Instructions	Coil Table	Overload Table	Additional References
<p>► Use complete catalog number. Replace (*) with letter from coil table. Dual voltage coils wired high unless specified on order.</p> <p>► Replace the (†) with the letter from table 1 that corresponds to correct FLA in the overload table.</p>	<p>60Hz Voltage Letter</p> <p>24 Separate Control J</p> <p>120 Separate Control F</p> <p>110-120/220-240 A</p> <p>200-208 D</p> <p>220-240 G</p> <p>220-240/440-480 C</p> <p>440-480 H</p>	<p>Size FLA †</p> <p>0, 1 5.6-11.6 C</p> <p>0, 1 7-14 D</p> <p>0, 1 11-22 E</p> <p>1½ 5.6-11.6 C</p> <p>1½ 7-14 D</p> <p>1½ 11-22 E</p> <p>1½ 14-28 F</p> <p>1½ 18-36 G</p> <p>1½ 20-40 H</p> <p>2 18-36 I</p> <p>2½ 28-56 J</p> <p>3 28-56 J</p> <p>3 35-70 K</p> <p>3 43-86 L</p> <p>3 50-90 Y</p> <p>3½ 43-86 L</p> <p>3½ 50-90 Y</p> <p>4 60-126 M</p> <p>4½ 75-150 W</p> <p>4½ 84-174 N</p> <p>4½ 105-210 P</p> <p>5 75-150 W</p> <p>5 84-174 N</p> <p>5 105-210 P</p> <p>5 132-264 R</p> <p>6 264-528 S</p>	<p>► Field Modification Kits see page 20.</p> <p>► Factory Modifications see page 21.</p> <p>► Dimensions see page 22.</p> <p>► Replacement Parts see pages 37-38.</p> <p>► For 380V 50 Hertz Information see page 129 in the PC6000.</p>
	<p>For other voltages and frequencies see Factories Modifications.</p>		

200/230V Max HP 3 Phase

Max Hp				Disconnect Switch	Fuse Clip Amps	NEMA 3R			
200 Volts	230 Volts	NEMA Size	Half Size			Fusible Disconnect		MCP	
						Catalog No	Price \$	Catalog No	Price \$
7½	7½	1	—	30	30	85DP14L*	780.	85DP14M*	996.
10	10	—	1½	60	60	85EP14L*	930.	85EP14M*	1116.
10	15	2	—	60	60	85FP14L*	1050.	85FP14M*	1236.
15	20	—	2½	100	100	85GP14L*	1554.	85GP14M*	1614.
25	30	3	—	100	100	85HP14L*	1686.	85HP14M*	1746.
30	40	—	3½	200	200	85IP14L*	2904.	85IP14M*	3456.
40	50	4	—	200	200	85JP14L*	3144.	85JP14M*	3696.
50	75	—	4½	400	400	85RP14L*	6324.	85RP14M*	7986.
75	100	5	—	400	400	85KP14L*	6744.	85KP14M*	8406.
150	200	6	—	—	—	—	—	85MP14M*	20952.

460/575V Max HP 3 Phase

Max Hp				Disconnect	Fuse Clip Amps	NEMA 3R			
460 Volts	575 Volts	NEMA Size	Half Size			Fusible Disconnect		MCP	
						Catalog No	Price \$	Catalog No	Price \$
10	10	1	—	30	30	85DP14F*	792.	85DP14M*	996.
15	15	—	1½	30	30	85EP14F*	930.	85EP14M*	1116.
25	25	2	—	60	60	85FP14F*	1068.	85FP14M*	1236.
30	30	—	2½	60	60	85GP14F*	1524.	85GP14M*	1614.
50	50	3	—	100	100	85HP14F*	1722.	85HP14M*	1746.
75	75	—	3½	200	200	85IP14F*	2928.	85IP14M*	3456.
100	100	4	—	200	200	85JP14F*	3168.	85JP14M*	3696.
150	150	—	4½	400	400	85RP14F*	6468.	85RP14M*	7986.
200	200	5	—	400	400	85KP14F*	6888.	85KP14M*	8406.
250	250	6	—	600	600	85MP14F*	17391.	—	—
400	400	6	—	—	—	—	—	85MP14M*	20952.

Oil Well Vacuum Break Pump Control Panels

Selection

Vacuum Contactor with 958L Solid-State Overload Relay

Ordering Instructions	Coil Table	Overload Table	Additional References																													
<ul style="list-style-type: none"> ▶ Use complete catalog number. Replace (*) with letter from coil table. Dual voltage coils wired high unless specified on order. ▶ Replace the (†) with the letter from table 1 that corresponds to correct FLA in the overload table. 	<table border="1"> <thead> <tr> <th>60Hz Voltage</th> <th>Letter</th> </tr> </thead> <tbody> <tr> <td>120 Separate Control</td> <td>F</td> </tr> <tr> <td>220-240</td> <td>G</td> </tr> <tr> <td>440-480</td> <td>H</td> </tr> </tbody> </table>	60Hz Voltage	Letter	120 Separate Control	F	220-240	G	440-480	H	<table border="1"> <thead> <tr> <th>Size</th> <th>FLA</th> <th>†</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>60-126</td> <td>M</td> </tr> <tr> <td>5</td> <td>75-150</td> <td>W</td> </tr> <tr> <td>5</td> <td>84-174</td> <td>N</td> </tr> <tr> <td>5</td> <td>105-210</td> <td>P</td> </tr> <tr> <td>5</td> <td>132-264</td> <td>R</td> </tr> <tr> <td>6</td> <td>264-528</td> <td>S</td> </tr> </tbody> </table>	Size	FLA	†	4	60-126	M	5	75-150	W	5	84-174	N	5	105-210	P	5	132-264	R	6	264-528	S	<ul style="list-style-type: none"> ▶ Field Modification Kits see page 20. ▶ Factory Modifications see page 21. ▶ Dimensions see page 22. ▶ Replacement Parts see pages 37-38. ▶ For 380V 50 Hertz Information see page 129 in the PC6000.
	60Hz Voltage	Letter																														
	120 Separate Control	F																														
	220-240	G																														
440-480	H																															
Size	FLA	†																														
4	60-126	M																														
5	75-150	W																														
5	84-174	N																														
5	105-210	P																														
5	132-264	R																														
6	264-528	S																														
For other voltages and frequencies see Factories Modifications.																																

460/575V Max HP 3 Phase

Max Hp				Disconnect	Fuse Clip Amps	NEMA 3R			
460 Volts	575 Volts	NEMA Size	Half Size			Fusible Disconnect		MCP	
						Catalog No	Price \$	Catalog No	Price \$
100	100	4	—	200	200	85JV14F*	5975.	85JV14M*	6540.
200	200	5	—	400	400	85KV14F*	9625.	85KV14M*	11250.
250	250	6	—	600	600	85MV14F*	20900.	—	—
400	400	6	—	—	—	—	—	85MV14M*	24715.

Discount Schedule A

Siemens & Furnas Control Products

Oil Well Pump Control Panels

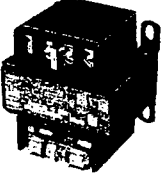
Selection







Field Modification Kits

Fuse Clip Field Kits (For Breaker Kits see page 39.)

Disc Size Amps	Fuse Clip Amps	Volts	Catalog No	Price \$
30/60	30	250	75P1045	12.
	30	600	75P1046	15.
	60	250	75P1046	15.
	60	600	75P1047	18.
	100	250/600	75P1038	63.
100	100	250/600	75P1048	63.
100	200	250/600	75P1049	96.
200	200	250/600	75P1050	96.
400	400	Factory Assembled Only	—	—
600	600	Factory Assembled Only	—	—

Control Power Transformer Kits

Description	Transformer Table			VA Rating [ⓐ]	Catalog No	Price \$
Transformer 50/60Hz 	Primary Volts	Secondary Volts	Code	45 VA	KT*050	108.
	120	24	1	50 VA	KT*050P	144.
	208	24	G	100 VA	KT*100	150.
	208	120	H	150 VA	KT*150	201.
	240/480	24	4	200 VA	KT*200	225.
	240/480	120	8	300 VA	KT*300	277.
	277	24	5	500 VA	KT*500	330.
	277	120	7	* Replace with letter from the Transformer Table.		
	600	24	6			
	600	120	9			

Description	Class	Controller Size	Voltage	Catalog No	Price \$
Lightning Arrester 	87.88	All	—	49D45584002	192.
Pressure Switch 	87.88	All	Refer to the Pressure Switch Catalog Supplement for more information.		
Voltage & Phase Monitor [ⓐ] 	87.88	All	208V 240V 380V 415V 480V 600V	47TA32DX1 47TA32GX1 47TA32PX1 47TA32HX1 47TA32EX1	282. 282. 297. 297. 297. 297.
Anti Backspin Timer 	87.88	All	Refer to Class 55 on pages 656–657 of PC6000 for complete information.		
Hole Plug [ⓐ] 	87.88	1–4	—	49D41149006	15.00
Isolated Neutral Kit 	87.88	60A 100A	—	49D29103001 49D29103002	67.50 141.00

For additional Field Modifications see the Siemens & Furnas Control Products (PC6000).

ⓐFor additional information see the Siemens & Furnas Control Products (PC6000).

ⓐKits contain 6 clips and mounting hardware and rejection members for Class R fusing.

ⓐThe standard control transformer supplied for starter sizes 0 through 2½ with be rated 45VA and have the appropriate secondary fuse. Primary fuses will not be supplied as standard. For primary fuse option select appropriate suffix from table. According to NEC 430-72, 450-3, and UL 508, section 32, primary fuses are not required for control transformers rated less than 50VA and are inherently protected.

Oil Well Pump Control Panels

Selection

Factory Assembled Modifications

Ordering Instructions	Transformer Table																																	
<ul style="list-style-type: none"> ▶ Replace (*) with letter from transformer table. ▶ Catalog No. suffixes indicate numbers or letters added to the end of a Catalog No. Example: 85DAE4FF becomes 85DAE4FFBA. ▶ Multiple modification suffixes are added in numerical, alphabetical sequence. 	<table border="1"> <thead> <tr> <th>Primary Volts</th> <th>Secondary Volts</th> <th>Letter</th> </tr> </thead> <tbody> <tr><td>240/480</td><td>120</td><td>A</td></tr> <tr><td>120/240</td><td>24</td><td>B</td></tr> <tr><td>600</td><td>120</td><td>C</td></tr> <tr><td>240/480</td><td>24</td><td>D</td></tr> <tr><td>600</td><td>24</td><td>E</td></tr> <tr><td>480</td><td>240</td><td>R</td></tr> <tr><td>208/416</td><td>24</td><td>S</td></tr> <tr><td>208/277</td><td>120</td><td>T</td></tr> <tr><td>380, 50Hz</td><td>110, 50Hz</td><td>U</td></tr> <tr><td>415, 50Hz</td><td>100, 50Hz</td><td>W</td></tr> </tbody> </table>	Primary Volts	Secondary Volts	Letter	240/480	120	A	120/240	24	B	600	120	C	240/480	24	D	600	24	E	480	240	R	208/416	24	S	208/277	120	T	380, 50Hz	110, 50Hz	U	415, 50Hz	100, 50Hz	W
	Primary Volts	Secondary Volts	Letter																															
	240/480	120	A																															
	120/240	24	B																															
	600	120	C																															
	240/480	24	D																															
	600	24	E																															
	480	240	R																															
	208/416	24	S																															
	208/277	120	T																															
380, 50Hz	110, 50Hz	U																																
415, 50Hz	100, 50Hz	W																																

Description	Catalog No	Controller Size/Price Addition \$					
		Suffix	1-1½	2, 2½	3, 3½	4	4½, 5
Control Circuit Transformer 50/60Hz 1 fuse in Secondary Per the National Electric Code, Article 450-3B, primary fuses are required in most typical installations. Add "F2" suffix and \$132 for factory supplied primary fusing. Refer to NEC Article 450 prior to ordering without primary fusing to insure compliance. Factory will furnish the same voltage coils as transformer secondary voltage. Extra capacity transformers may require larger enclosures; contact factory for dimensions.		Size 6 starters standard with 100VA transformer for DC rectifier circuit.					
Standard Capacity	B [ⓐ]	162.	162.	336.	408.	462.	—
Control Circuit Pneumatic Time Delay Backspin protection. 0.2 sec-3 minute run timer	T2 T3	468.	468.	468.	468.	468.	468.
Pilot Light, Red Transformer Type 120V 240V 480V 600V	FA FB FC FD	162.	162.	162.	162.	162.	162.
Phase Failure and Reverse Relay (Class 47VA) Under Voltage Relay Over Voltage Relay	R1 R2 R4	1500. 306. 1200.	1500. 306. 1200.	1500. 306. 1200.	1500. 306. 1200.	1500. 306. 1200.	1500. 306. 1200.
Auxiliary Contact NO SPDT Innova Series NO, NC SPDT	1 SPST 2 SPST 1 SPDT 2 SPDT	GA GE GA GC	66. 132. — —	66. 132. — —	66. 132. — —	66. 132. — —	— — 66. 132.
Fuse Clips NEMA Class R 30, 60 A 100, 200 A 400, 600 A	DR	9. — —	9. 18. —	— 18. 42.	— — 42.	— — 42.	— — —
Lightning Arrester Surge Capacitor	L SC	240. 288.	240. 288.	240. 288.	240. 288.	240. 288.	240. 288.
Start Button and 3 Position Selector Switch	B [ⓐ]	132.	132.	132.	132.	132.	132.

For additional Factory Assembled Modifications see the Siemens & Furnas Control Products (PC6000).

ⓐSee ordering instructions.
 ⓑCatalog No. Change 6th character.

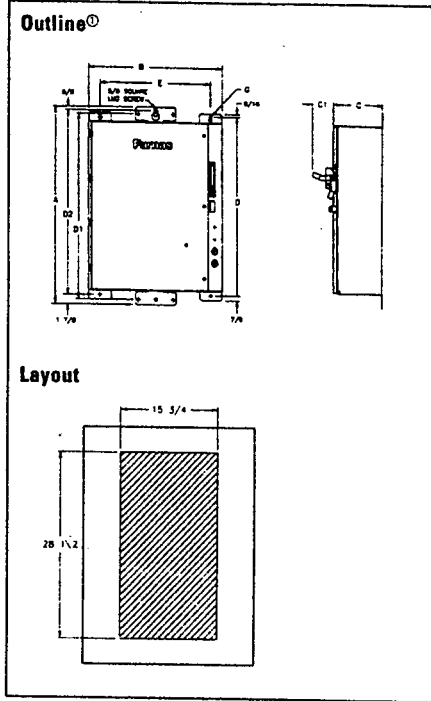


Figure 1

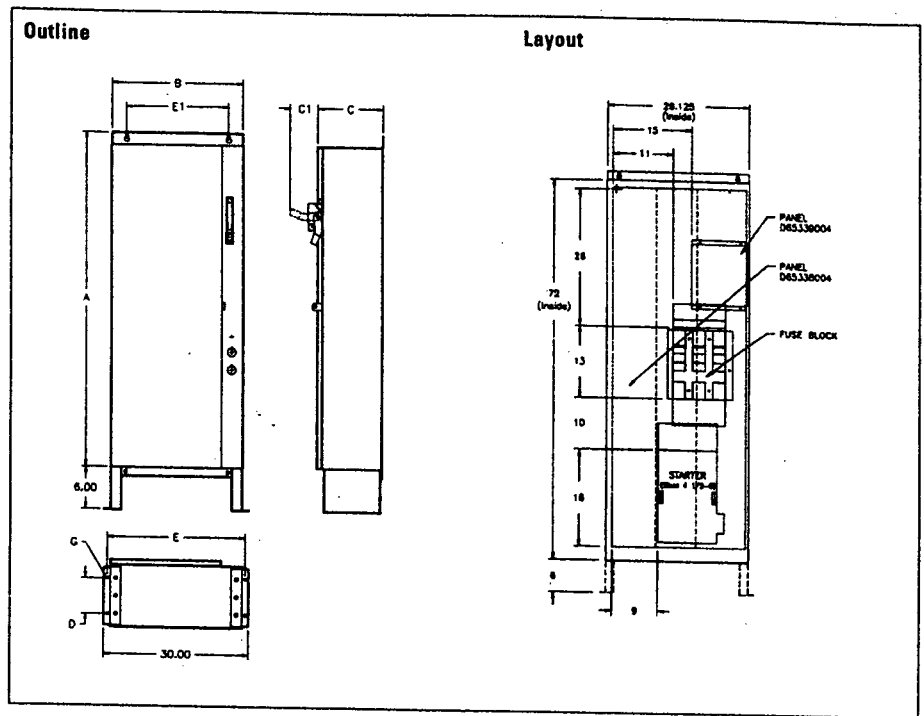


Figure 3

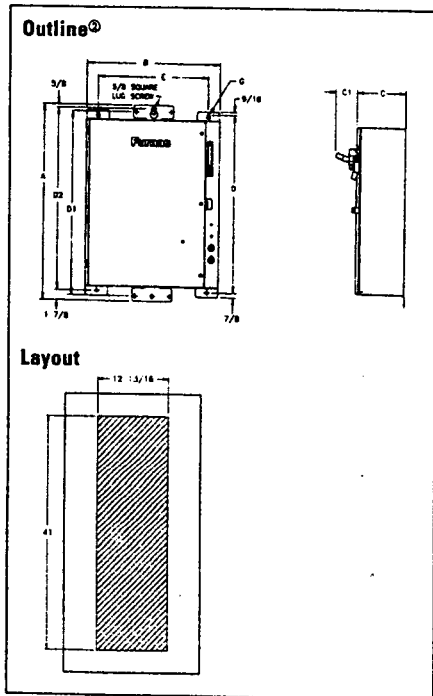


Figure 2

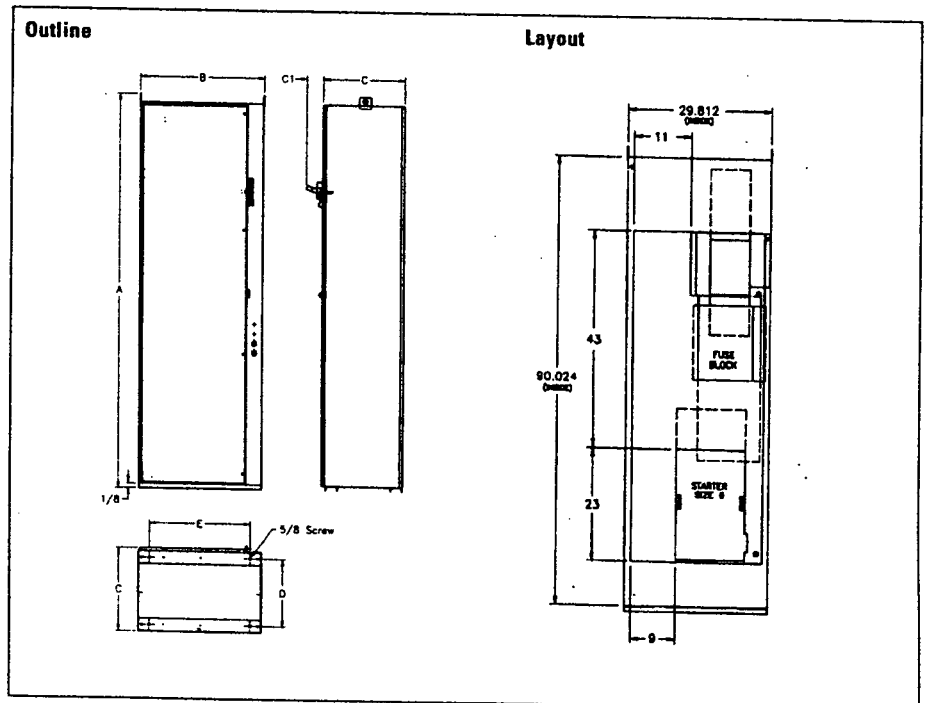


Figure 4

Fused or MCP

Size	Fig	Outline Dimensions				Mounting Dimensions					Mtg Screw	Conduit Size			Approx Ship Wt Lbs	Ref Dwg
		A	B	C	C1	D	D1	D2	E	E1		G	K1	K2		
0-2 1/2	1	37 1/2	26 1/4	9 7/32	4 1/16	34 1/2	35 1/4	35	22	—	3/8	—	—	—	110	D68571-D
3-4	2	49 1/4	26 1/4	9 7/32	4 1/16	45 3/32	47 1/4	46 1/4	22	—	3/8	—	—	—	150	D68571-C
4 1/2-5	3	73 7/32	28 3/4	10 1/4	4 1/16	7	—	—	28 7/16	23 3/4	3/8	—	—	—	775	D68571-C
6	4	93 1/16	30 1/4	19 1/4	4 1/4	16	—	—	24 1/2	—	3/8	—	—	—	875	D68571-A

Dimensions for reference, not for construction. Contact a Siemens & Furnas Controls Sales Office for dimensions not listed.

⊙Auxiliary panel available for modifications 15 3/4 x 28 1/2.

⊙Auxiliary panel available for modifications 12 13/16 x 41.

Class 87, 88

IS

- 3R Rainproof Enclosures
- 10,000 Amp Interrupting Capacity with Class R Fuses
- Heavy Duty NEMA Starters
- Solid State or Ambient Compensated metal Overload Relays
- Heavy Duty Disconnect Handle available in Reduced Voltage Versions
- Old Pilot Legend on Front
- Generous Accessory Space
- Welded Corners and Pole Brackets
- Copper Grounding Bar For Three Wires
- UL Listed for Outdoor Use and Service Equipment File #E14900
- SA Certified File #LR6535

Class 87 Compact Size 4 Fusible Pump Panel

Application

Heavy duty pump control panels are designed to withstand the most demanding environments. Typical applications include irrigation, agriculture, petrochemical, wastewater treatment and wherever motor control is challenged by harsh elements.

Rugged pump control panels are seam welded, rainproof, and sleet and ice resistant. There are no lapped surfaces to invite rust.

Installation is easy. Panels are factory wired to provide flexible control and protect against short circuits and overloads. Ample space is provided for field modifications and installation of accessories.

The exclusive **Compact NEMA Size 4** pump panels feature full sized NEMA starters in easy to "polemount" compact enclosures. The motor circuit protector panel features a full sized removable auxiliary panel for the mounting of accessories. The fusible version features fuse clips for full sized RK5 or compact class J fuses and accessory mounting space for the most commonly used accessories. A full sized Size 4 pump panel is also available for those applications that require an extra large auxiliary panel. See pages 41-42 for panel dimensions.

Class 87 pump panels become **jockey pump panels** with the addition of a pressure switch (see factory assembled modifications). The jockey pump's primary function is to maintain water pressure at a preset level and thus compensate for possible leakage of

water in the pumping system.

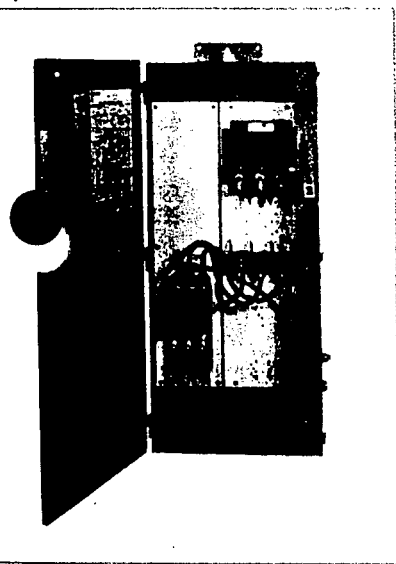
When the water pressure drops below the preset level, the pressure switch energizes the starter which in turn activates the jockey pump. The water pressure is then brought back up to the desired level. This insures the maintenance of proper water pressure at all times.

Features

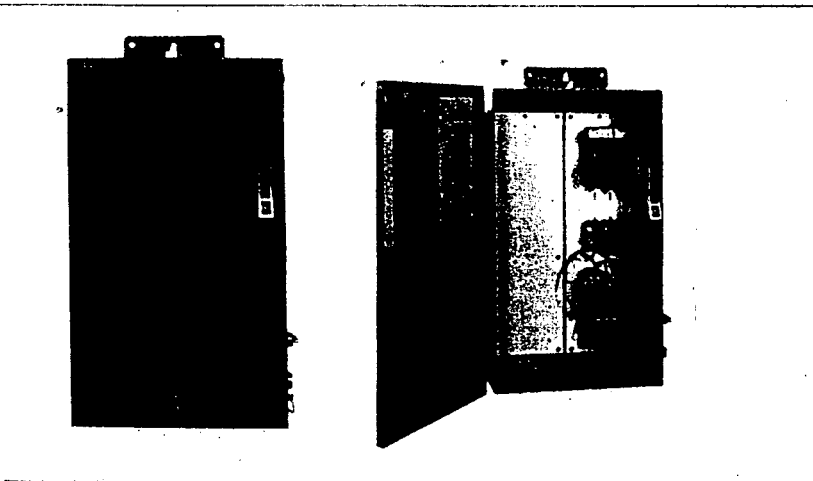
Specified by Fortune 500 companies, ESP100 or Innova Plus starters offer prolonged service under severe duty conditions. Made in the USA and NEMA rated, these starters utilize large silver cadmium oxide contacts and wide copper heat sinks to ensure rapid heat dissipation and maximum electrical life.

ESP100 solid state overload relays provide phase loss protection for the motor by tripping within three seconds upon complete loss of one phase in a three phase circuit. Each overload has a 2:1 (4:1 in lower ranges) FLA adjustment range with an adjustment dial reading out in FLA. This feature allows for extremely fine tuning. Their heaterless construction minimizes energy costs and costs of cabinet ventilation or cooling. (For more information see Section 8.)

The **ambient compensated bimetal overload relays** are designed to parallel thermal characteristics of typical pump motors. They prevent nuisance trips that may result from operation of the control in a higher ambient temperature than that at the pump. These relays are trip free, tamperproof and can be set to reset automatically or manually.



Class 87 Size 1 Fusible Pump Panel



Pump Control Panels

Selection

Factory Assembled Modifications

Ordering Instructions	Coil Table [ⓐ]																				
<ul style="list-style-type: none"> ▶ Use complete catalog number. Replace the (*) with letter from the coil table. Dual voltage coils are wired on high voltage unless specified on order. ▶ Contact Sales Office for 3 or 4 speed starters. ▶ For self-reset overload option on Sizes 0-5, change 4th character from "S" or "T" to "R". No price addition. 	<table border="1"> <thead> <tr> <th>60Hz Voltage</th> <th>Letter</th> </tr> </thead> <tbody> <tr> <td>24 Separate Control</td> <td>J</td> </tr> <tr> <td>120 Separate Control</td> <td>F</td> </tr> <tr> <td>110-120/220-240</td> <td>A</td> </tr> <tr> <td>200-208</td> <td>D</td> </tr> <tr> <td>220-240</td> <td>G</td> </tr> <tr> <td>220-240/440-480</td> <td>C</td> </tr> <tr> <td>277</td> <td>L</td> </tr> <tr> <td>440-480</td> <td>H</td> </tr> <tr> <td>550-600</td> <td>E</td> </tr> </tbody> </table>	60Hz Voltage	Letter	24 Separate Control	J	120 Separate Control	F	110-120/220-240	A	200-208	D	220-240	G	220-240/440-480	C	277	L	440-480	H	550-600	E
	60Hz Voltage	Letter																			
24 Separate Control	J																				
120 Separate Control	F																				
110-120/220-240	A																				
200-208	D																				
220-240	G																				
220-240/440-480	C																				
277	L																				
440-480	H																				
550-600	E																				

200/230V and 460/575V Max Hp 3 Phase

Max Hp				NEMA Size	Half Size	Overload Amp Range	Fuse Clip Amps	Fusible Disconnect		MCP			
200 Volts	230 Volts	460 Volts	575 Volts					NEMA 3R	NEMA 3R	Catalog No	Price \$	Catalog No	Price \$
1/2	1/2	—	—	1	—	0.75-3 [ⓑ]	—	—	—	87DSB6M*	996.		
—	—	1	1	1	—	0.75-3 [ⓑ]	—	87DSB6F*	792.	87DSB6M*	996.		
—	—	3	3	1	—	2.5-10	—	—	—	87DSC6M*	996.		
1	1	—	—	1	—	2.5-10	30	87DSC6L*	780.	87DSD6M*	996.		
2	2	—	—	1	—	2.5-10	30	87DSD6L*	780.	87DSD6M*	996.		
—	—	5	5	1	—	2.5-10	30	87DSD6F*	792.	87DSE6M*	996.		
3	3	—	—	1	—	9-18	30	87DSE6L*	780.	87DSE6M*	996.		
—	—	7 1/2	10	1	—	9-18	30	87DSE6F*	792.	87DSF6M*	996.		
7 1/2	7 1/2	—	—	1	—	13-27	30	87DSF6L*	780.	—	—		
7 1/2	7 1/2	—	—	1	—	13-27	60	87DSF6F*	792.	—	—		
—	—	7 1/2	10	1	—	9-18	60	87DSE60*	804.	87DFS6M*	996.		
—	—	10	—	1	—	13-27	—	—	—	—	—		
—	—	15	15	—	1 1/4	13-27	30	87ESF6F*	930.	87ESF6M*	1116.		
—	—	15	15	—	1 1/4	13-27	60	87ESF60*	942.	—	—		
10	10	—	—	—	1 1/4	20-40	60.	87ESG6L*	930.	87ESG6M*	1116.		
—	—	15	20	2	—	13-27	60	87FSF6F*	1068.	87FSF6M*	1236.		
10	15	—	—	2	—	22-45	60	87FSH6L*	1050.	87FSH6M*	1236.		
—	—	25	25	2	—	22-45	60	87FSH6F*	1068.	87FSH6M*	1236.		
10	15	—	—	2	—	22-45	100	87FSH60*	1122.	—	—		
—	—	25	25	2	—	22-45	100	87FSH60*	1134.	—	—		
—	—	30	30	—	2 1/2	22-45	60	87GSH6F*	1524.	87GSH6M*	1614.		
15	20	—	—	—	2 1/2	30-60	60-160	87GSJ6L*	1482.	87GSJ6M*	1614.		
—	—	30	30	—	2 1/2	22-45	100	87GSH60*	1590.	—	—		
15	20	—	—	—	2 1/2	30-60	100	87GSJ60*	1554.	—	—		
—	—	50	50	3	—	45-90	100	87HSK6L*	1686.	87HSK6M*	1746.		
25	30	—	—	3	—	45-90	100	87HSK6F*	1722.	87HSK6M*	1746.		
—	—	50	50	3	—	45-90	200	87HSK6P*	1824.	—	—		
25	30	—	—	3	—	45-90	200	87HSK60*	1848.	—	—		
—	—	75	75	—	3 1/2	57-115	200	87ISL6L*	2904.	87ISL6M*	3456.		
30	40	—	—	—	3 1/2	57-115	200	87ISL6F*	2928.	87ISL6M*	3456.		
—	—	75	75	—	3 1/2	57-115	200	87ISL60*	3054.	—	—		
—	—	100	100	4	—	67-135	200	87JSM6L*	3144.	87JSM6M*	3696.		
40	50	—	—	4	—	67-135	200	87JSM6F*	3168.	87JSM6M*	3696.		
—	—	100	100	Compact 4	—	67-135	200	87JSM6L*E6	3144.	87JSM6M*E6	3696.		
40	50	—	—	Compact 4	—	67-135	200	87JSM6F*E6	3168.	87JSM6M*E6	3696.		
—	—	100	100	—	—	67-135	200	—	—	—	—		
50	75	—	—	—	4 1/2	100-210	400	87RSS6L*	6324.	87RSS6M*	7986.		
—	—	150	150	—	4 1/2	100-210	400	87RSS6F*	6468.	87RSS6M*	7986.		
75	100	—	—	5	—	100-270	400	87KSU6L*	6744.	87KSU6M*	8406.		
—	—	150	200	5	—	100-270	—	—	—	87KST6M*	8406.		
—	—	200	—	5	—	100-270	400	87KSU6F*	6888.	87KSU6M*	8406.		
100	125	—	—	6	—	200-540	—	—	—	87MSW6M*	18225.		
150	200	—	—	6	—	200-540	—	—	—	87MSX6M*	20952.		
—	—	250	300 [ⓐ]	6	—	200-540	600	87MSW6F*	17391.	87MSW6M*	18225.		
—	—	400	400	6	—	200-540	—	—	—	87MSX6M*	20952.		

ⓐ Pump panels are stocked with a "C" coil 220-240/440-480V 60Hz

ⓑ For overload amp ranges below 0.75 amps, change the 5th character in the Cat No to "A" for 0.25-1A range.

ⓒ 300 Hp 575V rating applies to MCP only.

Pump Control Panels

Selection

Ambient Compensated Bimetal Overload, Class 87

Ordering Instructions	Coil Table [Ⓞ]																				
<ul style="list-style-type: none"> Use complete catalog number. Replace the (*) with letter from the coil table. Dual voltage coils are wired on high voltage unless specified on order. Order 3 heater elements by code number at \$9 each see page 870, in PC6000. To order jockey pump panel add suffix "P9" to Cat No. For single phase controllers with thermal overload, add suffix SP1 for 115V or SP2 for 230V. No price adder. 	<table border="1"> <thead> <tr> <th>60Hz Voltage</th> <th>Letter</th> </tr> </thead> <tbody> <tr> <td>24 Separate Control</td> <td>J</td> </tr> <tr> <td>120 Separate Control</td> <td>F</td> </tr> <tr> <td>110-120/220-240</td> <td>A</td> </tr> <tr> <td>200-208</td> <td>D</td> </tr> <tr> <td>220-240</td> <td>G</td> </tr> <tr> <td>220-240/440-480</td> <td>C</td> </tr> <tr> <td>277</td> <td>L</td> </tr> <tr> <td>440-480</td> <td>H</td> </tr> <tr> <td>550-600</td> <td>E</td> </tr> </tbody> </table>	60Hz Voltage	Letter	24 Separate Control	J	120 Separate Control	F	110-120/220-240	A	200-208	D	220-240	G	220-240/440-480	C	277	L	440-480	H	550-600	E
	60Hz Voltage	Letter																			
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200/230V Max Hp 3 Phase

Max Hp		NEMA Size	Half Size	Fuse Clip Amps	Fusible Disconnect	MCP		
200 Volts	230 Volts					NEMA 3R		
						Catalog No	Price \$	Catalog No
1/2	1/2	1	—	7.5 HP Panel is suitable for these ratings with proper customer supplied fuses. 87DAE6L* 87DAE6P*	—	87DAA6M*	969.	
1	1	1	—		—	87DAB6M*	969.	
3	3	1	—		—	87DAD6M*	969.	
7 1/2	7 1/2	1	—		30	87DAE6M*	969.	
7 1/2	7 1/2	1	—		60	—	—	
10	10	—	1 1/4	60	87EAG6L*	903.	87EAG6M*	1089.
10	15	2	—	60	87FAJ6L*	1023.	87FAJ6M*	1209.
10	15	2	—	100	87FAJ6P*	1095.	—	—
15	20	—	2 1/2	100	87GAL6L*	1527.	87GAL6M*	1587.
25	30	3	—	100	87HAN6L*	1659.	87HAN6M*	1719.
25	30	3	—	200	87HAN6P*	1797.	—	—
30	40	—	3 1/2	200	87IAP6L*	2877.	87IAP6M*	3429.
40	50	4	—	200	87JAR6L*	3117.	87JAR6M*	3669.
40	50	Compact 4	—	200	87JAR6L*E6	3117.	87JAR6M*E6	3669.
50	75	—	4 1/2	400	87RAS6L*	6297.	87RAS6M*	7959.
75	100	5	—	400	87KAU6L*	6717.	87KAU6M*	8379.
100	125	6	—	—	Use MCP type	—	87MAW6M*	18198.
150	200	6	—	—	Use MCP type	—	87MAX6M*	20925.

460/575V Max Hp 3 Phase

Max Hp		NEMA Size	Half Size	Fuse Clip Amps	Fusible Disconnect	MCP		
460 Volts	575 Volts					NEMA 3R		
						Catalog No	Price \$	Catalog No
1	1	1	—	10 HP Panel is suitable for these ratings with proper customer supplied fuses. 87DAE6F* 87DAE6O*	—	87DAA6M*	969.	
3	3	1	—		—	87DAB6M*	969.	
7 1/2	7 1/2	1	—		—	87DAD6M*	969.	
10	10	1	—		30	87DAE6M*	969.	
10	10	1	—		60	—	—	
15	15	—	1 1/4	30	87EAF6F*	903.	87EAF6M*	1089.
15	15	—	1 1/4	60	87EAF6O*	915.	—	—
—	—	2	—	—	25 HP Panel is suitable for this rating with proper customer supplied fuses.	—	87FAH6M*	1209.
—	—	—	—	—		—	—	—
25	25	2	—	60	87FAJ6F*	1041.	87FAJ6M*	1209.
25	25	2	—	100	87FAJ6O*	1107.	—	—
30	30	—	2 1/2	60	87GAK6F*	1497.	87GAK6M*	1587.
30	30	—	2 1/2	100	87GAK6O*	1563.	—	—
50	50	3	—	100	87HAN6F*	1695.	87HAN6M*	1719.
50	50	3	—	200	87HAN6O*	1821.	—	—
75	75	—	3 1/2	200	87IAP6F*	2901.	87IAP6M*	3429.
100	100	4	—	200	87JAR6F*	3141.	87JAR6M*	3669.
100	100	Compact 4	—	200	87JAR6F*E6	3141.	87JAR6M*E6	3669.
150	150	—	4 1/2	400	87RAS6F*	6441.	87RAS6M*	7959.
200	200	5	—	—	—	—	87KAT6M*	8379.
200	—	5	—	400	87KAU6F*	6861.	87KAU6M*	8379.
250	300	6	—	600	87MAV6F*	17364.	87MAV6M*	18198.
400	400	6	—	—	Use MCP type	—	87MAX6M*	20925.

Ⓞ Pump panels are stocked with a "C" coil 220-240/440-480V 60Hz.

Oil Well Pump Control Panels

Selection

958L Solid-State Overload Relay and HOA Selector Switch

Ordering Instructions	Coil Table	Overload Table																																																																																																	
<ul style="list-style-type: none"> ▶ Use complete catalog number. Replace (*) with letter from coil table. Dual voltage coils wired high unless specified on order. ▶ Replace (†) with letter from table 1 that corresponds to correct FLA. 	<table border="1"> <thead> <tr> <th>60Hz Voltage</th> <th>Letter</th> </tr> </thead> <tbody> <tr> <td>24 Separate Control</td> <td>J</td> </tr> <tr> <td>120 Separate Control</td> <td>F</td> </tr> <tr> <td>110-120/220-240</td> <td>A</td> </tr> <tr> <td>200-208</td> <td>D</td> </tr> <tr> <td>220-240</td> <td>G</td> </tr> <tr> <td>220-240/440-480</td> <td>C</td> </tr> <tr> <td>440-480</td> <td>H</td> </tr> </tbody> </table>	60Hz Voltage	Letter	24 Separate Control	J	120 Separate Control	F	110-120/220-240	A	200-208	D	220-240	G	220-240/440-480	C	440-480	H	<table border="1"> <thead> <tr> <th>Size</th> <th>FLA</th> <th>†</th> </tr> </thead> <tbody> <tr> <td>0, 1</td> <td>5.6-11.6</td> <td>C</td> </tr> <tr> <td>0, 1</td> <td>7-14</td> <td>D</td> </tr> <tr> <td>0, 1</td> <td>11-22</td> <td>E</td> </tr> <tr> <td>1½</td> <td>5.6-11.6</td> <td>C</td> </tr> <tr> <td>1½</td> <td>7-14</td> <td>D</td> </tr> <tr> <td>1½</td> <td>11-22</td> <td>E</td> </tr> <tr> <td>1½</td> <td>14-28</td> <td>F</td> </tr> <tr> <td>1½</td> <td>18-36</td> <td>G</td> </tr> <tr> <td>1½</td> <td>20-40</td> <td>H</td> </tr> <tr> <td>2</td> <td>18-36</td> <td>I</td> </tr> <tr> <td>2½</td> <td>28-56</td> <td>J</td> </tr> <tr> <td>3</td> <td>28-56</td> <td>J</td> </tr> <tr> <td>3</td> <td>35-70</td> <td>K</td> </tr> <tr> <td>3</td> <td>43-86</td> <td>L</td> </tr> <tr> <td>3</td> <td>50-90</td> <td>Y</td> </tr> <tr> <td>3½</td> <td>43-86</td> <td>L</td> </tr> <tr> <td>3½</td> <td>50-90</td> <td>Y</td> </tr> <tr> <td>4</td> <td>60-126</td> <td>M</td> </tr> <tr> <td>4½</td> <td>75-150</td> <td>W</td> </tr> <tr> <td>4½</td> <td>84-174</td> <td>N</td> </tr> <tr> <td>4½</td> <td>105-210</td> <td>P</td> </tr> <tr> <td>5</td> <td>75-150</td> <td>W</td> </tr> <tr> <td>5</td> <td>84-174</td> <td>N</td> </tr> <tr> <td>5</td> <td>105-210</td> <td>P</td> </tr> <tr> <td>5</td> <td>132-264</td> <td>R</td> </tr> <tr> <td>6</td> <td>264-528</td> <td>S</td> </tr> </tbody> </table>	Size	FLA	†	0, 1	5.6-11.6	C	0, 1	7-14	D	0, 1	11-22	E	1½	5.6-11.6	C	1½	7-14	D	1½	11-22	E	1½	14-28	F	1½	18-36	G	1½	20-40	H	2	18-36	I	2½	28-56	J	3	28-56	J	3	35-70	K	3	43-86	L	3	50-90	Y	3½	43-86	L	3½	50-90	Y	4	60-126	M	4½	75-150	W	4½	84-174	N	4½	105-210	P	5	75-150	W	5	84-174	N	5	105-210	P	5	132-264	R	6	264-528	S
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200/230V Max HP 3 Phase

Max Hp				Disconnect Switch	Fuse Clip Amps	NEMA 3R		MCP	
200 Volts	230 Volts	NEMA Size	Half Size			Fusible Disconnect	Price \$	Catalog No	Price \$
7½	7½	1	—	30	30	87DP14L*	780.	87DP14M*	996.
10	10	—	1¼	60	60	87EP14L*	930.	87EP14M*	1116.
10	15	2	—	60	60	87FP14L*	1050.	87FP14M*	1236.
15	20	—	2½	100	100	87GP14L*	1554.	87GP14M*	1614.
25	30	3	—	100	100	87HP14L*	1686.	87HP14M*	1746.
30	40	—	3½	200	200	87IP14L*	2904.	87IP14M*	3456.
40	50	4	—	200	200	87JP14L*	3144.	87JP14M*	3696.
50	75	—	4½	400	400	87RP14L*	6324.	87RP14M*	7986.
75	100	5	—	400	400	87KP14L*	6744.	87KP14M*	8406.
150	200	6	—	—	—	—	—	87MP14M*	20952.

460/575V Max HP 3 Phase

Max Hp				Disconnect	Fuse Clip Amps	NEMA 3R		MCP	
460 Volts	575 Volts	NEMA Size	Half Size			Fusible Disconnect	Price \$	Catalog No	Price \$
10	10	1	—	30	30	87DP14F*	792.	87DP14M*	996.
15	15	—	1¼	30	30	87EP14F*	930.	87EP14M*	1116.
25	25	2	—	60	60	87FP14F*	1068.	87FP14M*	1236.
30	30	—	2½	60	60	87GP14F*	1524.	87GP14M*	1614.
50	50	3	—	100	100	87HP14F*	1722.	87HP14M*	1746.
75	75	—	3½	200	200	87IP14F*	2928.	87IP14M*	3456.
100	100	4	—	200	200	87JP14F*	3168.	87JP14M*	3696.
150	150	—	4½	400	400	87RP14F*	6468.	87RP14M*	7986.
200	200	5	—	400	400	87KP14F*	6888.	87KP14M*	8406.
250	250	6	—	600	600	87MP14F*	17391.	—	—
400	400	6	—	—	—	—	—	87MP14M*	20952.

Watertight Hubs	Catalog No	Price \$
Size 1-1¼	49D411149001	15.74
Size 2-3	49D411149003	15.74
Size 3½-Compact 4	49D411149005	15.74

ⓉTo order with a start button and a selector switch, change the sixth character from 4 to 6 (no charge).

ⓐA closure plate is provided in place of the top mounted watertight hub.

Vacuum Break Pump Control Panels

Selection

Vacuum Contactor with ESP100 Quick Trip Overload Relay

Ordering Instructions	Coil Table	Overload Table	
<ul style="list-style-type: none"> ▶ Use complete catalog number. Replace (*) with letter from coil table. Dual voltage coils wired high unless specified on order. ▶ Replace (†) with letter from table 1 that corresponds to correct FLA. 	60Hz Voltage	Letter	
	120 Separate Control	F	
	220-240	G	
	440-480	H	
	For other voltages and frequencies see Factory Modifications.		
	Size	FLA	†
	Size	FLA	†
	4	60-126	M
	5	75-150	W
	5	84-174	N
	5	105-210	P
	5	132-264	R
	6	264-528	S

460/575V Max HP 3 Phase

Max Hp				Disconnect	Fuse Clip Amps	NEMA 3R			
460 Volts	575 Volts	NEMA Size	Half Size			Fusible Disconnect		MCP	
						Catalog No	Price \$	Catalog No	Price \$
100	100	4	—	200	200	87JC14F*	5515.	87JC14M*	6055.
200	200	5	—	400	400	87KC14F*	8850.	87KC14M*	10400.
250	250	6	—	600	600	87MC14F*	19600.	—	—
400	400	6	—	—	—	—	—	87MC14M*	23200.

Reduced Voltage Pump Panels

Selection

Auto Transformer & Part Winding 2 Step Solid State Overload, Class 88

Ordering Instructions	Coil Table		Overload Table		
	60Hz Voltage	Letter	Size	FLA	†
<p>► Use complete catalog number. If necessary replace the last letter of the catalog number with the appropriate letter from the coil table. Dual voltage coils are wired on high voltage unless specified on order. Ex: for 120V separate control change the last character of the catalog number to F. Example: 88FS†T2FG becomes 88FS†T2FF. Listed prices apply.</p> <p>► Use complete catalog number. Replace the (†) with letter that corresponds to the correct FLA in the overload table.</p>	24 Separate Control	J	0, 1	0.25-1	A
	120 Separate Control	F	0, 1	0.75-3	B
	110-120/220-240	A	0, 1	2.5-10	D
	200-208	D	0-1½	9-18	E
	220-240	G	1-4	13-27	F
	220-240/440-480	C	1½	20-40	G
	277	L	2-4	22-45	H
	440-480	H	2½-4	30-60	J
	550-600	E	3-4	45-90	K
			3½-4	57-115	L
			4	67-135	M
			4½	100-210	S
			5	100-270	U

Auto Transformer Type

Motor Volts	Max Hp	Size	Half Size	Fusible Disconnect		Motor Circuit Protector	
				Catalog No	Price \$	Catalog No	Price \$
230 240V Coil	15	2	—	88FS†T2FG	4986.	88FS†T2MG	5052.
	20	—	2½	88GS†T2FG	6744.	88GS†T2MG	6882.
	30	3	—	88HS†T2FG	7197.	88HS†T2MG	7884.
	40	—	3½	88IS†T2FG	10224.	88IS†T2MG	11292.
	50	4	—	88JS†T2FG	10800.	88JS†T2MG	11868.
	75	—	4½	88RS†T2FG	18072.	88RS†T2MG	18624.
	100	5	—	88KS†T2FG	18702.	88KS†T2MG	19992.
460 480V Coil	200	6	—	—	—	88MS†T2MG	33453.
	25	2	—	88FS†T4FH	5316.	88FS†T4MH	5403.
	30	—	2½	88GS†T4FH	6996.	88GS†T4MH	7065.
	50	3	—	88HS†T4FH	7452.	88HS†T4MH	7821.
	75	—	3½	88IS†T4FH	10572.	88IS†T4MH	11430.
	100	4	—	88JS†T4FH	11796.	88JS†T4MH	12150.
	150	—	4½	88RS†T4FH	17610.	88RS†T4MH	19128.
	200	5	—	88KS†T4FH	20610.	88KS†T4MH	21612.
	250	6	—	88MS†T7FH	28026.	88MS†T7MH	31326.
	300	6	—	88MS†T8FH	29419.	88MS†T8MH	32718.
	400	6	—	88MS†T4FH	30150.	88MS†T4MH	33450.

Part Winding 2 Step

Motor Volts	Max Hp	Size	Half Size	Fusible Disconnect		Motor Circuit Protector	
				Catalog No	Price \$	Catalog No	Price \$
230 240V Coil	20	—	1¾	88ES†P2FG	2982.	88ES†P2MG	2796.
	25	2	—	88FS†P2FG	3228.	88FS†P2MG	3126.
	40	—	2½	88GS†P2FG	4560.	88GS†P2MG	4440.
	50	3	—	88HS†P2FG	4944.	88HS†P2MG	4824.
	60	—	3½	88IS†P2FG	8760.	88IS†P2MG	9432.
	75	4	—	88JS†P2FG	9246.	88JS†P2MG	9912.
	125	—	4½	88RS†P2FG	17040.	88RS†P2MG	17466.
460 480V Coil	150	5	—	88KS†P2FG	17880.	88KS†P2MG	18306.
	30	—	1¾	88ES†P4FH	2982.	88ES†P4MH	2796.
	40	2	—	88FS†P4FH	3228.	88FS†P4MH	3126.
	60	—	2½	88GS†P4FH	4560.	88GS†P4MH	4440.
	75	3	—	88HS†P4FH	4944.	88HS†P4MH	4824.
	100	—	3½	88IS†P4FH	8760.	88IS†P4MH	9432.
	150	4	—	88JS†P4FH	9246.	88JS†P4MH	9912.
	250	—	4½	88RS†P4FH	17040.	88RS†P4MH	17466.
	350	5	—	88KS†P4FH	17880.	88KS†P4MH	18306.
	600	6	—	—	—	88MS†P4MH	32934.

Ⓢ Pump panels are stocked with a "C" coil 220-240/440-480V 60Hz.

Reduced Voltage Pump Panels

Selection

Auto Transformer & Part Winding 2 Step Ambient Compensated Bimetal Overload, Class 88

Ordering Instructions	Coil Table [®]																				
<ul style="list-style-type: none"> ▶ Use complete catalog number. If necessary replace the last letter of the catalog number with the appropriate letter from the coil table. Dual voltage coils are wired on high voltage unless specified on order. Ex: for 120V separate control change the last character of the catalog number to F. Example: 88FS1T2FG becomes 88FS1T2FF. Listed prices apply. ▶ Order 3 heater elements for auto transformer type by code number at \$9 each page 870, in PC6000. ▶ Order 6 heater elements for part winding type by code number at \$9 each page 870, in PC6000. To select proper code number multiply full load current by 50%. 	<table border="1"> <thead> <tr> <th>60Hz Voltage</th> <th>Letter</th> </tr> </thead> <tbody> <tr><td>24 Separate Control</td><td>J</td></tr> <tr><td>120 Separate Control</td><td>F</td></tr> <tr><td>110-120/220-240</td><td>A</td></tr> <tr><td>200-208</td><td>D</td></tr> <tr><td>220-240</td><td>G</td></tr> <tr><td>220-240/440-480</td><td>C</td></tr> <tr><td>277</td><td>L</td></tr> <tr><td>440-480</td><td>H</td></tr> <tr><td>550-600</td><td>E</td></tr> </tbody> </table> <p>For other voltages and frequencies see page 124, in PC6000.</p>	60Hz Voltage	Letter	24 Separate Control	J	120 Separate Control	F	110-120/220-240	A	200-208	D	220-240	G	220-240/440-480	C	277	L	440-480	H	550-600	E
60Hz Voltage	Letter																				
24 Separate Control	J																				
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277	L																				
440-480	H																				
550-600	E																				

Auto Transformer Type

Motor Volts	Max Hp	Size	Half Size	Fusible Disconnect		Motor Circuit Protector	
				Catalog No	Price \$	Catalog No	Price \$
230 240V Coil	15	2	—	88FPT2FG	4959.	88FPT2MG	5025.
	20	—	2½	88GPT2FG	6717.	88GPT2MG	6855.
	30	3	—	88HPT2FG	7170.	88HPT2MG	7857.
	40	—	3½	88IPT2FG	10197.	88IPT2MG	11265.
	50	4	—	88JPT2FG	10773.	88JPT2MG	11841.
	75	—	4½	88RPT2FG	18045.	88RPT2MG	18597.
460 480V Coil	100	5	—	88KPT2FG	18675.	88KPT2MG	19965.
	200	6	—	—	—	88MPT2MG	33426.
	25	2	—	88FPT4FH	5289.	88FPT4MH	5376.
	30	—	2½	88GPT4FH	6969.	88GPT4MH	7038.
	50	3	—	88HPT4FH	7425.	88HPT4MH	7794.
	75	—	3½	88IPT4FH	10545.	88IPT4MH	11403.
	100	4	—	88JPT4FH	11769.	88JPT4MH	12123.
	150	—	4½	88RPT4FH	17583.	88RPT4MH	19101.
200	5	—	88KPT4FH	20583.	88KPT4MH	21585.	
250	6	—	88MPT7FH	27999.	88MPT7MH	31299.	
300	6	—	88MPT8FH	29392.	88MPT8MH	32691.	
400	6	—	88MPT4FH	30123.	88MPT4MH	33423.	

Part Winding 2 Step

Motor Volts	Max Hp	Size	Half Size	Fusible Disconnect		Motor Circuit Protector	
				Catalog No	Price \$	Catalog No	Price \$
230 240V Coil	20	—	1¾	88EPP2FG	2928.	88EPP2MG	2742.
	25	2	—	88FPP2FG	3174.	88FPP2MG	3072.
	40	—	2½	88GPP2FG	4506.	88GPP2MG	4386.
	50	3	—	88HPP2FG	4890.	88HPP2MG	4770.
	60	—	3½	88IPP2FG	8706.	88IPP2MG	9378.
	75	4	—	88JPP2FG	9192.	88JPP2MG	9858.
460 480V Coil	125	—	4½	88RPP2FG	16986.	88RPP2MG	17412.
	150	5	—	88KPP2FG	17826.	88KPP2MG	18252.
	30	—	1¾	88EPP4FH	2928.	88EPP4MH	2742.
	40	2	—	88FPP4FH	3174.	88FPP4MH	3072.
	60	—	2½	88GPP4FH	4506.	88GPP4MH	4386.
	75	3	—	88HPP4FH	4890.	88HPP4MH	4770.
	100	—	3½	88IPP4FH	8706.	88IPP4MH	9378.
	150	4	—	88JPP4FH	9192.	88JPP4MH	9858.
250	—	4½	88RPP4FH	16986.	88RPP4MH	17412.	
350	5	—	88KPP4FH	17826.	88KPP4MH	18252.	
600	6	—	—	—	88MFP4MH	32880.	

Reduced Voltage Pump Panels

Selection

Wye Delta Closed Transition Solid State Overload, Class 88

Ordering Instructions	Coil Table	Overload Table																																																																	
<ul style="list-style-type: none"> ▶ Use complete catalog number. Replace the (*) with letter from the coil table. ▶ Replace (†) with the letter from the overload table that corresponds to the correct FLA. 	<table border="1"> <thead> <tr> <th>60Hz Voltage</th> <th>Letter</th> </tr> </thead> <tbody> <tr><td>24 Separate Control</td><td>J</td></tr> <tr><td>120 Separate Control</td><td>F</td></tr> <tr><td>110-120/220-240</td><td>A</td></tr> <tr><td>200-208</td><td>D</td></tr> <tr><td>220-240</td><td>G</td></tr> <tr><td>220-240/440-480</td><td>C</td></tr> <tr><td>277</td><td>L</td></tr> <tr><td>440-480</td><td>H</td></tr> <tr><td>550-600</td><td>E</td></tr> </tbody> </table>	60Hz Voltage	Letter	24 Separate Control	J	120 Separate Control	F	110-120/220-240	A	200-208	D	220-240	G	220-240/440-480	C	277	L	440-480	H	550-600	E	<table border="1"> <thead> <tr> <th>Size</th> <th>FLA</th> <th>†</th> </tr> </thead> <tbody> <tr><td>0, 1</td><td>0.25-1</td><td>A</td></tr> <tr><td>0, 1</td><td>0.75-3</td><td>B</td></tr> <tr><td>0, 1</td><td>2.5-10</td><td>D</td></tr> <tr><td>0-1½</td><td>9-18</td><td>E</td></tr> <tr><td>1-4</td><td>13-27</td><td>F</td></tr> <tr><td>1½</td><td>20-40</td><td>G</td></tr> <tr><td>2-4</td><td>22-45</td><td>H</td></tr> <tr><td>2½-4</td><td>30-60</td><td>J</td></tr> <tr><td>3-4</td><td>45-90</td><td>K</td></tr> <tr><td>3½-4</td><td>57-115</td><td>L</td></tr> <tr><td>4</td><td>67-135</td><td>M</td></tr> <tr><td>4½</td><td>100-210</td><td>S</td></tr> <tr><td>5</td><td>100-270</td><td>U</td></tr> <tr><td>6</td><td>200-540</td><td>X</td></tr> </tbody> </table>	Size	FLA	†	0, 1	0.25-1	A	0, 1	0.75-3	B	0, 1	2.5-10	D	0-1½	9-18	E	1-4	13-27	F	1½	20-40	G	2-4	22-45	H	2½-4	30-60	J	3-4	45-90	K	3½-4	57-115	L	4	67-135	M	4½	100-210	S	5	100-270	U	6	200-540	X
60Hz Voltage	Letter																																																																		
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Wye Delta Closed Transition—Solid State Overload[Ⓢ]

	Max Hp	Size (Y Δ)	Half Size	Fuse Clip Amps	MCP Amps	Fusible Disconnect		Motor Circuit Protector	
						Catalog No	Price \$	Catalog No	Price \$
200V	10	1	—	60	50	88DSTC6F*	4836.	88DSTC6M*	5070.
	15	—	1¾	100	100	88ESTC6F*	5112.	88ESTC6M*	5310.
	20	2	—	100	100	88FSTC6F*	5688.	88FSTC6M*	5724.
	30	—	2½	200	100	88GSTC6F*	7080.	88GSTC6M*	7392.
	40	3	—	200	150	88HSTC6F*	7848.	88HSTC6M*	8160.
	50	—	3½	400	200	88ISTC6F*	13086.	88ISTC6M*	14160.
	60	4	—	400	250	88JSTC6F*	14094.	88JSTC6M*	15168.
75	—	4½	400	400	88RSTC6F*	23721.	88RSTC6M*	23661.	
150	5	—	600	600	88KSTC6F*	24474.	88KSTC6M*	24090.	
300	6	—	—	800	Use MCP Type	—	88MSTC6M*	46500.	
230V	10	1	—	60	50	88DSTC2F*	4836.	88DSTC2M*	5070.
	15	—	1¾	60	50	88ESTC2F*	5046.	88ESTC2M*	5310.
	25	2	—	100	100	88FSTC2F*	5688.	88FSTC2M*	5724.
	30	—	2½	200	100	88GSTC2F*	7080.	88GSTC2M*	7392.
	50	3	—	200	150	88HSTC2F*	7848.	88HSTC2M*	8160.
	60	—	3½	400	200	88ISTC2F*	13086.	88ISTC2M*	14160.
	75	4	—	400	250	88JSTC2F*	14094.	88JSTC2M*	15168.
100	—	4½	400	400	88RSTC2F*	23721.	88RSTC2M*	23661.	
150	5	—	600	600	88KSTC2F*	24474.	88KSTC2M*	24090.	
350	6	—	—	1200	Use MCP Type	—	88MSTC2M*	46500.	
460V	15	1	—	30	30	88DSTC4F*	4836.	88DSTC4M*	5070.
	30	—	1¾	60	50	88ESTC4F*	5058.	88ESTC4M*	5310.
	40	2	—	100	100	88FSTC4F*	5814.	88FSTC4M*	5856.
	60	—	2½	100	100	88GSTC4F*	7212.	88GSTC4M*	7524.
	75	3	—	200	150	88HSTC4F*	8490.	88HSTC4M*	8802.
	100	—	3½	200	150	88ISTC4F*	13530.	88ISTC4M*	14832.
	150	4	—	400	250	88JSTC4F*	14622.	88JSTC4M*	15636.
200	—	4½	400	400	88RSTC4F*	24261.	88RSTC4M*	24201.	
300	5	—	600	600	88KSTC4F*	25776.	88KSTC4M*	25392.	
700	6	—	—	1200	Use MCP Type	—	88MSTC4M*	46500.	
575V	15	1	—	30	30	88DSTC5F*	4836.	88DSTC5M*	5070.
	30	—	1¾	60	50	88ESTC5F*	5058.	88ESTC5M*	5310.
	40	2	—	100	100	88FSTC5F*	5814.	88FSTC5M*	5856.
	60	—	2½	100	100	88GSTC5F*	7212.	88GSTC5M*	7524.
	75	3	—	200	100	88HSTC5F*	8490.	88HSTC5M*	8802.
	100	—	3½	200	200	88ISTC5F*	13530.	88ISTC5M*	14832.
	150	4	—	400	250	88JSTC5F*	14622.	88JSTC5M*	15636.
200	—	4½	400	400	88RSTC5F*	24261.	88RSTC5M*	24201.	
300	5	—	600	400	88KSTC5F*	25776.	88KSTC5M*	25392.	
700	6	—	—	1200	Use MCP Type	—	88MSTC5M*	46500.	

ⓈFor phase loss protection order factory modification
 *Phase Failure Relay, suffix R6. See page 36.

Reduced Voltage Pump Panels

Selection

Wye Delta Closed Transition Ambient Compensated Bimetal Overload, Class 88

Ordering Instructions	Coil Table [®]																				
<ul style="list-style-type: none"> ▶ Use complete catalog number. Replace the (*) with letter from the coil table. ▶ Order 3 heater elements by code number at \$9 each page 870, in PC6000. 	<table border="1"> <thead> <tr> <th>60Hz Voltage</th> <th>Letter</th> </tr> </thead> <tbody> <tr><td>24 Separate Control</td><td>J</td></tr> <tr><td>120 Separate Control</td><td>F</td></tr> <tr><td>110-120/220-240</td><td>A</td></tr> <tr><td>200-208</td><td>D</td></tr> <tr><td>220-240</td><td>G</td></tr> <tr><td>220-240/440-480</td><td>C</td></tr> <tr><td>277</td><td>L</td></tr> <tr><td>440-480</td><td>H</td></tr> <tr><td>550-600</td><td>E</td></tr> </tbody> </table> <p>For other voltages and frequencies see page 124, in SFPC-06000.</p>	60Hz Voltage	Letter	24 Separate Control	J	120 Separate Control	F	110-120/220-240	A	200-208	D	220-240	G	220-240/440-480	C	277	L	440-480	H	550-600	E
60Hz Voltage	Letter																				
24 Separate Control	J																				
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Wye Delta Closed Transition

	Max Hp	Size (Y Δ)	Half Size	Fuse Clip Amps	MCP Amps	Fusible Disconnect		Motor Circuit Protector	
						Catalog No	Price \$	Catalog No	Price \$
200V	10	1	—	60	50	88DPC6F*	4809.	88DPC6M*	5043.
	15	—	1¾	100	100	88EPC6F*	5085.	88EPC6M*	5283.
	20	2	—	100	100	88FPC6F*	5661.	88FPC6M*	5697.
	30	—	2½	200	100	88GPC6F*	7053.	88GPC6M*	7365.
	40	3	—	200	150	88HPC6F*	7821.	88HPC6M*	8133.
	50	—	3½	400	200	88IPC6F*	13059.	88IPC6M*	14133.
	60	4	—	400	250	88JPC6F*	14067.	88JPC6M*	15141.
	75	—	4½	400	400	88RFC6F*	23694.	88RFC6M*	23634.
	150	5	—	600	600	88KFC6F*	24447.	88KFC6M*	24063.
	300	6	—	—	800	Use MCP Type	—	88MFC6M*	46473.
230V	10	1	—	60	50	88DPC2F*	4809.	88DPC2M*	5043.
	15	—	1¾	60	50	88EPC2F*	5019.	88EPC2M*	5283.
	25	2	—	100	100	88FPC2F*	5661.	88FPC2M*	5697.
	30	—	2½	200	100	88GPC2F*	7053.	88GPC2M*	7365.
	50	3	—	200	150	88HPC2F*	7821.	88HPC2M*	8133.
	60	—	3½	400	200	88IPC2F*	13059.	88IPC2M*	14133.
	75	4	—	400	250	88JPC2F*	14067.	88JPC2M*	15141.
	100	—	4½	400	400	88RFC2F*	23694.	88RFC2M*	23634.
	150	5	—	600	600	88KFC2F*	24447.	88KFC2M*	24063.
	350	6	—	—	1200	Use MCP Type	—	88MFC2M*	46473.
460V	15	1	—	30	30	88DPC4F*	4809.	88DPC4M*	5043.
	30	—	1¾	60	50	88EPC4F*	5031.	88EPC4M*	5283.
	40	2	—	100	100	88FPC4F*	5787.	88FPC4M*	5829.
	60	—	2½	100	100	88GPC4F*	7185.	88GPC4M*	7497.
	75	3	—	200	150	88HPC4F*	8463.	88HPC4M*	8775.
	100	—	3½	200	150	88IPC4F*	13503.	88IPC4M*	14805.
	150	4	—	400	250	88JPC4F*	14595.	88JPC4M*	15669.
	200	—	4½	400	400	88RFC4F*	24234.	88RFC4M*	24174.
	300	5	—	600	600	88KFC4F*	25749.	88KFC4M*	25365.
	700	6	—	—	1200	Use MCP Type	—	88MFC4M*	46473.
575V	15	1	—	30	30	88DPC5F*	4809.	88DPC5M*	5043.
	30	—	1¾	60	50	88EPC5F*	5031.	88EPC5M*	5283.
	40	2	—	100	100	88FPC5F*	5787.	88FPC5M*	5829.
	60	—	2½	100	100	88GPC5F*	7185.	88GPC5M*	7497.
	75	3	—	200	100	88HPC5F*	8463.	88HPC5M*	8775.
	100	—	3½	200	200	88IPC5F*	13503.	88IPC5M*	14805.
	150	4	—	400	250	88JPC5F*	14595.	88JPC5M*	15669.
	200	—	4½	400	400	88RFC5F*	24234.	88RFC5M*	24174.
	300	5	—	600	400	88KFC5F*	25749.	88KFC5M*	25365.
	700	6	—	—	1200	Use MCP Type	—	88MFC5M*	46473.

Reduced Voltage Pump Panels

Selection

Wye Delta Open Transition Solid State Overload, Class 88

Ordering Instructions	Coil Table		Overload Table		
	60Hz Voltage	Letter	Size	FLA	†
▶ Use complete catalog number. Replace the (*) with letter from the coil table. ▶ Replace (†) with the letter from the overload table that corresponds to the correct FLA.	24 Separate Control	J	0, 1	0.25-1	A
	120 Separate Control	F	0, 1	0.75-3	B
	110-120/220-240	A	0, 1	2.5-10	D
	200-208	D	0-1½	9-18	E
	220-240	G	1-4	13-27	F
	220-240/440-480	C	1½	20-40	G
	277	L	2-4	22-45	H
	440-480	H	2½-4	30-60	J
	550-600	E	3-4	45-90	K
			3½-4	57-115	L
			4	67-135	M
			4½	100-210	S
			5	100-270	U
			6	200-540	X

Wye Delta Open Transition—Solid State Overload[Ⓢ]

	Max Hp	Size (Y Δ)	Half Size	Fuse Clip Amps	MCP Amps	Fusible Disconnect		Motor Circuit Protector	
						Catalog No	Price \$	Catalog No	Price \$
200V	10	1	—	60	50	88DS106F*	3750.	88DS106M*	3984.
	15	—	1¾	100	100	88ES106F*	4212.	88ES106M*	4194.
	20	2	—	100	100	88FS106F*	4800.	88FS106M*	4602.
	30	—	2½	200	100	88GS106F*	6018.	88GS106M*	6090.
	40	3	—	200	150	88HS106F*	6480.	88HS106M*	6792.
	50	—	3½	400	200	88IS106F*	11388.	88IS106M*	12162.
	60	4	—	400	250	88JS106F*	11808.	88JS106M*	12882.
	75	—	4½	400	400	88RS106F*	17763.	88RS106M*	20769.
	150	5	—	600	600	88KS106F*	21474.	88KS106M*	21090.
	300	6	—	—	800	Use MCP Type	—	88MS106M*	39156.
230V	10	1	—	60	50	88DS102F*	3750.	88DS102M*	3984.
	15	—	1¾	60	50	88ES102F*	4146.	88ES102M*	4194.
	25	2	—	100	100	88FS102F*	4800.	88FS102M*	4602.
	30	—	2½	200	100	88GS102F*	6018.	88GS102M*	6090.
	50	3	—	200	150	88HS102F*	6480.	88HS102M*	6792.
	60	—	3½	400	200	88IS102F*	11388.	88IS102M*	12162.
	75	4	—	400	250	88JS102F*	11808.	88JS102M*	12882.
	100	—	4½	400	400	88RS102F*	17763.	88RS102M*	20769.
	150	5	—	600	600	88KS102F*	21474.	88KS102M*	21090.
	350	6	—	—	1200	Use MCP Type	—	88MS102M*	39156.
460V	15	1	—	30	30	88DS104F*	3750.	88DS104M*	3984.
	30	—	1¾	60	50	88ES104F*	4158.	88ES104M*	4194.
	40	2	—	100	100	88FS104F*	4560.	88FS104M*	4602.
	60	—	2½	200	100	88GS104F*	5778.	88GS104M*	6090.
	75	3	—	200	150	88HS104F*	6480.	88HS104M*	6792.
	100	—	3½	200	150	88IS104F*	9912.	88IS104M*	12162.
	150	4	—	400	250	88JS104F*	11808.	88JS104M*	12882.
	200	—	4½	400	400	88RS104F*	17763.	88RS104M*	20769.
	300	5	—	600	600	88KS104F*	21474.	88KS104M*	21090.
	700	6	—	—	1200	Use MCP Type	—	88MS104M*	39156.
575V	15	1	—	30	30	88DS105F*	3750.	88DS105M*	3984.
	30	—	1¾	60	50	88ES105F*	4158.	88ES105M*	4194.
	40	2	—	100	100	88FS105F*	4560.	88FS105M*	4602.
	60	—	2½	100	100	88GS105F*	5778.	88GS105M*	6090.
	75	3	—	200	100	88HS105F*	6480.	88HS105M*	6792.
	100	—	3½	200	150	88IS105F*	9912.	88IS105M*	12162.
	150	4	—	400	250	88JS105F*	11808.	88JS105M*	12882.
	200	—	4½	400	400	88RS105F*	17763.	88RS105M*	20769.
	300	5	—	600	400	88KS105F*	21474.	88KS105M*	21090.
	700	6	—	—	1200	Use MCP Type	—	88MS105M*	39156.

ⓈFor phase loss protection order factory modification
 *Phase Failure Relay, suffix R6. See page 36.

Reduced Voltage Pump Panels

Selection

Wye Delta Open Transition Ambient Compensated Bimetal Overload, Class 88

Ordering Instructions	Coil Table®																				
<ul style="list-style-type: none"> ▶ Use complete catalog number. Replace the (*) with letter from the coil table. ▶ Order 3 heater elements by code number at \$9 each page 870, in PC6000. 	<table border="1"> <thead> <tr> <th>60Hz Voltage</th> <th>Letter</th> </tr> </thead> <tbody> <tr> <td>24 Separate Control</td> <td>J</td> </tr> <tr> <td>120 Separate Control</td> <td>F</td> </tr> <tr> <td>110-120/220-240</td> <td>A</td> </tr> <tr> <td>200-208</td> <td>D</td> </tr> <tr> <td>220-240</td> <td>G</td> </tr> <tr> <td>220-240/440-480</td> <td>C</td> </tr> <tr> <td>277</td> <td>L</td> </tr> <tr> <td>440-480</td> <td>H</td> </tr> <tr> <td>550-600</td> <td>E</td> </tr> </tbody> </table>	60Hz Voltage	Letter	24 Separate Control	J	120 Separate Control	F	110-120/220-240	A	200-208	D	220-240	G	220-240/440-480	C	277	L	440-480	H	550-600	E
60Hz Voltage	Letter																				
24 Separate Control	J																				
120 Separate Control	F																				
110-120/220-240	A																				
200-208	D																				
220-240	G																				
220-240/440-480	C																				
277	L																				
440-480	H																				
550-600	E																				

Wye Delta Open Transition

	Max Hp	Size (Y Δ)	Half Size	Fuse Clip Amps	MCP Amps	Fusible Disconnect		Motor Circuit Protector	
						Catalog No	Price \$	Catalog No	Price \$
200V	10	1	—	60	50	88DP06F*	3723.	88DP06M*	3957.
	15	—	1¾	100	100	88EP06F*	4185.	88EP06M*	4167.
	20	2	—	100	100	88FP06F*	4773.	88FP06M*	4575.
	30	—	2½	200	100	88GP06F*	5991.	88GP06M*	6063.
	40	3	—	200	150	88HP06F*	6453.	88HP06M*	6765.
	50	—	3½	400	200	88IP06F*	11361.	88IP06M*	12135.
	60	4	—	400	250	88JP06F*	11781.	88JP06M*	12855.
	75	—	4½	400	400	88RF06F*	17736.	88RF06M*	20742.
150	5	—	600	600	88KF06F*	21447.	88KF06M*	21063.	
300	6	—	—	800	Use MCP Type	—	88MF06M*	39129.	
230V	10	1	—	60	50	88DP02F*	3723.	88DP02M*	3957.
	15	—	1¾	60	50	88EP02F*	4119.	88EP02M*	4167.
	25	2	—	100	100	88FP02F*	4773.	88FP02M*	4575.
	30	—	2½	200	100	88GP02F*	5991.	88GP02M*	6063.
	50	3	—	200	150	88HP02F*	6453.	88HP02M*	6765.
	60	—	3½	400	200	88IP02F*	11361.	88IP02M*	12135.
	75	4	—	400	250	88JP02F*	11781.	88JP02M*	12855.
	100	—	4½	400	400	88RF02F*	17736.	88RF02M*	20742.
150	5	—	600	600	88KF02F*	21447.	88KF02M*	21063.	
350	6	—	—	1200	Use MCP Type	—	88MF02M*	39129.	
460V	15	1	—	30	30	88DP04F*	3723.	88DP04M*	3957.
	30	—	1¾	60	50	88EP04F*	4131.	88EP04M*	4167.
	40	2	—	100	100	88FP04F*	4533.	88FP04M*	4575.
	60	—	2½	200	100	88GP04F*	5751.	88GP04M*	6063.
	75	3	—	200	150	88HP04F*	6453.	88HP04M*	6765.
	100	—	3½	200	150	88IP04F*	9885.	88IP04M*	12135.
	150	4	—	400	250	88JP04F*	11781.	88JP04M*	12855.
	200	—	4½	400	400	88RF04F*	17736.	88RF04M*	20742.
300	5	—	600	600	88KF04F*	21447.	88KF04M*	21063.	
700	6	—	—	1200	Use MCP Type	—	88MF04M*	39129.	
575V	15	1	—	30	30	88DP05F*	3723.	88DP04M*	3957.
	30	—	1¾	60	50	88EP05F*	4131.	88EP05M*	4167.
	40	2	—	100	100	88FP05F*	4533.	88FP04M*	4575.
	60	—	2½	100	100	88GP05F*	5751.	88GP05M*	6063.
	75	3	—	200	100	88HP05F*	6453.	88HP04M*	6765.
	100	—	3½	200	150	88IP05F*	9885.	88IP05M*	12135.
	150	4	—	400	250	88JP05F*	11781.	88JP04M*	12855.
	200	—	4½	400	400	88RF05F*	17736.	88RF05M*	20742.
300	5	—	600	400	88KF05F*	21447.	88KF04M*	21063.	
700	6	—	—	1200	Use MCP Type	—	88MF04M*	39129.	

Pump Control Panels

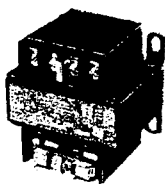
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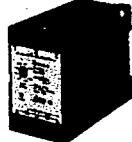



Field Modification Kits[Ⓢ]

Fuse Clip Field Kits^{ⓈⓈ}

Disc Size Amps	Fuse Clip Amps	Volts	Kit No	Price \$
30/60	30	250	75P1045	12.00
	30	600	75P1046	15.00
	60	250	75P1046	15.00
	60	600	75P1047	18.00
	100	250/600	75P1038	63.00
100	100	250/600	75P1048	63.00
100	200	Factory Assembled Only	—	—
200	200	Factory Assembled Only	—	—
400	400	Factory Assembled Only	—	—
600	600	Factory Assembled Only	—	—

Control Power Transformer Kits

Description	Transformer Table			VA Rating [Ⓢ]	Catalog No	Price \$
	Primary Volts	Secondary Volts	Code			
Transformer 50/60Hz 	120	24	1	45 VA	KT*050	108.
	208	24	G	50 VA	KT*050P	144.
	208	120	H	100 VA	KT*100	150.
	240/480	24	4	150 VA	KT*150	201.
	240/480	120	8	200 VA	KT*200	225.
	277	24	5	300 VA	KT*300	277.
	277	120	7	500 VA	KT*500	330.
	600	24	6	* Replace with letter from the Transformer Table.		
	600	120	9			

Description		Class	Controller Size	Voltage	Catalog No	Price \$
Lightning Arrester		87, 88	All	—	49D45584002	192.
Pressure Switch		87, 88	All	Refer to the Pressure Switch Catalog Supplement for more information.		
Voltage & Phase Monitor [Ⓢ]		87, 88	All	208V 240V 380V 415V 480V 600V	47TA320X1 47TA32GX1 47TA32PX1 47TA32KX1 47TA32HX1 47TA32EX1	282. 282. 297. 297. 297. 297.
Anti Backspin Timer		87, 88	All	Refer to Class 55 on pages 656–657 of PC6000 for complete information.		
Hole Plug [Ⓢ]		87, 88	1–4	—	49D41149006	15.00
Isolated Neutral Kit		87, 88	60A 100A	—	49D29103001 49D29103002	67.50 141.00

ⓈFor additional Field Modifications see the Furnas Industrial Control Catalog.

ⓈⓈKits contain 6 clips and mounting hardware and rejection members for class R fusing.

ⓈThe standard control transformer supplied for starter sizes 0 through 2½ with be rated 45VA and have the appropriate secondary fuse. Primary fuses will not be supplied as standard. For primary fuse option select appropriate suffix from table. According to NEC 430-72, 450-3, and UL 508, section 32, primary fuses are not required for control transformers rated less than 50VA and are inherently protected.

Ⓢ Replace (*) with letter from the Transformer Table.

Ⓢ Refer to page 47.

Ⓢ For additional information see Class 47 in the PC6000.

Ⓢ Replaces conduit hub in top of enclosure.

Discount Schedule AC-10 (FURN)

Siemens & Furnas Control Products

Factory Modifications

Ordering Instructions	Transformer Table		
<ul style="list-style-type: none"> ▶ Replace the (*) with letter from the transformer table. ▶ Multiple modification suffixes are added in numerical, alphabetical sequence. 	Primary Volts	Secondary Volts	Letter
	120	24	B
	208	24	S
	208	120	T
	240	24	J
	240	120	F
	277	24	N
	277	120	P
	480/240	24	D
	480/240	120	A
	600	24	E
	600	120	C

Description	Catalog No		Price Addition \$				
	Suffix	Class	1-1%	2, 2 1/2	3	3 1/2, 4	4 1/2, 5
Standard Capacity Control Circuit Transform Etc.Ⓞ	D*	87	162.	162.	336.	408.	462.
		88	288.	288.	408.	528.	588.

Description	Catalog No		Controller Size/Price \$					
	Suffix	Class	1-1%	2, 2 1/2	3, 3 1/2	4	4 1/2, 5	6
Control Circuit Pneumatic Time Delay	T2 T3	87, 88	468.	468.	468.	468.	468.	468.
Backspin protection 0.2 sec—3 minimum run timer			468.	468.	468.	468.	468.	468.
Pressure Switch For jockey pump applications (bourdon tube)	P9	87	268.	268.	268.	268.	268.	268.
Pilot Light, Red Transformer Type	FA	87	162.	162.	162.	162.	162.	162.
	FB	88	180.	180.	180.	180.	180.	180.
Voltage Monitor (Class 47VA) Over Voltage Relay Phase Failure and Reverse Relay	R1	87, 88	1500.	1500.	1500.	1500.	1500.	1500.
	R2		1200.	1200.	1200.	1200.	1200.	
	R4		1056.	1056.	1056.	1056.	1056.	
Auxiliary Interlock	G10	87, 88	66.	66.	66.	66.	66.	66.
	G20		132.	132.	132.	132.	132.	
	GB		87, 88	—	—	—	—	66.
Fuse Clips NEMA Class R	DR	87, 88	9.	9.	—	—	—	—
			18.	18.	—	—	—	
			42.	42.	—	—	—	
Lightning Arrester Surge Capacitor Floor Mounting Leg	L	87, 88	240.	240.	240.	240.	240.	240.
	SC	87, 88	288.	288.	288.	288.	288.	288.
	ML	87	300.	300.	300.	—	—	—
Phase Failure Relay	R6	87, 88	1056.	1056.	1056.	1056.	1056.	1056.

Factory will furnish the same voltage coils as transformer secondary voltage. Extra capacity transformers may require larger enclosures, contact factory for dimensions. Size 6 starters standard with 100VA transformer for DC rectifier circuit.



ⓄThe standard control transformer supplied for starter sizes 0 through 2 1/2 with be rated 45VA and have the appropriate secondary fuse. Primary fuses will not be supplied as standard. For primary fuse option select appropriate suffix from table. According to NEC 430-72, 450-3, and UL 508, section 32, primary fuses are not required for control transformers rated less than 50VA and are inherently protected.

Replacement Parts


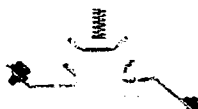




Ordering Instructions

- ▶ 4th character of starter or contactor catalog number indicates model.
- ▶ 3 phase units require 3 contact kits.
- ▶ Contact kit catalog numbers shown are for 1 pole.

Overload Relays

	Size	Model*	No Poles	Catalog No	Price \$	
 <p>1 Pole</p>  <p>3 Pole</p>	0-1	F	1 3	48DC18AA2 48DC38AA2	78.00 81.00	
	1P	G F G	1 3 1 1	48DC18AA3 48DC38AA3 48EC18AA2 48EC18AA3	78.00 81.00 102.00 102.00	
	1½	F G	3 3	48EC38AA2 48EC38AA3	105.00 105.00	
	2.2½	F G	1 3	48GC18AA2 48GC38AA2	111.00 114.00	
	2	G	1 3	48GC18AA3 48GC38AA3	111.00 114.00	
	2½	G	1 3	48GC18AA3 48GC38AA3	111.00 114.00	
	3, 3½	F	3	48HC38AA2	192.00	
	3	G	3	48HC38AA3	192.00	
	3½	G	3	48HC38AA3	192.00	
	4	G B B B	3 Left Center Right	48JC38AA3 48JB18AAAA2L 48JB18AAAA2R 48JB18AAAA3R	290.00 114.00 114.00 138.00	
	4½, 5	All	3	48DC38A4 48KBIT	75.00 213.00	
	6	All	3	48DC38A4 48MBIT	75.00 213.00	
	1 Current Transformer required per pole					

Contact Kits—Single Pole Stationary and Movable Contacts, Contact Spring































































	Size	Class 14 Model	Catalog No	Price \$
      	1	F, P, S	75DF14	30.00 HS
	1½-1P	F, P, S	75EF14	45.00 HS
	2	F P, S	75FF14 75FP14	54.00 HS 54.00 HS
	2½	F P, S	75GF14 75GP14	81.00 HS 81.00 HS
	3	F, P, S	75HF14	97.50 HS
	3½	F, P, S	75IF14	150.00 HS
	4	G, T	75JG14	195.00 HS
	4½	B, F, S	75RB14	540.00 HS
	5	B, F, S	75KB14	600.00 HS
	6	B, F, S	75MB14	975.00 HS

AC Coils

Ordering Instructions

- 4th character of starter or contactor catalog number indicates model.

AC Coils

	Size	Class 14 Model	Volts, 60 Hz	Volts, 50 Hz	Cat. No.	Price
	0-2 1/2	F, P S ESP100™	24	24	75D73070J	45.00
			120	110	75D73070F	45.00
	3-3 1/2	F, P S ESP100™	110-120/220-240	110/190-220	75D73070A	45.00
			208	-	75D73070D	45.00
	4	G T ESP100™	220-240	190-220	75D73070G	45.00
			277/550	240/480	75D73070L	45.00
	3 1/2, 4	B	220-240/440-480	190-220/380-440	75D73070C	45.00
			440-480	380-440	75D73070H	45.00
	4 1/2, 5	B, F S	550-600	550	75D73070E	45.00
			120	24	75D73251J	97.50
	4 1/2, 5	B, F S	110-120/220-240	110	75D73251F	97.50
			208	110/190-220	75D73251A	97.50
	4 1/2, 5	B, F S	220-240	190-220	75D73251D	97.50
			277/550	240/480	75D73251G	97.50
	4 1/2, 5	B, F S	220-240/440-480	190-220/380-440	75D73251L	97.50
			440-480	380-440	75D73251C	97.50
	4 1/2, 5	B, F S	550-600	550	75D73251H	97.50
			120	24	75D73251E	97.50
	4 1/2, 5	B, F S	110-120/220-240	110/190-220	75D70131J	117.00
			208	-	75D70131D	117.00
	4 1/2, 5	B, F S	220-240	190-220	75D70131F	117.00
			277/550	240/480	75D70131A	117.00
	4 1/2, 5	B, F S	220-240/440-480	190-220/380-440	75D70131G	117.00
			440-480	380-440	75D70131I	117.00
	4 1/2, 5	B, F S	550-600	550	75D70131C	117.00
			120	24	75D70131H	117.00
	4 1/2, 5	B, F S	110-120/220-240	110/190-220	75D70131E	117.00
			208	-	D71628047	117.00
	4 1/2, 5	B, F S	220-240	190-220	D71628040	117.00
			277/550	240/480	D71628031	117.00
	4 1/2, 5	B, F S	220-240/440-480	190-220/380-440	D71628048	117.00
			440-480	380-440	D71628044	117.00
	4 1/2, 5	B, F S	550-600	550	D71628034	117.00
			120	24	D71628032	117.00
	4 1/2, 5	B, F S	110-120/220-240	110/190-220	D71628045	117.00
			208	-	D71628033	117.00
	4 1/2, 5	B, F S	220-240	190-220	D72069040	180.00
			277/550	240/480	D72069031	180.00
	4 1/2, 5	B, F S	220-240/440-480	190-220/380-440	D72069047	180.00
			440-480	380/440	D72069044	180.00
	4 1/2, 5	B, F S	550-600	550	D72069034	180.00
			120	24	D72069044	180.00
	4 1/2, 5	B, F S	110-120/220-240	110/190-220	D72069032	180.00
			208	-	D72069045	180.00
	4 1/2, 5	B, F S	220-240	190-220	D72069045	180.00
			277/550	240/480	D72069033	180.00
	4 1/2, 5	B, F S	220-240/440-480	190-220/380-440	D72069045	180.00
			440-480	380/440	D72069033	180.00
	4 1/2, 5	B, F S	550-600	550	D72069033	180.00
			120	24	D72069040	180.00
	4 1/2, 5	B, F S	110-120/220-240	110/190-220	D72069031	180.00
			208	-	D72069047	180.00
	4 1/2, 5	B, F S	220-240	190-220	D72069044	180.00
			277/550	240/480	D72069034	180.00
	4 1/2, 5	B, F S	220-240/440-480	190-220/380-440	D72069032	180.00
			440-480	380/440	D72069045	180.00
	4 1/2, 5	B, F S	550-600	550	D72069033	180.00
			120	24	D72069040	180.00
	4 1/2, 5	B, F S	110-120/220-240	110/190-220	D72069031	180.00
			208	-	D72069047	180.00
	4 1/2, 5	B, F S	220-240	190-220	D72069044	180.00
			277/550	240/480	D72069034	180.00
	4 1/2, 5	B, F S	220-240/440-480	190-220/380-440	D72069032	180.00
			440-480	380/440	D72069045	180.00
	4 1/2, 5	B, F S	550-600	550	D72069033	180.00
			120	24	D72069040	180.00
	4 1/2, 5	B, F S	110-120/220-240	110/190-220	D72069031	180.00
			208	-	D72069047	180.00
	4 1/2, 5	B, F S	220-240	190-220	D72069044	180.00
			277/550	240/480	D72069034	180.00
	4 1/2, 5	B, F S	220-240/440-480	190-220/380-440	D72069032	180.00
			440-480	380/440	D72069045	180.00
	4 1/2, 5	B, F S	550-600	550	D72069033	180.00
			120	24	D72069040	180.00
	4 1/2, 5	B, F S	110-120/220-240	110/190-220	D72069031	180.00
			208	-	D72069047	180.00
	4 1/2, 5	B, F S	220-240	190-220	D72069044	180.00
			277/550	240/480	D72069034	180.00
	4 1/2, 5	B, F S	220-240/440-480	190-220/380-440	D72069032	180.00
			440-480	380/440	D72069045	180.00
	4 1/2, 5	B, F S	550-600	550	D72069033	180.00
			120	24	D72069040	180.00
	4 1/2, 5	B, F S	110-120/220-240	110/190-220	D72069031	180.00
			208	-	D72069047	180.00
	4 1/2, 5	B, F S	220-240	190-220	D72069044	180.00
			277/550	240/480	D72069034	180.00
	4 1/2, 5	B, F S	220-240/440-480	190-220/380-440	D72069032	180.00
			440-480	380/440	D72069045	180.00
	4 1/2, 5	B, F S	550-600	550	D72069033	180.00
			120	24	D72069040	180.00
	4 1/2, 5	B, F S	110-120/220-240	110/190-220	D72069031	180.00
			208	-	D72069047	180.00
	4 1/2, 5	B, F S	220-240	190-220	D72069044	180.00
			277/550	240/480	D72069034	180.00
	4 1/2, 5	B, F S	220-240/440-480	190-220/380-440	D72069032	180.00
			440-480	380/440	D72069045	180.00
	4 1/2, 5	B, F S	550-600	550	D72069033	180.00
			120	24	D72069040	180.00
	4 1/2, 5	B, F S	110-120/220-240	110/190-220	D72069031	180.00
			208	-	D72069047	180.00
	4 1/2, 5	B, F S	220-240	190-220	D72069044	180.00
			277/550	240/480	D72069034	180.00
	4 1/2, 5	B, F S	220-240/440-480	190-220/380-440	D72069032	180.00
			440-480	380/440	D72069045	180.00
	4 1/2, 5	B, F S	550-600	550	D72069033	180.00
			120	24	D72069040	180.00
	4 1/2, 5	B, F S	110-120/220-240	110/190-220	D72069031	180.00
			208	-	D72069047	180.00
	4 1/2, 5	B, F S	220-240	190-220	D72069044	180.00
			277/550	240/480	D72069034	180.00
	4 1/2, 5	B, F S	220-240/440-480	190-220/380-440	D72069032	180.00
			440-480	380/440	D72069045	180.00
	4 1/2, 5	B, F S	550-600	550	D72069033	180.00
			120	24	D72069040	180.00
	4 1/2, 5	B, F S	110-120/220-240	110/190-220	D72069031	180.00
			208	-	D72069047	180.00
	4 1/2, 5	B, F S	220-240	190-220	D72069044	180.00
			277/550	240/480	D72069034	180.00
	4 1/2, 5	B, F S	220-240/440-480	190-220/380-440	D72069032	180.00
			440-480	380/440	D72069045	180.00
	4 1/2, 5	B, F S	550-600	550	D72069033	180.00
			120	24	D72069040	180.00
	4 1/2, 5	B, F S	110-120/220-240	110/190-220	D72069031	180.00
			208	-		

Application Data

I-T-E MCP Type ETI Breakers

Instantaneous Trip Breakers: Recommended Settings

Max Settings

Hp	230Volts		460Volts		575Volts	
	A	Set	A	Set	A	Set
1/4	2	2	1	3	1	3
1/2	2	3	1	3	1	3
3/4	3	3	2	2	2	2
	5	3	3	2	2	2
1.0	5	4	3	3	2	3
1 1/2	10	2	3	4	3	3
2	10	4	5	3	5	2
3	25	3	10	2	5	4
5	30	3	10	4	10	3
7 1/2	40	3	25	3	25	2
10	40	4	30	3	25	3
15	50	4	30	4	30	3
20	100	3	40	4	40	3
25	100	4	50	3	40	4
30	100	4	50	4	50	3
40	150	4	100	3	50	4
50	250	2	100	4	100	3
60	250	4	100	4	100	3
75	250	6	150	4	100	4
100	400	4	250	3	150	4
125	400	6	250	4	250	3
150	600	4	250	5	250	3
200	600	7	400	4	250	6
250	-	-	400	6	400	4
300	-	-	600	4	400	5
350	-	-	600	4	400	5
400	-	-	600	6	600	4

A=Continuous amps.

For maximum protection the trip position should be set as low as possible. Turn the adjustment screw counterclockwise to successively lower positions until the breaker trips on motor starting. After this position is determined, turn the adjustment screw clockwise to the next higher setting for normal operation. The adjustment screw is infinitely adjustable for customer convenience. If the breaker does not trip at the lowest setting leave the indicator at this setting.

Breaker Kits

Class	Size	Max Hp					Cat. No.	Price
		200 Volts	230 Volts	460 Volts	575 Volts	Breaker Amps		
18, 26, 32, 37.87	0	1/2	1/2	1	1	3	ED63A003	*
		1	1	3	3	10	ED63A010	*
		3	3	5	5	25	ED63A025	*
	1	1/2	1/2	1	1	3	ED63A003	*
		1	1	3	3	10	ED63A010	*
		3	3	7 1/2	7 1/2	25	ED63A025	*
	1 1/4	7 1/2	7 1/2	10	10	30	ED63A030	*
		10	10	—	—	50	ED63A050	*
	2	7 1/2	10	20	20	40	ED63A040	*
		10	15	25	25	50	ED63A050	*
	2 1/2	—	—	30	30	50	ED63A050	*
		15	20	—	—	100	ED63A100	*
3	—	—	30	30	50	ED63A050	*	
	25	30	50	50	100	ED63A100	*	
3 1/2	30	40	75	75	125	ED63A125	*	
4	40	50	100	100	150	FXD63A150L	*	
4 1/2	50	75	150	150	250	FXD63A250L	*	
5	50	75	150	200	250	FXD63A250L	*	
	75	100	200	—	400	JX63A400L	*	
6	100	125	250	300	400	JXD63A400L	*	
	150	200	400	400	600	LXD63A600L	*	

* Consult factory for pricing.

The instantaneous trip circuit breaker is factory set at the LO position. In accordance with the National Electrical Code, "The setting on an instantaneous trip circuit breaker may be increased over 700 percent, but shall in no case exceed 1300 percent."

To set: determine motor full load current from the motor nameplate. Refer to the table and determine the recommended setting position. Use a screwdriver to set the indicator on the adjustment screw to the appropriate position.

I-T-E MCP Type ETI Setting Positions

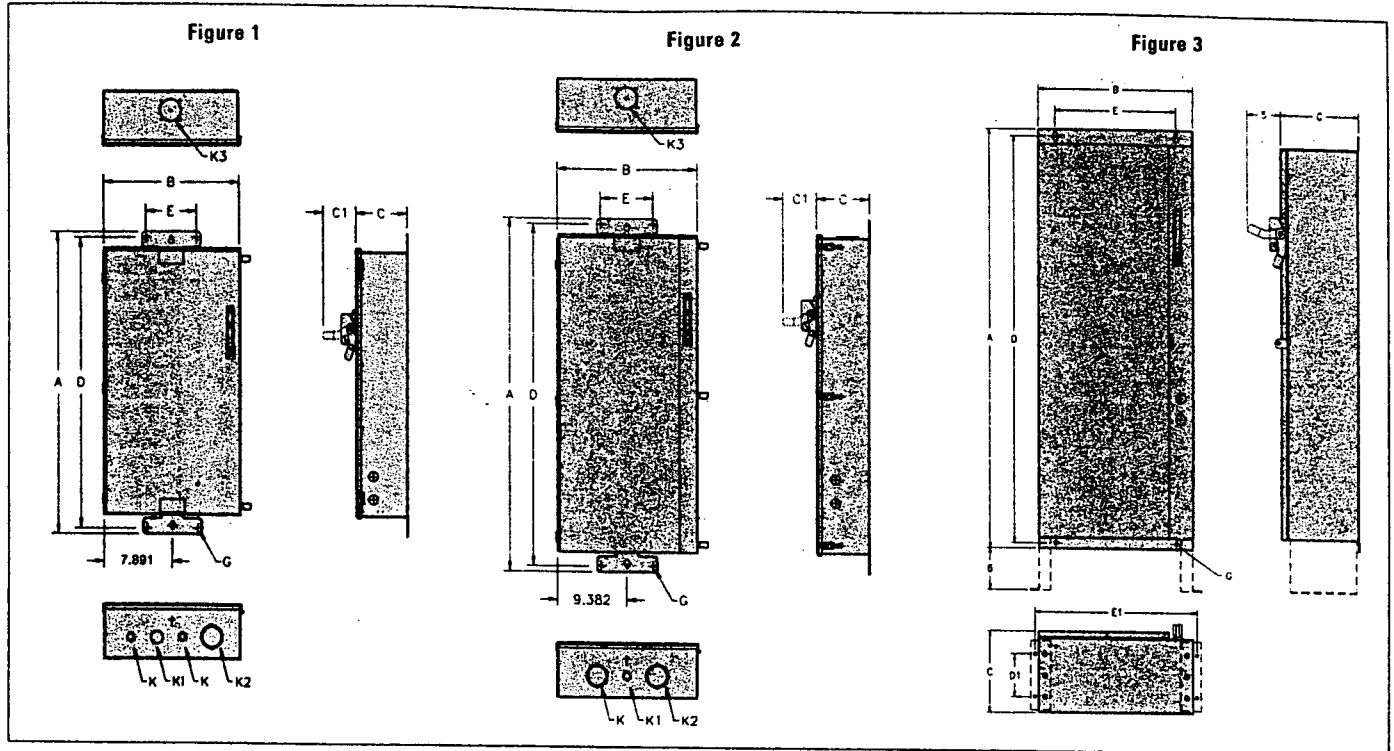
Cont Amps	Trip Settings Positions							
	LO	2	3	4	5	6	7	HI
1	2.6	4.5	6	7.5	—	—	—	9
2	7	11	15	19	—	—	—	22
3	10	17	23	30	—	—	—	35
5	16	26	36	46	—	—	—	54
10	30	50	70	85	—	—	—	100
25	55	90	120	150	—	—	—	180
30	80	135	180	230	—	—	—	270
40	115	185	250	320	—	—	—	375
50	180	300	400	510	—	—	—	600
100	300	500	640	850	—	—	—	1000
125	—	—	—	—	—	—	—	—
⓪ 150	800	900	1000	1100	1200	1300	1400	1500
250	1100	1300	1500	1700	1900	2100	2300	2500
⓪ 400	2000	2290	2570	2860	3140	3430	3710	4000
⓪ 600	3000	3430	3860	4290	4710	5140	5570	6000

Contact a Siemens-Furnas Controls Sales Office for settings with current limiters.

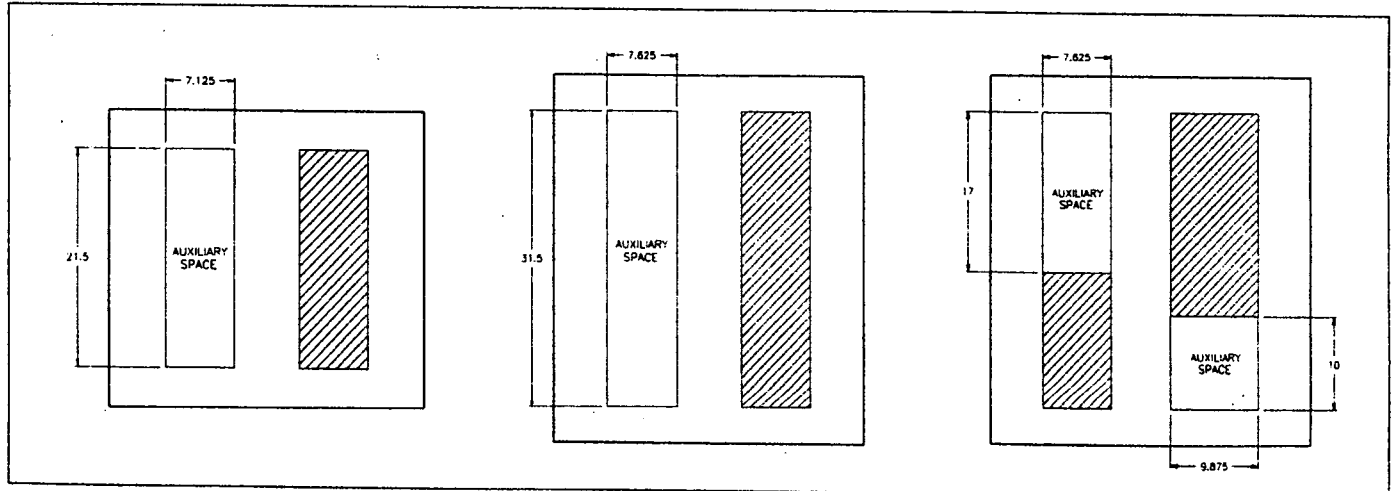
- ⓪ FJ63A150
- ⓪ JL63H400
- ⓪ LL63H800

Class 87, 88

Outline



Layout



Fused or MCP

Size	Fig	Outline Dimensions				Mounting Dimensions				Mtg Screw	Conduit Size			Approx Ship Wt Lbs (Kg)	Ref Dwg
		A	B	C	C1	D	D1	E	E1		K1	K2	K3		
1-2½ (250V, 100 Amp Max) (600V, 60 Amp Max)	1	30¾ (778)	15¾ (403)	5¼ (130)	5 (127)	29¾ (740)	—	7 (178)	—	⅜	⅝-1¼	1¼-1¾	1¾-1⅞	55 (25)	D68620-A
2-2½ (250V, 200 Amp Max) 3-3½, Compact 4 (600V, 200 Amp Max)	2	45¾ (1159)	18¾ (479)	6¾ (175)	5 (127)	44¾ (1121)	—	7 (178)	—	⅝ (10)	1¾-2⅞	⅝-1¼	2½-3	105 (48)	D68620-A
4	3	49 (1245)	19½ (486)	9⅝ (252)	—	47⅝ (1214)	5 (127)	15 (381)	20⅝ (532)	⅝	—	—	—	110 (50)	D56032
4½, 5	3	72¾ (1834)	20 (508)	9⅝ (237)	—	71 (1803)	5 (127)	16 (406)	21¼ (556)	⅝	—	—	—	—	D56032
6	3	79¾ (2010)	22 (559)	12⅝ (329)	—	78 (1981)	5 (127)	18 (457)	23¼ (606)	⅝	—	—	—	—	D56032

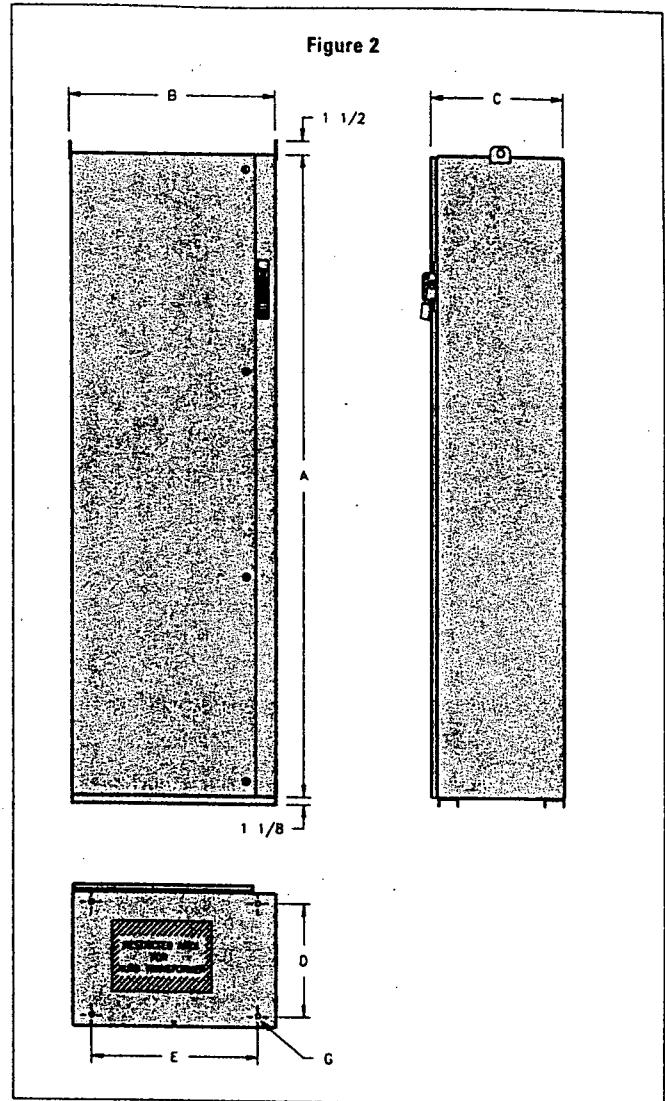
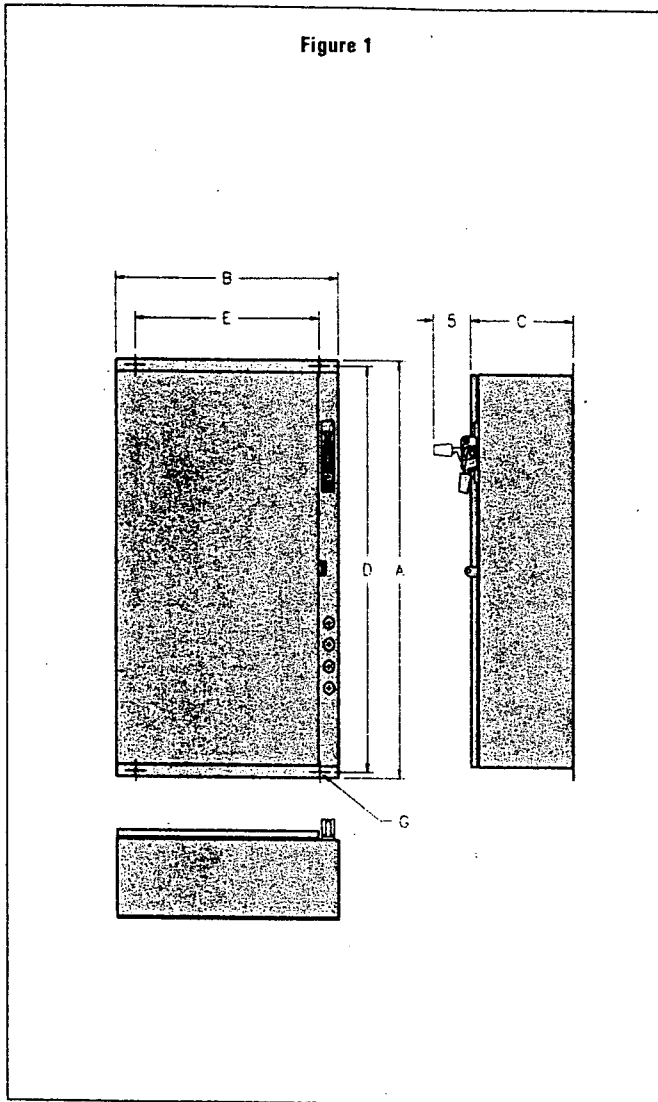
All dimensions shown in inches (mm).
Dimensions for reference, not for construction.

Contact a Siemens & Furnas Controls Sales Office for
dimensions not listed.

Reduced Voltage Pump Panels

Dimensions

Class 87, 88



Auto Transformer

Size			Outline Dimensions			Mtg Dimensions		Mtg Screw	Approx Ship Wt Lbs (Kg)	NEMA 3/12 Ref Dwg
Fusible	MCP	Fig	A	B	C	D	E	G		
0-2½	0-2½	1	43 ³ / ₁₆ (1100)	24 ¹ / ₂ (614)	11 (279)	42 ¹ / ₂ (1075)	20 (509)	¼	380 (172)	D68374
3-3½	3-3½	1	55 ³ / ₁₆ (1405)	28 ³ / ₂ (718)	11 (279)	54 ¹ / ₂ (1380)	24 (610)	¼	640 (290)	D68374
4	4	1	74 ⁷ / ₃₂ (1896)	28 ³ / ₂ (718)	11 (279)	73 ⁹ / ₃₂ (1865)	24 (610)	¼	740 (336)	D68374
4½-6	4½-6	2	90 (2286)	29 ⁹ / ₃₂ (761)	20 (508)	16 (406)	24 ⁷ / ₁₆ (621)	⅝	875 (397)	D68374

Part Winding

0-2	0-2½	1	43 ³ / ₁₆ (1100)	24 ¹ / ₂ (614)	11 (279)	42 ¹ / ₂ (1075)	20 (509)	¼	380 (172)	D68374
2½-3½	3-3½	1	55 ³ / ₁₆ (1405)	28 ³ / ₂ (718)	11 (279)	54 ¹ / ₂ (1380)	24 (610)	¼	640 (290)	D68374
4	4	1	74 ⁷ / ₃₂ (1896)	28 ³ / ₂ (718)	11 (279)	73 ⁹ / ₃₂ (1865)	24 (610)	¼	740 (336)	D68374
4½-5	4½-5	2	90 (2287)	29 ⁹ / ₃₂ (761)	20 (508)	16 (406)	24 ⁷ / ₁₆ (621)	⅝	875 (397)	D68374

Wye Delta—Open and Closed Transition

0-2	0-2½	1	43 ³ / ₁₆ (1100)	24 ¹ / ₂ (614)	11 (279)	42 ¹ / ₂ (1075)	20 (509)	¼	380 (172)	D68374
2½-3½	3-3½	1	55 ³ / ₁₆ (1405)	28 ³ / ₂ (718)	11 (279)	54 ¹ / ₂ (1380)	24 (610)	¼	640 (290)	D68374
4	4	1	74 ⁷ / ₃₂ (1896)	28 ³ / ₂ (718)	11 (279)	73 ⁹ / ₃₂ (1865)	24 (610)	¼	740 (336)	D68374
4½-5	4½-5	2	90 (2287)	29 ⁹ / ₃₂ (761)	20 (508)	16 (406)	24 ⁷ / ₁₆ (621)	⅝	875 (397)	D68374

All dimensions shown in inches (mm).

Dimensions for reference, not for construction.

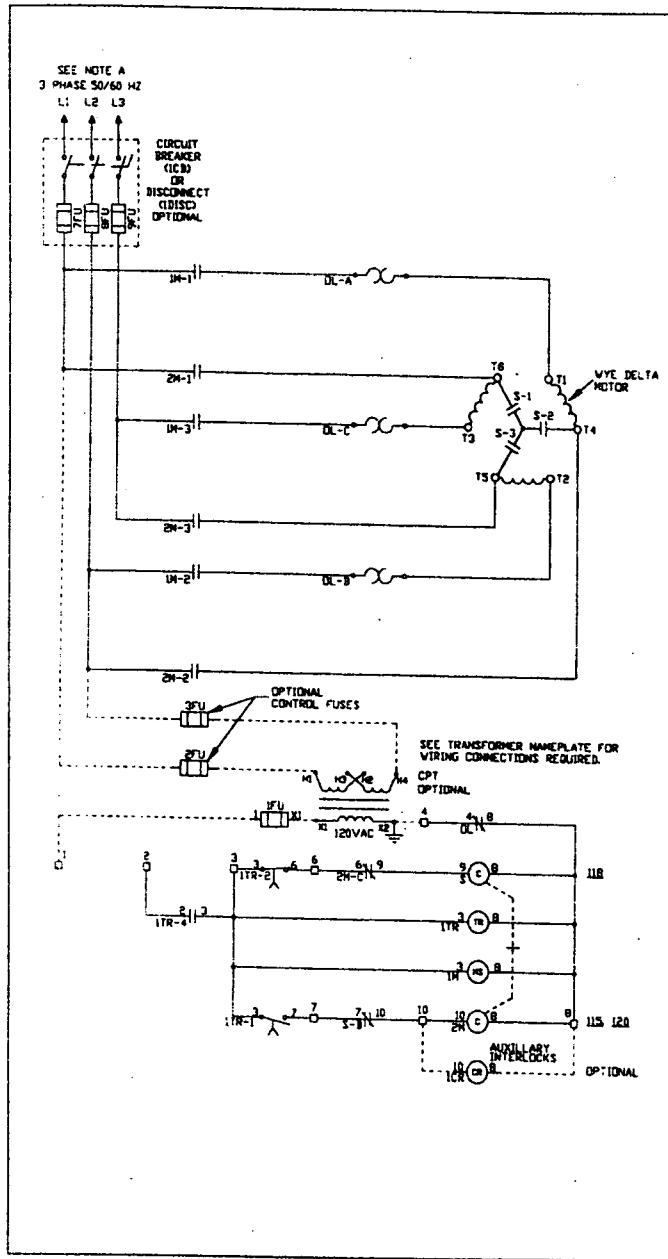
Contact a Siemens & Furnas Controls Sales Office for dimensions not listed.

Reduced Voltage Pump Panels

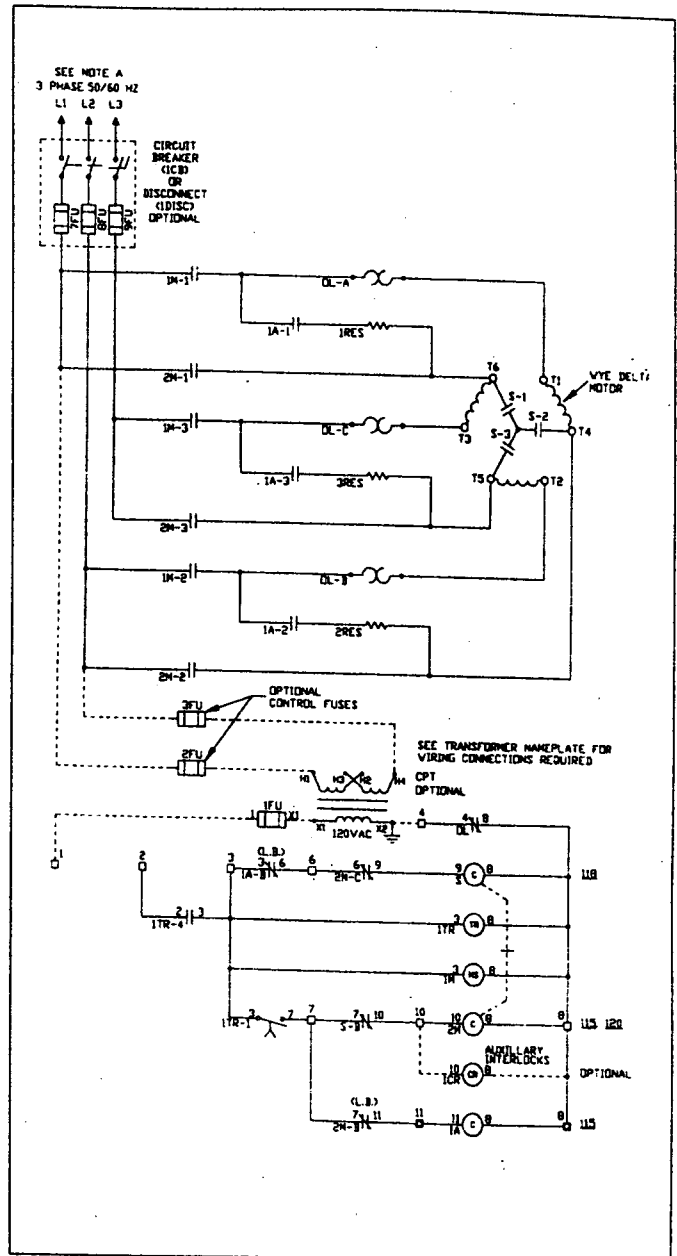
Wiring

Class 87, 88

Wye Delta—Open Transition



Wye Delta—Closed Transition

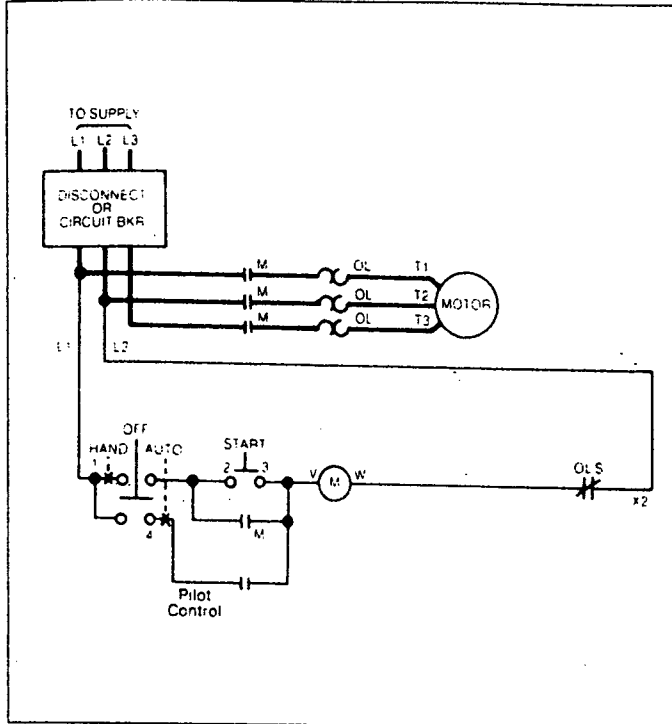


Reduced Voltage Pump Panels

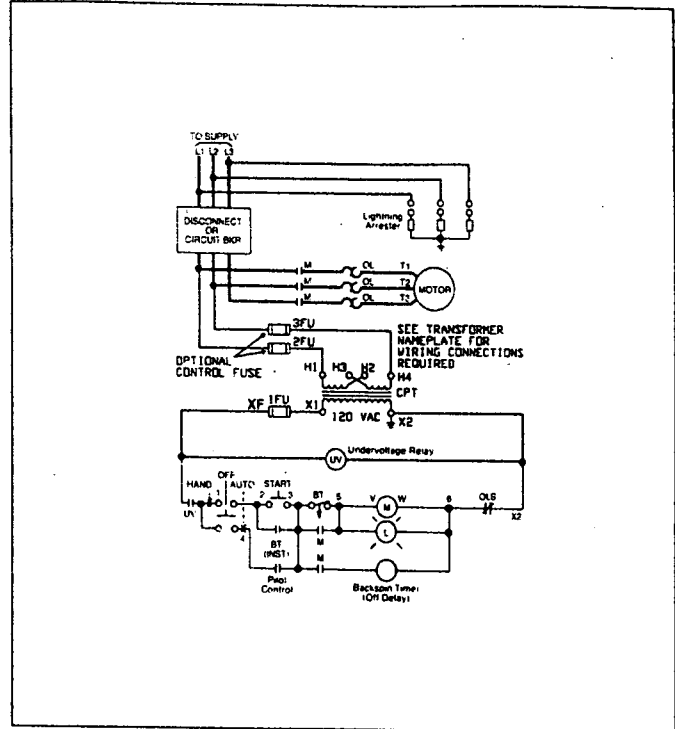
Wiring

Class 87, 88

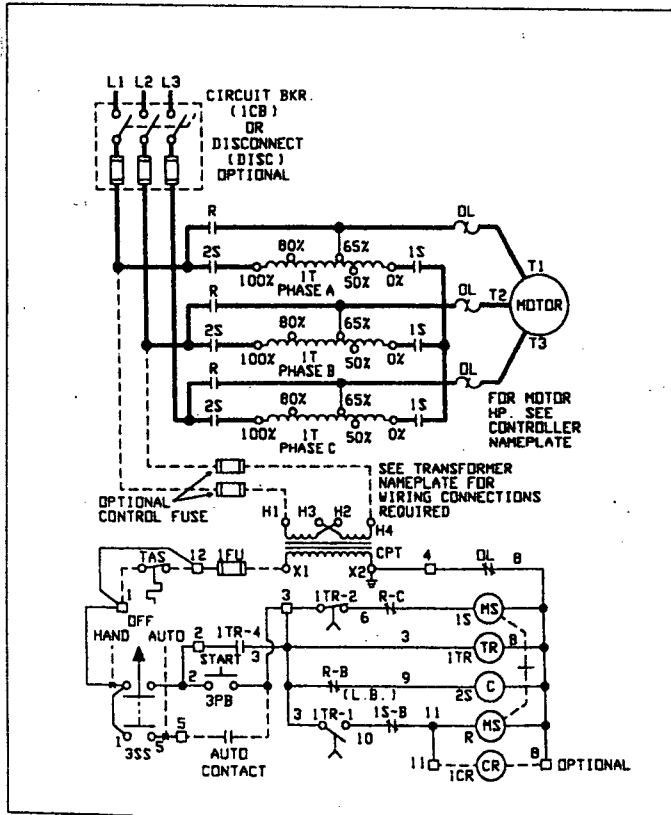
Elementary Diagram



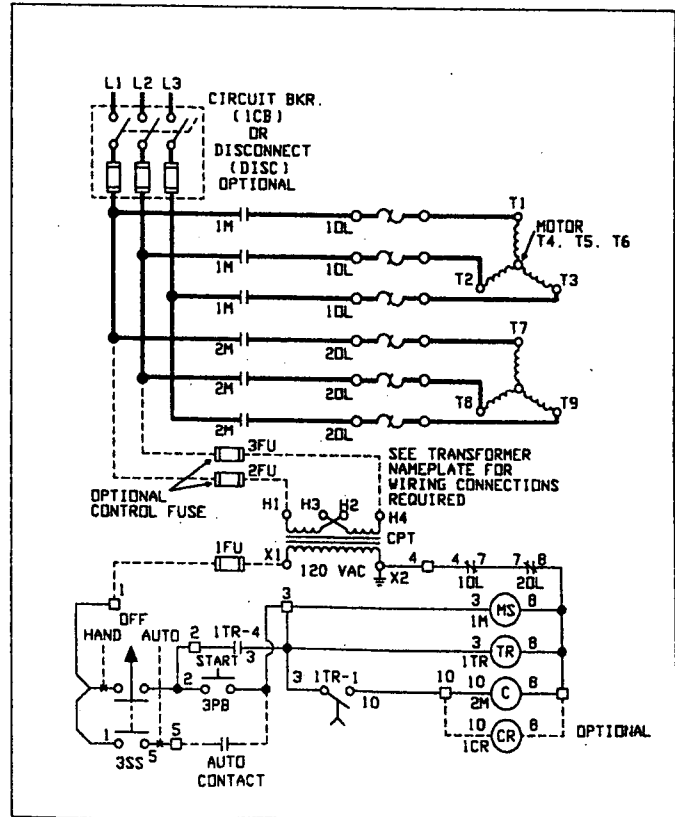
Typical Available Options



Auto Transformer



Two Step Part Winding



Pro Control[®]

Ordering Information

- ▶ Other Water System Switches page 460 in PC 6000.
- ▶ Low pressure protection page 460 in PC 6000.
- ▶ Air System Switches page 460 in PC 6000.
- ▶ Reverse Action page 460 in PC 6000.
- ▶ Float Switches page 460 in PC 6000.

Reference Literature

- ▶ Instruction Sheet-Replacement Contact Cartridge 75-HSE2

Certifications

- ▶ UL Listed File No. E14861
- ▶ CSA Certified File No. LR36854

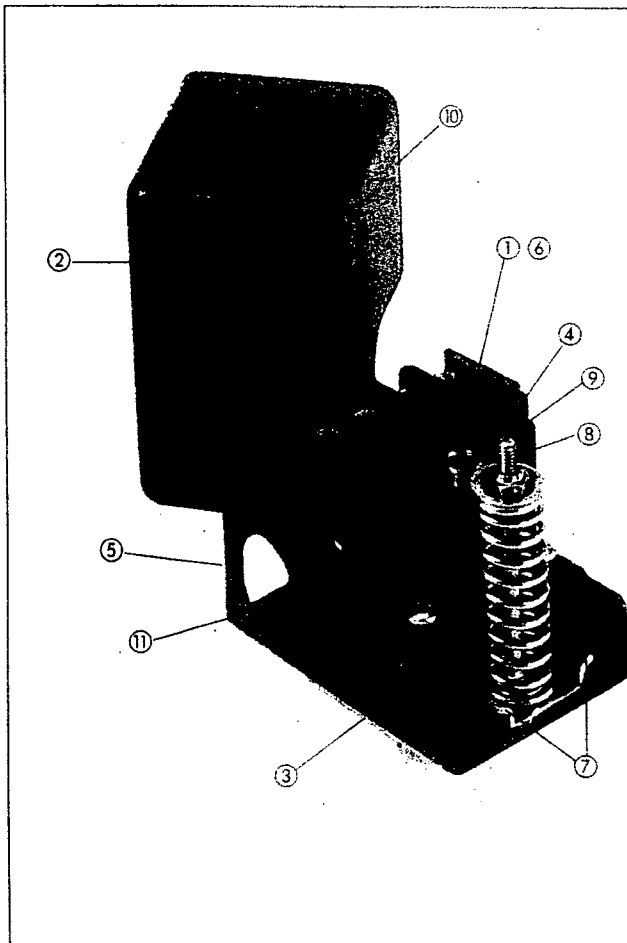
Description

Developed and sold for use by water-well professionals, the Furnas PRO CONTROL pressure switch answers the professional installer's need for rugged, reliable control with no cutting corners on quality. Built for direct use on all types of pumps up to 5 Hp and for use in the control circuit of a magnetic starter (see Class 14) for larger pumps. The features of PRO CONTROL make it standard equipment on some of the world's finest pumps.

Electrical Ratings

Description	Control Circuit	Horsepower			
		1 Phase		3 Phase	DC
		120V	240V	240V	32V-230V
69ES1	A600	1½	2	3	½
69ES2	A600	2	3	5	½

Control circuit ratings apply when pressure switch is being used to control the coil on a magnetic starter. For A600 rating information see Application Data Section.



- ① **100% copper contacts** for superior, dependable electrical performance even in the toughest applications.
- ② **Extra large captive cover nut** for quick and easy cover removal.
- ③ **Wider diaphragm orifice** reduces clogging, prolongs switch life. Nipple is center located to allow a smaller turning radius in tight access situations.
- ④ **Replaceable contact block** swaps out fast. Unique design allows replacement of points without disturbing the plumbing. Eliminates messy service calls, minimizes lengthy water interruptions.
- ⑤ **Roomy wiring space** makes installation faster and easier. No-wrap terminals use serrated bases and binding head screws to eliminate wire looping.
- ⑥ **Visible contacts** provide easy inspection yet are recessed enough to protect against accidental shocks.
- ⑦ **Pry points** enable safe, simple testing of the switch mechanism.
- ⑧ **State of the art switch mechanism** is enclosed for longer life and to prevent interference from wire leads.
- ⑨ **Adjustable differential nut** is recessed and requires a 3/8 inch socket drive (no screwdriver) to deter tampering by homeowners and other non-professionals.
- ⑩ **Rugged, non-metallic, professional-looking cover.** Installation and adjustment information is permanently mounted inside cover – moisture proof label can't be lost or misplaced.
- ⑪ **Two large ground screws** for full compliance with NEC code, featuring slotted/phillips head design for extra convenience.

Ordering Instructions

► Pressure setting adjustment tables page 460 in PC 6000.

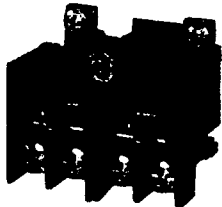
69ES Water Systems

Pressure in Pounds per Square Inch			Pressure Setting Adjustment Table	Horsepower			Factory Setting	NEMA 1 General Purpose	
Min Close Cut-In	Max Open Cut-Out	Differential Range		1 Phase		3 Phase		Catalog No	Price \$
				120V	240V	240V			
10	80	15-25	P	1½	2	3	30-50	69ES1	22.00
10	80	15-25	P	2	3	5	30-50	69ES2	32.40

69ES Modifications—24 Switches Minimum

Description	Suffix [Ⓞ]	Price Addition \$
Auto-Off Disconnect Lever (availability to be announced)	L	4.00
¼" Quick Connects (Load Terminals Only)	A	0.40
Pulsation Orifice	B	0.60
2 Rubber Grommets for ½" conduit hole	G	1.28
Pipe Fittings...		
½" Male NPT	2A	—
½" Female NPT	2B	1.20
¾" Female NPT	2J	—
Straight Mini Barb for ¼" plastic tube	2M	1.20
90° Mini Barb for ¼" plastic tube	2T	1.80
Special Pressure Settings: Suffix Z is followed by setting Example: 69ES1Z2040	Z	—

Accessories

Illustration	Description	Catalog No	Price \$	
	Contact Cartridge Complete with Contacts	For 69ES1	75ES1	
		For 69ES2	75ES2	
	Grommets for ½" conduit hole		D00492001	0.64
	Box Connector for non metallic cable fits ½" conduit hole		D35274001	0.72
	Plastic Pulsation Plug		D20909001	0.60

Ⓞ Suffixes are added in sequence listed.

Ordering Instructions

- ▶ Air System Switches page 460 in PC 6000.
- ▶ Special application reverse action switches page 460 in PC 6000.

Features

- Corrosion Resistant Non Metallic Cover
- No Wire Looping
- Straight Thru Wiring
- Visible Contacts 2 Pole Double Break
- No Drift Pressure Settings
- Captive Cover Screw
- Ample Wiring Room
- Ground Screws
- Easy to Adjust
- Two Ratings 3 Hp and 5 Hp Max
- UL Listed File #E14861
- CSA Certified File #LR36954

Description

Furnas **W** series pressure switches provide time tested, reliable control for automatic water systems. The switch is universally acceptable for use as original equipment on water well pumps or pumping systems. Its simple design makes it easy to use for professionals and non-professionals alike.

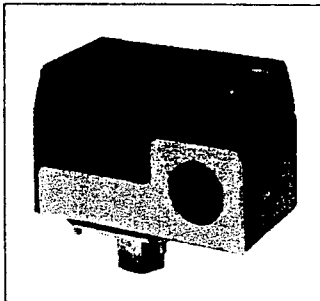
Gard-All®

GARD-ALL switches combine the functions of a standard pressure switch with protection against low pressure. They prevent the pump from starting whenever the system falls considerably below cut-in pressure. Upon restoration of the water supply, a manual reset lever is depressed until a build up of system pressure permits automatic operation.

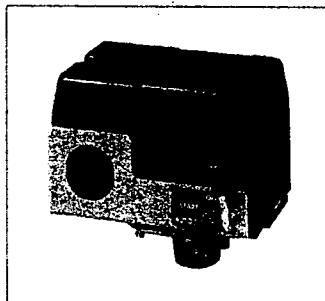
Electrical Ratings

Description	Control Circuit	Horsepower				
		1 Phase		3 Phase		DC
		120V	240V	240V	480-600V	32V-230V
69WA	A600	1½	2	3	—	¼
69WB	A600	2	3	5	1	½
69WE	A600	1½	2	3	—	½
69WF	A600	2	3	5	—	½

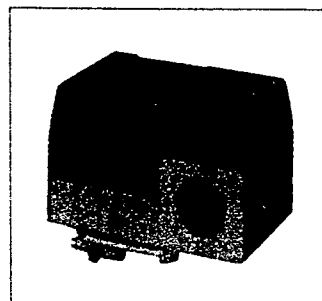
Control circuit ratings apply when pressure switch is being used to control the coil on a magnetic starter. For A600 rating information see Application Data Section.



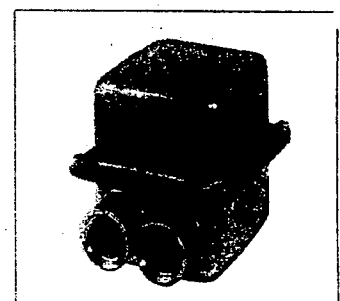
69WA4
NEMA 1



69WFC
Gard-All



69W
With 90° Mini Barb
NEMA 1



69W
Weatherproof
NEMA 3

Pressure Switches

Selection

Water Systems

9W Water Systems

Pressure in Pounds per Square Inch				Pressure Setting Adjustment Table	Horsepower				Factory Setting	NEMA 1 General Purpose	
Min Close Cut-In	Max Open Cut-Out	Differential Range	1 Phase		3 Phase		Catalog No	Price \$			
			120V		240V	240V				480/600V	
5	65	15-30	A	1½	2	3	—	30-50	69WA4	21.60	
5	80	15-30	B	2	3	5	1	30-50	69WB5	32.40	
3	35	6-15	C	2	3	5	1	5-10	69WB3	40.30	
1	12	3-5	D	2	3	5	1	3-7	69WB2	40.30	

69W with Low Pressure Cut-Off

Pressure in Pounds per Square Inch				Pressure Setting Adjustment Table	Horsepower				Fixed Low Pressure Cut-off	Factory Setting	NEMA 1 General Purpose	
Min Close Cut-In	Max Open Cut-Out	Differential Range	1 Phase		3 Phase		Catalog No	Price \$				
			120V		240V	240V					480/600V	
10	70	13-30	Q	1½	2	3	—	6	20-40	69WEC	29.00	
10	70	13-30	Q	2	3	5	—	6	20-40	69WFC	39.40	

69W Modifications

Description	Catalog No Suffix [Ⓛ]	Unit Price Addition \$	Price Addition \$ 24 Switches Minimum
Auto-Off Disconnect Lever	L	4.00	No Minimum
¾" Quick Connects (Load Terminals Only)	A	—	0.40
Pulsation Orifice	B	—	0.60
2 Rubber Grommets for ½" conduit hole	G	—	1.28
NEMA 3 Outdoor Weatherproof Enclosure—Cannot be used with Auto-Off Disconnect Lever	W	120.00	No Minimum
NEMA 4 Watertight Enclosure—Cannot be used with Auto-Off Disconnect Lever	X	180.00	No Minimum
Pipe Fittings			
¾" Male NPT	2A	—	No Price Adder
½" Female NPT	2B	—	No Price Adder
¾" Female NPT	2J	—	No Price Adder
Straight Mini Barb for ½" plastic tube	2M	—	1.20
90° Mini Barb for ½" plastic tube	2T	—	1.80
Special Pressure Settings: Suffix Z is followed by setting Example: 69WA4Z2040	Z	—	No Price Adder
1 NO & 1 NC Contact Example: 69WD4	Change 4th character of Catalog No to D	—	8.00

Replacement Parts

Description	Catalog No	Price \$
Grommet for ½" conduit hole	D00492001	0.64
Box Connector for non metallic cable fits ½" conduit hole	D35274001	0.72
Plastic Pulsation Plug	D20909001	0.60

[Ⓛ]Suffixes are added in sequence listed.

Siemens Energy & Automation, Inc.
Industrial Control Products Business
1000 McKee Street
Batavia, IL 60510
Tel: 630/879-6000
Tel: 800/323-5450

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Order No. SFCS-5001B-0200
5M0300ABS Printed in USA

Appendix 2: As-Built Drawing

- Full Size
- 11" X 17"



US Army Corps
of Engineers

Kansas City District
You Matter - We Care

OFF-POST ALTERNATE WATER SUPPLY

FORMER FIRE TRAINING AREA MARSHALL ARMY AIRFIELD

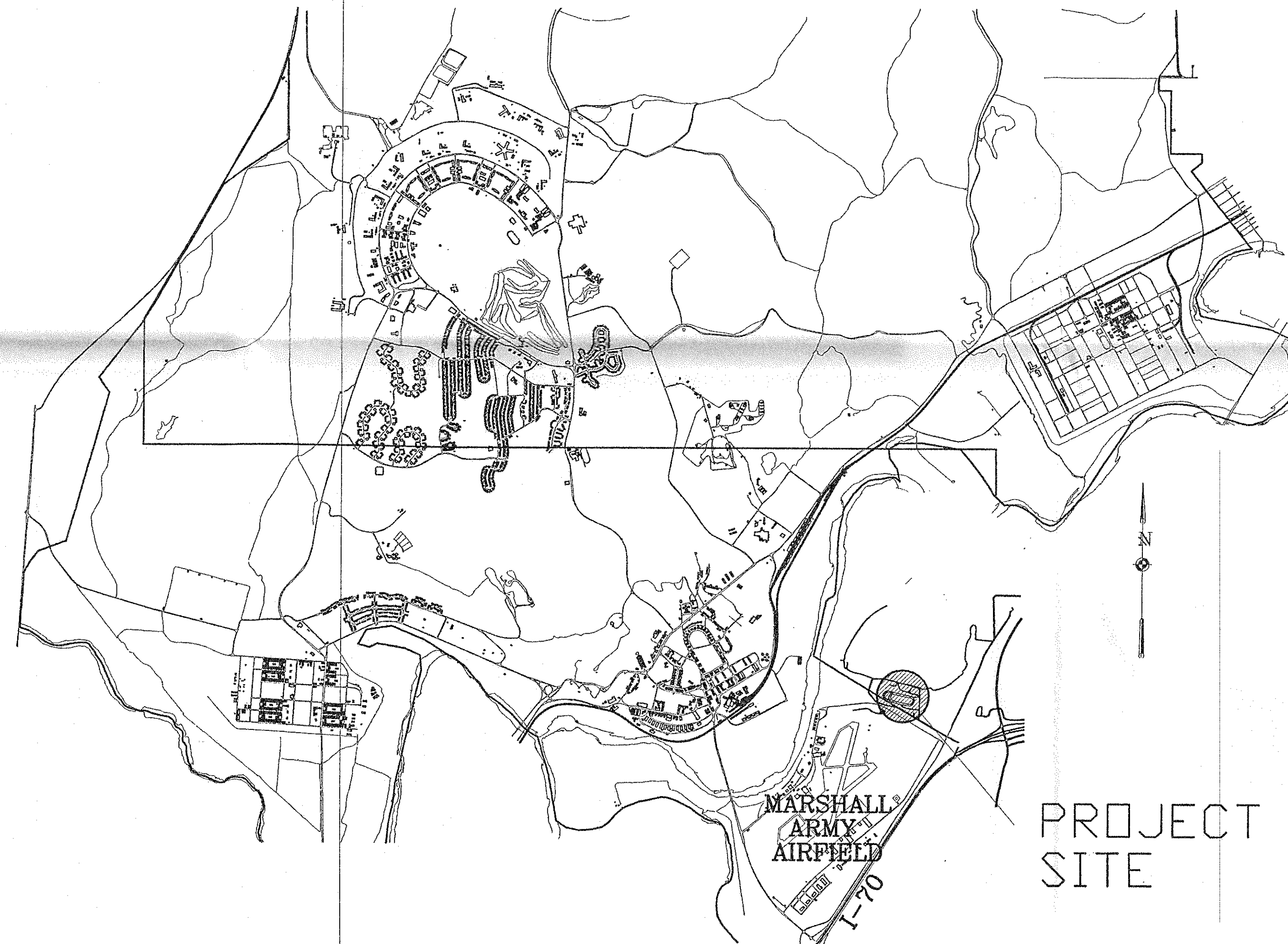
Fort Riley, Kansas

September 1998

(Revised May 2002)

(Final Revision November 2002-As Built)

IFB# DACW41-95-D-0022





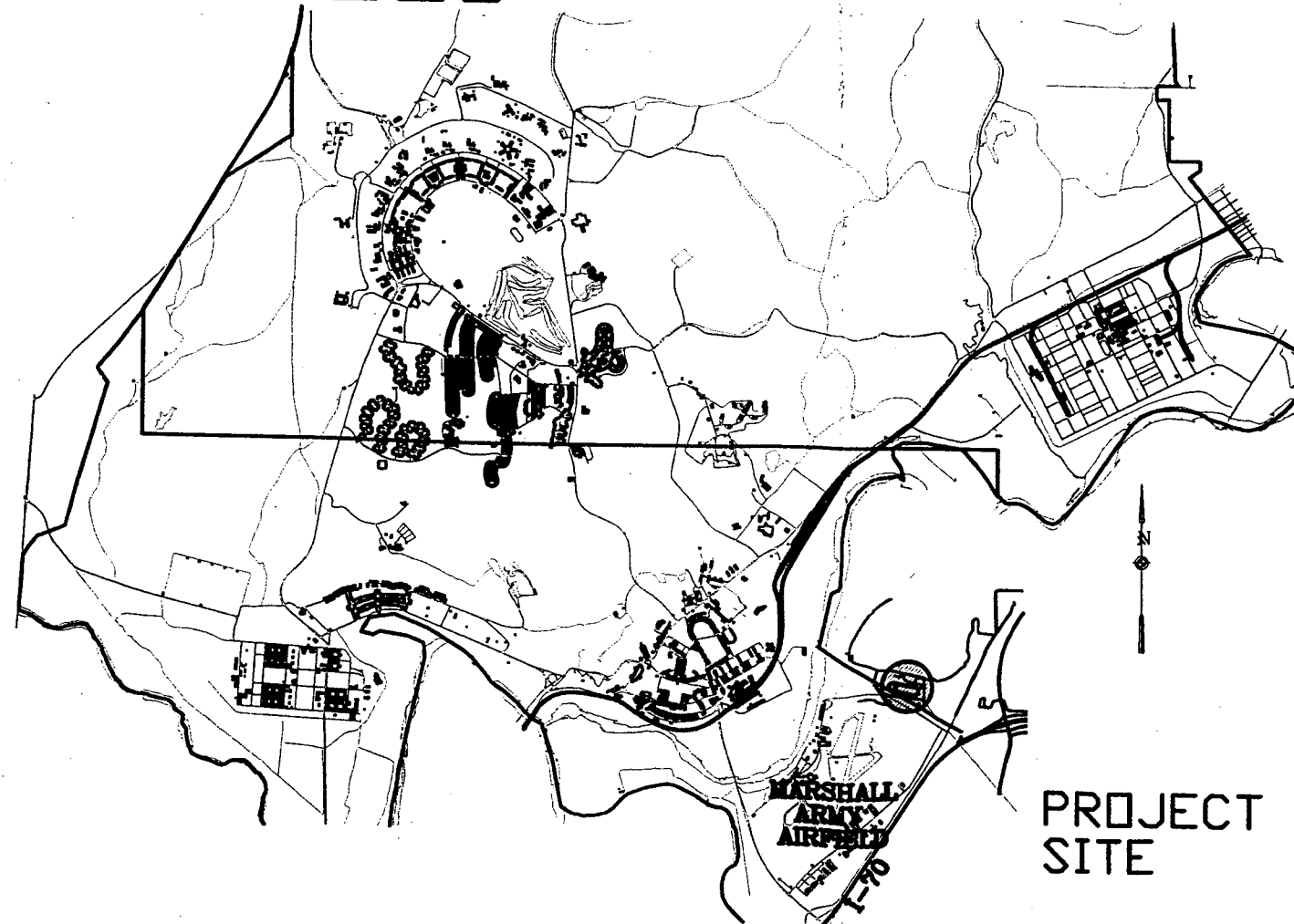
US Army Corps
of Engineers
Kansas City District
You Matter - We Care

OFF-POST ALTERNATE WATER SUPPLY

FORMER FIRE TRAINING AREA MARSHALL ARMY AIRFIELD

Fort Riley, Kansas

September 1998
(Revised May 2002)
(Final Revision November 2002-As Built)



IFB# DACW41-95-D-0022

Appendix 3: Analytical Data

- **Chemical Analysis**
- **Geotechnical Analysis**
- **Concrete Compressive Strength**

Company Name/

Bay West

10620 Widmer
Lenexa.KS 66215

Alternate billing information:

Analysis/Container/Preservative

Page of of Custody

Prepared by:

**ENVIRONMENTAL
SCIENCE CORP.**

12065 Lebanon Road
Mt Juliet, TN 37122

Phone (615) 758-5858

Phone (800) 767-5859

FAX (615) 758-5859

Report to: PHIL DULA

Email to: PHIL D @ BAYWEST.COM

Project Description: WATER WELL

City/State Collected

Phone: (913) 663-2915

Client Project #:

ESG-Key: LAB PROJECT #
BAY WEST

FAX: (913) 663-3067

Collected by: KEITH ELLIS

Site/Facility ID#:

P.O.#: 15102

Collected by (signature): Keith Ellis

Rush? (Lab MUST Be Notified)

___ Same Day.....200%
___ Next Day.....100%
___ Two Day.....50%

Date Results Needed:

Email? ___No___Yes

FAX? ___No___Yes

No. of Cntrs

Packed on Ice N

Sample ID	Comp/Grab	Matrix*	Depth	Date	Time	No. of Cntrs	Remarks/Contaminant	Sample # (lab only)
PIT AREA Rm-E	GRAB			10-22-02	1135	1	REST ROOM EAST	13546-01
PIT AREA Rm-E DUP	GRAB			10-22-02	1135	1	REST ROOM EAST	13546-02
PIT AREA Rm-W	GRAB			10-22-02	1135	1	REST ROOM WEST	13546-03
PIT AREA Rm-W	GRAB			10-22-02	1130	2	REST ROOM WEST	13546-04
PIT AREA Rm-W DUP	GRAB			10-22-02	1130	2	REST ROOM WEST DUP	13546-05
TRIP BLANK				10-22-02	1130	1		13546-06

LEAD, CAD, HCB, HCH, HCL, HCN, HCNH, HCNH2, HCNH3, HCNH4, HCNH5, HCNH6, HCNH7, HCNH8, HCNH9, HCNH10, HCNH11, HCNH12, HCNH13, HCNH14, HCNH15, HCNH16, HCNH17, HCNH18, HCNH19, HCNH20, HCNH21, HCNH22, HCNH23, HCNH24, HCNH25, HCNH26, HCNH27, HCNH28, HCNH29, HCNH30, HCNH31, HCNH32, HCNH33, HCNH34, HCNH35, HCNH36, HCNH37, HCNH38, HCNH39, HCNH40, HCNH41, HCNH42, HCNH43, HCNH44, HCNH45, HCNH46, HCNH47, HCNH48, HCNH49, HCNH50, HCNH51, HCNH52, HCNH53, HCNH54, HCNH55, HCNH56, HCNH57, HCNH58, HCNH59, HCNH60, HCNH61, HCNH62, HCNH63, HCNH64, HCNH65, HCNH66, HCNH67, HCNH68, HCNH69, HCNH70, HCNH71, HCNH72, HCNH73, HCNH74, HCNH75, HCNH76, HCNH77, HCNH78, HCNH79, HCNH80, HCNH81, HCNH82, HCNH83, HCNH84, HCNH85, HCNH86, HCNH87, HCNH88, HCNH89, HCNH90, HCNH91, HCNH92, HCNH93, HCNH94, HCNH95, HCNH96, HCNH97, HCNH98, HCNH99, HCNH100

*Matrix: SS - Soil/Solid GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other

pH _____ Temp _____

Remarks:

Flow _____ Other _____

Relinquished by: (Signature) <i>Keith Ellis</i>	Date: 10-22-02	Time: 1700	Received by: (Signature) <i>[Signature]</i>	Samples returned via: <input checked="" type="checkbox"/> UPS <input type="checkbox"/> FedEx <input type="checkbox"/> Courier <input type="checkbox"/>	Continued (lab use only)
Relinquished by: (Signature) <i>[Signature]</i>	Date:	Time:	Received by: (Signature) <i>[Signature]</i>	Temp: 40	Bottles Received: 8
Relinquished by: (Signature) <i>[Signature]</i>	Date:	Time:	Received by: (Signature) <i>[Signature]</i>	Date: 10-22-02	Time: 9:30

pH Checked: 6.2

Company Name

Bay West

10620 Widmer
Lenexa.KS 66215

Alternate billing information:

Analysis/Container/Preservative

Page of Custody
Page of

Prepared by:

L94344

ENVIRONMENTAL
SCIENCE CORP.

12065 Lebanon Road
Mt. Juliet, TN 37122

Phone (615) 758-5858
Phone (800) 767-5859
FAX (615) 758-5859

Report to: PHIL DULA

Email to: PHILD@BAYWEST.COM

Project Description: WATER WELL

City/State Collected

Phone: (913) 663-2915
FAX: (913) 663-3067

Client Project #:

ES&K Key: LAB PROJECT #
BAY WEST

Collected by: KEITH ELLIS

Site/Facility ID#:

P.O.#: 15109

Collected by (signature):

Keith Ellis

Rush? (Lab MUST Be Notified)

Same Day.....200%
Next Day.....100%
Two Day.....50%

Date Results Needed:

Email? _No_ _Yes_
FAX? _No_ _Yes_

No. of Cntrs

Packed on Ice N (V)

Sample ID	Comp/Grab	Matrix*	Depth	Date	Time	No. of Cntrs	Remarks/Contaminant	Sample # (lab only)
PIT AREA RM-E	GRAB	DW		10-22-02	1400	1		94344

*Matrix: SS - Soil/Solid GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other

pH _____ Temp _____
Flow _____ Other _____

Remarks:

Relinquished by: (Signature) Keith Ellis	Date: 10-22-02	Time:	Received by: (Signature) [Signature]	Samples returned via: <input type="checkbox"/> UPS <input type="checkbox"/> FedEx <input type="checkbox"/> Courier	Condition (lab use only) OK
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Temp: NA Bottles Received: 0	
Relinquished by: (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: 10-23-02 Time: 09:00	pH Checked: N



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(615) 758-5858
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Fax (615) 758-5859

Tax I.D. 62-0814289
Est. 1970

REPORT OF ANALYSIS

Mr. Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

October 29, 2002

Date Received : October 23, 2002
Description : Water Well
Sample ID : PIT AREA RM-E
Collected By : Keith Ellis
Collection Date : 10/22/02 11:35

ESC Sample # : L93566-01
Site ID :
Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Lead	BDL	0.0050	mg/l	6010B	10/29/02	1

Cheli Boucher

Cheli Boucher, ESC Representative

BDL - Below Detection Limit
Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

The reported analytical results relate only to the sample submitted.
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Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

October 29, 2002

Date Received : October 23, 2002
Description : Water Well
Sample ID : PIT AREA RM-E DUP
Collected By : Keith Ellis
Collection Date : 10/22/02 11:35

ESC Sample # : L93566-02

Site ID :

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Lead	BDL	0.0050	mg/l	6010B	10/29/02	1

Cheli Boucher

Cheli Boucher, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

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REPORT OF ANALYSIS

Mr. Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

October 29, 2002

Date Received : October 23, 2002
Description : Water Well

Sample ID : PIT AREA RM-W

Collected By : Keith Ellis
Collection Date : 10/22/02 11:35

ESC Sample # : L93566-03

Site ID :

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Lead	BDL	0.0050	mg/l	6010B	10/29/02	1

Cheli Boucher
Cheli Boucher, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

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Est. 1970

REPORT OF ANALYSIS

Mr. Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

October 29, 2002

Date Received : October 23, 2002
Description : Water Well

ESC Sample # : L93566-04

Sample ID : PIT AREA RM-W

Site ID :

Collected By : Keith Ellis
Collection Date : 10/22/02 11:30

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Volatile Organics						
Acetone	BDL	0.50	mg/l	8260B	10/26/02	10
Acrolein	BDL	0.50	mg/l	8260B	10/26/02	10
Acrylonitrile	BDL	0.50	mg/l	8260B	10/26/02	10
Benzene	BDL	0.010	mg/l	8260B	10/26/02	10
Bromobenzene	BDL	0.010	mg/l	8260B	10/26/02	10
Bromodichloromethane	BDL	0.010	mg/l	8260B	10/26/02	10
Bromoform	BDL	0.010	mg/l	8260B	10/26/02	10
Bromomethane	BDL	0.010	mg/l	8260B	10/26/02	10
n-Butylbenzene	BDL	0.010	mg/l	8260B	10/26/02	10
sec-Butylbenzene	BDL	0.010	mg/l	8260B	10/26/02	10
tert-Butylbenzene	BDL	0.010	mg/l	8260B	10/26/02	10
Carbon tetrachloride	BDL	0.010	mg/l	8260B	10/26/02	10
Chlorobenzene	BDL	0.010	mg/l	8260B	10/26/02	10
Chlorodibromomethane	BDL	0.010	mg/l	8260B	10/26/02	10
Chloroethane	BDL	0.010	mg/l	8260B	10/26/02	10
2-Chloroethyl vinyl ether	BDL	0.50	mg/l	8260B	10/26/02	10
Chloroform	BDL	0.050	mg/l	8260B	10/26/02	10
Chloromethane	BDL	0.010	mg/l	8260B	10/26/02	10
2-Chlorotoluene	BDL	0.010	mg/l	8260B	10/26/02	10
4-Chlorotoluene	BDL	0.010	mg/l	8260B	10/26/02	10
1,2-Dibromo-3-Chloropropane	BDL	0.020	mg/l	8260B	10/26/02	10
1,2-Dibromoethane	BDL	0.010	mg/l	8260B	10/26/02	10
Dibromomethane	BDL	0.010	mg/l	8260B	10/26/02	10
1,2-Dichlorobenzene	BDL	0.010	mg/l	8260B	10/26/02	10
1,3-Dichlorobenzene	BDL	0.010	mg/l	8260B	10/26/02	10
1,4-Dichlorobenzene	BDL	0.010	mg/l	8260B	10/26/02	10
Dichlorodifluoromethane	BDL	0.010	mg/l	8260B	10/26/02	10
1,1-Dichloroethane	BDL	0.010	mg/l	8260B	10/26/02	10
1,2-Dichloroethane	BDL	0.010	mg/l	8260B	10/26/02	10
1,1-Dichloroethene	BDL	0.010	mg/l	8260B	10/26/02	10
cis-1,2-Dichloroethene	BDL	0.010	mg/l	8260B	10/26/02	10
trans-1,2-Dichloroethene	BDL	0.010	mg/l	8260B	10/26/02	10
1,2-Dichloropropane	BDL	0.010	mg/l	8260B	10/26/02	10
1,1-Dichloropropene	BDL	0.010	mg/l	8260B	10/26/02	10
1,3-Dichloropropane	BDL	0.010	mg/l	8260B	10/26/02	10
cis-1,3-Dichloropropene	BDL	0.010	mg/l	8260B	10/26/02	10
trans-1,3-Dichloropropene	BDL	0.010	mg/l	8260B	10/26/02	10
2,2-Dichloropropane	BDL	0.010	mg/l	8260B	10/26/02	10
Di-isopropyl ether	BDL	0.010	mg/l	8260B	10/26/02	10

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



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Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

October 29, 2002

Date Received : October 23, 2002
Description : Water Well

ESC Sample # : L93566-04

Sample ID : PIT AREA RM-W

Site ID :

Collected By : Keith Ellis
Collection Date : 10/22/02 11:30

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Ethylbenzene	BDL	0.010	mg/l	8260B	10/26/02	10
Hexachlorobutadiene	BDL	0.010	mg/l	8260B	10/26/02	10
Isopropylbenzene	BDL	0.010	mg/l	8260B	10/26/02	10
p-Isopropyltoluene	BDL	0.010	mg/l	8260B	10/26/02	10
2-Butanone (MEK)	BDL	0.50	mg/l	8260B	10/26/02	10
Methylene Chloride	BDL	0.050	mg/l	8260B	10/26/02	10
4-Methyl-2-pentanone (MIBK)	BDL	0.50	mg/l	8260B	10/26/02	10
Methyl tert-butyl ether	BDL	0.010	mg/l	8260B	10/26/02	10
Naphthalene	BDL	0.050	mg/l	8260B	10/26/02	10
n-Propylbenzene	BDL	0.010	mg/l	8260B	10/26/02	10
Styrene	BDL	0.010	mg/l	8260B	10/26/02	10
1,1,1,2-Tetrachloroethane	BDL	0.010	mg/l	8260B	10/26/02	10
1,1,2,2-Tetrachloroethane	BDL	0.010	mg/l	8260B	10/26/02	10
Tetrachloroethene	BDL	0.010	mg/l	8260B	10/26/02	10
Toluene	0.20	0.050	mg/l	8260B	10/26/02	10
1,2,3-Trichlorobenzene	BDL	0.010	mg/l	8260B	10/26/02	10
1,2,4-Trichlorobenzene	BDL	0.010	mg/l	8260B	10/26/02	10
1,1,1-Trichloroethane	BDL	0.010	mg/l	8260B	10/26/02	10
1,1,2-Trichloroethane	BDL	0.010	mg/l	8260B	10/26/02	10
Trichloroethene	BDL	0.010	mg/l	8260B	10/26/02	10
Trichlorofluoromethane	BDL	0.010	mg/l	8260B	10/26/02	10
1,2,3-Trichloropropane	BDL	0.010	mg/l	8260B	10/26/02	10
1,2,4-Trimethylbenzene	BDL	0.010	mg/l	8260B	10/26/02	10
1,3,5-Trimethylbenzene	BDL	0.010	mg/l	8260B	10/26/02	10
Vinyl chloride	BDL	0.010	mg/l	8260B	10/26/02	10
Xylenes, Total	BDL	0.030	mg/l	8260B	10/26/02	10
Surrogate Recovery						
Toluene-d8	98.		% Rec.	8260B	10/26/02	10
Dibromofluoromethane	100		% Rec.	8260B	10/26/02	10
4-Bromofluorobenzene	100		% Rec.	8260B	10/26/02	10

Cheli Boucher
Cheli Boucher, ESC Representative

BDL - Below Detection Limit
Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

AZLA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:
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Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

October 29, 2002

Date Received : October 23, 2002
Description : Water Well

ESC Sample # : L93566-05

Sample ID : PIT AREA RM-W DUP

Site ID :

Collected By : Keith Ellis
Collection Date : 10/22/02 11:30

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Volatile Organics						
Acetone	BDL	0.050	mg/l	8260B	10/27/02	1
Acrolein	BDL	0.050	mg/l	8260B	10/27/02	1
Acrylonitrile	BDL	0.050	mg/l	8260B	10/27/02	1
Benzene	BDL	0.0010	mg/l	8260B	10/27/02	1
Bromobenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
Bromodichloromethane	BDL	0.0010	mg/l	8260B	10/27/02	1
Bromoform	BDL	0.0010	mg/l	8260B	10/27/02	1
Bromomethane	BDL	0.0010	mg/l	8260B	10/27/02	1
n-Butylbenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
sec-Butylbenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
tert-Butylbenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
Carbon tetrachloride	BDL	0.0010	mg/l	8260B	10/27/02	1
Chlorobenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
Chlorodibromomethane	BDL	0.0010	mg/l	8260B	10/27/02	1
Chloroethane	BDL	0.0010	mg/l	8260B	10/27/02	1
2-Chloroethyl vinyl ether	BDL	0.050	mg/l	8260B	10/27/02	1
Chloroform	0.0050	0.0050	mg/l	8260B	10/27/02	1
Chloromethane	BDL	0.0010	mg/l	8260B	10/27/02	1
2-Chlorotoluene	BDL	0.0010	mg/l	8260B	10/27/02	1
4-Chlorotoluene	BDL	0.0010	mg/l	8260B	10/27/02	1
1,2-Dibromo-3-Chloropropane	BDL	0.0020	mg/l	8260B	10/27/02	1
1,2-Dibromoethane	BDL	0.0010	mg/l	8260B	10/27/02	1
Dibromomethane	BDL	0.0010	mg/l	8260B	10/27/02	1
1,2-Dichlorobenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
1,3-Dichlorobenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
1,4-Dichlorobenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
Dichlorodifluoromethane	BDL	0.0010	mg/l	8260B	10/27/02	1
1,1-Dichloroethane	BDL	0.0010	mg/l	8260B	10/27/02	1
1,2-Dichloroethane	BDL	0.0010	mg/l	8260B	10/27/02	1
1,1-Dichloroethene	BDL	0.0010	mg/l	8260B	10/27/02	1
cis-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	10/27/02	1
trans-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	10/27/02	1
1,2-Dichloropropane	BDL	0.0010	mg/l	8260B	10/27/02	1
1,1-Dichloropropene	BDL	0.0010	mg/l	8260B	10/27/02	1
1,3-Dichloropropane	BDL	0.0010	mg/l	8260B	10/27/02	1
cis-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	10/27/02	1
trans-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	10/27/02	1
2,2-Dichloropropane	BDL	0.0010	mg/l	8260B	10/27/02	1
Di-isopropyl ether	BDL	0.0010	mg/l	8260B	10/27/02	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



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Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

October 29, 2002

Date Received : October 23, 2002
Description : Water Well
Sample ID : PIT AREA RM-W DUP
Collected By : Keith Ellis
Collection Date : 10/22/02 11:30

ESC Sample # : L93566-05

Site ID :

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Ethylbenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
Hexachlorobutadiene	BDL	0.0010	mg/l	8260B	10/27/02	1
Isopropylbenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
p-Isopropyltoluene	BDL	0.0010	mg/l	8260B	10/27/02	1
2-Butanone (MEK)	BDL	0.050	mg/l	8260B	10/27/02	1
Methylene Chloride	BDL	0.0050	mg/l	8260B	10/27/02	1
4-Methyl-2-pentanone (MIBK)	BDL	0.050	mg/l	8260B	10/27/02	1
Methyl tert-butyl ether	BDL	0.0010	mg/l	8260B	10/27/02	1
Naphthalene	BDL	0.0050	mg/l	8260B	10/27/02	1
n-Propylbenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
Styrene	BDL	0.0010	mg/l	8260B	10/27/02	1
1,1,1,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	10/27/02	1
1,1,2,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	10/27/02	1
Tetrachloroethene	BDL	0.0010	mg/l	8260B	10/27/02	1
Toluene	0.011	0.0050	mg/l	8260B	10/27/02	1
1,2,3-Trichlorobenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
1,2,4-Trichlorobenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
1,1,1-Trichloroethane	BDL	0.0010	mg/l	8260B	10/27/02	1
1,1,2-Trichloroethane	BDL	0.0010	mg/l	8260B	10/27/02	1
Trichloroethene	BDL	0.0010	mg/l	8260B	10/27/02	1
Trichlorofluoromethane	BDL	0.0010	mg/l	8260B	10/27/02	1
1,2,3-Trichloropropane	BDL	0.0010	mg/l	8260B	10/27/02	1
1,2,4-Trimethylbenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
1,3,5-Trimethylbenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
Vinyl chloride	BDL	0.0010	mg/l	8260B	10/27/02	1
Xylenes, Total	BDL	0.0030	mg/l	8260B	10/27/02	1
Surrogate Recovery						
Toluene-d8	99		% Rec.	8260B	10/27/02	1
Dibromofluoromethane	100		% Rec.	8260B	10/27/02	1
4-Bromofluorobenzene	100		% Rec.	8260B	10/27/02	1

Cheli Boucher
Cheli Boucher, ESC Representative

BDL - Below Detection Limit
Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

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Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

October 29, 2002

Date Received : October 23, 2002
Description : Water Well

ESC Sample # : L93566-06

Sample ID : TRIP BLANK

Site ID :

Collected By : Keith Ellis
Collection Date : 10/22/02 11:30

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Volatile Organics						
Acetone	BDL	0.050	mg/l	8260B	10/27/02	1
Acrolein	BDL	0.050	mg/l	8260B	10/27/02	1
Acrylonitrile	BDL	0.050	mg/l	8260B	10/27/02	1
Benzene	0.0014	0.0010	mg/l	8260B	10/27/02	1
Bromobenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
Bromodichloromethane	BDL	0.0010	mg/l	8260B	10/27/02	1
Bromoform	BDL	0.0010	mg/l	8260B	10/27/02	1
Bromomethane	BDL	0.0010	mg/l	8260B	10/27/02	1
n-Butylbenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
sec-Butylbenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
tert-Butylbenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
Carbon tetrachloride	BDL	0.0010	mg/l	8260B	10/27/02	1
Chlorobenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
Chlorodibromomethane	BDL	0.0010	mg/l	8260B	10/27/02	1
Chloroethane	BDL	0.0010	mg/l	8260B	10/27/02	1
2-Chloroethyl vinyl ether	BDL	0.050	mg/l	8260B	10/27/02	1
Chloroform	BDL	0.0050	mg/l	8260B	10/27/02	1
Chloromethane	BDL	0.0010	mg/l	8260B	10/27/02	1
2-Chlorotoluene	BDL	0.0010	mg/l	8260B	10/27/02	1
4-Chlorotoluene	BDL	0.0010	mg/l	8260B	10/27/02	1
1,2-Dibromo-3-Chloropropane	BDL	0.0020	mg/l	8260B	10/27/02	1
1,2-Dibromoethane	BDL	0.0010	mg/l	8260B	10/27/02	1
Dibromomethane	BDL	0.0010	mg/l	8260B	10/27/02	1
1,2-Dichlorobenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
1,3-Dichlorobenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
1,4-Dichlorobenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
Dichlorodifluoromethane	BDL	0.0010	mg/l	8260B	10/27/02	1
1,1-Dichloroethane	BDL	0.0010	mg/l	8260B	10/27/02	1
1,2-Dichloroethane	BDL	0.0010	mg/l	8260B	10/27/02	1
1,1-Dichloroethene	BDL	0.0010	mg/l	8260B	10/27/02	1
cis-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	10/27/02	1
trans-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	10/27/02	1
1,2-Dichloropropane	BDL	0.0010	mg/l	8260B	10/27/02	1
1,1-Dichloropropene	BDL	0.0010	mg/l	8260B	10/27/02	1
1,3-Dichloropropane	BDL	0.0010	mg/l	8260B	10/27/02	1
cis-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	10/27/02	1
trans-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	10/27/02	1
2,2-Dichloropropane	BDL	0.0010	mg/l	8260B	10/27/02	1
Di-isopropyl ether	BDL	0.0010	mg/l	8260B	10/27/02	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



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Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Mr. Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

October 29, 2002

Date Received : October 23, 2002
Description : Water Well

ESC Sample # : L93566-06

Sample ID : TRIP BLANK

Site ID :

Collected By : Keith Ellis
Collection Date : 10/22/02 11:30

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Ethylbenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
Hexachlorobutadiene	BDL	0.0010	mg/l	8260B	10/27/02	1
Isopropylbenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
p-Isopropyltoluene	BDL	0.0010	mg/l	8260B	10/27/02	1
2-Butanone (MEK)	BDL	0.050	mg/l	8260B	10/27/02	1
Methylene Chloride	BDL	0.0050	mg/l	8260B	10/27/02	1
4-Methyl-2-pentanone (MIBK)	BDL	0.050	mg/l	8260B	10/27/02	1
Methyl tert-butyl ether	BDL	0.0010	mg/l	8260B	10/27/02	1
Naphthalene	BDL	0.0050	mg/l	8260B	10/27/02	1
n-Propylbenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
Styrene	BDL	0.0010	mg/l	8260B	10/27/02	1
1,1,1,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	10/27/02	1
1,1,2,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	10/27/02	1
Tetrachloroethene	BDL	0.0010	mg/l	8260B	10/27/02	1
Toluene	BDL	0.0050	mg/l	8260B	10/27/02	1
1,2,3-Trichlorobenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
1,2,4-Trichlorobenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
1,1,1-Trichloroethane	BDL	0.0010	mg/l	8260B	10/27/02	1
1,1,2-Trichloroethane	BDL	0.0010	mg/l	8260B	10/27/02	1
Trichloroethene	BDL	0.0010	mg/l	8260B	10/27/02	1
Trichlorofluoromethane	BDL	0.0010	mg/l	8260B	10/27/02	1
1,2,3-Trichloropropane	BDL	0.0010	mg/l	8260B	10/27/02	1
1,2,4-Trimethylbenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
1,3,5-Trimethylbenzene	BDL	0.0010	mg/l	8260B	10/27/02	1
Vinyl chloride	BDL	0.0010	mg/l	8260B	10/27/02	1
Xylenes, Total	BDL	0.0030	mg/l	8260B	10/27/02	1
Surrogate Recovery						
Toluene-d8	98.		% Rec.	8260B	10/27/02	1
Dibromofluoromethane	100		% Rec.	8260B	10/27/02	1
4-Bromofluorobenzene	100		% Rec.	8260B	10/27/02	1

Cheli Boucher
Cheli Boucher, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

The reported analytical results relate only to the sample submitted.

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Bay West
 10620 Widmer
 Lenexa, KS 66215

Alternate billing information:

Analysis/Container/Preservative

Prepared by:

**ENVIRONMENTAL
 SCIENCE CORP.**
 12065 Lebanon Road
 Mt. Juliet, TN 37122
 Phone (800) 767-5859
 FAX (615) 758-5859

Report to: **Phil Dula**

Email:

Project Description: **Fort Riley**

City/State Collected

Phone: (913) 663-2915
 FAX: (913) 663-3067

Client Project #:

Lab Project #
BAYWEST - FORT RILEY

Collected by (print):

Site/Facility ID#:

P.O.#:
15108

Collected by (signature):
 Packed on Ice N Y

Rush? (Lab MUST Be Notified)
 Same Day 200%
 Next Day 100%
 Two Day 50%

Date Results Needed
 Email? No Yes
 FAX? No Yes

No. of Cntrs

V8260 40ml/Amb-HCI

GoCode: BAYWEST (lab use only)
 Temp/Pres: BISS64/P62322
 Shipped Via: **FedEx Priority**

Sample ID	Comp/Grab	Matrix*	Depth	Date	Time	No. of Cntrs	Analysis/Container/Preservative				Remarks/Contaminant	Sample # (lab only)	
WELL M-1		GW				2	X						1849-2
WELL R-1		GW	30' FT.	7-30-02	1430	2	X						01
R-1 DUPLICATE		GW	30' FT.	7-30-02	1430	2	X						-02
RINESATE		GW		7-30-02	1540	2	X				SAMPLD 1510		-03
EQUIPMENT BLANK		GW				2	X						
TRIP BLANK		GW		7-30-02	1500	1	X				ONLY 1 TRIP BLANK		04

*Matrix: SS - Soil GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other _____

Remarks: **NEW WELL FOR DRINKING WATER SUPPLY**

pH _____ Temp _____
 Flow _____ Other _____

Relinquished by: (Signature) K. ELLIS	Date: 7-30-02	Time: 1530	Received by: (Signature)	Samples returned via: <input type="checkbox"/> UPS <input checked="" type="checkbox"/> FedEx <input type="checkbox"/> Courier <input type="checkbox"/>	Condition: (lab use only)
Relinquished by:	Date:	Time:	Received by: (Signature)	Temp: <input type="checkbox"/> Bottled: <input type="checkbox"/> Received: <input type="checkbox"/>	
Relinquished by: (Signature)	Date:	Time:	Received for lab by: (Signature) Dana Dula	Date: 7/31/02	Time: 9:15



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Est. 1970

REPORT OF ANALYSIS

Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

August 01, 2002

Date Received : July 31, 2002
Description : Fort Riley
Sample ID : WELL R-1
Collected By :
Collection Date : 07/30/02 14:30

ESC Sample # : L84942-01
ESC Key : BAYWEST - FORT RILEY
Site ID :
Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Volatile Organics						
Acetone	BDL	0.050	mg/l	8260B	07/31/02	1
Acrolein	BDL	0.050	mg/l	8260B	07/31/02	1
Acrylonitrile	BDL	0.050	mg/l	8260B	07/31/02	1
Benzene	BDL	0.0010	mg/l	8260B	07/31/02	1
Bromobenzene	BDL	0.0010	mg/l	8260B	07/31/02	1
Bromodichloromethane	BDL	0.0010	mg/l	8260B	07/31/02	1
Bromoform	BDL	0.0010	mg/l	8260B	07/31/02	1
Bromomethane	BDL	0.0010	mg/l	8260B	07/31/02	1
n-Butylbenzene	BDL	0.0010	mg/l	8260B	07/31/02	1
sec-Butylbenzene	BDL	0.0010	mg/l	8260B	07/31/02	1
tert-Butylbenzene	BDL	0.0010	mg/l	8260B	07/31/02	1
Carbon tetrachloride	BDL	0.0010	mg/l	8260B	07/31/02	1
Chlorobenzene	BDL	0.0010	mg/l	8260B	07/31/02	1
Chlorodibromomethane	BDL	0.0010	mg/l	8260B	07/31/02	1
Chloroethane	BDL	0.0010	mg/l	8260B	07/31/02	1
2-Chloroethyl vinyl ether	BDL	0.050	mg/l	8260B	07/31/02	1
Chloroform	BDL	0.0050	mg/l	8260B	07/31/02	1
Chloromethane	BDL	0.0010	mg/l	8260B	07/31/02	1
2-Chlorotoluene	BDL	0.0010	mg/l	8260B	07/31/02	1
4-Chlorotoluene	BDL	0.0010	mg/l	8260B	07/31/02	1
1,2-Dibromo-3-Chloropropane	BDL	0.0020	mg/l	8260B	07/31/02	1
1,2-Dibromoethane	BDL	0.0010	mg/l	8260B	07/31/02	1
Dibromomethane	BDL	0.0010	mg/l	8260B	07/31/02	1
1,2-Dichlorobenzene	BDL	0.0010	mg/l	8260B	07/31/02	1
1,3-Dichlorobenzene	BDL	0.0010	mg/l	8260B	07/31/02	1
1,4-Dichlorobenzene	BDL	0.0010	mg/l	8260B	07/31/02	1
Dichlorodifluoromethane	BDL	0.0010	mg/l	8260B	07/31/02	1
1,1-Dichloroethane	BDL	0.0010	mg/l	8260B	07/31/02	1
1,2-Dichloroethane	BDL	0.0010	mg/l	8260B	07/31/02	1
1,1-Dichloroethene	BDL	0.0010	mg/l	8260B	07/31/02	1
cis-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	07/31/02	1
trans-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	07/31/02	1
1,2-Dichloropropane	BDL	0.0010	mg/l	8260B	07/31/02	1
1,1-Dichloropropene	BDL	0.0010	mg/l	8260B	07/31/02	1
1,3-Dichloropropane	BDL	0.0010	mg/l	8260B	07/31/02	1
cis-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	07/31/02	1
trans-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	07/31/02	1
2,2-Dichloropropane	BDL	0.0010	mg/l	8260B	07/31/02	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



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Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS


Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

August 01, 2002

Date Received : July 31, 2002
Description : Fort Riley
Sample ID : WELL R-1
Collected By :
Collection Date : 07/30/02 14:30

ESC Sample # : L84942-01
ESC Key : BAYWEST - FORT RILEY
Site ID :
Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Di-isopropyl ether	BDL	0.0010	mg/l	8260B	07/31/02	1
Ethylbenzene	BDL	0.0010	mg/l	8260B	07/31/02	1
Hexachlorobutadiene	BDL	0.0010	mg/l	8260B	07/31/02	1
Isopropylbenzene	BDL	0.0010	mg/l	8260B	07/31/02	1
p-Isopropyltoluene	BDL	0.0010	mg/l	8260B	07/31/02	1
2-Butanone (MEK)	BDL	0.050	mg/l	8260B	07/31/02	1
Methylene Chloride	BDL	0.0050	mg/l	8260B	07/31/02	1
4-Methyl-2-pentanone (MIBK)	BDL	0.050	mg/l	8260B	07/31/02	1
Methyl tert-butyl ether	BDL	0.0010	mg/l	8260B	07/31/02	1
Naphthalene	BDL	0.0050	mg/l	8260B	07/31/02	1
n-Propylbenzene	BDL	0.0010	mg/l	8260B	07/31/02	1
Styrene	BDL	0.0010	mg/l	8260B	07/31/02	1
1,1,1,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	07/31/02	1
1,1,2,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	07/31/02	1
Tetrachloroethene	BDL	0.0010	mg/l	8260B	07/31/02	1
Toluene	BDL	0.0050	mg/l	8260B	07/31/02	1
1,2,3-Trichlorobenzene	BDL	0.0010	mg/l	8260B	07/31/02	1
1,2,4-Trichlorobenzene	BDL	0.0010	mg/l	8260B	07/31/02	1
1,1,1-Trichloroethane	BDL	0.0010	mg/l	8260B	07/31/02	1
1,1,2-Trichloroethane	BDL	0.0010	mg/l	8260B	07/31/02	1
Trichloroethene	BDL	0.0010	mg/l	8260B	07/31/02	1
Trichlorofluoromethane	BDL	0.0010	mg/l	8260B	07/31/02	1
1,2,3-Trichloropropane	BDL	0.0010	mg/l	8260B	07/31/02	1
1,2,4-Trimethylbenzene	BDL	0.0010	mg/l	8260B	07/31/02	1
1,3,5-Trimethylbenzene	BDL	0.0010	mg/l	8260B	07/31/02	1
Vinyl chloride	BDL	0.0010	mg/l	8260B	07/31/02	1
Xylenes, Total	BDL	0.0030	mg/l	8260B	07/31/02	1
Surrogate Recovery						
Toluene-d8	98.		% Rec.	8260B	07/31/02	1
Dibromofluoromethane	100		% Rec.	8260B	07/31/02	1
4-Bromofluorobenzene	95.		% Rec.	8260B	07/31/02	1


Terrie Fudge, ESC Representative

BDL - Below Detection Limit
Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

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Est. 1970

REPORT OF ANALYSIS

Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

August 01, 2002

Date Received : July 31, 2002
Description : Fort Riley
Sample ID : R-1 DUPLICATE
Collected By :
Collection Date : 07/30/02 14:30

ESC Sample # : L84942-02
ESC Key : BAYWEST - FORT RILEY
Site ID :
Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Volatile Organics						
Acetone	BDL	0.050	mg/l	8260B	08/01/02	1
Acrolein	BDL	0.050	mg/l	8260B	08/01/02	1
Acrylonitrile	BDL	0.050	mg/l	8260B	08/01/02	1
Benzene	BDL	0.0010	mg/l	8260B	08/01/02	1
Bromobenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
Bromodichloromethane	BDL	0.0010	mg/l	8260B	08/01/02	1
Bromoform	BDL	0.0010	mg/l	8260B	08/01/02	1
Bromomethane	BDL	0.0010	mg/l	8260B	08/01/02	1
n-Butylbenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
sec-Butylbenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
tert-Butylbenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
Carbon tetrachloride	BDL	0.0010	mg/l	8260B	08/01/02	1
Chlorobenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
Chlorodibromomethane	BDL	0.0010	mg/l	8260B	08/01/02	1
Chloroethane	BDL	0.0010	mg/l	8260B	08/01/02	1
2-Chloroethyl vinyl ether	BDL	0.050	mg/l	8260B	08/01/02	1
Chloroform	BDL	0.0050	mg/l	8260B	08/01/02	1
Chloromethane	BDL	0.0010	mg/l	8260B	08/01/02	1
2-Chlorotoluene	BDL	0.0010	mg/l	8260B	08/01/02	1
4-Chlorotoluene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,2-Dibromo-3-Chloropropane	BDL	0.0020	mg/l	8260B	08/01/02	1
1,2-Dibromoethane	BDL	0.0010	mg/l	8260B	08/01/02	1
Dibromomethane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,2-Dichlorobenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,3-Dichlorobenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,4-Dichlorobenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
Dichlorodifluoromethane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,1-Dichloroethane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,2-Dichloroethane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,1-Dichloroethene	BDL	0.0010	mg/l	8260B	08/01/02	1
cis-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	08/01/02	1
trans-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,2-Dichloropropane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,1-Dichloropropene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,3-Dichloropropane	BDL	0.0010	mg/l	8260B	08/01/02	1
cis-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	08/01/02	1
trans-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	08/01/02	1
2,2-Dichloropropane	BDL	0.0010	mg/l	8260B	08/01/02	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



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Est. 1970

REPORT OF ANALYSIS

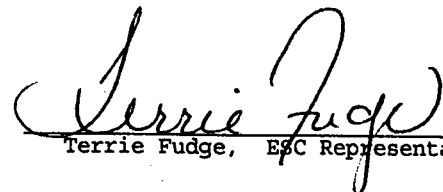
Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

August 01, 2002

Date Received : July 31, 2002
Description : Fort Riley
Sample ID : R-1 DUPLICATE
Collected By :
Collection Date : 07/30/02 14:30

ESC Sample # : L84942-02
ESC Key : BAYWEST - FORT RILEY
Site ID :
Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Di-isopropyl ether	BDL	0.0010	mg/l	8260B	08/01/02	1
Ethylbenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
Hexachlorobutadiene	BDL	0.0010	mg/l	8260B	08/01/02	1
Isopropylbenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
p-Isopropyltoluene	BDL	0.0010	mg/l	8260B	08/01/02	1
2-Butanone (MEK)	BDL	0.050	mg/l	8260B	08/01/02	1
Methylene Chloride	BDL	0.0050	mg/l	8260B	08/01/02	1
4-Methyl-2-pentanone (MIBK)	BDL	0.050	mg/l	8260B	08/01/02	1
Methyl tert-butyl ether	BDL	0.0010	mg/l	8260B	08/01/02	1
Naphthalene	BDL	0.0050	mg/l	8260B	08/01/02	1
n-Propylbenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
Styrene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,1,1,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,1,2,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	08/01/02	1
Tetrachloroethene	BDL	0.0010	mg/l	8260B	08/01/02	1
Toluene	BDL	0.0050	mg/l	8260B	08/01/02	1
1,2,3-Trichlorobenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,2,4-Trichlorobenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,1,1-Trichloroethane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,1,2-Trichloroethane	BDL	0.0010	mg/l	8260B	08/01/02	1
Trichloroethene	BDL	0.0010	mg/l	8260B	08/01/02	1
Trichlorofluoromethane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,2,3-Trichloropropane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,2,4-Trimethylbenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,3,5-Trimethylbenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
Vinyl chloride	BDL	0.0010	mg/l	8260B	08/01/02	1
Xylenes, Total	BDL	0.0030	mg/l	8260B	08/01/02	1
Surrogate Recovery						
Toluene-d8	99.		% Rec.	8260B	08/01/02	1
Dibromofluoromethane	100		% Rec.	8260B	08/01/02	1
4-Bromofluorobenzene	93.		% Rec.	8260B	08/01/02	1


Terrie Fudge, ESC Representative

BDL - Below Detection Limit
Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

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Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

August 01, 2002

Date Received : July 31, 2002

ESC Sample # : L84942-03

Description : Fort Riley

ESC Key : BAYWEST - FORT RILEY

Sample ID : RINESATE

Site ID :

Collected By :
Collection Date : 07/30/02 15:10

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Volatile Organics						
Acetone	BDL	0.050	mg/l	8260B	08/01/02	1
Acrolein	BDL	0.050	mg/l	8260B	08/01/02	1
Acrylonitrile	BDL	0.050	mg/l	8260B	08/01/02	1
Benzene	BDL	0.0010	mg/l	8260B	08/01/02	1
Bromobenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
Bromodichloromethane	BDL	0.0010	mg/l	8260B	08/01/02	1
Bromoform	BDL	0.0010	mg/l	8260B	08/01/02	1
Bromomethane	BDL	0.0010	mg/l	8260B	08/01/02	1
n-Butylbenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
sec-Butylbenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
tert-Butylbenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
Carbon tetrachloride	BDL	0.0010	mg/l	8260B	08/01/02	1
Chlorobenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
Chlorodibromomethane	BDL	0.0010	mg/l	8260B	08/01/02	1
Chloroethane	BDL	0.0010	mg/l	8260B	08/01/02	1
2-Chloroethyl vinyl ether	BDL	0.050	mg/l	8260B	08/01/02	1
Chloroform	BDL	0.0050	mg/l	8260B	08/01/02	1
Chloromethane	BDL	0.0010	mg/l	8260B	08/01/02	1
2-Chlorotoluene	BDL	0.0010	mg/l	8260B	08/01/02	1
4-Chlorotoluene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,2-Dibromo-3-Chloropropane	BDL	0.0020	mg/l	8260B	08/01/02	1
1,2-Dibromoethane	BDL	0.0010	mg/l	8260B	08/01/02	1
Dibromomethane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,2-Dichlorobenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,3-Dichlorobenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,4-Dichlorobenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
Dichlorodifluoromethane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,1-Dichloroethane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,2-Dichloroethane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,1-Dichloroethene	BDL	0.0010	mg/l	8260B	08/01/02	1
cis-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	08/01/02	1
trans-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,2-Dichloropropane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,1-Dichloropropene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,3-Dichloropropane	BDL	0.0010	mg/l	8260B	08/01/02	1
cis-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	08/01/02	1
trans-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	08/01/02	1
2,2-Dichloropropane	BDL	0.0010	mg/l	8260B	08/01/02	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



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Est. 1970

REPORT OF ANALYSIS

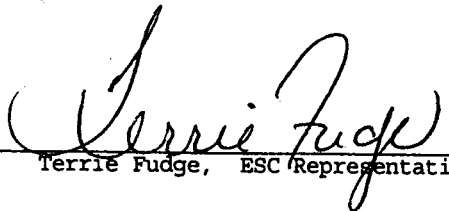
Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

August 01, 2002

Date Received : July 31, 2002
Description : Fort Riley
Sample ID : RINESATE
Collected By :
Collection Date : 07/30/02 15:10

ESC Sample # : L84942-03
ESC Key : BAYWEST - FORT RILEY
Site ID :
Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Di-isopropyl ether	BDL	0.0010	mg/l	8260B	08/01/02	1
Ethylbenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
Hexachlorobutadiene	BDL	0.0010	mg/l	8260B	08/01/02	1
Isopropylbenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
p-Isopropyltoluene	BDL	0.0010	mg/l	8260B	08/01/02	1
2-Butanone (MEK)	BDL	0.050	mg/l	8260B	08/01/02	1
Methylene Chloride	BDL	0.0050	mg/l	8260B	08/01/02	1
4-Methyl-2-pentanone (MIBK)	BDL	0.050	mg/l	8260B	08/01/02	1
Methyl tert-butyl ether	BDL	0.0010	mg/l	8260B	08/01/02	1
Naphthalene	BDL	0.0050	mg/l	8260B	08/01/02	1
n-Propylbenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
Styrene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,1,1,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,1,2,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	08/01/02	1
Tetrachloroethene	BDL	0.0010	mg/l	8260B	08/01/02	1
Toluene	BDL	0.0050	mg/l	8260B	08/01/02	1
1,2,3-Trichlorobenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,2,4-Trichlorobenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,1,1-Trichloroethane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,1,2-Trichloroethane	BDL	0.0010	mg/l	8260B	08/01/02	1
Trichloroethene	BDL	0.0010	mg/l	8260B	08/01/02	1
Trichlorofluoromethane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,2,3-Trichloropropane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,2,4-Trimethylbenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,3,5-Trimethylbenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
Vinyl chloride	BDL	0.0010	mg/l	8260B	08/01/02	1
Xylenes, Total	BDL	0.0030	mg/l	8260B	08/01/02	1
Surrogate Recovery						
Toluene-d8	98.		% Rec.	8260B	08/01/02	1
Dibromofluoromethane	100		% Rec.	8260B	08/01/02	1
4-Bromofluorobenzene	93.		% Rec.	8260B	08/01/02	1


Terrie Fudge, ESC Representative

BDL - Below Detection Limit
Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

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Est. 1970

REPORT OF ANALYSIS

Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

August 01, 2002

Date Received : July 31, 2002

ESC Sample #: L84942-04

Description : Fort Riley

ESC Key : BAYWEST - FORT RILEY

Sample ID : TRIP BLANK

Site ID :

Collected By :
Collection Date : 07/30/02 15:00

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Volatile Organics						
Acetone	BDL	0.050	mg/l	8260B	08/01/02	1
Acrolein	BDL	0.050	mg/l	8260B	08/01/02	1
Acrylonitrile	BDL	0.050	mg/l	8260B	08/01/02	1
Benzene	BDL	0.0010	mg/l	8260B	08/01/02	1
Bromobenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
Bromodichloromethane	BDL	0.0010	mg/l	8260B	08/01/02	1
Bromoform	BDL	0.0010	mg/l	8260B	08/01/02	1
Bromomethane	BDL	0.0010	mg/l	8260B	08/01/02	1
n-Butylbenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
sec-Butylbenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
tert-Butylbenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
Carbon tetrachloride	BDL	0.0010	mg/l	8260B	08/01/02	1
Chlorobenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
Chlorodibromomethane	BDL	0.0010	mg/l	8260B	08/01/02	1
Chloroethane	BDL	0.0010	mg/l	8260B	08/01/02	1
2-Chloroethyl vinyl ether	BDL	0.050	mg/l	8260B	08/01/02	1
Chloroform	BDL	0.0050	mg/l	8260B	08/01/02	1
Chloromethane	BDL	0.0010	mg/l	8260B	08/01/02	1
2-Chlorotoluene	BDL	0.0010	mg/l	8260B	08/01/02	1
4-Chlorotoluene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,2-Dibromo-3-Chloropropane	BDL	0.0020	mg/l	8260B	08/01/02	1
1,2-Dibromoethane	BDL	0.0010	mg/l	8260B	08/01/02	1
Dibromomethane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,2-Dichlorobenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,3-Dichlorobenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,4-Dichlorobenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
Dichlorodifluoromethane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,1-Dichloroethane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,2-Dichloroethane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,1-Dichloroethene	BDL	0.0010	mg/l	8260B	08/01/02	1
cis-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	08/01/02	1
trans-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,2-Dichloropropane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,1-Dichloropropene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,3-Dichloropropane	BDL	0.0010	mg/l	8260B	08/01/02	1
cis-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	08/01/02	1
trans-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	08/01/02	1
2,2-Dichloropropane	BDL	0.0010	mg/l	8260B	08/01/02	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



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REPORT OF ANALYSIS

August 01, 2002

Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

Date Received : July 31, 2002
Description : Fort Riley
Sample ID : TRIP BLANK
Collected By :
Collection Date : 07/30/02 15:00

ESC Sample # : L84942-04
ESC Key : BAYWEST - FORT RILEY
Site ID :
Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Di-isopropyl ether	BDL	0.0010	mg/l	8260B	08/01/02	1
Ethylbenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
Hexachlorobutadiene	BDL	0.0010	mg/l	8260B	08/01/02	1
Isopropylbenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
p-Isopropyltoluene	BDL	0.0010	mg/l	8260B	08/01/02	1
2-Butanone (MEK)	BDL	0.050	mg/l	8260B	08/01/02	1
Methylene Chloride	BDL	0.0050	mg/l	8260B	08/01/02	1
4-Methyl-2-pentanone (MIBK)	BDL	0.050	mg/l	8260B	08/01/02	1
Methyl tert-butyl ether	BDL	0.0010	mg/l	8260B	08/01/02	1
Naphthalene	BDL	0.0050	mg/l	8260B	08/01/02	1
n-Propylbenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
Styrene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,1,1,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,1,2,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	08/01/02	1
Tetrachloroethene	BDL	0.0010	mg/l	8260B	08/01/02	1
Toluene	BDL	0.0050	mg/l	8260B	08/01/02	1
1,2,3-Trichlorobenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,2,4-Trichlorobenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,1,1-Trichloroethane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,1,2-Trichloroethane	BDL	0.0010	mg/l	8260B	08/01/02	1
Trichloroethene	BDL	0.0010	mg/l	8260B	08/01/02	1
Trichlorofluoromethane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,2,3-Trichloropropane	BDL	0.0010	mg/l	8260B	08/01/02	1
1,2,4-Trimethylbenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
1,3,5-Trimethylbenzene	BDL	0.0010	mg/l	8260B	08/01/02	1
Vinyl chloride	BDL	0.0010	mg/l	8260B	08/01/02	1
Xylenes, Total	BDL	0.0030	mg/l	8260B	08/01/02	1
Surrogate Recovery						
Toluene-d8	98.		% Rec.	8260B	08/01/02	1
Dibromofluoromethane	100		% Rec.	8260B	08/01/02	1
4-Bromofluorobenzene	91.		% Rec.	8260B	08/01/02	1


Terrie Fudge, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

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KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

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Attachment A
List of Analytes with QC Qualifiers

Sample #	Analyte	Qualifier
L84942-01	Acrolein	J4
	Chloroethane	J4J5
	2-Chloroethyl vinyl ether	J4J6
L84942-02	Acrolein	J4
	Chloroethane	J4
	2-Chloroethyl vinyl ether	J4
L84942-03	Acrolein	J4
	Chloroethane	J4
	2-Chloroethyl vinyl ether	J4
L84942-04	Acrolein	J4
	Chloroethane	J4
	2-Chloroethyl vinyl ether	J4

Attachment B
Explanation of QC Qualifier Codes

Qualifier	Meaning
J4	The associated batch QC did not successfully meet the established quality control criteria for accuracy.
J5	The sample matrix interfered with the ability to make any accurate determination; spike value is unacceptably high
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is unacceptably low

Qualifier Report Information

ESC utilizes sample and result qualifiers as set forth by the EPA Contract Laboratory Program and as required by most certifying bodies including NELAC. In addition to the EPA qualifiers adopted by ESC, we have implemented ESC qualifiers to provide more information pertaining to our analytical results. Each qualifier is designated in the qualifier explanation as either EPA or ESC. Data qualifiers are intended to provide the ESC client with more detailed information concerning the potential bias of reported data. Because of the wide range of constituents and variety of matrices incorporated by most EPA methods, it is common for some compounds to fall outside of established ranges. These exceptions are evaluated and all reported data is valid and useable unless qualified as 'R' (Rejected).

Definitions

- Accuracy** - The relationship of the observed value of a known sample to the true value of a known sample. Represented by percent recovery and relevant to samples such as: control samples, matrix spike recoveries, surrogate recoveries, etc.
- Precision** - The agreement between a set of samples or between duplicate samples. Relates to how close together the results are and is represented by Relative Percent Difference.
- Surrogate** - Organic compounds that are similar in chemical composition, extraction, and chromatography to analytes of interest. The surrogates are used to determine the probable response of the group of analytes that are chemically related to the surrogate compound. Surrogates are added to the sample and carried through all stages of preparation and analyses.
- TIC** - Tentatively Identified Compound: Compounds detected in samples that are not target compounds, internal standards, system monitoring compounds, or surrogates.



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Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

August 08, 2002

Date Received : August 01, 2002
Description : Fort Riley
Sample ID : WELL M-1 30 FT
Collected By :
Collection Date : 07/30/02 11:00

ESC Sample # : L85066-01
ESC Key : BAYWEST - FORT RILEY
Site ID :
Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Volatile Organics						
Acetone	BDL	0.050	mg/l	8260B	08/05/02	1
Acrolein	BDL	0.050	mg/l	8260B	08/05/02	1
Acrylonitrile	BDL	0.050	mg/l	8260B	08/05/02	1
Benzene	BDL	0.0010	mg/l	8260B	08/05/02	1
Bromobenzene	BDL	0.0010	mg/l	8260B	08/05/02	1
Bromodichloromethane	BDL	0.0010	mg/l	8260B	08/05/02	1
Bromoform	BDL	0.0010	mg/l	8260B	08/05/02	1
Bromomethane	BDL	0.0010	mg/l	8260B	08/05/02	1
n-Butylbenzene	BDL	0.0010	mg/l	8260B	08/05/02	1
sec-Butylbenzene	BDL	0.0010	mg/l	8260B	08/05/02	1
tert-Butylbenzene	BDL	0.0010	mg/l	8260B	08/05/02	1
Carbon tetrachloride	BDL	0.0010	mg/l	8260B	08/05/02	1
Chlorobenzene	BDL	0.0010	mg/l	8260B	08/05/02	1
Chlorodibromomethane	BDL	0.0010	mg/l	8260B	08/05/02	1
Chloroethane	BDL	0.0010	mg/l	8260B	08/05/02	1
2-Chloroethyl vinyl ether	BDL	0.050	mg/l	8260B	08/05/02	1
Chloroform	BDL	0.0050	mg/l	8260B	08/05/02	1
Chloromethane	BDL	0.0010	mg/l	8260B	08/05/02	1
2-Chlorotoluene	BDL	0.0010	mg/l	8260B	08/05/02	1
4-Chlorotoluene	BDL	0.0010	mg/l	8260B	08/05/02	1
1,2-Dibromo-3-Chloropropane	BDL	0.0020	mg/l	8260B	08/05/02	1
1,2-Dibromoethane	BDL	0.0010	mg/l	8260B	08/05/02	1
Dibromomethane	BDL	0.0010	mg/l	8260B	08/05/02	1
1,2-Dichlorobenzene	BDL	0.0010	mg/l	8260B	08/05/02	1
1,3-Dichlorobenzene	BDL	0.0010	mg/l	8260B	08/05/02	1
1,4-Dichlorobenzene	BDL	0.0010	mg/l	8260B	08/05/02	1
Dichlorodifluoromethane	BDL	0.0010	mg/l	8260B	08/05/02	1
1,1-Dichloroethane	BDL	0.0010	mg/l	8260B	08/05/02	1
1,2-Dichloroethane	BDL	0.0010	mg/l	8260B	08/05/02	1
1,1-Dichloroethene	BDL	0.0010	mg/l	8260B	08/05/02	1
cis-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	08/05/02	1
trans-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	08/05/02	1
1,2-Dichloropropane	BDL	0.0010	mg/l	8260B	08/05/02	1
1,1-Dichloropropene	BDL	0.0010	mg/l	8260B	08/05/02	1
1,3-Dichloropropane	BDL	0.0010	mg/l	8260B	08/05/02	1
cis-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	08/05/02	1
trans-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	08/05/02	1
2,2-Dichloropropane	BDL	0.0010	mg/l	8260B	08/05/02	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

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Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

August 08, 2002

Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

Date Received : August 01, 2002
Description : Fort Riley
Sample ID : WELL M-1 30 FT
Collected By :
Collection Date : 07/30/02 11:00

ESC Sample # : L85066-01
ESC Key : BAYWEST - FORT RILEY
Site ID :
Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Di-isopropyl ether	BDL	0.0010	mg/l	8260B	08/05/02	1
Ethylbenzene	BDL	0.0010	mg/l	8260B	08/05/02	1
Hexachlorobutadiene	BDL	0.0010	mg/l	8260B	08/05/02	1
Isopropylbenzene	BDL	0.0010	mg/l	8260B	08/05/02	1
p-Isopropyltoluene	BDL	0.0010	mg/l	8260B	08/05/02	1
2-Butanone (MEK)	BDL	0.050	mg/l	8260B	08/05/02	1
Methylene Chloride	BDL	0.0050	mg/l	8260B	08/05/02	1
4-Methyl-2-pentanone (MIBK)	BDL	0.050	mg/l	8260B	08/05/02	1
Methyl tert-butyl ether	BDL	0.0010	mg/l	8260B	08/05/02	1
Naphthalene	BDL	0.0050	mg/l	8260B	08/05/02	1
n-Propylbenzene	BDL	0.0010	mg/l	8260B	08/05/02	1
Styrene	BDL	0.0010	mg/l	8260B	08/05/02	1
1,1,1,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	08/05/02	1
1,1,2,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	08/05/02	1
Tetrachloroethene	BDL	0.0010	mg/l	8260B	08/05/02	1
Toluene	BDL	0.0050	mg/l	8260B	08/05/02	1
1,2,3-Trichlorobenzene	BDL	0.0010	mg/l	8260B	08/05/02	1
1,2,4-Trichlorobenzene	BDL	0.0010	mg/l	8260B	08/05/02	1
1,1,1-Trichloroethane	BDL	0.0010	mg/l	8260B	08/05/02	1
1,1,2-Trichloroethane	BDL	0.0010	mg/l	8260B	08/05/02	1
Trichloroethene	BDL	0.0010	mg/l	8260B	08/05/02	1
Trichlorofluoromethane	BDL	0.0010	mg/l	8260B	08/05/02	1
1,2,3-Trichloropropane	BDL	0.0010	mg/l	8260B	08/05/02	1
1,2,4-Trimethylbenzene	BDL	0.0010	mg/l	8260B	08/05/02	1
1,3,5-Trimethylbenzene	BDL	0.0010	mg/l	8260B	08/05/02	1
Vinyl chloride	BDL	0.0010	mg/l	8260B	08/05/02	1
Xylenes, Total	BDL	0.0030	mg/l	8260B	08/05/02	1
Surrogate Recovery						
Toluene-d8	100		% Rec.	8260B	08/05/02	1
Dibromofluoromethane	100		% Rec.	8260B	08/05/02	1
4-Bromofluorobenzene	98.		% Rec.	8260B	08/05/02	1

Terrie Fudge
Terrie Fudge, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

The reported analytical results relate only to the sample submitted.

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Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

August 08, 2002

Date Received : August 01, 2002
Description : Fort Riley
Sample ID : TRIP BLANK
Collected By :
Collection Date : 07/30/02 10:50

ESC Sample # : L85066-02
ESC Key : BAYWEST - FORT RILEY
Site ID :
Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Volatile Organics						
Acetone	BDL	0.050	mg/l	8260B	08/06/02	1
Acrolein	BDL	0.050	mg/l	8260B	08/06/02	1
Acrylonitrile	BDL	0.050	mg/l	8260B	08/06/02	1
Benzene	BDL	0.0010	mg/l	8260B	08/06/02	1
Bromobenzene	BDL	0.0010	mg/l	8260B	08/06/02	1
Bromodichloromethane	BDL	0.0010	mg/l	8260B	08/06/02	1
Bromoform	BDL	0.0010	mg/l	8260B	08/06/02	1
Bromomethane	BDL	0.0010	mg/l	8260B	08/06/02	1
n-Butylbenzene	BDL	0.0010	mg/l	8260B	08/06/02	1
sec-Butylbenzene	BDL	0.0010	mg/l	8260B	08/06/02	1
tert-Butylbenzene	BDL	0.0010	mg/l	8260B	08/06/02	1
Carbon tetrachloride	BDL	0.0010	mg/l	8260B	08/06/02	1
Chlorobenzene	BDL	0.0010	mg/l	8260B	08/06/02	1
Chlorodibromomethane	BDL	0.0010	mg/l	8260B	08/06/02	1
Chloroethane	BDL	0.0010	mg/l	8260B	08/06/02	1
2-Chloroethyl vinyl ether	BDL	0.050	mg/l	8260B	08/06/02	1
Chloroform	BDL	0.0050	mg/l	8260B	08/06/02	1
Chloromethane	BDL	0.0010	mg/l	8260B	08/06/02	1
2-Chlorotoluene	BDL	0.0010	mg/l	8260B	08/06/02	1
4-Chlorotoluene	BDL	0.0010	mg/l	8260B	08/06/02	1
1,2-Dibromo-3-Chloropropane	BDL	0.0020	mg/l	8260B	08/06/02	1
1,2-Dibromoethane	BDL	0.0010	mg/l	8260B	08/06/02	1
Dibromomethane	BDL	0.0010	mg/l	8260B	08/06/02	1
1,2-Dichlorobenzene	BDL	0.0010	mg/l	8260B	08/06/02	1
1,3-Dichlorobenzene	BDL	0.0010	mg/l	8260B	08/06/02	1
1,4-Dichlorobenzene	BDL	0.0010	mg/l	8260B	08/06/02	1
Dichlorodifluoromethane	BDL	0.0010	mg/l	8260B	08/06/02	1
1,1-Dichloroethane	BDL	0.0010	mg/l	8260B	08/06/02	1
1,2-Dichloroethane	BDL	0.0010	mg/l	8260B	08/06/02	1
1,1-Dichloroethene	BDL	0.0010	mg/l	8260B	08/06/02	1
cis-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	08/06/02	1
trans-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	08/06/02	1
1,2-Dichloropropane	BDL	0.0010	mg/l	8260B	08/06/02	1
1,1-Dichloropropene	BDL	0.0010	mg/l	8260B	08/06/02	1
1,3-Dichloropropane	BDL	0.0010	mg/l	8260B	08/06/02	1
cis-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	08/06/02	1
trans-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	08/06/02	1
2,2-Dichloropropane	BDL	0.0010	mg/l	8260B	08/06/02	1

BDL - Below Detection Limit
Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



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Est. 1970

REPORT OF ANALYSIS

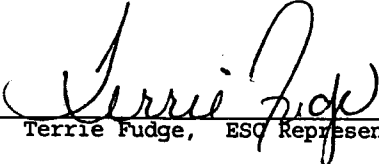
Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

August 08, 2002

Date Received : August 01, 2002
Description : Fort Riley
Sample ID : TRIP BLANK
Collected By :
Collection Date : 07/30/02 10:50

ESC Sample # : L85066-02
ESC Key : BAYWEST - FORT RILEY
Site ID :
Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Di-isopropyl ether	BDL	0.0010	mg/l	8260B	08/06/02	1
Ethylbenzene	BDL	0.0010	mg/l	8260B	08/06/02	1
Hexachlorobutadiene	BDL	0.0010	mg/l	8260B	08/06/02	1
Isopropylbenzene	BDL	0.0010	mg/l	8260B	08/06/02	1
p-Isopropyltoluene	BDL	0.0010	mg/l	8260B	08/06/02	1
2-Butanone (MEK)	BDL	0.050	mg/l	8260B	08/06/02	1
Methylene Chloride	BDL	0.0050	mg/l	8260B	08/06/02	1
4-Methyl-2-pentanone (MIBK)	BDL	0.050	mg/l	8260B	08/06/02	1
Methyl tert-butyl ether	BDL	0.0010	mg/l	8260B	08/06/02	1
Naphthalene	BDL	0.0050	mg/l	8260B	08/06/02	1
n-Propylbenzene	BDL	0.0010	mg/l	8260B	08/06/02	1
Styrene	BDL	0.0010	mg/l	8260B	08/06/02	1
1,1,1,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	08/06/02	1
1,1,2,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	08/06/02	1
Tetrachloroethene	BDL	0.0010	mg/l	8260B	08/06/02	1
Toluene	BDL	0.0050	mg/l	8260B	08/06/02	1
1,2,3-Trichlorobenzene	BDL	0.0010	mg/l	8260B	08/06/02	1
1,2,4-Trichlorobenzene	BDL	0.0010	mg/l	8260B	08/06/02	1
1,1,1-Trichloroethane	BDL	0.0010	mg/l	8260B	08/06/02	1
1,1,2-Trichloroethane	BDL	0.0010	mg/l	8260B	08/06/02	1
Trichloroethene	BDL	0.0010	mg/l	8260B	08/06/02	1
Trichlorofluoromethane	BDL	0.0010	mg/l	8260B	08/06/02	1
1,2,3-Trichloropropane	BDL	0.0010	mg/l	8260B	08/06/02	1
1,2,4-Trimethylbenzene	BDL	0.0010	mg/l	8260B	08/06/02	1
1,3,5-Trimethylbenzene	BDL	0.0010	mg/l	8260B	08/06/02	1
Vinyl chloride	BDL	0.0010	mg/l	8260B	08/06/02	1
Xylenes, Total	BDL	0.0030	mg/l	8260B	08/06/02	1
Surrogate Recovery						
Toluene-d8	98.		‡ Rec.	8260B	08/06/02	1
Dibromofluoromethane	110		‡ Rec.	8260B	08/06/02	1
4-Bromofluorobenzene	82.		‡ Rec.	8260B	08/06/02	1


Terrie Fudge, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

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Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

August 08, 2002

Date Received : August 01, 2002
Description : Fort Riley
Sample ID : EQUIPMENT BLANK
Collected By :
Collection Date : 07/30/02 13:30

ESC Sample # : L85066-03
ESC Key : BAYWEST - FORT RILEY
Site ID :
Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Volatile Organics						
Acetone	BDL	0.050	mg/l	8260B	08/03/02	1
Acrolein	BDL	0.050	mg/l	8260B	08/03/02	1
Acrylonitrile	BDL	0.050	mg/l	8260B	08/03/02	1
Benzene	BDL	0.0010	mg/l	8260B	08/03/02	1
Bromobenzene	BDL	0.0010	mg/l	8260B	08/03/02	1
Bromodichloromethane	BDL	0.0010	mg/l	8260B	08/03/02	1
Bromoform	BDL	0.0010	mg/l	8260B	08/03/02	1
Bromomethane	BDL	0.0010	mg/l	8260B	08/03/02	1
n-Butylbenzene	BDL	0.0010	mg/l	8260B	08/03/02	1
sec-Butylbenzene	BDL	0.0010	mg/l	8260B	08/03/02	1
tert-Butylbenzene	BDL	0.0010	mg/l	8260B	08/03/02	1
Carbon tetrachloride	BDL	0.0010	mg/l	8260B	08/03/02	1
Chlorobenzene	BDL	0.0010	mg/l	8260B	08/03/02	1
Chlorodibromomethane	BDL	0.0010	mg/l	8260B	08/03/02	1
Chloroethane	BDL	0.0010	mg/l	8260B	08/03/02	1
2-Chloroethyl vinyl ether	BDL	0.050	mg/l	8260B	08/03/02	1
Chloroform	BDL	0.0050	mg/l	8260B	08/03/02	1
Chloromethane	BDL	0.0010	mg/l	8260B	08/03/02	1
2-Chlorotoluene	BDL	0.0010	mg/l	8260B	08/03/02	1
4-Chlorotoluene	BDL	0.0010	mg/l	8260B	08/03/02	1
1,2-Dibromo-3-Chloropropane	BDL	0.0020	mg/l	8260B	08/03/02	1
1,2-Dibromoethane	BDL	0.0010	mg/l	8260B	08/03/02	1
Dibromomethane	BDL	0.0010	mg/l	8260B	08/03/02	1
1,2-Dichlorobenzene	BDL	0.0010	mg/l	8260B	08/03/02	1
1,3-Dichlorobenzene	BDL	0.0010	mg/l	8260B	08/03/02	1
1,4-Dichlorobenzene	BDL	0.0010	mg/l	8260B	08/03/02	1
Dichlorodifluoromethane	BDL	0.0010	mg/l	8260B	08/03/02	1
1,1-Dichloroethane	BDL	0.0010	mg/l	8260B	08/03/02	1
1,2-Dichloroethane	BDL	0.0010	mg/l	8260B	08/03/02	1
1,1-Dichloroethene	BDL	0.0010	mg/l	8260B	08/03/02	1
cis-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	08/03/02	1
trans-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	08/03/02	1
1,2-Dichloropropane	BDL	0.0010	mg/l	8260B	08/03/02	1
1,1-Dichloropropene	BDL	0.0010	mg/l	8260B	08/03/02	1
1,3-Dichloropropane	BDL	0.0010	mg/l	8260B	08/03/02	1
cis-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	08/03/02	1
trans-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	08/03/02	1
2,2-Dichloropropane	BDL	0.0010	mg/l	8260B	08/03/02	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



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Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

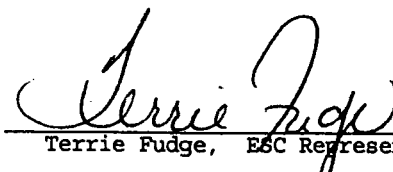
Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

August 08, 2002

Date Received : August 01, 2002
Description : Fort Riley
Sample ID : EQUIPMENT BLANK
Collected By :
Collection Date : 07/30/02 13:30

ESC Sample # : L85066-03
ESC Key : BAYWEST - FORT RILEY
Site ID :
Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Di-isopropyl ether	BDL	0.0010	mg/l	8260B	08/03/02	1
Ethylbenzene	BDL	0.0010	mg/l	8260B	08/03/02	1
Hexachlorobutadiene	BDL	0.0010	mg/l	8260B	08/03/02	1
Isopropylbenzene	BDL	0.0010	mg/l	8260B	08/03/02	1
p-Isopropyltoluene	BDL	0.0010	mg/l	8260B	08/03/02	1
2-Butanone (MEK)	BDL	0.050	mg/l	8260B	08/03/02	1
Methylene Chloride	BDL	0.0050	mg/l	8260B	08/03/02	1
4-Methyl-2-pentanone (MIBK)	BDL	0.050	mg/l	8260B	08/03/02	1
Methyl tert-butyl ether	BDL	0.0010	mg/l	8260B	08/03/02	1
Napthalene	BDL	0.0050	mg/l	8260B	08/03/02	1
n-Propylbenzene	BDL	0.0010	mg/l	8260B	08/03/02	1
Styrene	BDL	0.0010	mg/l	8260B	08/03/02	1
1,1,1,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	08/03/02	1
1,1,2,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	08/03/02	1
Tetrachloroethene	BDL	0.0010	mg/l	8260B	08/03/02	1
Toluene	BDL	0.0050	mg/l	8260B	08/03/02	1
1,2,3-Trichlorobenzene	BDL	0.0010	mg/l	8260B	08/03/02	1
1,2,4-Trichlorobenzene	BDL	0.0010	mg/l	8260B	08/03/02	1
1,1,1-Trichloroethane	BDL	0.0010	mg/l	8260B	08/03/02	1
1,1,2-Trichloroethane	BDL	0.0010	mg/l	8260B	08/03/02	1
Trichloroethene	BDL	0.0010	mg/l	8260B	08/03/02	1
Trichlorofluoromethane	BDL	0.0010	mg/l	8260B	08/03/02	1
1,2,3-Trichloropropane	BDL	0.0010	mg/l	8260B	08/03/02	1
1,2,4-Trimethylbenzene	BDL	0.0010	mg/l	8260B	08/03/02	1
1,3,5-Trimethylbenzene	BDL	0.0010	mg/l	8260B	08/03/02	1
Vinyl chloride	BDL	0.0010	mg/l	8260B	08/03/02	1
Xylenes, Total	BDL	0.0030	mg/l	8260B	08/03/02	1
Surrogate Recovery						
Toluene-d8	100		% Rec.	8260B	08/03/02	1
Dibromofluoromethane	100		% Rec.	8260B	08/03/02	1
4-Bromofluorobenzene	99.		% Rec.	8260B	08/03/02	1


Terrie Fudge, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

The reported analytical results relate only to the sample submitted.

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Attachment A
List of Analytes with QC Qualifiers

Sample #	Analyte	Qualifier
J5066-01	Acetone	H
	Acrolein	HJ4J6
	Acrylonitrile	H
	Benzene	H
	Bromobenzene	H
	Bromodichloromethane	H
	Bromoform	H
	Bromomethane	H
	n-Butylbenzene	HJ3
	sec-Butylbenzene	H
	tert-Butylbenzene	H
	Carbon tetrachloride	H
	Chlorobenzene	H
	Chlorodibromomethane	H
	Chloroethane	H
	2-Chloroethyl vinyl ether	H
	Chloroform	H
	Chloromethane	H
	2-Chlorotoluene	H
	4-Chlorotoluene	H
	1,2-Dibromo-3-Chloropropane	H
	1,2-Dibromoethane	H
	Dibromomethane	H
	1,2-Dichlorobenzene	H
	1,3-Dichlorobenzene	H
	1,4-Dichlorobenzene	H
	Dichlorodifluoromethane	H
	1,1-Dichloroethane	H
	1,2-Dichloroethane	H
	1,1-Dichloroethene	H
	cis-1,2-Dichloroethene	H
	trans-1,2-Dichloroethene	H
	1,2-Dichloropropane	H
	1,1-Dichloropropene	H
	1,3-Dichloropropane	H
	cis-1,3-Dichloropropene	H
	trans-1,3-Dichloropropene	H
	2,2-Dichloropropane	H
	Di-isopropyl ether	H
	Ethylbenzene	H
	Hexachlorobutadiene	H
	Isopropylbenzene	H
	p-Isopropyltoluene	H
	2-Butanone (MEK)	H
	Methylene Chloride	H
	4-Methyl-2-pentanone (MIBK)	H
	Methyl tert-butyl ether	H
	Naphthalene	HJ3
	n-Propylbenzene	H
	Styrene	H
	1,1,1,2-Tetrachloroethane	H
	1,1,2,2-Tetrachloroethane	H
	Tetrachloroethene	H
	Toluene	H
	1,2,3-Trichlorobenzene	HJ3J5
	1,2,4-Trichlorobenzene	HJ3J5
	1,1,1-Trichloroethane	H
	1,1,2-Trichloroethane	H
	Trichloroethene	H
	Trichlorofluoromethane	H
	1,2,3-Trichloropropane	H
1,2,4-Trimethylbenzene	HJ3	
1,3,5-Trimethylbenzene	H	
Vinyl chloride	H	
Xylenes, Total	H	
L85066-02	Acetone	H
	Acrolein	HJ4
	Acrylonitrile	H
	Benzene	H

Attachment A
List of Analytes with QC Qualifiers

Sample #	Analyte	Qualifier
	Bromobenzene	H
	Bromodichloromethane	H
	Bromoform	H
	Bromomethane	H
	n-Butylbenzene	H
	sec-Butylbenzene	H
	tert-Butylbenzene	H
	Carbon tetrachloride	H
	Chlorobenzene	H
	Chlorodibromomethane	H
	Chloroethane	H
	2-Chloroethyl vinyl ether	H
	Chloroform	H
	Chloromethane	H
	2-Chlorotoluene	H
	4-Chlorotoluene	H
	1,2-Dibromo-3-Chloropropane	H
	1,2-Dibromoethane	H
	Dibromomethane	H
	1,2-Dichlorobenzene	H
	1,3-Dichlorobenzene	H
	1,4-Dichlorobenzene	H
	Dichlorodifluoromethane	H
	1,1-Dichloroethane	H
	1,2-Dichloroethane	H
	1,1-Dichloroethene	H
	cis-1,2-Dichloroethene	H
	trans-1,2-Dichloroethene	H
	1,2-Dichloropropane	H
	1,1-Dichloropropene	H
	1,3-Dichloropropene	H
	cis-1,3-Dichloropropene	H
	trans-1,3-Dichloropropene	H
	2,2-Dichloropropane	H
	Di-isopropyl ether	H
	Ethylbenzene	H
	Hexachlorobutadiene	H
	Isopropylbenzene	H
	p-Isopropyltoluene	H
	2-Butanone (MEK)	H
	Methylene Chloride	H
	4-Methyl-2-pentanone (MIBK)	H
	Methyl tert-butyl ether	H
	Naphthalene	H
	n-Propylbenzene	H
	Styrene	H
	1,1,1,2-Tetrachloroethane	H
	1,1,2,2-Tetrachloroethane	H
	Tetrachloroethene	H
	Toluene	H
	1,2,3-Trichlorobenzene	H
	1,2,4-Trichlorobenzene	H
	1,1,1-Trichloroethane	H
	1,1,2-Trichloroethane	H
	Trichloroethene	H
	Trichlorofluoromethane	H
	1,2,3-Trichloropropane	H
	1,2,4-Trimethylbenzene	H
	1,3,5-Trimethylbenzene	H
	Vinyl chloride	H
	Xylenes, Total	H
	Acrolein	J4

L85066-03

Attachment B
Explanation of QC Qualifier Codes

Qualifier	Meaning
	RIN(EPA)-Re-Analyzed: The indicated analytical results were generated from a reinjection of the same sample extract or aliquot.
J3	The associated batch QC did not successfully meet the established quality control criteria for precision.
J5	The sample matrix interfered with the ability to make any accurate determination; spike value is unacceptably high
J4	The associated batch QC did not successfully meet the established quality control criteria for accuracy.
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is unacceptably low

Qualifier Report Information

ESC utilizes sample and result qualifiers as set forth by the EPA Contract Laboratory Program and as required by most certifying bodies including NELAC. In addition to the EPA qualifiers adopted by ESC, we have implemented ESC qualifiers to provide more information pertaining to our analytical results. Each qualifier is designated in the qualifier explanation as either EPA or ESC. Data qualifiers are intended to provide the ESC client with more detailed information concerning the potential bias of reported data. Because of the wide range of constituents and variety of matrices incorporated by most EPA methods, it is common for some compounds to fall outside of established ranges. These exceptions are evaluated and all reported data is valid and useable unless qualified as 'R' (Rejected).

Definitions

- Accuracy - The relationship of the observed value of a known sample to the true value of a known sample. Represented by percent recovery and relevant to samples such as: control samples, matrix spike recoveries, surrogate recoveries, etc.
- Precision - The agreement between a set of samples or between duplicate samples. Relates to how close together the results are and is represented by Relative Percent Difference.
- Surrogate - Organic compounds that are similar in chemical composition, extraction, and chromatography to analytes of interest. The surrogates are used to determine the probable response of the group of analytes that are chemically related to the surrogate compound. Surrogates are added to the sample and carried through all stages of preparation and analyses.
- TIC - Tentatively Identified Compound: Compounds detected in samples that are not target compounds, internal standards, system monitoring compounds, or surrogates.

Company Name/Address:

Bay West

10620 Widmer
Lenexa.KS 66215

Alternate billing information:

Analysis/Container/Preservative

Number of Custody
ge of

Prepared by:

**ENVIRONMENTAL
SCIENCE CORP.**

12065 Lebanon Road
Mt. Juliet, TN 37122

Phone (615) 758-5858
Phone (800) 767-5859
FAX (615) 758-5859

Report to: PHIL DULA

Email to: PHILD@BAYWEST.COM

Project Description: MONITORING WELL

City/State Collected

Phone: (913) 663-2915
FAX: (913) 663-3067

Client Project #:

ESG Key: LAB PROJECT #
BAYWEST-MW

Collected by:

Site/Facility ID#:

P.O.#: 15109

Collected by (signature):

Rush? (Lab MUST Be Notified)
 ___ Same Day.....200%
 ___ Next Day.....100%
 ___ Two Day.....50%

Date Results Needed:

Email? ___No___Yes
FAX? ___No___Yes

No. of Cntrs

Packed on Ice N Y

Sample ID	Comp/Grab	Matrix*	Depth	Date	Time	No. of Cntrs	Remarks/Contaminant	Sample # (lab only)
M1-003	GRAB	GW		9-12-02	1000	2		689319-01
M1-003 DUP	GRAB	GW		9-12-02	1000	2		
TRAILER KITCHEN	GRAB	DW		9-12-02	1000	1	X	02
TRAILER KITCHEN DUP	GRAB	DW		9-12-02	1000	1	X	04
TRAILER BATH-SINK	GRAB	DW		9-12-02	1000	1	X	05
TRAILER BATH-SINK DUP	GRAB	DW		9-12-02	1000	1	X	06
TRIP BLANK		GW		9-12-02	1000	1	X	07

*Matrix: SS - Soil/Solid GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other

pH _____ Temp _____

Remarks:

Flow _____ Other _____

Relinquished by: (Signature) <i>[Signature]</i>	Date: 9-12-02	Time: 1300	Received by: (Signature) <i>[Signature]</i>	Samples returned via: <input checked="" type="checkbox"/> UPS <input checked="" type="checkbox"/> FedEx <input type="checkbox"/> Courier <input type="checkbox"/>	Condition: (lab use only)
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Temp: 40°	Bottles Received: 9
Relinquished by: (Signature)	Date:	Time:	Received for lab by: (Signature) <i>[Signature]</i>	Date: 9-13-02	Time: 9:45
				pH Checked: 6.2	NCF



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Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

September 21, 2002

Date Received : September 13, 2002
Description : Monitoring Well

ESC Sample # : L89314-01

Sample ID : M1-003

Site ID :

Collected By :
Collection Date : 09/12/02 10:00

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Volatile Organics						
Acetone	BDL	0.050	mg/l	8260B	09/18/02	1
Acrolein	BDL	0.050	mg/l	8260B	09/18/02	1
Acrylonitrile	BDL	0.050	mg/l	8260B	09/18/02	1
Benzene	BDL	0.0010	mg/l	8260B	09/18/02	1
Bromobenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
Bromodichloromethane	0.0014	0.0010	mg/l	8260B	09/18/02	1
Bromoform	BDL	0.0010	mg/l	8260B	09/18/02	1
Bromomethane	BDL	0.0010	mg/l	8260B	09/18/02	1
n-Butylbenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
sec-Butylbenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
tert-Butylbenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
Carbon tetrachloride	BDL	0.0010	mg/l	8260B	09/18/02	1
Chlorobenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
Chlorodibromomethane	BDL	0.0010	mg/l	8260B	09/18/02	1
Chloroethane	BDL	0.0010	mg/l	8260B	09/18/02	1
2-Chloroethyl vinyl ether	BDL	0.050	mg/l	8260B	09/18/02	1
Chloroform	0.067	0.0050	mg/l	8260B	09/18/02	1
Chloromethane	BDL	0.0010	mg/l	8260B	09/18/02	1
2-Chlorotoluene	BDL	0.0010	mg/l	8260B	09/18/02	1
4-Chlorotoluene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,2-Dibromo-3-Chloropropane	BDL	0.0020	mg/l	8260B	09/18/02	1
1,2-Dibromoethane	BDL	0.0010	mg/l	8260B	09/18/02	1
Dibromomethane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,2-Dichlorobenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,3-Dichlorobenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,4-Dichlorobenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
Dichlorodifluoromethane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,1-Dichloroethane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,2-Dichloroethane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,1-Dichloroethene	BDL	0.0010	mg/l	8260B	09/18/02	1
cis-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	09/18/02	1
trans-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,2-Dichloropropane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,1-Dichloropropene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,3-Dichloropropane	BDL	0.0010	mg/l	8260B	09/18/02	1
cis-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	09/18/02	1
trans-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	09/18/02	1
2,2-Dichloropropane	BDL	0.0010	mg/l	8260B	09/18/02	1
Di-isopropyl ether	BDL	0.0010	mg/l	8260B	09/18/02	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



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Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

September 21, 2002

Date Received : September 13, 2002
Description : Monitoring Well

ESC Sample # : L89314-01

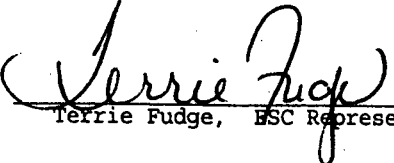
Sample ID : M1-003

Site ID :

Collected By :
Collection Date : 09/12/02 10:00

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Ethylbenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
Hexachlorobutadiene	BDL	0.0010	mg/l	8260B	09/18/02	1
Isopropylbenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
p-Isopropyltoluene	BDL	0.0010	mg/l	8260B	09/18/02	1
2-Butanone (MEK)	0.26	0.050	mg/l	8260B	09/18/02	1
Methylene Chloride	BDL	0.0050	mg/l	8260B	09/18/02	1
4-Methyl-2-pentanone (MIBK)	BDL	0.050	mg/l	8260B	09/18/02	1
Methyl tert-butyl ether	BDL	0.0010	mg/l	8260B	09/18/02	1
Naphthalene	BDL	0.0050	mg/l	8260B	09/18/02	1
n-Propylbenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
Styrene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,1,1,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,1,2,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	09/18/02	1
Tetrachloroethene	BDL	0.0010	mg/l	8260B	09/18/02	1
Toluene	BDL	0.0050	mg/l	8260B	09/18/02	1
1,2,3-Trichlorobenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,2,4-Trichlorobenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,1,1-Trichloroethane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,1,2-Trichloroethane	BDL	0.0010	mg/l	8260B	09/18/02	1
Trichloroethene	BDL	0.0010	mg/l	8260B	09/18/02	1
Trichlorofluoromethane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,2,3-Trichloropropane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,2,4-Trimethylbenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,3,5-Trimethylbenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
Vinyl chloride	BDL	0.0010	mg/l	8260B	09/18/02	1
Xylenes, Total	BDL	0.0030	mg/l	8260B	09/18/02	1
Surrogate Recovery						
Toluene-d8	99.		% Rec.	8260B	09/18/02	1
Dibromofluoromethane	95.		% Rec.	8260B	09/18/02	1
4-Bromofluorobenzene	99.		% Rec.	8260B	09/18/02	1


Terrie Fudge, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

The reported analytical results relate only to the sample submitted.

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Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

September 21, 2002

Date Received : September 13, 2002
Description : Monitoring Well
Sample ID : M1-003 DUP
Collected By :
Collection Date : 09/12/02 10:00

ESC Sample # : L89314-02

Site ID :

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Volatile Organics						
Acetone	BDL	0.050	mg/l	8260B	09/18/02	1
Acrolein	BDL	0.050	mg/l	8260B	09/18/02	1
Acrylonitrile	BDL	0.050	mg/l	8260B	09/18/02	1
Benzene	BDL	0.0010	mg/l	8260B	09/18/02	1
Bromobenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
Bromodichloromethane	0.0014	0.0010	mg/l	8260B	09/18/02	1
Bromoform	BDL	0.0010	mg/l	8260B	09/18/02	1
Bromomethane	BDL	0.0010	mg/l	8260B	09/18/02	1
n-Butylbenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
sec-Butylbenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
tert-Butylbenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
Carbon tetrachloride	BDL	0.0010	mg/l	8260B	09/18/02	1
Chlorobenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
Chlorodibromomethane	BDL	0.0010	mg/l	8260B	09/18/02	1
Chloroethane	BDL	0.0010	mg/l	8260B	09/18/02	1
2-Chloroethyl vinyl ether	BDL	0.050	mg/l	8260B	09/18/02	1
Chloroform	0.066	0.0050	mg/l	8260B	09/18/02	1
Chloromethane	BDL	0.0010	mg/l	8260B	09/18/02	1
2-Chlorotoluene	BDL	0.0010	mg/l	8260B	09/18/02	1
4-Chlorotoluene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,2-Dibromo-3-Chloropropane	BDL	0.0020	mg/l	8260B	09/18/02	1
1,2-Dibromoethane	BDL	0.0010	mg/l	8260B	09/18/02	1
Dibromomethane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,2-Dichlorobenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,3-Dichlorobenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,4-Dichlorobenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
Dichlorodifluoromethane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,1-Dichloroethane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,2-Dichloroethane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,1-Dichloroethene	BDL	0.0010	mg/l	8260B	09/18/02	1
cis-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	09/18/02	1
trans-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,2-Dichloropropane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,1-Dichloropropene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,3-Dichloropropane	BDL	0.0010	mg/l	8260B	09/18/02	1
cis-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	09/18/02	1
trans-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	09/18/02	1
2,2-Dichloropropane	BDL	0.0010	mg/l	8260B	09/18/02	1
Di-isopropyl ether	BDL	0.0010	mg/l	8260B	09/18/02	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



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Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

September 21, 2002

Date Received : September 13, 2002
Description : Monitoring Well

ESC Sample # : L89314-02

Sample ID : M1-003 DUP

Site ID :

Collected By :
Collection Date : 09/12/02 10:00

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Ethylbenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
Hexachlorobutadiene	BDL	0.0010	mg/l	8260B	09/18/02	1
Isopropylbenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
p-Isopropyltoluene	BDL	0.0010	mg/l	8260B	09/18/02	1
2-Butanone (MEK)	0.26	0.050	mg/l	8260B	09/18/02	1
Methylene Chloride	BDL	0.0050	mg/l	8260B	09/18/02	1
4-Methyl-2-pentanone (MIBK)	BDL	0.050	mg/l	8260B	09/18/02	1
Methyl tert-butyl ether	BDL	0.0010	mg/l	8260B	09/18/02	1
Naphthalene	BDL	0.0050	mg/l	8260B	09/18/02	1
n-Propylbenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
Styrene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,1,1,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,1,2,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	09/18/02	1
Tetrachloroethene	BDL	0.0010	mg/l	8260B	09/18/02	1
Toluene	BDL	0.0050	mg/l	8260B	09/18/02	1
1,2,3-Trichlorobenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,2,4-Trichlorobenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,1,1-Trichloroethane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,1,2-Trichloroethane	BDL	0.0010	mg/l	8260B	09/18/02	1
Trichloroethene	BDL	0.0010	mg/l	8260B	09/18/02	1
Trichlorofluoromethane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,2,3-Trichloropropane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,2,4-Trimethylbenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,3,5-Trimethylbenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
Vinyl chloride	BDL	0.0010	mg/l	8260B	09/18/02	1
Xylenes, Total	BDL	0.0030	mg/l	8260B	09/18/02	1
Surrogate Recovery						
Toluene-d8	99.		% Rec.	8260B	09/18/02	1
Dibromofluoromethane	95.		% Rec.	8260B	09/18/02	1
4-Bromofluorobenzene	98.		% Rec.	8260B	09/18/02	1


Terrie Fudge, ESC Representative

BDL - Below Detection Limit
Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

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Est. 1970

REPORT OF ANALYSIS

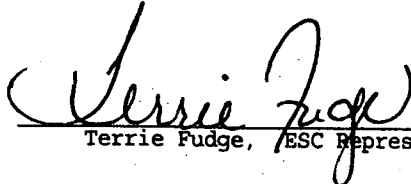
Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

September 21, 2002

Date Received : September 13, 2002
Description : Monitoring Well
Sample ID : TRAILER KITCHEN
Collected By :
Collection Date : 09/12/02 10:00

ESC Sample # : L89314-03
Site ID :
Project :

Parameter	Result	Det. Limit	Units	Reg. Limit	Method	Date	Dil
Lead	0.012	0.0050	mg/l	0.015	200.7	09/17/02	1


Terrie Fudge, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

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REPORT OF ANALYSIS

Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

September 21, 2002

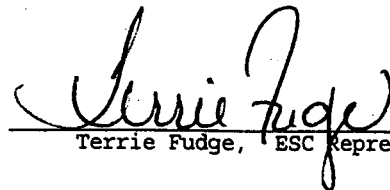
Date Received : September 13, 2002
Description : Monitoring Well
Sample ID : TRAILER KITCHEN DUP
Collected By :
Collection Date : 09/12/02 10:00

ESC Sample # : L89314-04

Site ID :

Project :

Parameter	Result	Det. Limit	Units	Reg. Limit	Method	Date	Dil
Lead	0.010	0.0050	mg/l	0.015	200.7	09/21/02	1


Terrie Fudge, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

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REPORT OF ANALYSIS

Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

September 21, 2002

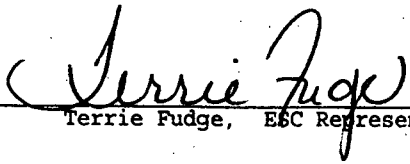
Date Received : September 13, 2002
Description : Monitoring Well
Sample ID : TRAILER BATH SINK
Collected By :
Collection Date : 09/12/02 10:00

ESC Sample # : L89314-05

Site ID :

Project :

Parameter	Result	Det. Limit	Units	Reg. Limit	Method	Date	Dil
Lead	0.013	0.0050	mg/l	0.015	200.7	09/20/02	1


Terrie Fudge, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

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REPORT OF ANALYSIS

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Lenexa, KS 66215

September 21, 2002

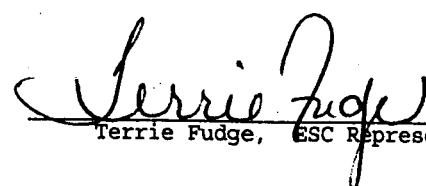
Date Received : September 13, 2002
Description : Monitoring Well
Sample ID : TRAILER BATH SINK DU
Collected By :
Collection Date : 09/12/02 10:00

ESC Sample # : L89314-06

Site ID :

Project :

Parameter	Result	Det. Limit	Units	Reg. Limit	Method	Date	Dil
Lead	0.010	0.0050	mg/l	0.015	200.7	09/20/02	1


Terrie Fudge, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

Note:

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REPORT OF ANALYSIS

Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

September 21, 2002

Date Received : September 13, 2002
Description : Monitoring Well

ESC Sample # : L89314-07

Sample ID : TRIP BLANK

Site ID :

Collected By :
Collection Date : 09/12/02 10:00

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Volatile Organics						
Acetone	BDL	0.050	mg/l	8260B	09/18/02	1
Acrolein	BDL	0.050	mg/l	8260B	09/18/02	1
Acrylonitrile	BDL	0.050	mg/l	8260B	09/18/02	1
Benzene	BDL	0.0010	mg/l	8260B	09/18/02	1
Bromobenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
Bromodichloromethane	BDL	0.0010	mg/l	8260B	09/18/02	1
Bromoform	BDL	0.0010	mg/l	8260B	09/18/02	1
Bromomethane	BDL	0.0010	mg/l	8260B	09/18/02	1
n-Butylbenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
sec-Butylbenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
tert-Butylbenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
Carbon tetrachloride	BDL	0.0010	mg/l	8260B	09/18/02	1
Chlorobenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
Chlorodibromomethane	BDL	0.0010	mg/l	8260B	09/18/02	1
Chloroethane	BDL	0.0010	mg/l	8260B	09/18/02	1
2-Chloroethyl vinyl ether	BDL	0.050	mg/l	8260B	09/18/02	1
Chloroform	BDL	0.0050	mg/l	8260B	09/18/02	1
Chloromethane	BDL	0.0010	mg/l	8260B	09/18/02	1
2-Chlorotoluene	BDL	0.0010	mg/l	8260B	09/18/02	1
4-Chlorotoluene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,2-Dibromo-3-Chloropropane	BDL	0.0020	mg/l	8260B	09/18/02	1
1,2-Dibromoethane	BDL	0.0010	mg/l	8260B	09/18/02	1
Dibromomethane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,2-Dichlorobenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,3-Dichlorobenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,4-Dichlorobenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
Dichlorodifluoromethane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,1-Dichloroethane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,2-Dichloroethane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,1-Dichloroethene	BDL	0.0010	mg/l	8260B	09/18/02	1
cis-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	09/18/02	1
trans-1,2-Dichloroethene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,2-Dichloropropane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,1-Dichloropropene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,3-Dichloropropane	BDL	0.0010	mg/l	8260B	09/18/02	1
cis-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	09/18/02	1
trans-1,3-Dichloropropene	BDL	0.0010	mg/l	8260B	09/18/02	1
2,2-Dichloropropane	BDL	0.0010	mg/l	8260B	09/18/02	1
Di-isopropyl ether	BDL	0.0010	mg/l	8260B	09/18/02	1

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit(EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233



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Est. 1970

REPORT OF ANALYSIS

Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

September 21, 2002

Date Received : September 13, 2002
Description : Monitoring Well

ESC Sample # : L89314-07

Sample ID : TRIP BLANK

Site ID :

Collected By :
Collection Date : 09/12/02 10:00

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Ethylbenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
Hexachlorobutadiene	BDL	0.0010	mg/l	8260B	09/18/02	1
Isopropylbenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
p-Isopropyltoluene	BDL	0.0010	mg/l	8260B	09/18/02	1
2-Butanone (MEK)	BDL	0.050	mg/l	8260B	09/18/02	1
Methylene Chloride	BDL	0.0050	mg/l	8260B	09/18/02	1
4-Methyl-2-pentanone (MIBK)	BDL	0.050	mg/l	8260B	09/18/02	1
Methyl tert-butyl ether	BDL	0.0010	mg/l	8260B	09/18/02	1
Naphthalene	BDL	0.0050	mg/l	8260B	09/18/02	1
n-Propylbenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
Styrene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,1,1,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,1,2,2-Tetrachloroethane	BDL	0.0010	mg/l	8260B	09/18/02	1
Tetrachloroethene	BDL	0.0010	mg/l	8260B	09/18/02	1
Toluene	BDL	0.0050	mg/l	8260B	09/18/02	1
1,2,3-Trichlorobenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,2,4-Trichlorobenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,1,1-Trichloroethane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,1,2-Trichloroethane	BDL	0.0010	mg/l	8260B	09/18/02	1
Trichloroethene	BDL	0.0010	mg/l	8260B	09/18/02	1
Trichlorofluoromethane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,2,3-Trichloropropane	BDL	0.0010	mg/l	8260B	09/18/02	1
1,2,4-Trimethylbenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
1,3,5-Trimethylbenzene	BDL	0.0010	mg/l	8260B	09/18/02	1
Vinyl chloride	BDL	0.0010	mg/l	8260B	09/18/02	1
Xylenes, Total	BDL	0.0030	mg/l	8260B	09/18/02	1
Surrogate Recovery						
Toluene-d8	100		% Rec.	8260B	09/18/02	1
Dibromofluoromethane	95.		% Rec.	8260B	09/18/02	1
4-Bromofluorobenzene	98.		% Rec.	8260B	09/18/02	1

Terrie Fudge
Terrie Fudge, ESC Representative

BDL - Below Detection Limit
Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

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Attachment A
List of Analytes with QC Qualifiers

Sample #	Analyte	Qualifier
L89314-01	Acrolein	J4
	2-Chloroethyl vinyl ether	J4
	Chloroform	E
	2-Butanone (MEK)	E
L89314-02	Acrolein	J4
	Chloroform	E
	2-Butanone (MEK)	E
L89314-07	Acrolein	J4
	2-Chloroethyl vinyl ether	J4

Attachment B
Explanation of QC Qualifier Codes

Qualifier	Meaning
4	GTL (EPA) - Greater than upper calibration limit: Actual value is known to be greater than the upper calibration range.
J4	The associated batch QC did not successfully meet the established quality control criteria for accuracy.

Qualifier Report Information

ESC utilizes sample and result qualifiers as set forth by the EPA Contract Laboratory Program and as required by most certifying bodies including NELAC. In addition to the EPA qualifiers adopted by ESC, we have implemented ESC qualifiers to provide more information pertaining to our analytical results. Each qualifier is designated in the qualifier explanation as either EPA or ESC. Data qualifiers are intended to provide the ESC client with more detailed information concerning the potential bias of reported data. Because of the wide range of constituents and variety of matrices incorporated by most EPA methods, it is common for some compounds to fall outside of established ranges. These exceptions are evaluated and all reported data is valid and useable unless qualified as 'R' (Rejected).

Definitions

- Accuracy** - The relationship of the observed value of a known sample to the true value of a known sample. Represented by percent recovery and relevant to samples such as: control samples, matrix spike recoveries, surrogate recoveries, etc.
- Precision** - The agreement between a set of samples or between duplicate samples. Relates to how close together the results are and is represented by Relative Percent Difference.
- Surrogate** - Organic compounds that are similar in chemical composition, extraction, and chromatography to analytes of interest. The surrogates are used to determine the probable response of the group of analytes that are chemically related to the surrogate compound. Surrogates are added to the sample and carried through all stages of preparation and analyses.
- IC** - Tentatively Identified Compound: Compounds detected in samples that are not target compounds, internal standards, system monitoring compounds, or surrogates.



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Est. 1970

REPORT OF ANALYSIS

September 18, 2002

Phil Dula
Bay West
10620 Widmer
Lenexa, KS 66215

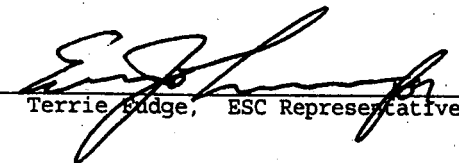
Date Received : September 13, 2002
Description : MONITORING WELL
Sample ID : M1 TRALER
Collected By :
Collection Date : 09/12/02 13:00

ESC Sample # : L89379-01

Site ID :

Project # : MONITORING WELL

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Coliform, fecal	BDL	1.0	col/100ml	909A	09/12/02	1


Terrie Edge, ESC Representative

BDL - Below Detection Limit

Det. Limit - Estimated Quantitation Limit (EQL)

Laboratory Certification Numbers:

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT- PH-0197, FL - E87487, GA - 923, IN - C-TN-01
KY - 90010, KYUST - 0016, NC - ENV375, DW21704, ND - R-140, SC - 84004, TN - 2006, VA - 00109, WV - 233

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KAW VALLEY ENGINEERING
Consulting Engineers

Nuclear Relative Compaction Test Data

Project: Plaza Speedway Repairs Project No.: A02T0875 Date: 27 Sept 02 Contractor: Ray West

	1	2	3	4			
Test Location	Trench on E. side of Race Track <i>Finish grade</i>	E side of Race track Existing Grade	Trench on E. side of Track <i>Finish grade</i>	E side of track Existing Grade			
Mode & Depth	6"	6"					
Moisture Correction							
Density Count	3206	2446	2337	2141			
Moisture Count	93	163	130	146			
Wet Density PCF	119.5	121.2	123.2	126.8			
Dry Density PCF	112.5	108.7	113.5	115.7			
Moisture P	7.0	12.5	9.7	11.0			
% Moisture	6.3	11.5	8.5	9.5			
Max. Obtainable Density	121.0	121.0	121.0	121.0			
Optimum Moisture	8.0	8.0	8.0	8.0			
% Relative Compaction	93.0	89.8	93.8	95.7			
Density	Remarks: ASTM-D 2922 ASTM-D 3017 Tested By: <u>JL</u>						
Moisture							
	Checked By:						



KAW VALLEY ENGINEERING

Consulting Engineers

PO Box 1304
Junction City, KS 66441
Tel: (785) 762-5040

**Compressive Strength of Concrete Cylinders
or Flex Strength of Concrete Beams**

Client: Bay West

Date of Report: 8/20/2002
Project Number: A02T0875
Class of Concrete: 4000
Concrete Supplier: Meiers

Owner:
Reviewed By: Jim Lee, Lab Supervisor
Field Technician: KVE

Test Methods: ASTM C31, C39, C1064, C78,
C143, C138, C231, C172, C617

Remarks:

Plaza Speedway Improvements

Specimen Number:	Portion of Construction Represented by Specimen:	Date Made:	Date Tested:	Date to Lab:	Air Temp:	Concrete Temp:	Ticket Number:	Age:	Air Content:	Slump:	Weight In lbs:	Unit Strength:
07-31-A	Conc Slab S. of	07/31/2002	08/07/2002	08/01/2002	76	78	48805	7	6.20%	4 0/0	28.0	3212
07-31-B	Restrooms	07/31/2002	08/28/2002	08/01/2002				28	6.20%	4 0/0	28.0	
07-31-C		07/31/2002	08/28/2002	08/01/2002				28	6.20%	4 0/0	28.0	



KAW VALLEY ENGINEERING
Consulting Engineers
PO Box 1304
Junction City, KS 66441
Tel: (785) 762-5040

Compressive Strength of Concrete Cylinders or Flex Strength of Concrete Beams

Page 1 of 1

Client: Bay West

Date of Report: 9/3/2002
Project Number: A02T0875
Class of Concrete: 4000
Concrete Supplier: Meiers

Owner:
Reviewed By: Jim Lee, Lab Supervisor
Field Technician: KVE

Test Methods: ASTM C31, C39, C1064, C78,
C143, C138, C231, C172, C617

Remarks:

Plaza Speedway Improvements

Specimen Number:	Portion of Construction Represented by Specimen:	Date Made:	Date Tested:	Date to Lab:	Air Temp:	Concrete Temp:	Ticket Number:	Age:	Air Content:	Slump:	Weight in lbs:	Unit Strength:
07-31-A	Conc Slab S. of	07/31/2002	08/07/2002	08/01/2002	76	78	48805	7	6.20%	4 0/0	28.0	3212
07-31-B	Restrooms	07/31/2002	08/28/2002	08/01/2002				28	6.20%	4 0/0	28.0	4200
07-31-C		07/31/2002	08/28/2002	08/01/2002				28	6.20%	4 0/0	28.0	4191

Appendix 4: Well Logs, Well Construction, & Well Permits

- Well Permits
- Well Design and Approval
- Well Log, Construction Details, and Pump Test Data. – Racetrack Replacement Well
- Well Log, Construction Details, and Pump Test Data- M-1 Replacement Well
- Well Abandonment Records

Well Permits

- Rural Lakes Region
- Racetrack Replacement Well
- M-1 Replacement Well



Rural Lakes Region

Local Environmental Protection Program

1212 W. Ash, P.O. Box 282
Junction City, Kansas 66441
(785)762-5788
FAX (785)762-5025

Serving the Counties of: Clay, Cloud, Geary, Marshall, Morris and Washington

PRIVATE WATER SUPPLY SYSTEM APPROVAL TO BEGIN CONSTRUCTION

PERMIT # 274

COUNTY Geary

CONTRACTOR NEEDS TO SUBMIT PLANS BEFORE CONSTRUCTION BEGINS.

All wells used as sources of water for private water supplies shall be separated from the specified sources of pollution by distances equal to or greater than those shown below.

- 50 ft. minimum separation from septic systems, sewer lines not constructed of cast iron or other equally tight construction, confined animal pens or barn, other contamination sources.
- 25 ft. from streams, lakes and ponds
- 10 ft. from sewer lines constructed of cast iron or other equally tight construction.
- 25 ft. from property lines or public right-of-ways.

Permission is hereby granted to Roger Thompson (property owner)

for the construction of a water supply system at 2100 Race Track Rd. Junction City
66441 (address) and legal description of SW 1/4 section 27, township 11 S,

range 6 E of Geary County, Kansas. This system will be constructed in conformity with the minimum requirements of the County Sanitary Code and State specifications.

YOU NEED TO NOTIFY THE RURAL LAKES REGION UPON COMPLETION OF CONSTRUCTION so an inspection can be made. If construction is satisfactory, a permit to operate will be issued.

This approval is valid until 10/15/02 (date)

If construction is not completed by this date, it will be necessary for you to notify us and request an extension of time.

7/15/02
Date

Mike Horak
Authorizing Agent

Sanitarian
Title

Contractor - Bay West 913 663 2915



Rural Lakes Region

Local Environmental Protection Program

1212 W. Ash, P.O. Box 282
Junction City, Kansas 66441
(785)762-5788
FAX (785)762-5025

Serving the Counties of: Clay, Cloud, Geary, Marshall, Morris and Washington

PRIVATE WATER SUPPLY SYSTEM APPROVAL TO BEGIN CONSTRUCTION

PERMIT # 275

COUNTY Geary

CONTRACTOR NEEDS TO SUBMIT PLANS BEFORE CONSTRUCTION BEGINS.

All wells used as sources of water for private water supplies shall be separated from the specified sources of pollution by distances equal to or greater than those shown below.

- 50 ft. minimum separation from septic systems, sewer lines not constructed of cast iron or other equally tight construction, confined animal pens or barn, other contamination sources.
- 25 ft. from streams, lakes and ponds
- 10 ft. from sewer lines constructed of cast iron or other equally tight construction.
- 25 ft. from property lines or public right-of-ways.

Permission is hereby granted to Robert More (property owner)

for the construction of a water supply system at 1100 Race Track Rd. Junction City

66441 (address) and legal description of SW¹/₄ section 27, township 11 S,

range 6 E of Geary County, Kansas. This system will be constructed in conformity with the minimum requirements of the County Sanitary Code and State specifications.

YOU NEED TO NOTIFY THE RURAL LAKES REGION UPON COMPLETION OF CONSTRUCTION so an inspection can be made. If construction is satisfactory, a permit to operate will be issued.

This approval is valid until 10/15/02 (date)

If construction is not completed by this date, it will be necessary for you to notify us and request an extension of time.

7/15/02
Date

Mike Henck
Authorizing Agent

Sanitarian
Title

Contractor - Bay West 913 663 2915

BAY WEST ENVIRONMENTAL
MONITOR WELL LOCATIONS
PLAZA SPEEDWAY NORTH OF MARSHALL AIR FIELD

WELL	NORTHING	EASTING	TOP OF CASING	TOP OF CONC PAD
SE CORNER	267678.02	1666256.17	1059.34	1057.83
NW CORNER	268876.47	1664639.22	1054.68	1053.20

NOTES:

1. COORDINATES GIVEN ARE IN UTM (NAD83) FEET
2. ELEVATIONS GIVEN ARE IN NAVD88



P.O. BOX 1304
2319 NORTH JACKSON
JUNCTION CITY, KS 66441

785-762-5040
FAX 785-762-7744
E-MAIL jc@kveng.com

KAW VALLEY ENGINEERING, INC. - CONSULTING ENGINEERS

Well Design and Approval

PhilD

From: Van-saun, Richard NWK [Richard.Van-saun@nwk02.usace.army.mil]
Sent: Wednesday, August 21, 2002 3:23 PM
To: Rohloff, Terry L NWK
Cc: Phil Dula (E-mail)
Subject: Well Design, Contract DACW41-95-D-0012, Task Order 0012

Terry,

The well design for subject contract and transmitted via Eng Form 4025 dated 8/12/2002 has been reviewed by the project geologist and is approved.

Richard Van Saun
CENWK-PM-ED
816-983-3552
FAX 816-426-5550
Richard.Van-Saun@NWK02.usace.army.mil

8/21/02

Layne-Western
1108 Jana Drive
Lawrence Ks. 66049
Phone: (785) 842-1280
Fax: (785) 842-1825

Layne-Western, A Division of Layne Christensen Company

To: Phil Fax: 913 663-3067

From: Don Caillouet Phone: (785) 842-1280

Re: CASING & SCREEN Date: August 13, 2002

CC: Pages 6 including cover sheet

Notes:

Phil : This is the CASING &
well screen we will be using

DM

Layne-Western
1108 Jana Drive
Lawrence Ks. 66049
Phone: (785) 842-1280
Fax: (785) 842-1825

Layne-Western, A Division of Layne Christensen Company

To: *Phil* Fax: *913 663-3067*

From: Don Caillouet Phone: (785) 842-1280

Re: Date: August 13, 2002

CC: Pages: *3* including cover sheet

Notes:

*Phil: HERE ARE THE GRAVEL
PACK ANALYSIS THAT WE WILL BE
USING 8-12 ON THE HOUSE WALL
& 4-8 ON THE 8" RACE TRUCK WELF*

Don

Bay West

Delivering Environmental, Industrial, Marine, and Emergency Solutions

August 12, 2002

United States Army Corps of Engineers
Ft Riley Area Office
ATTN: Terry Rolouf
Building 322, Marshall Avenue
Ft Riley, KS 66442

Bay West, Inc. • 24 Hours: 1-800-279-0456 • www.baywest.com
5 Empire Drive, St. Paul, MN 55103 • 651/291-0456 • FAX 651/291-0099
10620 Widmer Rd., Lenexa, KS 66215 • 913/663-2915 • FAX 913/663-3067

RE: Material Approval Submittal for Well Materials for Contract No. DACW41-95-D-0022, Delivery Order No. 0012. Water Distribution and Well Installation, Off-Post Near the Former Fire Training Area, Marshall Army Airfield, Ft. Riley, Kansas.

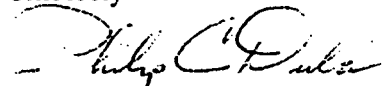
Dear Mr. Rolouf:

Please find enclosed Engineering Form 4025 and Layne Western's design for the Racetrack Replacement Well and the M-1 Replacement Well for the referenced project. The well design was performed by Carl Nuzman a P.E. and Certified Hydrogeologist for Bay West and Layne Western.

Due to the time critical nature of this project we would appreciate your approval as soon as possible so that materials can be ordered and well installations completed by August 26, 2002.

If you require any additional information or have questions regarding this submittal please call me at (913) 663-2915.

Sincerely



Philip Dula P.G., CHMM
Kansas City Office Manager

COPY

Enclosures:
Eng Form 4025

Cc:
Rick Van Saun, USACE KC District/PM

TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE <i>(Read instructions on the reverse side prior to initiating this form)</i>	DATE 8/12/02	TRANSMITTAL NO. 1 of 1
---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------	---------------------------

SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS *(This section will be initiated by the contractor)*

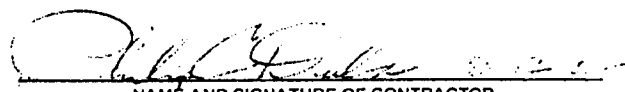
TO: Terry Rolouf USACE /Ft Riley Area Office Building 322, Marshall Ave. Ft Riley, KS 66442	FROM: Phil Dula Bay West, Inc. 10620 Widmer Lenexa, KS 66215	CONTRACT NO. DACW41-95-D-0022 Task Order 0012	CHECK ONE: <input checked="" type="checkbox"/> THIS IS A NEW TRANSMITTAL <input type="checkbox"/> THIS IS A RESUBMITTAL OF TRANSMITTAL _____
------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------	-----------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------

SPECIFICATION SEC. NO <i>(cover only one section with each submittal)</i>	PROJECT TITLE AND LOCATION
---------------------------------------------------------------------------	----------------------------

ITEM NO.	DESCRIPTION OF ITEMS SUBMITTED <i>(Type size, model number/etc.)</i>	MFG OR CONTR. CAT., CURVE DRAWING OR BROCHURE NO. <i>(See Instruction No.8)</i>	NO. OF COPIES	CONTRACT REFERENCE DOCUMENT		FOR CONTRACTOR USE CODE	VARIATION <i>(See instruction No. 6)</i>	FOR CE USE CODE
				SPEC. PARA. NO.	DRAWING SHEET NO.			
a.	b.	c.	d.	e.	f.	g.	h.	i.
1	Well Design	Layne Western	6	Work Plan 7.7				

REMARKS
Additional 3 copies sent to KC District Office.
3 copies sent to Terry Rolouf at Ft Riley Area Office.
Well design attached

I certify that the above submitted items have been reviewed in detail and are correct and in strict conformance with the contract drawings and specifications except as other wise stated.


NAME AND SIGNATURE OF CONTRACTOR

SECTION II - APPROVAL ACTION

ENCLOSURES RETURNED (List by Item No.)	NAME, TITLE AND SIGNATURE OF APPROVING AUTHORITY	DATE
----------------------------------------	--------------------------------------------------	------

Layne-Western
1108 Jana Drive
Lawrence Ks. 66049
Phone: (785) 842-1280
Fax: (785) 842-1825

Layne-Western, A Division of Layne Christensen Company

To: Phil - Bay West Fax: 913 663-3067

From: Don Callouet Phone: (785) 842-1280

Re: Date: August 12, 2002

CC: Pages: 5 including cover sheet

Notes: Hi Phil
SCREEN PLACEMENT, GRAVEL SIZE
FOR THE RACE TRUCK WELL &
HOUSE WELL. DESIGNED BY
CARL NYZMAN PE & HE.
THANKS DON

FORT RILEY Bay West**Test Hole (House Well) TH2-02**

Based on the test hole boring log made July 31, 2002, saturated unconsolidated sediments were found from 21.0 feet, the static water level, to a total depth 60 feet below land surface.

Based on conventional water well design, it is recommended that TH2-02 be screened from 40 feet to 60 feet depth as recorded on the test hole log. The recommended gravel pack is 0.9 cubic yards of 8-12 production Colorado Silica Sand, Inc.

Based on an assumed average permeability of 120 feet/day, the estimated well specific capacity for 100 percent is 10.5 gpm/ft. The projected yield of this well is 200 gpm more or less.

If less dense non-aqueous fluids are present, an alternate design is to install 40 feet of screen in this well. This alternative design would maximize water yield if needed. The yield could be further enhanced with a larger borehole diameter and using reverse circulation drilling method.

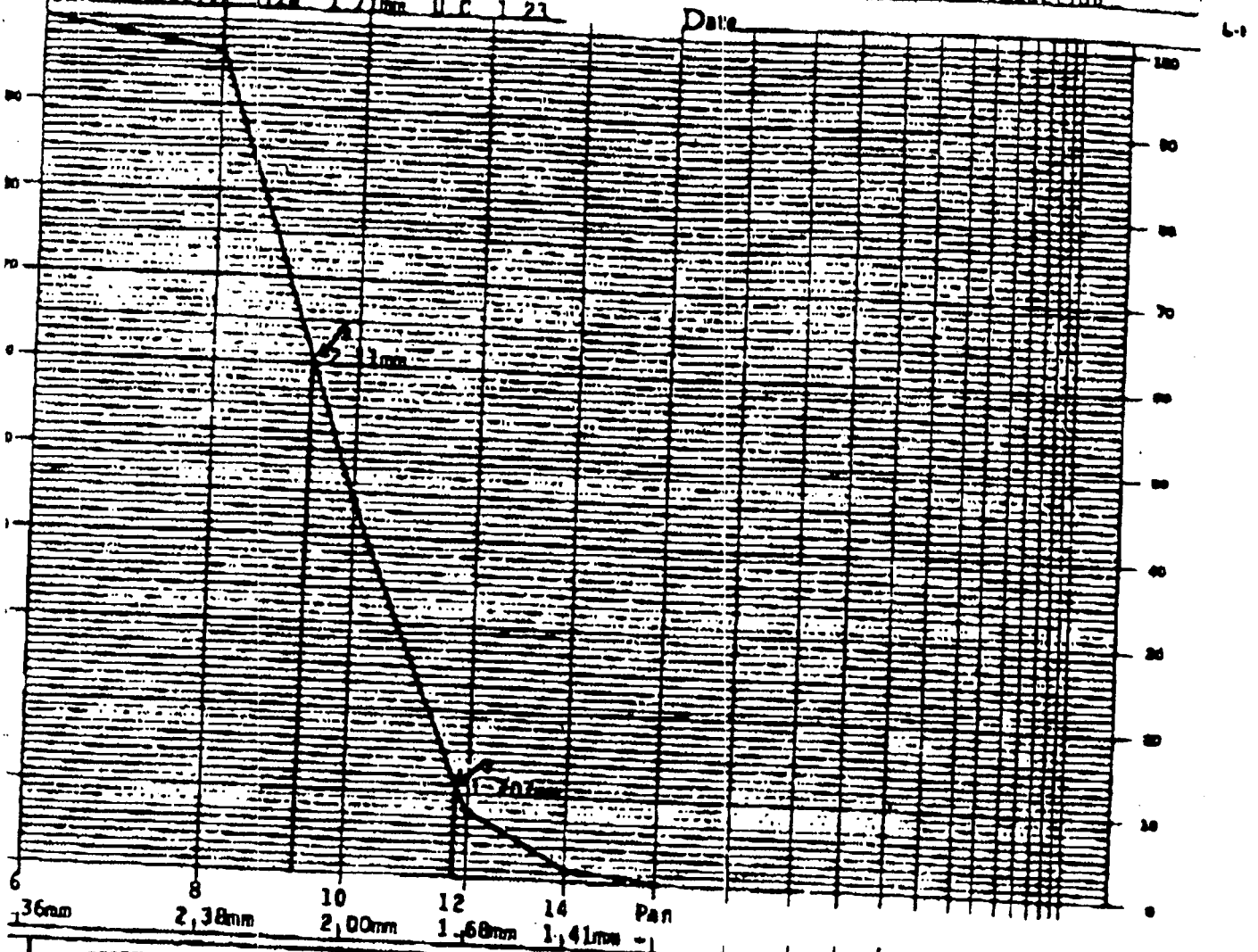
Prepared by *Robert P. Hays* PE, P. H.

The Tyler Standard Screen Scale

Fourth Root of Two Series for Closer Sizing

Form No. 1
 Tyler Standard
 When ordered

Cumulative Direct Diagram of Screen Analysis on Sample of R-12 Production
 Name Effective Size 1.7mm U.C. 1.23 Date _____



SCREEN SCALE RATIO 1.189												
Openings		Tyler Mesh	U.S. No.	Sample Weights	Per Cent	Per Cent Cumulative Weights	Sample Weights	Per Cent	Per Cent Cumulative Weights	Sample Weights	Per Cent	Per Cent Cumulative Weights
Inches	Millimeters											
			6			100						
			8			96.7						
			10			44.2						
			12			7.8						
			14			1.2						
			Pan									
			Total									

COLORADO SILICA SAND, INC.
 P.O. BOX 16615
 COLORADO SPRINGS, COLORADO 80901

TING SQUARE ROOT OF TWO SERIES FOR CLOSER SIZING

FORT RILEY - Bay West

Recommended Well Construction

Test Hole (Race-track Well) TH1-02

Based on the test hole boring log made July 30, 2002, saturated unconsolidated sediments were found from 21.3 feet depth, the static water level, to a total depth of 71.5 feet below land surface.

Based on conventional water well design criteria, it is recommended that TH1-02 be screened from 45.5 feet to 59.5 feet, followed by 2 feet of blank casing from 59.5 feet to 61.5 feet, then 10 more feet of well screen to a total depth of 71.5 feet. The recommended gravel pack material is 1.1 cubic yards of 4-8 production Colorado Silica Sand, Inc.

Based on an assumed average formation permeability of 120 feet/day, characteristic of these deposits, the estimated well specific capacity for 100 percent well efficiency is 12 gpm/ft of drawdown. With a reported static water level of 21.3 feet gives an allowable drawdown of 24 feet to the top of the screen. It is projected that at 250 gpm. The drawdown may be 19 feet, more or less.

If less dense non-aqueous liquids are present at this site, an alternate screen design recommended would be to screen all unconsolidated formation from 21.5 feet to 71.5 feet. This alternate design would also maximize water production if needed. Further enhancement of water yield is available by drilling a larger borehole and using reverse circulation method.

Prepared by *Carl Nuzman* PE/PHG

Layne-Western
1108 Jana Drive
Lawrence Ks. 66049
Phone: (785) 842-1280
Fax: (785) 842-1825

Layne-Western, A Division of Layne Christensen Company

To: Phil Bay West

Fax: 913 663-3067

From: Don Caillouet

Phone: (785) 842-1280

Re: Screen Slot Size

Date: August 13, 2002

CC:

Pages: 3- including cover sheet

Notes: Hi Phil: The design I sent to you yesterday did not include the screen slot opening size. Also, I'll be sending you submittals for the wire wrap screen with this slot size. Thank you. Don

FORT RILEY - Bay West

Recommended Well Construction

Test Hole (Racetrack Well) TH1-02

Based on the test hole boring log made July 30, 2002, saturated unconsolidated sediments were found from 21.3 feet depth, the static water level, to a total depth of 71.5 feet below land surface.

Based on conventional water well design criteria, it is recommended that TH1-02 be screened from 45.5 feet to 59.5 feet, followed by 2 feet of blank casing from 59.5 feet to 61.5 feet, then 10 more feet of well screen to a total depth of 71.5 feet. The recommended gravel pack material is 1.1 cubic yards of 4-8 production Colorado Silica Sand, Inc. The suggested screen slot size for the 4-8 gravel pack is 0.080 inch width.

Based on an assumed average formation permeability of 120 feet/day, characteristic of these deposits, the estimated well specific capacity for 100 percent well efficiency is 12 gpm/ft of drawdown. With a reported static water level of 21.3 feet gives an allowable drawdown of 24 feet to the top of the screen. It is projected that at 250 gpm. The drawdown may be 19 feet, more or less.

If less dense non-aqueous liquids are present at this site, an alternate screen design recommended would be to screen all unconsolidated formation from 21.5 feet to 71.5 feet. This alternate design would also maximize water production if needed. Further enhancement of water yield is available by drilling a larger borehole and using reverse circulation method.

Prepared by Carl Nuzman P.E., P.Hy

August 12, 2002

FORT RILEY Bay West

Test Hole (House Well) TH2-02

Based on the test hole boring log made July 31, 2002, saturated unconsolidated sediments were found from 21.0 feet, the static water level, to a total depth 60 feet below land surface.

Based on conventional water well design, it is recommended that TH2-02 be screened from 40 feet to 60 feet depth as recorded on the test hole log. The recommended gravel pack is 0.9 cubic yards of 8-12 production Colorado Silica Sand, Inc. The suggested screen slot size for the 8-12 gravel pack is 0.060 inch.

Based on an assumed average permeability of 120 feet/day, the estimated well specific capacity for 100 percent is 10.5 gpm/ft. The projected yield of this well is 200 gpm more or less.

If less dense non-aqueous fluids are present, an alternate design is to install 40 feet of screen in this well. This alternative design would maximize water yield is needed. The yield could be further enhanced with a larger borehole diameter and using reverse circulation drilling method.

*Proposed by
Carl Nuzman PE, P.Hg.
Aug 12, 2002*

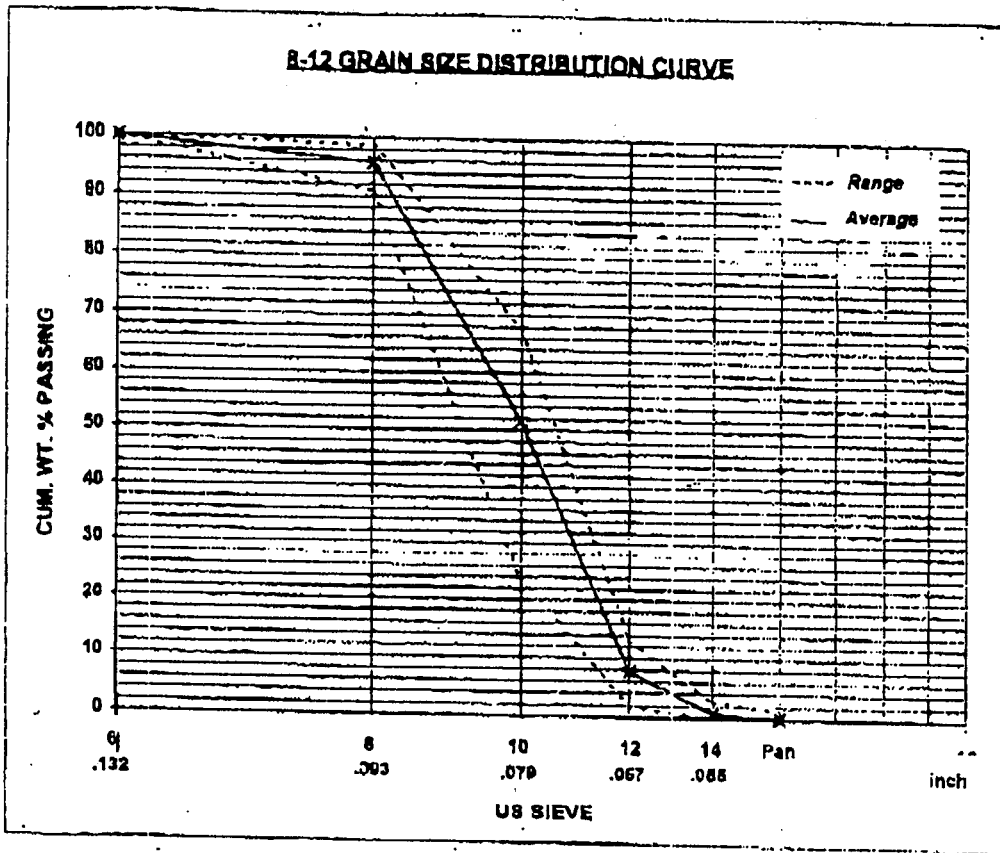


OGLEBAY NORTON INDUSTRIAL SANDS
COLORADO SILICA SAND, INC.

Cumulative Direct Diagram of Screen Analysis on Sample of

8-12

UC = 1.75



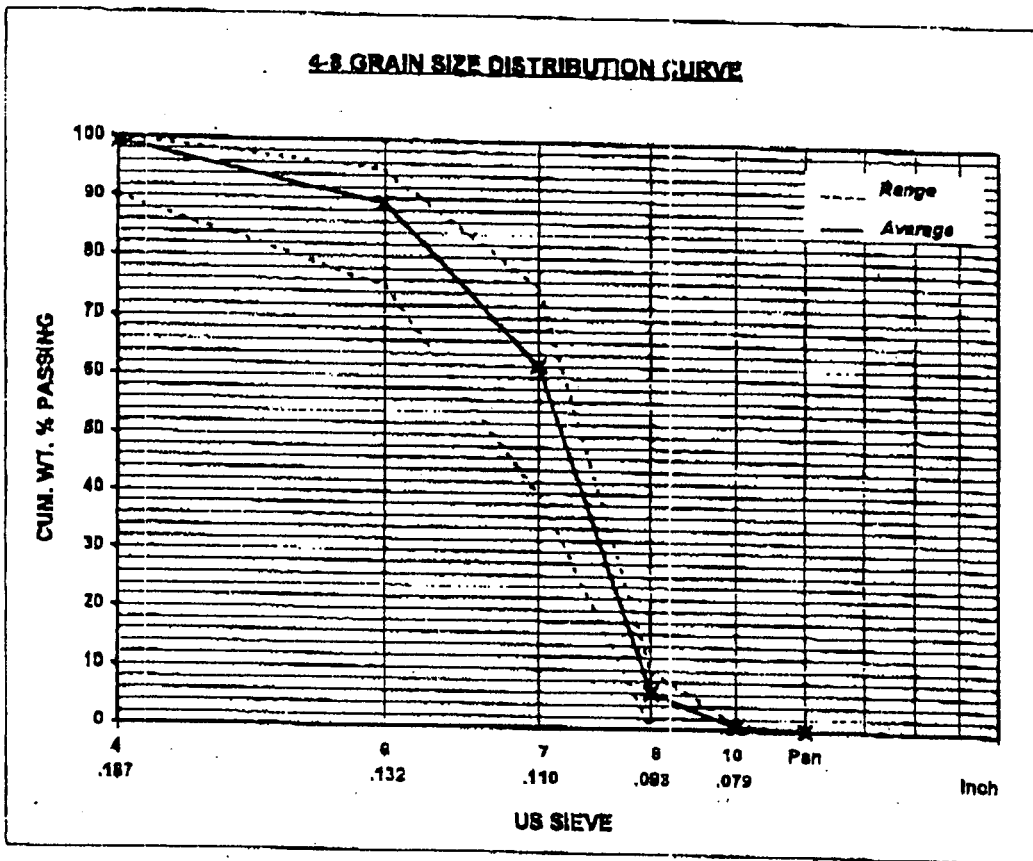
US SIEVE	Opening (inches)	Opening (mm)	Cumulative Wt. % Passing	Cumulative Wt. % Retained	Individual Wt. % Retained
6	0.1310	3.35	100	0	0
8	0.0929	2.36	90 - 100	0 - 10	0 - 10
10	0.0787	2.00	23 - 68	32 - 77	32 - 67
12	0.0669	1.70	0 - 10	90 - 100	23 - 78
14	0.0551	1.40	0 - 2	98 - 100	0 - 8
Pan	Pan				

*UC and ES based on a linear curve



OGLEBAY NORTON INDUSTRIAL SANDS
 COLORADO SPRINGS PLANT

Cumulative Direct Diagram of Screen Analysis on Sample of



US SIEVE	Opening (Inches)	Opening (mm)	Cumulative Wt % Passing	Cumulative Wt % Retained	Individual Wt % Retained
4	0.1870	4.76	90 - 100	0 - 10	0 - 10
6	0.1319	3.35	75 - 95	5 - 25	5 - 15
7	0.1102	2.80	40 - 75	25 - 60	20 - 35
8	0.0929	2.36	0 - 10	90 - 100	40 - 65
10	0.0787	2.00	0 - 1	99 - 100	0 - 9
Pan	Pan				

* E9 and UC calculation is based on a linear graph
 P.O. Box 15815, COLORADO SPRINGS, CO 80935
 719-390-7869 FAX 719-390-5617

January 2001

ENGINEERING SPECIFICATIONS

PVC FLUSH THREAD MONITOR WELL SCREENS AND CASINGS

1. All PVC well screens and casings used on this project shall be manufactured by Monoflex and conform to ASTM F-480: "Standard Specification for Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR), SCH 40 and SCH 80."
2. PVC materials used to produce the raw PVC pipe shall meet ASTM Standard D-1784: "Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds for PVC Normal Impact, Type I Grade I (1120), cell classification 12454-B."
3. The finished schedules 40, 80, and 120 raw pipe shall meet the requirements of ASTM Standard D-1785: "Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120." In addition, both the raw material and the finished raw pipe shall be approved by the National Sanitation Foundation (NSF) for use in potable water applications.
4. The PVC pipe used to produce the well screens and casings shall be made from virgin plastic produced by the original compounder.
5. The pipe shall be homogeneous throughout and essentially uniform in color, opacity and density. The inside and outside surfaces shall be glossy in appearance and free of chalking, sticky or tacky material and visually free of oils, grease, dust and marks imparted as a result of the manufacturing process. In addition the pipe walls shall be free of cracks, holes, blisters, voids, foreign inclusion, or other defects that are visible to the naked eye and that may affect the wall integrity. Machined slots or holes deliberately placed in the pipe are acceptable.
6. The outside diameters, wall thicknesses and out of roundness tolerances shall fall within the guidelines of Tables 1 & 2 of the ASTM F-480 Standard Specification when measured in accordance with Test Method D-2122.
7. All flush thread materials must be slotted and threaded without the use of any type of liquid coolant. Air is the only acceptable coolant.
8. Well screens 1/2" through 5" are to be slotted on 1/8" spacing. Well screens 6" and larger are to be slotted on 1/4" spacing unless otherwise specified. ALL well screens .040 slot and larger will be slotted on 1/4" spacing unless otherwise specified.
9. All screens and casings shall be nominal length except for 2" and 4" schedule 40 which shall be laying length. The term "laying length" refers to the overall length less the length required to complete the assembly. Nominal length + the length of the exposed male thread (pin) = laying length.
10. The threads per inch for the various diameters and schedules of flush thread materials shall be the same as that produced by Monoflex, Largo, Florida or approved equal.
11. All screens and casings shall be supplied in individual polyethylene bags hermetically sealed at BOTH ends. Said products shall be shipped in cardboard boxes with properly secured ends. Each box shall display a color coded label containing a full description of the product inside. Said label must indicate the number pieces per box, the threads per inch, the date of packaging, the signatures of the packer and QC inspector and show a drawing of the product.

800-257-5183

www.campbellmfg.com

The logo for Campbell Monoflex, featuring the word "Campbell" in a small font above a stylized "M" and "F" symbol, with the word "NOFLEX" in a large, bold, sans-serif font to the right.

Product Specifications



A Weatherford Company

PVC Vee-Wire Monitoring Screen Specifications

GENERAL: The product is made of white PVC Type 1, Grade 1 material as described in ASTM F480 and ASTM D1784, Class 12454B. The product is Vee-Wire screen with a continuous slot widening inwardly to minimize clogging. The surface wire is helically wrapped and sonic welded to a circular array of internal rods. The slot is selected based on a sieve analysis of the waterbearing formation sediments or the selected filter pack.

STRENGTH: The screen meets the following minimum strength requirements:

COLLAPSE PRESSURE: 56 psi at 60 slot

TENSILE STRENGTH: 1150 lbs. of hanging weight

DIAMETER: The nominal screen outside diameter is 6.625 inches, and is round within 0.030 inches. The clear inside diameter is 5.75 inches.

The screen body is straight within 1/16" over a 5' length.

SLOT: The required slot opening is 0.060 inches with minimum open area of 62 sq. in./ft. of screen. The manufactured slot is within ±.004 inches of the nominal, and the slots are essentially free of stringers or burrs.

FITTINGS: ASTM F480 flush thread fittings are required: including a Buna N O-ring on the male end. The fittings are heat welded to the screen body. Fittings are square to the screen body within .015" for 2" PS, .020" for 4" PS, or .030" for 6" PS screens.

FINISH: The screen surface is free of oils, grease, paint, dirt, and any manufacturer's markings that could alter the chemistry of the sample. Stringers or burrs are removed.

The product is completely incased in an individual 7 mil thick polyethylene protective wrapper with sealed ends and shipped in water resistant cardboard boxes.

DOCUMENTATION: If required, the manufacturer will provide documentation that the screen meets the specifications. Examples are material certificate of compliance, test results for strength or leak test requirements, inspection records for dimensions, cleaning process used and its acceptance criteria.

PVC Vee-Wire 8" PS Screen Specifications

GENERAL: The product is made of white PVC Type 1, Grade 1 material as described in ASTM F480 and ASTM D1784, Class 12454B. The product is Vee-Wire screen with a continuous slot widening inwardly to minimize clogging. The surface wire is helically wrapped and sonic welded to a circular array of internal rods. The slot is selected based on a sieve analysis of the waterbearing formation sediments or the selected filter pack.

STRENGTH: The screen meets the following minimum strength requirements:

COLLAPSE PRESSURE: _____ psi at _____ slot

TENSILE STRENGTH: _____ lbs. of hanging weight

DIAMETER: The nominal screen outside diameter is 8.63 inches, and is round within 0.030 inches. The clear inside diameter is 7.50 inches.

The screen body is straight within 1/8" over a 5' length.

SLOT: The required slot opening is _____ inches with minimum open area of _____ sq. in./ft. of screen. The manufactured slot is within ±.004 inches of the nominal, and the slots are essentially free of stringers, or burrs.

FITTINGS: ASTM F480 flush thread fittings are required: including a Buna N O-ring on the male end. The fittings are heat welded to the screen body. Fittings are square to the screen body within .030".

FINISH: The screen surface is essentially free of oils, grease, paint, dirt, and any manufacturer's markings. Stringers or burrs are removed.

The product is completely incased in an individual 7 mil thick polyethylene protective wrapper with sealed ends and shipped in cardboard or wooden boxes.

DOCUMENTATION: If required, the manufacturer will provide documentation that the screen meets the specifications. Examples are material certificate of compliance, test results for strength or leak test requirements, inspection records for dimensions, cleaning process used and its acceptance criteria.



Product Specifications

Johnson screens[®]
A Weatherford Company

PVC Vee-Wire Monitoring Screen Specifications

GENERAL: The product is made of white PVC Type 1, Grade 1 material as described in ASTM F480 and ASTM D1784, Class 12454B. The product is Vee-Wire screen with a continuous slot widening inwardly to minimize clogging. The surface wire is helically wrapped and sonic welded to a circular array of internal rods. The slot is selected based on a sieve analysis of the waterbearing formation sediments or the selected filter pack.

STRENGTH: The screen meets the following minimum strength requirements:

COLLAPSE PRESSURE: _____ psi
at _____ slot

TENSILE STRENGTH: _____ lbs.
of hanging weight

DIAMETER: The nominal screen outside diameter is _____ inches, and is round within 0.030 inches. The clear inside diameter is _____ inches.

The screen body is straight within 1/16" over a 5' length.

SLOT: The required slot opening is _____ inches with minimum open area of _____ sq. in./ft. of screen. The manufactured slot is within ± 0.004 inches of the nominal, and the slots are essentially free of stringers or burrs.

FITTINGS: ASTM F480 flush thread fittings are required: including a Buna N O-ring on the male end. The fittings are heat welded to the screen body. Fittings are square to the screen body within .015" for 2" PS, .020" for 4" PS, or .030" for 6" PS screens.

FINISH: The screen surface is free of oils, grease, paint, dirt, and any manufacturer's markings that could alter the chemistry of the sample. Stringers or burrs are removed.

The product is completely incased in an individual 7 mil thick polyethylene protective wrapper with sealed ends and shipped in water resistant cardboard boxes.

DOCUMENTATION: If required, the manufacturer will provide documentation that the screen meets the specifications. Examples are material certificate of compliance, test results for strength or leak test requirements, inspection records for dimensions, cleaning process used and its acceptance criteria.

PVC Vee-Wire 8" PS Screen Specifications

GENERAL: The product is made of white PVC Type 1, Grade 1 material as described in ASTM F480 and ASTM D1784, Class 12454B. The product is Vee-Wire screen with a continuous slot widening inwardly to minimize clogging. The surface wire is helically wrapped and sonic welded to a circular array of internal rods. The slot is selected based on a sieve analysis of the waterbearing formation sediments or the selected filter pack.

STRENGTH: The screen meets the following minimum strength requirements:

COLLAPSE PRESSURE: 37 psi
at 80 slot

TENSILE STRENGTH: 1375 lbs.
of hanging weight

DIAMETER: The nominal screen outside diameter is 8.63 inches, and is round within 0.030 inches. The clear inside diameter is 7.50 inches.

The screen body is straight within 1/8" over a 5' length.

SLOT: The required slot opening is 0.080 inches with minimum open area of 118 sq. in./ft. of screen. The manufactured slot is within ± 0.004 inches of the nominal, and the slots are essentially free of stringers, or burrs.

FITTINGS: ASTM F480 flush thread fittings are required: including a Buna N O-ring on the male end. The fittings are heat welded to the screen body. Fittings are square to the screen body within .030".

FINISH: The screen surface is essentially free of oils, grease, paint, dirt, and any manufacturer's markings. Stringers or burrs are removed.

The product is completely incased in an individual 7 mil thick polyethylene protective wrapper with sealed ends and shipped in cardboard or wooden boxes.

DOCUMENTATION: If required, the manufacturer will provide documentation that the screen meets the specifications. Examples are material certificate of compliance, test results for strength or leak test requirements, inspection records for dimensions, cleaning process used and its acceptance criteria.

January 2001

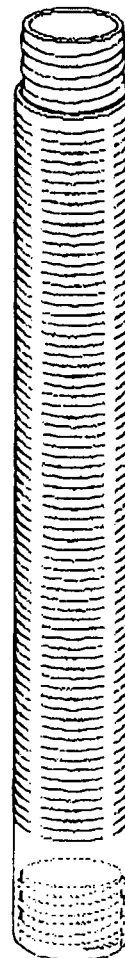
FLUSH THREAD PVC SCREEN AND CASING

- ✓ Monoflex CNC computer lathed flush threads follow ASTM F-480 recommendations for reliable, consistent results on the job site.
- ✓ Our close tolerances provide a strong connection while retaining ease of assembly.
- ✓ Manufactured from quality PVC pipe; Monoflex flush thread screens and casings are available in diameters of 1/2" through 12" with 2, 4, or 8 threads per inch stocked in schedules 40 & 80. Other schedules and SDR's are available in PVC and high density polyethylene.
- ✓ Laying length is standard for 2" and 4" schedule 40 PVC. Other sizes are end to end length. Custom lengths are available in all diameters.
- ✓ All standard Monoflex PVC threads are compatible with other materials threaded to ASTM F-480 recommendations, with the same TPI.
- ✓ All standard screens provide maximum net open area. A wide variety of slot sizes and spacings is available to adapt to various site conditions.
- ✓ 2" and 4" schedules 40 and 80 screens & casings are supplied with Buna-N O-rings at no additional charge. Buna-N O-rings are available for all other sizes for a nominal charge.
- ✓ All flush thread well screens and casings are Envirowrapped and hermetically sealed at both ends as a standard practice.

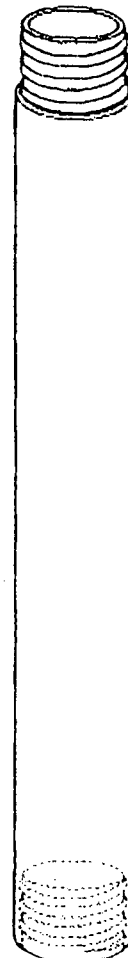
PLEASE SPECIFY PART NUMBER WHEN ORDERING.

The following pages list flush thread PVC screens and casings along with the appropriate Buna-N O-rings, and flush thread caps, plugs, and points.

Custom lengths, threads and adapters available.



Flush Thread
Screen



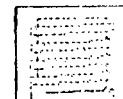
Flush Thread
Casing



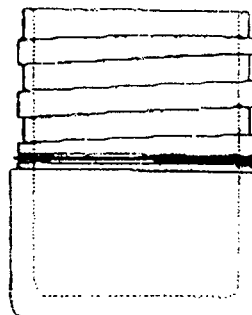
Buna-N O-Rings



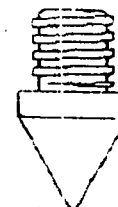
Male Plug
(solid)



Female Cap
(solid)



Male Point
(molded)



Male Point
(solid)



Female Point
(solid)

January 2001

PVC PIPE SPECIFICATIONS

PVC Schedule 40					
Nominal Pipe Size (in.)	O.D.	Average I.D.	Min. Wall	Nominal Wt./ft.	Max. W.P. PSI*
1/8	.406	.261	.068	.045	810
1/4	.540	.354	.088	.081	780
3/8	.675	.483	.091	.109	820
1/2	.840	.609	.109	.181	800
3/4	1.050	.810	.113	.214	880
1	1.315	1.033	.133	.315	450
1 1/4	1.660	1.384	.140	.424	370
1 1/2	1.900	1.592	.145	.509	330
2	2.375	2.049	.154	.682	290
2 1/2	2.875	2.445	.200	1.078	300
3	3.500	3.042	.216	1.409	260
3 1/2	4.000	3.520	.226	1.697	240
4	4.500	3.996	.237	2.106	220
5	5.563	5.017	.254	2.726	190
6	6.625	6.031	.280	3.535	180
8	8.625	7.943	.312	5.306	160
10	10.750	9.978	.355	7.532	140
12	12.750	11.880	.406	9.949	130
14	14.000	13.072	.437	11.810	130
16	15.000	14.340	.500	15.415	130
18	16.000	14.809	.582	20.112	130
20	20.000	18.743	.693	23.624	120
24	24.000	22.544	.887	32.873	120

PVC Schedule 80					
Nominal Pipe Size (in.)	O.D.	Average I.D.	Min. Wall	Nominal Wt./ft.	Max. W.P. PSI*
1/8	.406	.203	.035	.068	1200
1/4	.540	.288	.119	.100	1100
3/8	.675	.407	.128	.138	900
1/2	.840	.528	.147	.202	850
3/4	1.050	.724	.154	.273	890
1	1.315	.935	.179	.402	630
1 1/4	1.660	1.256	.181	.554	520
1 1/2	1.900	1.475	.200	.673	470
2	2.375	1.913	.214	.932	400
2 1/2	2.875	2.269	.276	1.419	420
3	3.500	2.864	.300	1.903	370
3 1/2	4.000	3.326	.318	2.322	350
4	4.500	3.795	.337	2.742	320
6	5.563	4.767	.375	3.867	290
8	6.625	5.709	.432	5.313	280
10	10.750	9.492	.593	11.866	230
12	12.750	11.294	.687	16.437	230
14	14.000	12.410	.750	19.790	220
16	16.000	14.214	.843	25.430	220
18	18.000	16.014	.937	31.800	220
20	20.000	17.814	1.031	40.091	220
24	24.000	21.478	1.218	56.882	210

PVC Schedule 120					
Nominal Pipe Size (in.)	O.D.	Average I.D.	Min. Wall	Nominal Wt./ft.	Max. W.P. PSI*
1/2	.84	.480	.170	.223	1010
3/4	1.050	.690	.170	.296	770
1	1.315	.891	.200	.440	720
1 1/4	1.660	1.204	.215	.614	600
1 1/2	1.900	1.423	.225	.744	540
2	2.375	1.845	.250	1.052	470
2 1/2	2.875	2.239	.303	1.529	470
3	3.500	2.758	.350	2.184	440
4	4.500	3.572	.437	3.516	430
6	6.625	5.434	.562	6.789	370

SDR 21 - W.P. 200 PSI (Water @ 73.4 F)					
Nominal Pipe Size (in.)	O.D.	Average I.D.	Min. Wall	Nominal Wt./ft.	
3/4	1.050	.910	.060	.129	
1	1.315	1.189	.063	.170	
1 1/4	1.660	1.482	.079	.263	
1 1/2	1.900	1.700	.090	.339	
2	2.375	2.129	.113	.521	
2 1/2	2.875	2.581	.137	.754	
3	3.500	3.146	.167	1.106	
3 1/2	4.000	3.598	.190	1.443	
4	4.500	4.048	.214	1.825	
5	5.563	5.001	.265	2.792	
6	6.625	5.955	.318	3.984	
8	8.625	7.755	.410	6.879	

SDR 26 - W.P. 160 PSI (Water @ 73.4 F)					
Nominal Pipe Size (in.)	O.D.	Average I.D.	Min. Wall	Nominal Wt./ft.	
1	1.315	1.175	.090	.184	
1 1/4	1.660	1.512	.094	.221	
1 1/2	1.900	1.734	.073	.284	
2	2.375	2.173	.091	.432	
2 1/2	2.875	2.635	.110	.622	
3	3.500	3.210	.135	.915	
3 1/2	4.000	3.872	.154	1.183	
4	4.500	4.134	.173	1.494	
5	5.663	5.109	.214	2.288	
6	6.625	6.085	.255	3.228	
8	8.625	7.921	.332	5.468	
10	10.750	9.874	.413	8.492	
12	12.750	11.710	.490	11.956	
14	14.000	12.880	.538	14.430	
16	16.000	14.898	.615	18.810	
18	18.000	16.534	.692	23.860	
20	20.000	18.370	.769	29.470	
24	24.000	22.043	.923	42.520	

CLEAR PVC Schedule 40					
Nominal Pipe Size (in.)	O.D.	Average I.D.	Min. Wall	Nominal Wt./ft.	Max. W.P. PSI*
1/4	.540	.394	.068	.081	390
3/8	.675	.489	.091	.109	310
1/2	.840	.606	.109	.161	300
3/4	1.050	.810	.113	.214	240
1	1.315	1.020	.133	.315	220
1 1/4	1.660	1.384	.140	.429	180
1 1/2	1.900	1.592	.145	.509	170
2	2.375	2.049	.154	.682	140
2 1/2	2.875	2.445	.203	1.078	150
3	3.500	3.042	.216	1.403	130
3 1/2	4.000	3.520	.226	1.697	120
4	4.500	3.996	.237	2.106	110
6	6.625	6.031	.280	3.535	90
8 1/8	6.625	6.355	.125	.547	45
8	6.625	7.943	.322	11.005	80

* Notes: All pressure ratings are for water at 73.4° with solvent cemented joints.

Bell and Gasket PVC Pipe is available in Schedules 40, 80, 120 and SDR's 21, 26, 35, 41 and C-900. Compounds used in the manufacture of PVC and CPVC Pipe meet ASTM Standard D-1784. Schedules 40, 80 and 120 PVC Pipe meet ASTM Standard D-1785. Pressure Rated (SDR Series) PVC Pipe meets ASTM Standard D-2241. ASTM Standard D-1784 classification equivalents:
 PVC Normal Impact = Type I Grade I = PVC 1120 = Cell Classification 12154-B
 For more complete information, request "Condensed Catalog HB-103-A&B"

800-257-5183
 www.campbellmfg.com

 9/7/01 11:47 AM

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A DEPARTMENT OF THE UNIVERSITY OF KANSAS

August 07, 2002

Layne-Western
 Mr. James W.oley
 1011 West Harry Street
 Wichita, Kansas 67213

Re: Washed Sieve Analysis (Fort Riley, Bay West, Test Holes #1 & #2)
 A/L Sample No. 7182 A thru D
 A/L File No. 71-02177
 A/L Report No. 020807ADW1240

Gentlemen:

Following are results of tests performed on samples of fine aggregate delivered to this laboratory by your personnel on August 06, 2002.

WASHED SIEVE ANALYSIS, ASTM C-136, 117												
Sample I.D.	Sieve Size	% Retained										% Passing
		3/4	1/2	3/8	4	5	10	30	60	100	200	
TH1-02, 24.5-28.5		0	0	0	0	2	8	34	64	97	99.5	1.5
TH1-02, 28.5-30.0		0	0	1	4	24	45	71	88	92	93.0	6.1
TH1-02, 30.0-37.5		0	2	2	6	19	45	80	96	98	96.6	1.6
TH1-02, 40.0-45.0		0	0	0	0	3	11	68	85	99	98.3	1.7
TH1-02, 45.0-60.0		12	12	13	18	20	44	91	95	97	98.3	1.7
TH1-02, 60.0-65.0		0	0	1	4	18	58	86	94	98	98.6	1.4
TH1-02, 65.0-75.0		0	0	0	1	4	17	63	84	99	99.5	0.5
TH1-02, 75.0-90.0		0	0	0	14	22	37	64	85	93	98.0	21.0
TH1-02, no depth given		0	0	2	5	15	39	74	91	96	97.0	3.0

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 DIVISION LOCATED AT
 833 SOUTH WASHINGTON
 WICHITA, KANSAS 67202
 (316) 261-0497
 FAX NO. (316) 262-0200

Layne-Webern
 Washed Sieve Analysis-Fort Riley Project
 August 07, 2002
 page 2

WASHED SIEVE ANALYSIS, ASTM C-136, 117												
Sample I.D.	Sieve Size	% Retained										% Passing
		3/4	1/2	3/8	4	8	16	30	60	100	200	
TH2-02, 25.0-26.5		0	0	0	0	1	4	30	81	82	94.6	5.4
TH2-02, 26.8-27.0		0	3	4	13	33	57	70	78	84	91.5	8.5
TH2-02, 30.0-32.0		1	2	3	11	32	56	70	83	88	92.7	7.3
TH2-02, 35.0-38.5		0	0	0	6	27	52	66	78	84	88.6	11.4
TH2-02, 50.0-50.9		0	0	0	0	1	12	45	74	89	93.9	6.1
TH2-02, 55.0-55.5		0	0	0	1	4	18	48	78	81	85.8	14.2

If you have any questions arise, please contact us at your convenience.

Very truly yours,

ALLIED LABORATORIES



Alan D. Ward, CET
 Laboratory Supervisor

Sunday, August 11, 2002 9:23 PM

08/07/2002 WED 13:11 FAX 3162895365
08/07/02 14:06 316 282 8592

Cari Nuzman 785 582 4155
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PAGE 01

0003
002/003

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A DIVISION OF ALLIED TECHNICAL
CORPORATION, 200 SOUTH WASHINGTON, WICHITA, KS

August 07, 2002

Layne-Western
Mr. James W. Soley
1011 West Harry Street
Wichita, Kansas 67213

Re: Washed Sieve Analysis (Port Riley, Bay West, Test Holes #1 & #2)
A/L Sample No. 7183 A thru D
A/L File No. 71-02177
A/L Report No. OZ0807ADW1240

Gentlemen:

Following are results of tests performed on samples of fine aggregate delivered to this laboratory by your personnel on August 06, 2002.

WASHED SIEVE ANALYSIS, ASTM C-136, 117													
Sample I.D.	Sieve Size	% Retained											% Passing
		3/4	1/2	3/8	4	5	10	30	60	100	200	-200	
TH1-02, 24.5-28.5		0	0	0	0	2	8	34	64	87	88.5	1.5	
TH1-02, 29.5-30.0		0	0	1	8	24	43	71	88	92	93.0	6.1	
TH1-02, 35.5-38.5		0	2	3	8	19	48	60	88	88	88.8	1.5	
TH1-02, 44.5-48.0		0	0	0	0	3	11	68	83	88	88.3	1.7	
TH1-02, 48.5-60.8		12	12	15	18	20	44	81	95	97	98.3	1.7	
TH1-02, 64.5-68.8		0	0	1	4	18	58	86	94	98	98.6	1.4	
TH1-02, 69.5-80.0		0	0	0	1	4	17	63	84	88	88.5	0.5	
TH1-02, 80.0-90.2		0	0	8	14	22	27	64	88	93	99.0	21.0	
TH1-02, no sample given		0	0	2	3	15	39	74	93	95	87.0	3.0	

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CONSTRUCTION DIVISION TECHNICAL
DIVISION LOCATED AT
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WICHITA, KANSAS 67202
(316) 282-8487
FAX NO. (316) 282-8592

Sunday, August 11, 2002 9:23 PM

Carl Nuzman 785 562 4155

08/07/2002 WED 13:12 FAX 3162698385
08/07/02 14:10 316 262 8892

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003/003

P.12

Layne-Western
Washed Sieve Analysis-Fort Riley Project
August 07, 2002
Page 2

WASHED SIEVE ANALYSIS, ASTM C-136, 117												
Sample ID.	Sieve Size	% Retained										% Passing
		3/4	1/2	3/8	4	5	10	30	50	100	200	
TH2-02, 25.0-28.5		0	0	0	0	1	4	30	81	82	94.6	5.4
TH2-02, 26.8-27.0		0	3	4	13	33	57	70	79	84	91.5	8.5
TH2-02, 30.0-32.0		1	2	9	11	32	56	70	83	88	92.7	7.3
TH3-02, 25.0-38.5		0	0	0	5	27	52	68	78	84	95.8	4.2
TH2-02, 30.0-35.0		0	0	0	0	1	12	48	74	89	93.9	6.1
TH2-02, 55.0-55.5		0	0	0	1	4	18	48	79	81	95.8	4.2

Should questions arise, please contact us at your convenience.

Very truly yours,

ALLIED LABORATORIES



Alan D. Ward, CET
Laboratory Supervisor

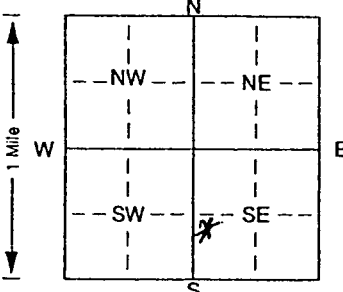
Well Log and Construction Details, and Pump Test Data.

Racetrack Replacement Well

1] LOCATION OF WATER WELL: Fraction NW 1/4 SW 1/4 SE 1/4 Section Number 27 Township Number T 11 S Range Number R 5 E
 County: Geary

Place and direction from nearest town or city, street address of well if located within city?
NEAR RACETRACK AREA EAST OF MARSHALL FIELD AIR BASE

2] WATER WELL OWNER: Roger Thompson RACETRACK WELL No. 1
 RR#, St. Address, Box #: 2100 Racetrack Rd. Board of Agriculture, Division of Water Resources
 City, State, ZIP Code: Junction City Ks 66441-7090 Application Number:

3] LOCATE WELL'S LOCATION WITHIN SECTION BOX: AN "X" IN SECTION BOX:

 4] DEPTH OF COMPLETED WELL: 70.90 ft. ELEVATION:
 Depth(s) Groundwater Encountered 1. ft. 2. ft. 3. ft.
 WELL'S STATIC WATER LEVEL: 23.16 ft. below land surface measured on mo/day/yr 9-4-02
 Pump test data: Well water was ft. after hours pumping gpm
 Est. Yield 500 gpm; Well water was ft. after hours pumping gpm
 Bore Hole Diameter: 14 in. to ft., and in. to ft.
 WELL WATER TO BE USED AS: Public water supply 8 Air conditioning 11 Injection well
 1 Domestic 3 Feedlot 6 Oil field water supply 9 Dewatering 12 Other (Specify below)
 2 Irrigation 4 Industrial 7 Domestic (lawn & garden) 10 Monitoring well
 Was a chemical/bacteriological sample submitted to Department? Yes No; If yes, mo/day/yr sample was submitted SEPT. 5, 2002 Water Well Disinfected? Yes No

5] TYPE OF BLANK CASING USED: 5 Wrought iron 8 Concrete tile CASING JOINTS: Glued. Clamped.
 1 Steel 3 RMP (SR) 6 Asbestos-Cement 9 Other (specify below) Welded
 PVC 4 ABS 7 Fiberglass Threaded
 Blank casing diameter: 8 in. to 38.9 ft., Dia. in. to ft., Dia. in. to ft.
 Casing height above land surface: 24 in., weight lbs./ft. Wall thickness or gauge No.

TYPE OF SCREEN OR PERFORATION MATERIAL: PVC 10 Asbestos-cement
 1 Steel 3 Stainless steel 5 Fiberglass 8 RMP (SR) 11 Other (specify)
 2 Brass 4 Galvanized steel 6 Concrete tile 9 ABS 12 None used (open hole)
 SCREEN OR PERFORATION OPENINGS ARE: 5 Gauzed wrapped 8 Saw cut 11 None (open hole)
 1 Continuous slot 3 Mill slot Wire wrapped 9 Drilled holes
 Louvered shutter 4 Key punched 7 Torch cut 10 Other (specify) ft.
 SCREEN-PERFORATED INTERVALS: From 65.9 ft. to 55.9 ft., From ft. to ft.
 From 53.4 ft. to 38.9 ft., From ft. to ft.
 GRAVEL PACK INTERVALS: From 65.9 ft. to 22 ft., From ft. to ft.
 From ft. to ft., From ft. to ft.

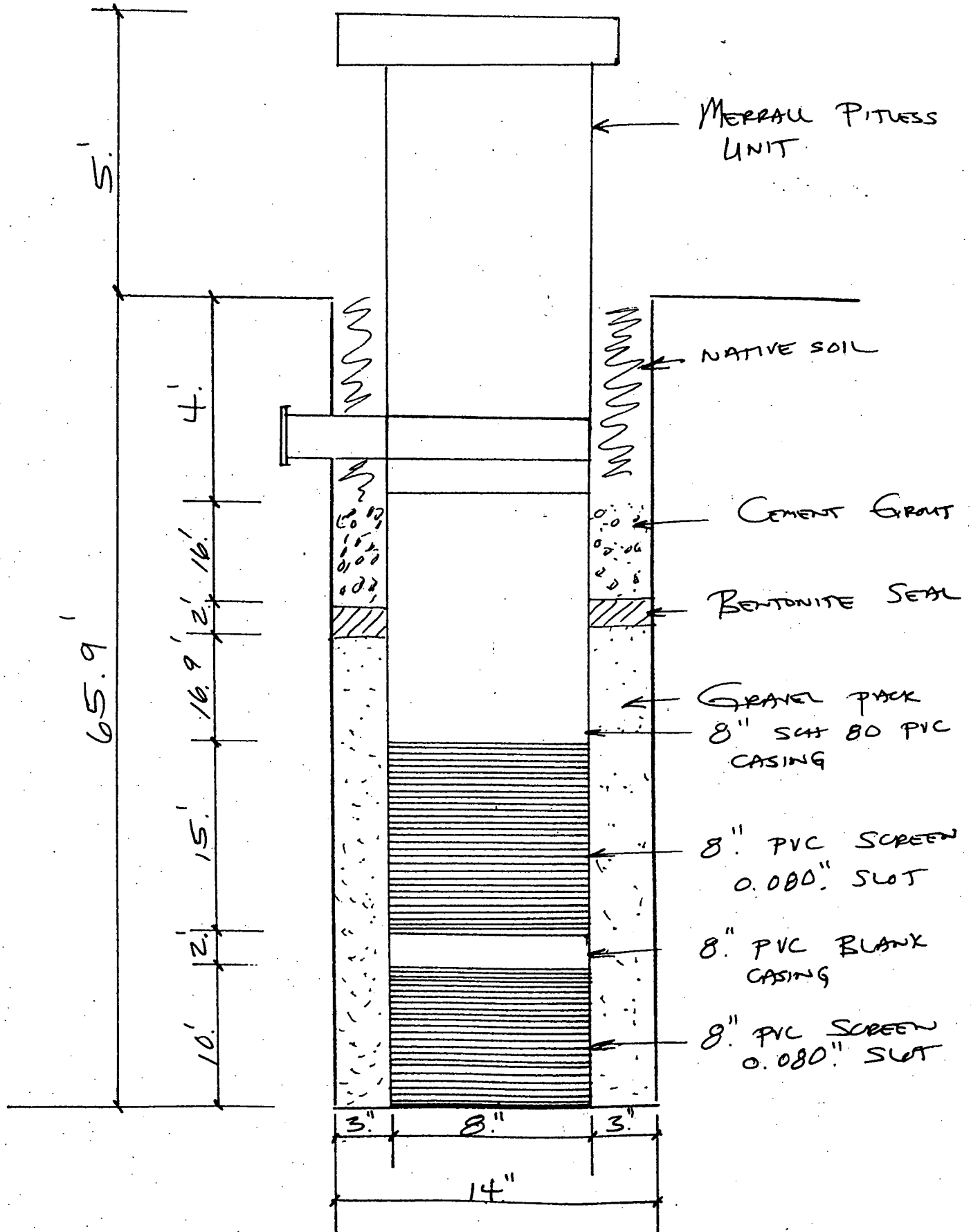
6] GROUT MATERIAL: Neat cement Cement grout Bentonite 4 Other FITNESS UNVT - NATIVE SOIL
 Grout Intervals: From 22 ft. to 20 ft., From 20 ft. to 4 ft., From 4 ft. to 0 ft.
 What is the nearest source of possible contamination:
 1 Septic tank 4 Lateral lines 7 Pit privy 10 Livestock pens Abandoned water well
 2 Sewer lines 5 Cess pool 8 Sewage lagoon 11 Fuel storage 15 Oil well/Gas well
 3 Watertight sewer lines 6 Seepage pit 9 Feedyard 12 Fertilizer storage 16 Other (specify below)
 13 Insecticide storage
 Direction from well? WEST How many feet? WITHIN 1 MILE

FROM	TO	LITHOLOGIC LOG	FROM	TO	PLUGGING INTERVALS
0	1.50	Top Soil			
1.50	8.	SILT, LOOSELY COMPACTED BROWN			
8.	14.50	SAND, FINE, LIGHT GRAY			
14.50	29.50	SAND, LOOSE, BROWN, FINE			
29.50	29.60	CLAY, MEDIUM DENSE			
29.60	45.	SAND, MEDIUM FINE			
45.	60.	SAND, MEDIUM COURSE			
60.	71.50	SAND, SILT, MEDIUM COURSE SAND			
71.50	72.50	LIMESTONE, GRAY			

7] CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on (mo/day/year) AUGUST 29, 2002 and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's Licence No. 581 This Water Well Record was completed on (mo/day/yr) SEPT. 23, 2002 under the business name of LAYNE WESTERN by (signature) [Signature]

CONSTRUCTION OF WELL

RACETRACK WELL No. 1



Well Number: TH 1-02(Racetrack Well)	Logged by: Rolland Yoakum
Project: Fort Riley	Driller's Name: Randy Crowl
Total Depth: 72.5 feet	Borehole Diameter: 6"
Date Started: 7/30/02	Water Level: 21.3'
Date Completed: 7/30/02	

Log

0 – 1.5	Topsoil, dark reddish gray (10R 3/1), silty, moist
1.5 – 4.5	Silt, loosely compacted, dry, brown
4.5 – 5.3	Silt, loose, unconsolidated, moist, brown (7.5 YR 4/2)
5.3 – 6.5	Silt, loose, unconsolidated, dry, pale brown (10YR 6/3)
6.5 – 8.0	Silt, loosely compacted, dry, brown
8.0 – 9.5	Sand, dry, light gray (10YR 7/2), subrounded to rounded, fine
9.5 – 11.5	Sand, loosely compacted, unconsolidated, dry, light gray (10YR 7/2), subrounded to rounded, fine
11.5 – 14.5	Sand, fine, subrounded to subangular
14.5 – 15.2	Sand, loose, unconsolidated, dry, very pale brown (10YR 7/3), fine, subrounded to subangular
15.2 – 16.1	Sand, loose, unconsolidated, dry, light reddish brown (5YR 6/4), fine, subangular
16.1 – 16.4	Sand, loose, unconsolidated, dry, very pale brown (10YR 7/3), fine, subrounded to subangular
16.4 – 16.5	Silt, loose, unconsolidated, moist, very dusky red (2.5 YR 2.5/2)
16.5 – 19.5	Sand, dry, fine, subrounded to subangular
19.5 – 20.9	Sand, loose, unconsolidated, moist, reddish yellow (5YR 6/8), fine, subangular
20.9 – 21.3	Sand, loose, unconsolidated, moist, light reddish brown (5YR 6/3), fine, subangular
21.3 – 21.5	Sand, loose, unconsolidated, wet, gray (N5/), fine, subrounded
21.5 – 24.5	Sand, wet, fine to medium, subrounded to rounded
24.5 – 26.5	Sand, loose, unconsolidated, wet, dark greenish gray (5BG 4/1), fine to medium, subrounded to rounded
26.5 – 29.5	Sand, wet, fine to medium, subrounded
29.5 – 29.6	Clay, medium dense, medium to high plasticity, wet, very dark gray (N 3/), sandy, sand is angular to subangular, poorly sorted, medium to fine
29.6 – 30.0	Sand, low density, unconsolidated, wet, very dark gray (N 3/), angular to subangular, medium to fine, poorly sorted
30.0 – 35.5	Sand, wet, medium to fine
35.5 – 36.5	Sand, loose, unconsolidated, wet, dusky red (2.5 YR 4/4), coarse to medium, trace gravel, poorly sorted, vitreous, angular to subrounded
36.5 – 40.5	Sand, wet, coarse to medium
40.5 – 41.5	Sand, loose, unconsolidated, wet, dusky red (2.5 YR 4/4), coarse to medium, trace gravel, poorly sorted, vitreous, angular to subrounded
41.5 – 44.5	Sand, medium
44.5 – 45.0	Sand, loose, unconsolidated, wet, pale red (2.5 YR 7/3), medium to fine, subrounded

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-
- 45.0 – 49.5 Sand, medium to coarse, wet
49.5 – 50.5 Sand, loose, unconsolidated, wet, weak red (2.5 YR 6/3), rounded to subrounded, medium to coarse, trace gravel, subangular
50.5 – 54.5 Sand, coarse to medium
54.5 – 55.5 Sand, loose, unconsolidated, wet, reddish brown (5YR 5/3) coarse to medium, subangular to subrounded, poorly sorted
55.5 – 59.5 Sand, coarse to medium
59.5 – 60.0 Sand, loose, unconsolidated, wet, reddish brown (5YR 5/3), coarse to medium, subrounded, poorly sorted
60.0 – 60.2 Sand, silty, tight, unconsolidated, wet, yellowish red (5YR 5/6), fine, with trace medium sand
60.2 – 71.5 Sand, medium to coarse, subrounded
71.5 – 72.5 Limestone, weathered, argillaceous, dark gray



WELL INFORMATION

Layne Christensen Company

1. CONTRACT <u>BayWest</u> <u>Fort Riley Water Supply Services</u>	5. Driller <u>R. Bowles</u>
2. City, State <u>Fort Riley Kansas</u> <u>Race Track Area</u>	6. DATE <u>8/29/2002</u>
3. Well No. <u>1</u> at Test Hole No. <u>1-02</u>	7. Date Started _____ Completed _____
4. Well Location (attach map) <u>Race Track Well</u>	8. Drill Crew Man Hrs. _____
	9. Working Days _____ Drilling _____ Other _____

10. MATERIAL IN WELL			WALL THICK-NESS IN.	MATERIAL	TYPE	NO.
LENGTH FT.	IN.	DIA. IN.				
Screen	<u>25'</u>	<u>8"</u>	<u>Sch. 40</u>	<u>PVC</u>	<u>PVC Wire Wrap</u>	<u>0.080"</u>
					<u>Shutter Wirewound</u>	<u>Openings</u>
Inner Casing	<u>50.9'</u>	<u>8"</u>	<u>Sch. 40</u>	<u>PVC</u>	<u>Flush joint</u>	
					<u>Welded Screwed</u>	
Outer Casing						
					<u>Welded Screwed</u>	

11. GRAVEL
 Size Colorado Silica Sand 4-8
 Tons 1.5

12. CASING SEALED:
 Puddled Clay ~~Yes~~ (No)
 With 2 Bags Bentonite Added
 or
 With 3 Bags/cu. yds. Cement
 Seal Material Placed in
 Well With Tremie Pipe
 Bottom of Well Screen
 Sealed With PVC Plate

13. DIMENSIONS
 A. Total Depth 70.90
 (From Top of Inner Casing to Bottom of Well)
 B. Height of Inner Casing 5'
 (Above Ground Level)
 C. Distance to Top of Gravel 21'
 (From Ground Level)
 D. Diameter of Drill Hole 14"
 E. Rig No. _____

Comments centralizers placed both of screen, bottom of riser & 10' below land surface

AQUIFER TEST

Layne Western, a Division of Layne Christensen
Wichita, Kansas

Fort Riley Water Supply	September 4, 2002
Plaza Race Track	8" Well <i>RACETRACK Well No. 1</i>
Fort Riley, Kansas	
SWL: 23' 2"	(Bay West)

Time of Day	Elapsed Min	Tape Read.	Water Level	Drawdown Ft.	Pump Rate
	0				261 gpm
	5		29' 2"		
	10		29' 2-1/4"		
	15		29' 2-1/4"		
	20		29' 2-1/4"		
	25		29' 2"		
	30		29' 1-3/4"		
	35		29' 2"		
	40		29' 2"		
	45		29' 4-1/2"		
	50		29' 4-1/2"		
	55		29' 4"		
	60		29' 4"		
	70		29' 4"		
	80		29' 4"		
	90		29' 4-1/2"		
	120		29' 4-1/2"		
	150		29' 4-1/2"		
	180		29' 4"		
	210		29' 4"		
	240		29' 4"		
Recovery	5 min		23' 3"		
	10		22' 3"		
	15		'		
	20		'		
	25		'		
	30		'		

Product Specifications



PVC Vee-Wire Monitoring Screen Specifications

GENERAL: The product is made of white PVC Type 1, Grade 1 material as described in ASTM F480 and ASTM D1784, Class 12454B. The product is Vee-Wire screen with a continuous slot widening inwardly to minimize clogging. The surface wire is helically wrapped and sonic welded to a circular array of internal rods. The slot is selected based on a sieve analysis of the waterbearing formation sediments or the selected filter pack.

STRENGTH: The screen meets the following minimum strength requirements:

COLLAPSE PRESSURE: _____ psi at _____ slot

TENSILE STRENGTH: _____ lbs. of hanging weight

DIAMETER: The nominal screen outside diameter is _____ inches, and is round within 0.030 inches. The clear inside diameter is _____ inches.

The screen body is straight within 1/16" over a 5' length.

SLOT: The required slot opening is _____ inches with minimum open area of _____ sq. in./ft. of screen. The manufactured slot is within ±.004 inches of the nominal, and the slots are essentially free of stringers or burrs.

FITTINGS: ASTM F480 flush thread fittings are required: including a Buna N O-ring on the male end. The fittings are heat welded to the screen body. Fittings are square to the screen body within .015" for 2" PS, .020" for 4" PS, or .030" for 6" PS screens.

FINISH: The screen surface is free of oils, grease, paint, dirt, and any manufacturer's markings that could alter the chemistry of the sample. Stringers or burrs are removed.

The product is completely incased in an individual 7 mil thick polyethylene protective wrapper with sealed ends and shipped in water resistant cardboard boxes.

DOCUMENTATION: If required, the manufacturer will provide documentation that the screen meets the specifications. Examples are material certificate of compliance, test results for strength or leak test requirements, inspection records for dimensions, cleaning process used and its acceptance criteria.

PVC Vee-Wire 8" PS Screen Specifications

GENERAL: The product is made of white PVC Type 1, Grade 1 material as described in ASTM F480 and ASTM D1784, Class 12454B. The product is Vee-Wire screen with a continuous slot widening inwardly to minimize clogging. The surface wire is helically wrapped and sonic welded to a circular array of internal rods. The slot is selected based on a sieve analysis of the waterbearing formation sediments or the selected filter pack.

STRENGTH: The screen meets the following minimum strength requirements:

COLLAPSE PRESSURE: 37 psi at 80 slot

TENSILE STRENGTH: 1375 lbs. of hanging weight

DIAMETER: The nominal screen outside diameter is 8.63 inches, and is round within 0.030 inches. The clear inside diameter is 7.50 inches.

The screen body is straight within 1/8" over a 5' length.

SLOT: The required slot opening is 0.080 inches with minimum open area of 118 sq. in./ft. of screen. The manufactured slot is within ±.004 inches of the nominal, and the slots are essentially free of stringers, or burrs.

FITTINGS: ASTM F480 flush thread fittings are required: including a Buna N O-ring on the male end. The fittings are heat welded to the screen body. Fittings are square to the screen body within .030".

FINISH: The screen surface is essentially free of oils, grease, paint, dirt, and any manufacturer's markings. Stringers or burrs are removed.

The product is completely incased in an individual 7 mil thick polyethylene protective wrapper with sealed ends and shipped in cardboard or wooden boxes.

DOCUMENTATION: If required, the manufacturer will provide documentation that the screen meets the specifications. Examples are material certificate of compliance, test results for strength or leak test requirements, inspection records for dimensions, cleaning process used and its acceptance criteria.

Product Specifications

Johnson screens[®]

A Weatherford Company

PVC Vee-Wire Monitoring Screen Specifications

GENERAL: The product is made of white PVC Type 1, Grade 1 material as described in ASTM F480 and ASTM D1784, Class 12454B. The product is Vee-Wire screen with a continuous slot widening inwardly to minimize clogging. The surface wire is helically wrapped and sonic welded to a circular array of internal rods. The slot is selected based on a sieve analysis of the waterbearing formation sediments or the selected filter pack.

STRENGTH: The screen meets the following minimum strength requirements:

COLLAPSE PRESSURE: 56 psi
at 60 slot

TENSILE STRENGTH: 1150 lbs.
of hanging weight

DIAMETER: The nominal screen outside diameter is 6.625 inches, and is round within 0.030 inches. The clear inside diameter is 5.75 inches.

The screen body is straight within 1/16" over a 5' length.

SLOT: The required slot opening is 0.060 inches with minimum open area of 62 sq. in./ft. of screen. The manufactured slot is within ±.004 inches of the nominal, and the slots are essentially free of stringers or burrs.

FITTINGS: ASTM F480 flush thread fittings are required: including a Buna N O-ring on the male end. The fittings are heat welded to the screen body. Fittings are square to the screen body within .015" for 2" PS, .020" for 4" PS, or .030" for 6" PS screens.

FINISH: The screen surface is free of oils, grease, paint, dirt, and any manufacturer's markings that could alter the chemistry of the sample. Stringers or burrs are removed.

The product is completely incased in an individual 7 mil thick polyethylene protective wrapper with sealed ends and shipped in water resistant cardboard boxes.

DOCUMENTATION: If required, the manufacturer will provide documentation that the screen meets the specifications. Examples are material certificate of compliance, test results for strength or leak test requirements, inspection records for dimensions, cleaning process used and its acceptance criteria.

PVC Vee-Wire 8" PS Screen Specifications

GENERAL: The product is made of white PVC Type 1, Grade 1 material as described in ASTM F480 and ASTM D1784, Class 12454B. The product is Vee-Wire screen with a continuous slot widening inwardly to minimize clogging. The surface wire is helically wrapped and sonic welded to a circular array of internal rods. The slot is selected based on a sieve analysis of the waterbearing formation sediments or the selected filter pack.

STRENGTH: The screen meets the following minimum strength requirements:

COLLAPSE PRESSURE: _____ psi
at _____ slot

TENSILE STRENGTH: _____ lbs.
of hanging weight

DIAMETER: The nominal screen outside diameter is 8.63 inches, and is round within 0.030 inches. The clear inside diameter is 7.50 inches.

The screen body is straight within 1/8" over a 5' length.

SLOT: The required slot opening is _____ inches with minimum open area of _____ sq. in./ft. of screen. The manufactured slot is within ±.004 inches of the nominal, and the slots are essentially free of stringers, or burrs.

FITTINGS: ASTM F480 flush thread fittings are required: including a Buna N O-ring on the male end. The fittings are heat welded to the screen body. Fittings are square to the screen body within .030".

FINISH: The screen surface is essentially free of oils, grease, paint, dirt, and any manufacturer's markings. Stringers or burrs are removed.

The product is completely incased in an individual 7 mil thick polyethylene protective wrapper with sealed ends and shipped in cardboard or wooden boxes.

DOCUMENTATION: If required, the manufacturer will provide documentation that the screen meets the specifications. Examples are material certificate of compliance, test results for strength or leak test requirements, inspection records for dimensions, cleaning process used and its acceptance criteria.

PVC PIPE SPECIFICATIONS

PVC Schedule 40

Nominal Pipe Size (in.)	O.D.	Average I.D.	Min. Wall	Nominal Wt./ft.	Max. W.P. PSI*
1/8	.405	.261	.068	.045	819
1/4	.540	.354	.088	.081	780
3/8	.675	.483	.091	.109	620
1/2	.840	.608	.109	.161	600
3/4	1.050	.810	.113	.214	480
1	1.315	1.035	.133	.315	450
1 1/4	1.660	1.364	.140	.476	370
1 1/2	1.900	1.592	.145	.509	330
2	2.375	2.049	.154	.682	290
2 1/2	2.875	2.445	.203	1.076	300
3	3.500	3.042	.216	1.409	260
3 1/2	4.000	3.520	.226	1.697	240
4	4.500	3.998	.237	2.106	225
5	5.563	5.017	.258	2.726	190
6	6.625	6.031	.280	3.535	160
8	8.625	7.943	.322	5.305	160
10	10.750	9.976	.365	7.532	140
12	12.750	11.890	.406	9.949	130
14	14.000	13.072	.437	11.010	130
16	16.000	14.940	.500	15.415	130
18	18.000	16.809	.562	20.112	130
20	20.000	18.743	.593	23.624	120
24	24.000	22.544	.687	32.673	120

PVC Schedule 80

Nominal Pipe Size (in.)	O.D.	Average I.D.	Min. Wall	Nominal Wt./ft.	Max. W.P. PSI*
1/8	.405	.203	.095	.058	1230
1/4	.540	.288	.119	.109	1130
3/8	.675	.407	.126	.138	920
1/2	.840	.528	.147	.202	850
3/4	1.050	.724	.154	.273	690
1	1.315	.935	.179	.402	630
1 1/4	1.660	1.256	.191	.554	520
1 1/2	1.900	1.476	.200	.673	470
2	2.375	1.913	.213	.932	400
2 1/2	2.875	2.289	.276	1.419	420
3	3.500	2.864	.300	1.963	370
3 1/2	4.000	3.326	.318	2.322	350
4	4.500	3.786	.337	2.782	330
5	5.563	4.767	.375	3.867	290
6	6.625	5.709	.432	5.313	280
8	8.625	7.565	.500	8.058	250
10	10.750	9.492	.593	11.956	230
12	12.750	11.294	.667	16.437	230
14	14.000	12.410	.750	19.790	220
16	16.000	14.214	.843	25.420	220
18	18.000	16.014	.937	31.800	220
20	20.000	17.814	1.031	40.091	220
24	24.000	21.418	1.218	56.882	210

PVC Schedule 120

Nominal Pipe Size (in.)	O.D.	Average I.D.	Min. Wall	Nominal Wt./ft.	Max. W.P. PSI*
1/2	.84	.480	.170	.223	1010
3/4	1.050	.690	.170	.295	770
1	1.315	.891	.200	.440	720
1 1/4	1.660	1.204	.215	.614	600
1 1/2	1.900	1.423	.225	.744	540
2	2.375	1.845	.250	1.052	470
2 1/2	2.875	2.239	.300	1.529	470
3	3.500	2.758	.350	2.184	440
4	4.500	3.572	.437	3.516	430
6	6.625	5.494	.562	6.759	370

SDR 21 - W.P. 200 PSI (Water @ 73.4°F)

Nominal Pipe Size (in.)	O.D.	Average I.D.	Min. Wall	Nominal Wt./ft.
3/4	1.050	.910	.060	.129
1	1.315	1.169	.063	.170
1 1/4	1.660	1.482	.079	.263
1 1/2	1.900	1.700	.090	.339
2	2.375	2.129	.113	.521
2 1/2	2.875	2.581	.137	.754
3	3.500	3.146	.167	1.106
3 1/2	4.000	3.596	.190	1.443
4	4.500	4.046	.214	1.825
5	5.563	5.001	.255	2.792
6	6.625	5.955	.316	3.964
8	8.625	7.755	.410	6.679

SDR 26 - W.P. 160 PSI (Water @ 73.4°F)

Nominal Pipe Size (in.)	O.D.	Average I.D.	Min. Wall	Nominal Wt./ft.
1	1.315	1.175	.060	.164
1 1/4	1.660	1.512	.064	.221
1 1/2	1.900	1.734	.073	.284
2	2.375	2.173	.091	.432
2 1/2	2.875	2.635	.110	.622
3	3.500	3.210	.135	.915
3 1/2	4.000	3.672	.154	1.183
4	4.500	4.134	.173	1.494
5	5.563	5.109	.214	2.288
6	6.625	6.085	.255	3.278
8	8.625	7.921	.332	5.468
10	10.750	9.874	.413	8.492
12	12.750	11.710	.490	11.956
14	14.000	12.860	.538	14.430
16	16.000	14.696	.615	18.010
18	18.000	16.534	.692	23.860
20	20.000	18.370	.769	29.470
24	24.000	22.043	.923	42.520

CLEAR

PVC Schedule 40

Nominal Pipe Size (in.)	O.D.	Average I.D.	Min. Wall	Nominal Wt./ft.	Max. W.P. PSI*
1/4	.540	.354	.088	.081	390
3/8	.675	.483	.091	.109	310
1/2	.840	.608	.109	.161	300
3/4	1.050	.810	.113	.214	240
1	1.315	1.033	.133	.315	220
1 1/4	1.660	1.264	.140	.476	180
1 1/2	1.900	1.582	.145	.509	170
2	2.375	2.049	.154	.682	140
2 1/2	2.875	2.445	.203	1.076	150
3	3.500	3.042	.216	1.409	130
3 1/2	4.000	3.520	.226	1.697	120
4	4.500	3.998	.237	2.000	110
6	6.625	6.031	.280	3.535	90
6 1/4	6.625	6.355	.325	.647	45
8	8.625	7.943	.322	5.305	80

* Note: All pressure ratings are for water at 73.4°F with solvent cemented joints

Bell and Gasket PVC Pipe is available in Schedules 40, 80, 120 and SDR's 21, 26, 35, 41 and C-900.

Compounds used in the manufacture of PVC and CPVC Pipe meet ASTM Standard D-1784.

Schedules 40, 80 and 120 PVC Pipe meet ASTM Standard D-1785.

Pressure Rated (SDR Series) PVC Pipe meets ASTM Standard D-2241.

ASTM Standard D-1784 classification equivalents:

PVC Normal Impact = Type I Grade I = PVC 1120 = Cell Classification 12154-B

For more complete information, request "Condensed Catalog HJ'B-103-A&B"

800-257-5183

www.campbellmfg.com

8/7/00 RA77.0N

Campbell

MONOFLEX

1070 products with 150,000' of pipe in stock

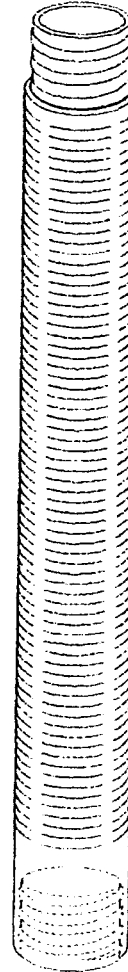
FLUSH THREAD PVC SCREEN AND CASING

- ✓ Monoflex CNC computer lathed flush threads follow ASTM F-480 recommendations for reliable, consistent results on the job site.
- ✓ Our close tolerances provide a strong connection while retaining ease of assembly.
- ✓ Manufactured from quality PVC pipe; Monoflex flush thread screens and casings are available in diameters of 1/2" through 12" with 2, 4, or 8 threads per inch stocked in schedules 40 & 80. Other schedules and SDR's are available in PVC and high density polyethylene.
- ✓ Laying length is standard for 2" and 4" schedule 40 PVC. Other sizes are end to end length. Custom lengths are available in all diameters.
- ✓ All standard Monoflex PVC threads are compatible with other materials threaded to ASTM F-480 recommendations, with the same TPI.
- ✓ All standard screens provide maximum net open area. A wide variety of slot sizes and spacings is available to adapt to various site conditions.
- ✓ 2" and 4" schedules 40 and 80 screens & casings are supplied with Buna-N O-rings at no additional charge. Buna-N O-rings are available for all other sizes for a nominal charge.
- ✓ All flush thread well screens and casings are Envirowrapped and hermetically sealed at both ends as a standard practice.

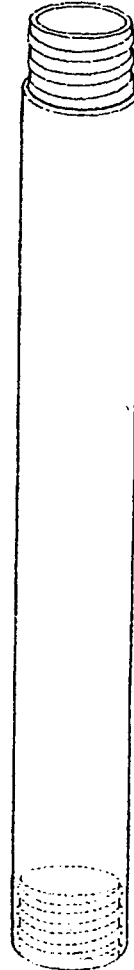
PLEASE SPECIFY PART NUMBER WHEN ORDERING.

The following pages list flush thread PVC screens and casings along with the appropriate Buna-N O-rings, and flush thread caps, plugs, and points.

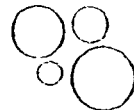
Custom lengths, threads and adapters available.



Flush Thread Screen



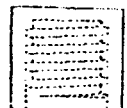
Flush Thread Casing



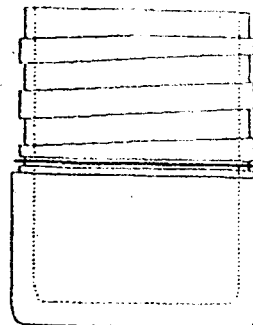
Buna-N O-Rings



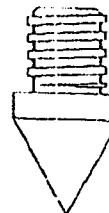
Male Plug (solid)



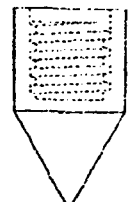
Female Cap (solid)



Male Plug (molded)



Male Point (solid)



Female Point (solid)

ENGINEERING SPECIFICATIONS

PVC FLUSH THREAD MONITOR WELL SCREENS AND CASINGS

1. All PVC well screens and casings used on this project shall be manufactured by Monoflex and conform to ASTM F-480: "Standard Specification for Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR), SCH 40 and SCH 80."
2. PVC materials used to produce the raw PVC pipe shall meet ASTM Standard D-1784: "Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds for PVC Normal Impact, Type I Grade I (1120), cell classification 12454-B."
3. The finished schedules 40, 80, and 120 raw pipe shall meet the requirements of ASTM Standard D-1785: "Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120." In addition, both the raw material and the finished raw pipe shall be approved by the National Sanitation Foundation (NSF) for use in potable water applications.
4. The PVC pipe used to produce the well screens and casings shall be made from virgin plastic produced by the original compounder.
5. The pipe shall be homogeneous throughout and essentially uniform in color, opacity and density. The inside and outside surfaces shall be glossy in appearance and free of chalking, sticky or tacky material and visually free of oils, grease, dust and marks imparted as a result of the manufacturing process. In addition the pipe walls shall be free of cracks, holes, blisters, voids, foreign inclusion, or other defects that are visible to the naked eye and that may affect the wall integrity. Machined slots or holes deliberately placed in the pipe are acceptable.
6. The outside diameters, wall thicknesses and out of roundness tolerances shall fall within the guidelines of Tables 1 & 2 of the ASTM F-480 Standard Specification when measured in accordance with Test Method D-2122.
7. All flush thread materials must be slotted and threaded without the use of any type of liquid coolant. Air is the only acceptable coolant.
8. Well screens 1/2" through 5" are to be slotted on 1/8" spacing. Well screens 6" and larger are to be slotted on 1/4" spacing unless otherwise specified. ALL well screens .040 slot and larger will be slotted on 1/4" spacing unless otherwise specified.
9. All screens and casings shall be nominal length except for 2" and 4" schedule 40 which shall be laying length. The term "laying length" refers to the overall length less the length required to complete the assembly. Nominal length + the length of the exposed male thread (pin) = laying length.
10. The threads per inch for the various diameters and schedules of flush thread materials shall be the same as that produced by Monoflex, Largo, Florida or approved equal.
11. All screens and casings shall be supplied in individual polyethylene bags hermetically sealed at BOTH ends. Said products shall be shipped in cardboard boxes with properly secured ends. Each box shall display a color coded label containing a full description of the product inside. Said label must indicate the number pieces per box, the threads per inch, the date of packaging, the signatures of the packer and QC inspector and show a drawing of the product.

Layne-Western PUMP INSTALLATION

<p>1. JOB NAME <u>BayWest; Ft. Riley Water</u> Address <u>Supply; DACW4195D0022</u> City, State <u>Fort Riley Ks</u></p> <hr/> <p>2. DATE <u>10</u> <u>18</u> <u>2002</u> Job Completed Month Day Year</p> <hr/> <p>3. PUMP NO. <u>5 THC</u> Oil-Water Lube New-Repair Pump Trouble _____</p> <hr/> <p>4. PUMP SIZE</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;">DIAMETER</th> <th style="text-align: center;">LENGTHS</th> </tr> </thead> <tbody> <tr> <td>Discharge</td> <td style="text-align: center;">Above Below</td> <td style="text-align: center;">X</td> </tr> <tr> <td>Column</td> <td style="text-align: center;">4" Screw Flange</td> <td style="text-align: center;">2 - 20</td> </tr> <tr> <td>Tubing</td> <td></td> <td></td> </tr> <tr> <td>Shaft</td> <td style="text-align: center;">Stainless Carbon</td> <td></td> </tr> </tbody> </table> <p>Column setting to bowl <u>40</u> ft. BOWL Diameter <u>5"</u> Shaft Diameter <u>1"</u> Type <u>submersible</u> Stages <u>5</u> Cast Iron or Bronze Suction _____" Diameter _____ Ft. Long Special Paint or Coating on: _____ Zinc Sleeves in: Column _____ Tubing _____</p>		DIAMETER	LENGTHS	Discharge	Above Below	X	Column	4" Screw Flange	2 - 20	Tubing			Shaft	Stainless Carbon		<p>6. MOTOR OR GEAR DRIVE Make <u>Franklin</u> HP <u>15</u> Speed <u>3450</u> Volts <u>460</u> 3 ph Or Gear Drive Ratio _____ Standard Combination Frame Size _____ Non-Reverse—Yes No Running Amps. <u>20-19-19</u> Running Volts _____ Serial No. <u>#10-3 w/grd. wire</u></p> <hr/> <p>7. WELL <u>Race Track</u> No. <u>1</u> Year Drilled <u>Aug. 2002</u> Location <u>Near Race Track</u> Diameter <u>8"</u> Depth <u>65'</u> Measured from top of _____" diameter casing which is _____ feet above ground. groundlevel Tape to Water _____ Air Line Length _____ A. L. Material _____ Static Gage _____ Static Level _____ Pumping Gage _____ Pumping Level _____ Discharge Pressure _____ Feet when pumping into System _____</p> <hr/> <p>8. INSTALLER <u>A. Contreras</u> Rig Used _____ Foreman Hours to Rig Up _____ To Pull _____ Inspect _____ Repair _____ To Set _____</p>
	DIAMETER	LENGTHS														
Discharge	Above Below	X														
Column	4" Screw Flange	2 - 20														
Tubing																
Shaft	Stainless Carbon															
<p>5. PUMP REPAIR</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">CONDITION OF PUMP WHEN PULLED</th> <th style="width: 50%;">NEW PARTS INSTALLED</th> </tr> </thead> <tbody> <tr> <td>Column _____</td> <td>Column <u>40'</u> <u>4" PVC</u></td> </tr> <tr> <td>Tubing _____</td> <td>Tubing _____</td> </tr> <tr> <td>Shafting _____</td> <td>Shafting _____</td> </tr> <tr> <td>Bowl _____</td> <td>Bowl <u>5THC, 5-stage submersible,</u> <u>235 GPM at 178' TDH</u></td> </tr> <tr> <td>Suction _____</td> <td>Suction _____</td> </tr> <tr> <td>MACHINE WORK _____</td> <td> 1. DRAIN PORTS OPEN Yes No 2. CHLORINATE WELL Yes No 3. PUMP RUNS _____ 4. ALIGN PUMP HEAD WITH DIAL INDICATOR Yes No 5. GROUTED HEAD—BASE PLATE Yes No </td> </tr> </tbody> </table>	CONDITION OF PUMP WHEN PULLED	NEW PARTS INSTALLED	Column _____	Column <u>40'</u> <u>4" PVC</u>	Tubing _____	Tubing _____	Shafting _____	Shafting _____	Bowl _____	Bowl <u>5THC, 5-stage submersible,</u> <u>235 GPM at 178' TDH</u>	Suction _____	Suction _____	MACHINE WORK _____	1. DRAIN PORTS OPEN Yes No 2. CHLORINATE WELL Yes No 3. PUMP RUNS _____ 4. ALIGN PUMP HEAD WITH DIAL INDICATOR Yes No 5. GROUTED HEAD—BASE PLATE Yes No		
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Specifications Vertical Turbine Pump Submersible

RACE TRACK WELL No. 1

A. Scope

This specification covers a deep well submersible turbine pump with above ground discharge and furnished with suitable driver and accessories as specified herein. The pumping unit shall be designed and furnished in accordance with the latest hydraulic institute and AWWA specifications for submersible turbine pumps.

B. Service Conditions

The pump shall be designed and constructed to operate satisfactorily with a reasonable service life, when installed in a typical continuous turbine pump application. The pump shall be the product of, and manufactured by Goulds Pumps, Inc. Other manufacturers will be considered providing the unit offered is an approved equal in all respects to the brand and model preferred by the customer. Factory pump curves for alternate pumps shall be submitted with the bid.

C. Operating Conditions

Design conditions: 235 Gallons per minute

STHC - 5 STAGE

Design head: 178 Feet total dynamic head (TDH)

Minimum pump efficiency of: 73 Percent

Maximum allowable speed: 3450 RPM

Liquid to be pumped: Water

Pump bowl setting: 45 Feet

Well diameter I.D.: 8 Inches

D. Pump Construction

1. *Bowl assembly*: the intermediate bowls, and discharge adapter shall be flanged type constructed from close grained cast iron, and shall conform to ASTM designation A48, class 30. They shall be free from sand holes, blow holes, or other faults and must be accurately machined and fitted to close tolerances. The intermediate bowls shall have vitra glass lined waterways for maximum efficiency and wear protection. All intermediate bowls shall be of identical design for interchangeability.

A thrust ring shall be above the top impeller to prevent excessive vertical upthrust. Threaded intermediate bowls will be allowed on bowl sizes 8" and smaller. To ensure quality and consistency of product, cast iron components must be produced in a foundry owned by the pump manufacturer.

2. *Impellers*: the impellers shall be constructed from ASTM B584 Silicon Bronze and shall be the enclosed, (or semi-open) type. They shall be free from defects and must be accurately cast, machined, balanced, and filed for optimum performance and minimum vibration. Impellers are to be standard product of the pump manufacturer and not contain special workmanship to temporarily increase efficiency. They shall be securely fastened to the bowl shaft with taper locks of C1045 steel (or 416SS).

3. The discharge adapter shall be provided with a non-soluble grease packed bronze bearing, extending through the top bowl into and through the discharge adapter and topped with a threaded cast iron cap or plug to protect the bearing from abrasives. The adapter should be such that the bearing can be easily removed through the top of the adapter housing.

4. The inlet motor adapter shall be a minimum of class 40 cast iron and shall contain an extra long bronze bearing. The inlet area shall have a net open area of at least four times the eye of the impeller and shall be protected with a 304 stainless steel screen.

5. *Wear rings*: pumps 6" and larger shall (or shall not) be fitted with replaceable wear rings of bronze material in the motor adapter and intermediate bowls. Wear rings shall have the minimum practical clearance to the mating cylindrical surface of the impeller to provide adequate sealing independent of vertical positioning of the impellers.

6. The bowl shaft shall be constructed from ASTM A582 type 416 stainless steel. It shall be precision turned, ground and polished and shall be supported by water lubricated bronze bearings, or optional fluted rubber bearings.

7. The motor coupling shall be of stainless steel and shall conform to NEMA specifications and be capable of transmitting the total torque and total thrust of the bowl assembly in either direction of rotation.

Column Pipe

Sch. 80 PVC

The column pipe shall be grade A steel pipe, in 20 feet (or random) lengths, with the ends machined with 8 threads per inch with 3/4" taper. Inside diameter of the pipe shall be such that the head losses shall not be over 5 feet per 100 feet of pipe, and shall weigh not less than lbs/ft. Pipe shall be connected with threaded sleeve type steel couplings.

F. Submersible Cable

Pump cable shall be sized to limit the voltage drop to no more than 5%. The cable shall have three separate conductors and a ground and shall be included in a single continuous jacketed assembly.

The insulation shall be water and oil resistant, and suitable for continuous immersion. The cable should be the length of the column pipe plus 20 feet to extend from the well plate to the pump electrical controller. The cable should be adequately secured to the column pipe by plastic ties, or other non metallic means, at 10 foot intervals. #10-3 w/625

G. Submersible Surface Plate

The surface plate shall be of fabricated steel. The plate shall incorporate a long radius elbow welded securely to a 150 lb. steel ANSI 3" flange and shall rigidly support the total weight of the motor, bowl assembly, column pipe, cable, and column of water. The cable outlet shall have a cable seal of adequate size to accommodate the cable size. Threaded vent and drawdown holes shall be provided.

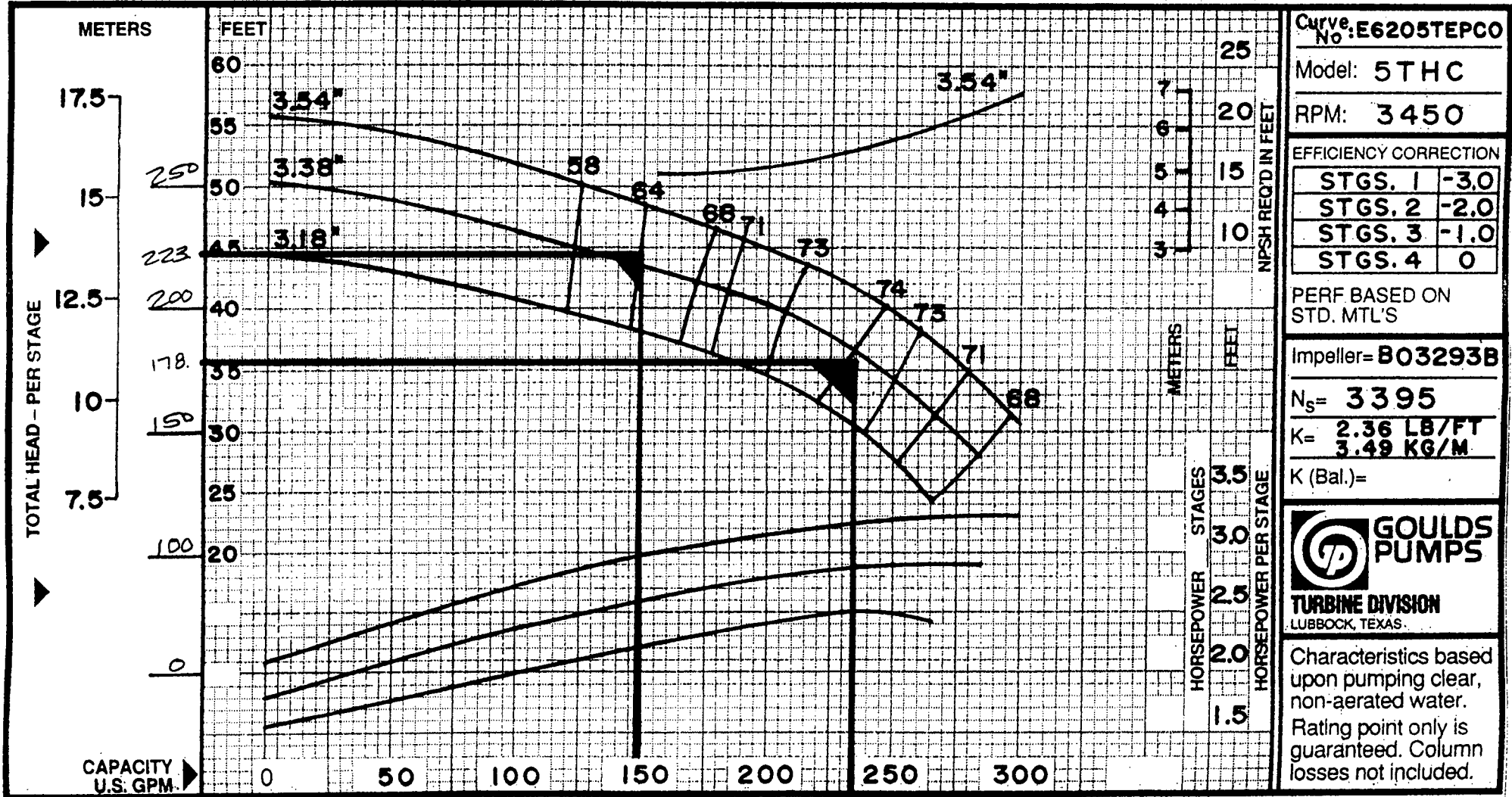
H. Submersible Electric Motor

The motor shall be a heavy duty canned type or wet wound of NEMA design for 4", 6" and 8" motors, 3450 RPM. The motor shall be capable of continuous operation under water at the specified conditions outlined above. A suitable thrust bearing shall be incorporated in the lower end of the motor adequate to receive the entire hydraulic thrust load of the pump unit plus the weight of the rotating parts regardless of the direction of rotation. The motor shall have a 1.15 service factor, and suitable for use on a 460 volt, three phase, 60 cycle electric service.

The motor leads shall be protected against the pump end with a 304 stainless steel cable guard held in place with stainless steel banding. As the motor lead exit the top of the cable guard it shall be properly protected to prevent damaging or cutting the lead by the cable guard material.

GOULDS PROPOSAL NO.	GOULDS S.O. NO.	INQUIRY NO.	CUSTOMER P.O. NO.	P.O. DATE	ITEM NO.	CUSTOMER		
PROJECT FT. RILEY			SERVICE RACETRACK WELL No. 1		GPM CAPACITY 150. 235.	F.T. TDH 223. 178.	% EFFICIENCY 64. 73.	RPM 3450.

5. STAGE UNIT



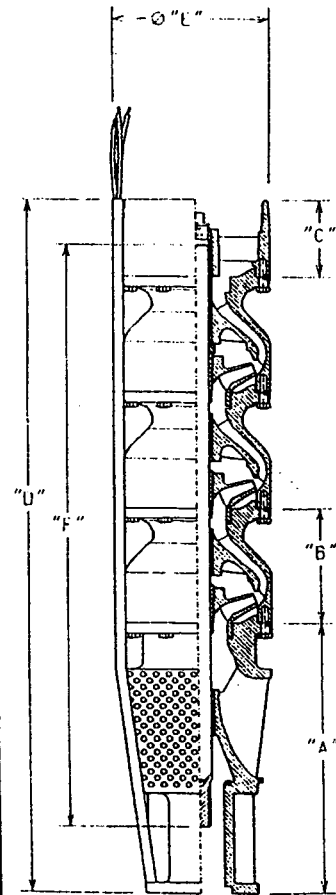
DATE
March 1995
SUPERCEDES
April 1, 1994

MODEL
5THC

235

Submersible Pump Data

Model	NEMA	"A"	"B"	"C"	"D"	"E"	"F"	Disch. Size	First Stage Wt.	Add'l Stage Wt.
5C	4	8.25	4.63	3.06	15.94	5.64	12.88	3.4	44	13
	6	10.56	4.63	3.06	18.25	5.64	13.63	3.4	49	13
5T	4	8.25	4.81	3.06	16.13	5.64	13.06	3.4	44	13
	6	10.56	4.81	3.06	18.44	5.64	13.81	3.4	49	13
5WA	4	8.38	4.00	3.06	15.44	5.64	13.25	3.4	44	13
	6	10.56	4.00	3.06	17.63	5.64	13.75	3.4	49	13
6C	4	8.44	5.13	3.75	17.31	6.28	13.63	3.4,5	50	17
	6	10.56	5.13	3.75	19.44	6.28	14.25	3.4,5	55	17
	8	12.50	5.13	3.75	21.38	6.28	15.38	3.4,5	60	17
6DH	4	4.94	5.50	3.75	14.19	5.94	10.63	3.4,5	41	16
	6	9.75	5.50	3.75	19.00	5.94	13.75	3.4,5	53	16
6RA	6	10.56	3.75	3.75	18.06	5.94	12.88	3.4	90	20
7C	6	12.88	6.38	3.63	22.88	7.50	18.50	5.6	75	28
	8	14.56	6.38	3.63	24.56	7.50	19.25	5.6	87	28
7RA	6	8.44	4.50	3.63	16.56	7.90	11.50	3.4	105	28
7T	6	12.88	7.09	3.63	23.59	7.50	19.06	5.6	78	31
	8	14.56	7.09	3.63	25.28	7.50	19.94	5.6	90	31
7WA	6	12.88	5.50	3.63	22.00	7.50	17.75	5.6	68	30
	8	14.56	5.50	3.63	23.69	7.50	18.50	5.6	80	30
8DH	6	12.88	7.38	3.63	23.88	7.90	19.25	5.6	125	34
	8	14.56	7.38	3.63	25.56	7.90	20.13	5.6	137	34
8I	6	12.88	6.38	3.63	22.88	7.90	18.13	5.6	90	33
	8	14.56	6.38	3.63	24.56	7.90	18.88	5.6	102	33
8RA	6	12.88	5.00	3.63	21.50	7.90	17.25	4.5,6	165	36
	8	14.56	5.00	3.63	23.19	7.90	18.13	4.5,6	177	36
8RJ	6	12.88	6.50	3.63	23.00	7.90	17.50	5.6	90	34
	8	14.56	6.50	3.63	24.69	7.90	18.88	5.6	102	34
9RA	6	12.88	5.50	3.63	22.00	7.90	17.50	4.5,6	185	46
	8	14.56	5.50	3.63	23.69	7.90	18.50	4.5,6	197	46
9RC	6	15.13	8.50	4.50	28.13	9.81	24.25	5.6,8	194	64
	8	13.25	8.50	4.50	26.25	9.81	21.50	5.6,8	206	64
	10	13.25	8.50	4.50	26.25	9.81	20.50	5.6,8	206	64
9T	6	15.13	9.25	4.50	28.88	9.81	25.00	5.6,8	200	70
9RT	8	13.25	9.25	4.50	27.00	9.81	22.25	5.6,8	212	70
	10	13.25	9.25	4.50	27.00	9.81	21.25	5.6,8	212	70
	6	15.13	6.63	4.50	26.25	9.81	22.38	5.6,8	158	58
9WA	8	13.25	6.63	4.50	24.38	9.81	19.63	5.6,8	170	58
	10	13.25	6.63	4.50	24.38	9.81	18.63	5.6,8	170	58
	8	13.25	9.25	4.50	27.00	10.00	22.00	6.8	185	65
10DH	10	13.25	9.25	4.50	27.00	10.00	22.00	6.8	190	65
	12	13.25	9.25	4.50	27.00	10.00	21.00	6.8	190	65
	6	15.13	6.63	4.50	26.25	10.00	22.38	4.6,8	280	76
10RA	8	13.25	6.63	4.50	24.38	10.00	19.63	4.6,8	285	76
	10	13.25	6.63	4.50	24.38	10.00	18.63	4.6,8	285	76
	6	15.13	8.40	4.50	28.03	10.00	23.38	6.8	187	60
10RJ	8	13.25	8.40	4.50	26.15	10.00	20.75	6.8	192	60
	10	13.25	8.40	4.50	26.15	10.00	19.75	6.8	192	60
	6	15.13	7.63	4.50	27.25	10.00	23.38	4.6,8	183	56
10WA	8	13.25	7.63	4.50	25.38	10.00	20.63	4.6,8	188	56
	10	13.25	7.63	4.50	25.38	10.00	19.63	4.6,8	188	56



Effective January 1, 2000

Performance Correction Factors

"Use the multipliers listed below to de-rate head, capacity and efficiency for special materials" bowls and impellers. Apply both multipliers listed if both bowl and impeller are of special construction.

Bowl Size & Model	Bowl Multiplier		Impeller Multiplier	
	* C.I. CL30 without Enamel	D.I. and other Materials without Enamel	C.I. CL30 AI-BRZ	D.I. and other Materials
50, 5T	1.00	0.99	0.98	0.98
5WA, 6C, 6D, 6RA	0.98	0.97	0.98	0.97
7C, 7RA, 7T, 7WA	0.98	0.97	0.98	0.97
8DH	0.98	0.97	0.99	0.97
8RA, 8RJ, 8I	0.98	0.97	0.98	0.97
9RA, 9WA, 9RC, 9T	0.98	0.97	0.98	0.97
10DH	0.99	0.98	0.99	0.98
10RA, 10WA	0.98	0.97	0.99	0.97
10RJ	0.98	0.98	0.99	0.98
10L	0.99	0.98	0.99	0.98
11C, 11WA	0.99	0.98	0.99	0.98
11RA	0.98	0.97	0.99	0.97
12C, 12DH, 12FR	0.99	0.98	0.99	0.98
12WA, 12RJ	0.99	0.98	0.99	0.98
13C, 13RA	0.98	0.97	0.99	0.97
14DH, 14F, 14H, 14RJ	0.99	0.98	0.99	0.98
15F	0.99	0.99	0.99	0.97
16B	0.99	0.98	0.99	0.97
16DH	1.00	0.99	1.00	0.99
18B, 18H, 18L	0.99	0.99	0.99	0.97
18D	1.00	1.00	0.99	0.97
20B, 20G, 20H	0.99	0.99	0.99	0.97
20E	0.98	0.98	0.99	0.97

Example:

Customer's rating is 1000 GPM at 50 ft. head with a 316 SS bowl and impeller construction. A 12RJMO at 1760 RPM was selected. From the table, both the bowl and impeller correction is 0.98. To determine pump efficiency, the rating must be corrected:

$$\text{Corrected capacity} = \frac{1000 \text{ GPM}}{.98 \times .98} = 1041 \text{ GPM}$$

$$\text{Corrected head} = \frac{50 \text{ ft.}}{.98 \times .98} = 52 \text{ ft.}$$

Referring to the bowl assembly performance curve, the efficiency at the corrected rating is 85% minus 3 points de-rate for one stage which equals 82%. This efficiency must now be derated:

$$\text{The pump efficiency} = 82\% \times .98 \times .98 = 78.8\%$$

Therefore, the pump performance is 1000 GPM, 50 ft. and 78.8% efficiency.

$$\text{BHP} = \frac{1000 \times 50}{3960 \times .788} = 16.02 \text{ HP}$$

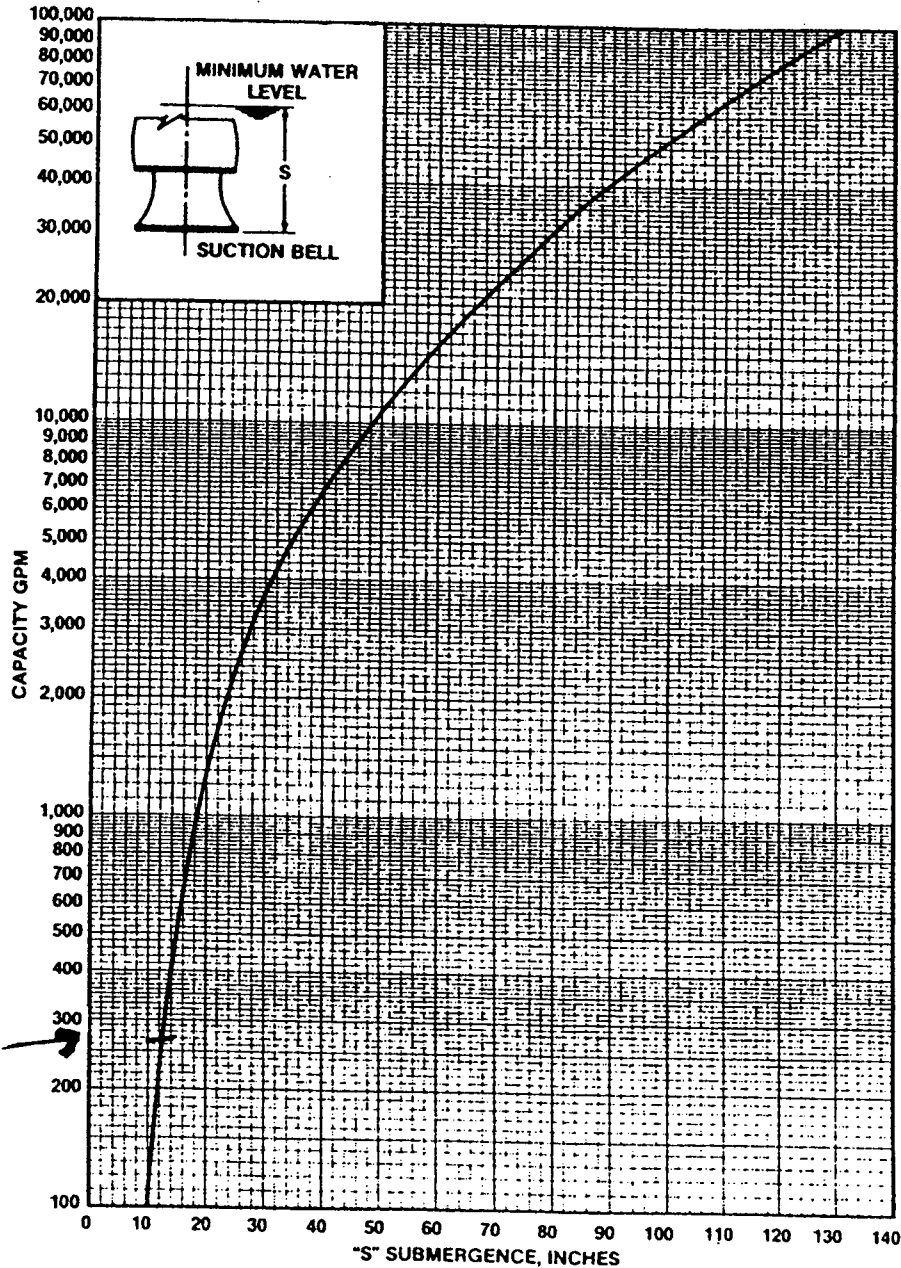
Bowl Assembly Pressure Limits

Bowl Size & Model	Maximum Bowl Working Pressure (PSIG) *1	
	* Cast Iron CL 30	Ductile Iron *3 Double Bolting
	Std Bolts (Grade 8)	Std Bolts (Grade 8)
5C	480	720
5T 5WA	480	720
6C	420	720
6DH *2	200	-
6RA	430	790
7C	415	720
7RA	430	790
7T	310	720
7WA	364	680
8DHC	364	600
8DHO *2	300	-
8I	364	720
8RA	430	790
8RJ	425	790
9RA	450	850
9WA	530	920
9RC	400	860
9T	530	920
10DH	322	600
10LC	244	500
10RA	450	850
10RJ	430	790
10WA	375	790
11C, 11WA	380	680
11RA	400	632
12C	340	680
12DH	327	600
12FR	300	600
12WA	390	720
12RJ	340	632
13C	327	632
13RA	430	680
14DH	327	680
14F	327	680
14H	327	680
14RJ	340	720
15F	260	410
16DH	240	480
16DM	335	620
16B	322	643
18B	348	656
18D	308	562
18H	373	537
18L	160	-
20B	327	636
20E	380	650
20G	300	534
20H	307	524

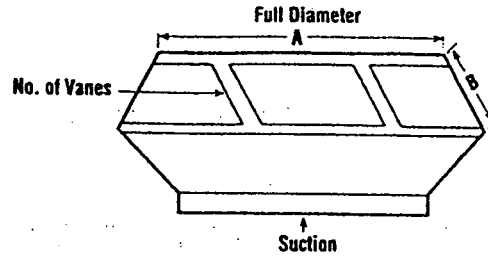
NOTES:

1. Pressure units based on maximum operating pressure of pump at any point on performance curve, normally occurring at shutoff.
2. Threaded bowl connection.
3. To insure proper sealing at bowl mating surfaces: Either O-ring or liquid gasket material recommended on all ductile iron, double-bolted bowl assemblies.

MINIMUM SUBMERGENCE REQUIRED FOR VORTEX SUPPRESSION



- NOTE: 1. Submergence values above are for Vortex free operation. Check performance curves for NPSH required. Submergence to satisfy NPSH requirements may be greater than "S".
2. Minimum submergence is based on 2 times the bell diameter distance between pump centerlines and other ideal flow conditions. Refer to Figure 69 and 70 in Hydraulic Institute or refer to factory for more information regarding your particular installation, as less than ideal conditions will require additional submergence.



Turbine Impeller Mechanical Data

Bowl Size and Model	Allowable Lateral Bearing Type (inches)		Eye Area (square inches)	Wet WR2 lbs.-ft. 2	Impeller Identifications									Impeller Weight (lbs.)	
	Bronze	Rubber			A (inches)			B (inches)			Number of Vanes			Closed	Open
					Low Capacity	Medium Capacity	High Capacity	Low Capacity	Medium Capacity	High Capacity	Low Capacity	Medium Capacity	High Capacity		
5C	0.25	NA	3.08	0.03	3.76	-	3.76	0.43	-	0.43	5	-	8	2.00	NA
5T	0.25	NA	5.02	0.03	3.54	-	3.54	0.62	-	0.62	4	-	7	2.40	NA
5WA	0.50	0.50	1.62	0.05	4.00	-	4.00	0.21	-	0.21	5	-	8	2.40	NA
6C	0.25	0.25	4.05	0.07	4.22	-	4.22	0.46	-	0.46	5	-	8	2.30	NA
6D	0.44	0.44	6.86	0.05	3.56	-	3.56	1.00	-	1.06	4	-	7	1.50	2.20
6RA	0.25	NA	1.62	0.05	4.00	-	4.00	0.21	-	0.21	5	-	8	2.40	NA
7C	0.50	0.50	7.54	0.14	5.25	-	5.25	0.60	-	0.60	5	-	8	3.10	NA
7RA	0.25	NA	2.65	0.08	4.75	-	4.75	0.25	-	0.25	5	-	8	3.30	NA
7T	0.38	0.38	10.40	0.18	4.96	-	4.96	1.26	-	1.26	4	-	7	5.10	NA
7WA	0.50	0.31	5.04	0.25	5.40	-	5.40	0.49	-	0.49	5	-	8	4.20	NA
8D	0.56	0.56	13.48	0.21	5.06	-	5.06	1.31	-	1.31	4	-	7	6.80	4.50
8I	0.62	0.44	6.10	0.22	6.03	-	6.03	0.44	-	0.44	5	-	8	5.70	NA
8RA	0.25	0.25	3.08	0.16	5.50	-	5.50	0.28	-	0.28	5	-	8	3.60	NA
8RJ	0.62	0.44	8.51	0.29	5.25	-	5.25	0.71	-	0.71	5	-	8	5.70	4.20
9RA	0.31	0.31	5.05	0.25	5.56	-	5.56	0.38	-	0.38	5	-	8	6.20	NA
9WA	0.56	0.56	6.84	0.45	6.69	-	6.69	0.46	-	0.46	5	-	8	11.50	NA
9RC	0.88	0.88	12.56	0.33	6.88	-	6.88	1.00	-	1.00	5	-	8	7.00	NA
9T	0.75	0.75	16.94	0.50	6.44	-	6.44	1.44	-	1.44	4	-	7	10.00	NA
10DH	0.75	0.75	20.92	0.97	6.37	-	6.37	1.62	-	1.62	4	-	7	14.00	NA
10L	0.50	0.50	27.18	0.94	-	-	5.81	-	-	1.68	-	-	7	10.50	NA
10RA	0.37	0.37	6.84	0.45	6.68	-	6.68	0.46	-	0.46	5	-	8	11.50	NA
10RJ	0.75	0.50	13.40	0.77	6.62	6.62	6.62	0.90	0.90	0.90	5	6	8	10.50	6.50
10WA	0.63	0.44	8.60	0.58	7.31	-	7.31	0.73	-	0.73	5	-	9	7.90	NA
11C	0.75	0.75	15.60	0.89	8.12	8.12	8.12	0.90	0.90	0.90	5	7	8	13.00	10.00
11RA	0.37	0.37	9.90	1.00	8.00	-	8.00	0.55	-	0.55	5	-	8	13.00	NA
11WA	0.75	0.75	11.20	0.93	8.38	-	8.38	0.82	-	0.82	5	-	9	11.60	NA
12C	1.00	0.88	20.43	1.65	-	-	8.69	-	-	1.20	-	-	8	18.00	14.50
12DH	0.68	0.68	31.47	2.36	7.75	-	7.75	2.00	-	2.12	4	-	7	19.50	19.50
12FR	0.88	0.88	38.30	2.42	-	-	7.25	-	-	2.12	-	-	8	19.00	16.00
12WA	0.75	0.68	13.70	1.65	8.94	8.94	8.94	0.75	0.75	0.75	5	8	9	14.00	NA
12RJ	1.00	0.88	19.91	1.63	8.00	8.00	8.12	1.09	1.09	1.09	5	6	8	18.00	11.00
13C	0.88	0.75	19.78	1.69	9.20	9.20	9.20	1.00	1.00	1.00	5	7	8	22.00	NA
13RA	0.50	0.50	20.21	1.69	9.62	-	9.62	0.66	-	0.66	5	-	5	18.00	NA
14DH	1.00	1.00	43.42	3.72	9.06	-	9.06	2.31	-	2.31	4	-	7	NA	26.50
14F	1.00	1.00	49.00	5.10	-	-	9.88	-	-	2.31	-	-	7	29.00	NA
14H	0.75	0.75	36.06	5.05	-	-	9.88	-	1.62	-	-	5	-	29.00	29.00
14RJ	1.00	1.00	30.24	3.12	9.81	9.81	9.81	1.34	1.34	1.34	5	6	8	27.00	27.00
15F	1.25	1.25	70.00	8.70	-	-	9.75	-	-	3.00	-	-	7	30.00	NA
16B	0.88	0.88	29.50	11.44	12.25	-	12.25	1.03	-	1.03	5	-	7	60.00	NA
16DH	0.88	0.88	57.96	9.33	10.44	-	10.44	2.68	-	2.68	4	-	7	48.50	48.50
16DM	0.75	0.75	40.37	9.65	-	11.62	-	-	1.41	-	-	7	-	62.00	NA
18B	0.75	0.75	46.90	13.96	12.94	-	12.94	1.28	-	1.28	7	-	7	88.00	NA
18D	0.75	0.75	49.00	13.30	-	12.75	-	-	1.56	-	-	7	-	60.70	NA
18H	0.75	0.75	68.40	21.68	-	12.63	-	-	2.50	-	-	5	-	65.00	NA
18L	1.12	1.12	78.40	8.04	-	-	10.41	-	-	2.78	-	-	6	87.50	NA
20B	0.81	0.81	38.25	19.32	-	-	14.25	-	-	1.26	-	-	7	95.00	NA
20E	0.88	0.88	80.70	17.16	-	-	13.25	-	-	1.97	-	-	7	68.00	NA
20G	1.41	1.41	99.90	15.80	13.50	-	13.50	3.00	-	3.00	5	-	5	77.00	NA
20H	0.87	0.88	72.40	21.68	14.00	14.00	14.00	1.75	1.75	1.75	7	7	7	74.00	NA

NOTE: WR2 are for enclosed impellers only.

Well Log and Construction Details, and Pump Test Data.

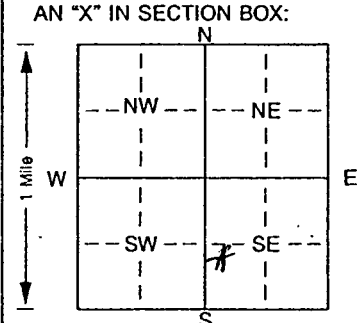
M-1 Replacement Well

1 LOCATION OF WATER WELL:	Fraction	Section Number	Township Number	Range Number
County: <u>Genry</u>	<u>NW 1/4 SW 1/4 SE 1/4</u>	<u>27</u>	T <u>11</u> S	R <u>5</u> <u>EN</u>

Distance and direction from nearest town or city street address of well if located within city?
EAR RACETRACK AREA, EAST OF MARSHALL FIELD AVE BASE

2 WATER WELL OWNER: Robert More House Well No. 2
 RR#, St. Address, Box #: 1100 Racetrack Rd.
 City, State, ZIP Code: Junction city Ks 66441
 Board of Agriculture, Division of Water Resources
 Application Number:

3 LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX: 4 DEPTH OF COMPLETED WELL: 63 ft. ELEVATION:



Depth(s) Groundwater Encountered ft. 2. ft. 3. ft.
 WELL'S STATIC WATER LEVEL 19.67 ft. below land surface measured on mo/day/yr 9-3-02 ft.
 Pump test data: Well water was ft. after hours pumping gpm
 Est. Yield 100 gpm: Well water was ft. after hours pumping gpm
 Bore Hole Diameter in. to ft., and in. to ft.
 WELL WATER TO BE USED AS: Public water supply 8 Air conditioning 11 Injection well
 1 Domestic 3 Feedlot 6 Oil field water supply 9 Dewatering 12 Other (Specify below)
 2 Irrigation 4 Industrial 7 Domestic (lawn & garden) 10 Monitoring well
 Was a chemical/bacteriological sample submitted to Department? Yes. No.; If yes, mo/day/yr sample was submitted 9-5-02 Water Well Disinfected? Yes No

5 TYPE OF BLANK CASING USED: 5 Wrought iron 8 Concrete tile CASING JOINTS: Glued. Clamped.
 1 Steel 3 RMP (SR) 6 Asbestos-Cement 9 Other (specify below) Welded.
 PVC 4 ABS 7 Fiberglass Threaded.

Blank casing diameter 6 in. to 40 ft., Dia in. to ft., Dia in. to ft.
 Casing height above land surface 24 in., weight lbs./ft. Wall thickness or gauge No.

TYPE OF SCREEN OR PERFORATION MATERIAL: PVC 10 Asbestos-cement
 1 Steel 3 Stainless steel 5 Fiberglass 8 RMP (SR) 11 Other (specify)
 2 Brass 4 Galvanized steel 6 Concrete tile 9 ABS 12 None used (open hole)

SCREEN OR PERFORATION OPENINGS ARE: 5 Gauzed wrapped 8 Saw cut 11 None (open hole)
 1 Continuous slot 3 Mill slot Wire wrapped 9 Drilled holes
 2 Louvered shutter 4 Key punched 7 Torch cut 10 Other (specify) ft.

GREEN-PERFORATED INTERVALS: From 60 ft. to 40 ft., From ft. to ft.
 From ft. to ft., From ft. to ft.
 GRAVEL PACK INTERVALS: From 60 ft. to 22 ft., From ft. to ft.
 From ft. to ft., From ft. to ft.

6 GROUT MATERIAL: 1 Neat cement Cement grout Bentonite 4 Other PLEASE PRESS NATIVE SOIL
 Grout Intervals From 22 ft. to 20 ft., From 20 ft. to 4 ft., From 4 ft. to 0 ft.

What is the nearest source of possible contamination:
 1 Septic tank 4 Lateral lines 7 Pit privy 10 Livestock pens Abandoned water well
 2 Sewer lines 5 Cess pool 8 Sewage lagoon 11 Fuel storage 15 Oil well/Gas well
 3 Watertight sewer lines 6 Seepage pit 9 Feedyard 12 Fertilizer storage 16 Other (specify below)
 13 Insecticide storage

Direction from well? NORTH How many feet? WITHIN 1 MILE

FROM	TO	LITHOLOGIC LOG	FROM	TO	PLUGGING INTERVALS
0	0.50	TOP SOIL			
0.50	3.50	SILT, SANDY, LOOSE, BROWN			
3.50	5.0	SAND FINE			
5.0	5.80	SILT, LOOSE, BROWN			
5.80	6.60	SAND, LOOSE, FINE			
6.60	7.0	CLAY, DENSE, DARK			
7.0	10.30	SAND, LOOSE, FINE			
10.30	11.0	CLAY, DENSE, BROWN			
11.0	15.0	SAND FINE SILT			
15.0	15.90	CLAY SILT, BROWN			
15.90	32.	SAND, LOOSE, FINE			
32.	60.	SAND MEDIUM/FINE			
60.	60.20	CLAY, SILT			
60.20	61.50	LIMESTONE			

1 CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on (mo/day/year) AUGUST 29, 2002 and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's Licence No. 581 This Water Well Record was completed on (mo/day/yr) SEPT. 23, 2002 under the business name of LAYNE WESTERN by (signature) [Signature]



WELL INFORMATION

Layne Christensen Company

1. CONTRACT Baywest
Fort Riley Water Supply Services

2. City, State Fort Riley Kansas

3. Well No. 2 at Test Hole No. 2-02

4. Well Location (attach map) house well

5. Driller R. Bowles

6. DATE 8/29/2002

7. Date Started _____
 Completed _____

8. Drill Crew Man Hrs. _____

9. Working Days _____
 Drilling _____
 Other _____

10. MATERIAL IN WELL			WALL THICKNESS IN.	MATERIAL	TYPE	NO.
LENGTH FT.	IN.	DIA. IN.				
Screen	20'	6"	Sch. 40	PVC	PVC Wire Wrap	0.060"
					Shutter Wirewound	Openings
Inner Casing	43'	6"	Sch. 40	PVC	Flush joint	
					Welded Screwed	
Outer Casing					Welded Screwed	

11. GRAVEL
 Size Colorado Silica Sand 8-12
 Tons 1

12. CASING SEALED:
 Puddled Clay (Yes) (No)
 With 2 Bags Bentonite Added
 or
 With 2 Bags/cu. yds. Cement
 Seal Material Placed in
 Well With tremie pipe
 Bottom of Well Screen
 Sealed With PVC pipe

13. DIMENSIONS

A. Total Depth 63'
 (From Top of Inner Casing to Bottom of Well)

B. Height of Inner Casing 3'
 (Above Ground Level)

C. Distance to Top of Gravel 21'
 (From Ground Level)

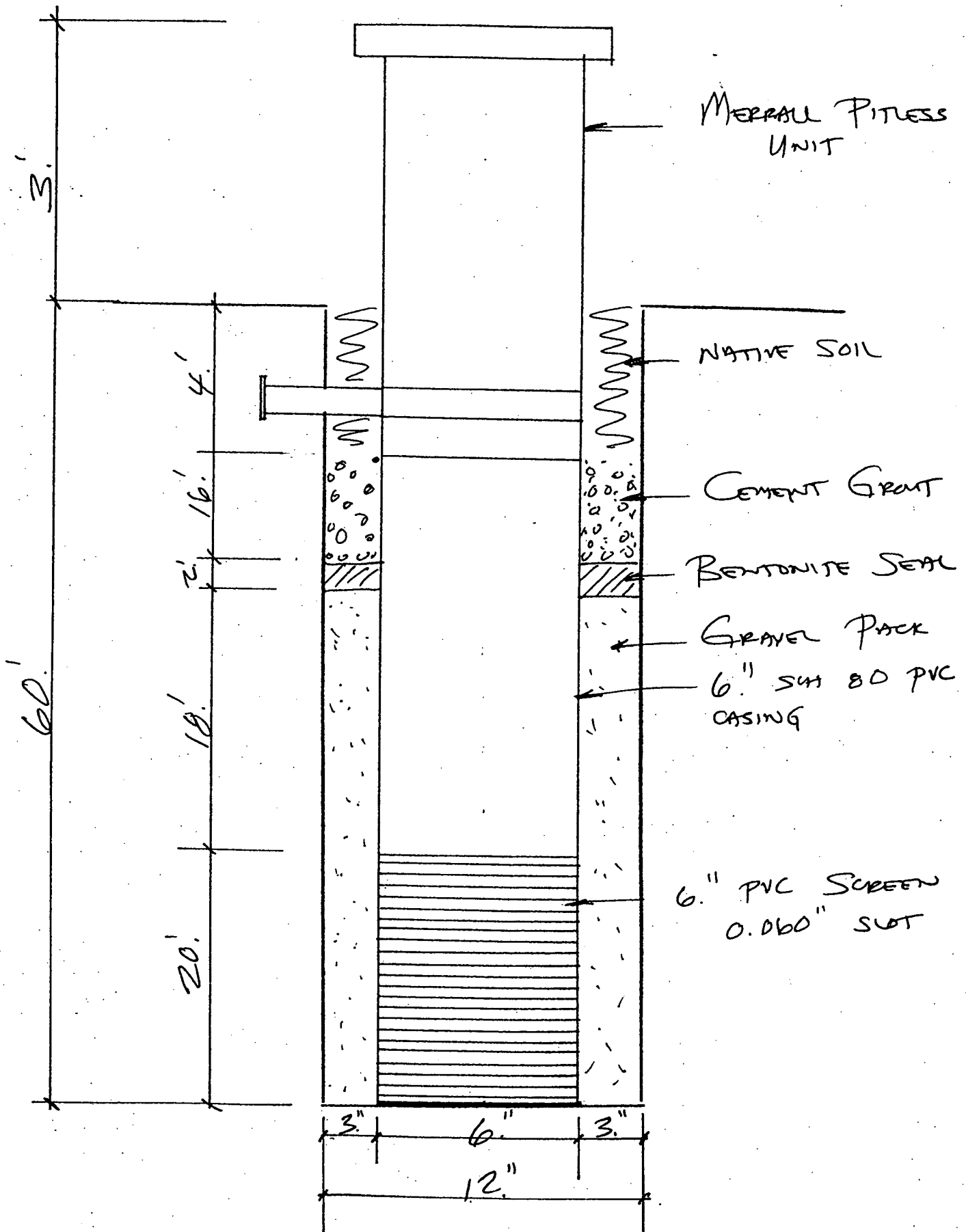
D. Diameter of Drill Hole 12"

E. Rig No. _____

Comments _____

CONSTRUCTION OF WELL

House Well No. 2



Well Number: TH 2-02 (House Well)	Logged by: Rolland Yoakum
Project: Fort Riley	Driller's Name: Randy Crowl
Total Depth: 61.5 feet	Borehole Diameter: 6"
Date Started: 7/31/02	Water Level: 21.0'
Date Completed: 7/31/02	

Log

0 – 0.5	Topsoil, organic material, dark reddish gray (10R 3/1), silty, moist
0.5 – 3.5	Silt, sandy, loosely compacted, dry, brown
3.5 – 5.0	Sand, dry, fine, subrounded to subangular
5.0 – 5.8	Silt, loose, unconsolidated, dark reddish brown (5YR 3/4)
5.8 – 6.5	Sand, loose, unconsolidated, dry, light brown (7.5 YR 6/3)
6.5 – 6.6	Sand, loose, unconsolidated, moist, dark red (10R 3/6), fine, rounded
6.6 – 7.0	Clay, dense, low plasticity, moist, very dark gray (N 3/)
7.0 – 10.0	Sand, fine, subrounded to subangular
10.0 – 10.3	Sand, loose, unconsolidated, dry, brown (7.5 YR 5/2), fine, subrounded to rounded
10.3 – 11.0	Clay, dense, low plasticity, dry, dark brown (7.5 YR 3/2)
11.0 – 11.2	Sand, loose, unconsolidated, dry, brown (7.5 YR 5/4), fine, subrounded
11.2 – 11.5	Silt, medium dense, unconsolidated, dry, brown (7.5 YR 5/3), trace sand, fine, rounded
11.5 – 12.0	Sand, loose, unconsolidated, dry, pink (7.5 YR 7/3), fine, rounded, well sorted
12.0 – 15.0	Sand, dry, fine, subrounded to rounded
15.0 – 15.9	Clay, silty, medium density, low plasticity, dry, dark brown (7.5 YR 3/2)
15.9 – 17.0	Sand, loose, unconsolidated, moist, light brown (7.5 YR 6/3), fine to medium, coarsening downhole, rounded to subrounded
17.0 – 20.0	Sand, moist, fine to medium, subrounded to rounded
20.0 – 21.0	Sand, loose, unconsolidated, moist, brown (7.5 YR 4/2), fine, subrounded to subangular
21.0 – 21.3	Sand, loose, unconsolidated, wet, brown, (7.5 YR 5/3), medium to fine, subangular
21.3 – 22.0	Sand, loose, unconsolidated, wet, dark gray (N 4/), medium to fine, rounded to subrounded
22.0 – 25.0	Sand, wet, medium to fine
25.0 – 26.5	Sand, loose, unconsolidated, wet, brown (7.5 YR 4/3) fine with trace medium, poorly sorted, subangular
26.5 – 26.6	Clay, low density, high plasticity, wet, very dark gray (N 3/)
26.6 – 27.0	Sand, loose, unconsolidated, wet, gray (N 5/), medium to fine to coarse, with trace gravel, poorly sorted, angular to subrounded
27.0 – 30.0	Sand, wet, medium to fine
30.0 – 31.4	Sand, loose, unconsolidated, wet, very dark gray, (N 3/), medium to fine, subangular to angular, poorly sorted
31.4 – 32.0	Sand, loose, unconsolidated, wet, dark greenish gray (5GY 4/1), medium, with some fine, angular to subangular
32.0 – 35.0	Sand, medium

35.0 – 35.4	Sand, firm, unconsolidated, wet, greenish – gray (5GY 5/1), angular to subangular, medium to fine, trace coarse, poorly sorted
35.4 – 35.45	Clay, dense, high plasticity, wet, dark brown (7.5 YR 3/2)
35.45 – 35.5	Sand, firm, unconsolidated, wet, greenish – gray (5GY 5/1), angular to subangular, medium to fine, trace coarse, poorly sorted
35.5 – 40.0	Sand, medium
40.0 – 40.5	Sand, loose, unconsolidated, wet, dark greenish gray (5GY 4/1), fine to coarse, subrounded to subangular
40.5 – 50.0	Sand, medium
50.0 – 50.9	Sand, loose, unconsolidated, wet, brown (7.5 YR 4/4), medium to fine, trace coarse, subangular to subrounded
50.9 – 55.0	Sand, medium
55.0 – 55.5	Sand, loose, unconsolidated, wet, brown (7.5 YR 4/3), medium with some fine, angular to subangular
55.5 – 60.0	Sand, medium to coarse
60.0 – 60.2	Clay, dense, silty, medium plasticity, moist, greenish gray (5GY 5/1), some mottling, trace sand, angular, medium
60.2 – 61.5	Limestone, light gray, fossiliferous (fusulinids), some calcite crystallization

Split Spoons – 2" samples, 2' in length.

Split spoon samples taken at following intervals:

Sample Interval	Recovery	Blow Counts
5.0 – 7.0	100% recovery	5, 6, 6, 10
10.0 – 12.0	100% recovery	9, 9, 6, 4
15.0 – 17.0	100% recovery	7, 8, 4, 4
20.0 – 22.0	100% recovery	4, 5, 10, 11
25.0 – 27.0	100% recovery	11, 8, 5, 6
30.0 – 32.0	100% recovery	5, 4, 4, 6
35.0 – 37.0	25% recovery	21, 19, 20, 20
40.0 – 42.0	25% recovery	14, 30, 12, 20
45.0 – 47.0	0% recovery	8, 10, 12, 17
50.0 – 52.0	45% recovery	8, 9, 13, 7
55.0 – 57.0	25% recovery	6, 5, 7, 7

Layne-Western Company, Inc.

PUMP INSTALLATION

JOB NAME BayWest; Ft. Riley Water
 Address Supply; DACW4195D0022
 City, State Ft. Riley Ks
 DATE 10 18 2002 Job Completion
 Month Day Year

PUMP NO. 10GS07412 Oil-Water Lube
 Pump Trouble _____ New-Repair

PUMP SIZE

	DIAMETER		LENGTHS
	Above	Below	
Discharge			X
Column	1-1/4"	Screw Flange	2 - 20
Tubing			
Shaft		Stainless Carbon	

Column setting to bowl 40 ft.

BOWL

Diameter 4" Shaft Diameter 1"

Type submersible Stages _____

Cast Iron or Bronze

Suction _____" Diameter _____ Ft. Long

Special Paint or Coating on: _____ Zinc Sleeves in:

Column _____

Tubing _____

MOTOR OR GEAR DRIVE

Make Franklin HP 3/4
 Speed 3450 Volts 230 1 Phase

Or Gear Drive Ratio _____ Standard
 Combination

Frame Size _____ Non-Reverse — Yes No

Running Amps. _____

Running Volts _____

Serial No. #12-3 w/grnd wire

WELL House well

No. M-1 Year Drilled Aug. 2002

Location _____

Diameter 6" Depth 60'

Measured from top of _____" diameter casing which is
 _____ feet above ground

Tape to Water _____

Air Line Length _____ A.L. Material _____

Static Gage _____ Static Level _____

Pumping Gage _____ Pumping Level _____

Discharge Pressure _____ Feet when pumping into
 System

INSTALLER A. Contreras

Rig Used _____

Foreman Hours to Rig Up _____ To Pull _____

Inspect _____ Repair _____ To Set _____

PUMP REPAIR

CONDITION OF PUMP WHEN PULLED	NEW PARTS INSTALLED
Column _____	Column <u>40'</u> <u>1-1/4" PVC</u>
Tubing _____	Tubing _____
Shafting _____	Shafting _____
Bowl _____	Bowl <u>10GS07412</u> <u>10 GPM at 190' TDH</u>
Suction _____	Suction _____
MACHINE WORK _____	1. DRAIN PORTS OPEN Yes No 2. CHLORINATE WELL Yes No 3. PUMP RUNS _____ 4. ALIGN PUMP HEAD WITH DIAL INDICATOR Yes No 5. GROUTED HEAD-BASE PLATE Yes No

AQUIFER TEST

Layne Western, a Division of Layne Christensen
Wichita, Kansas

Fort Riley Water Supply	September 3, 2002
Plaza Race Track	House Well No. 1, M-1
Fort Riley, Kansas	2" Meter
SWL: 19' 8"	(Bay West)

Time of Day	Elapsed Min	Tape Read.	Water Level	Drawdown Ft.	Pump Rate
	0				
	5		21' 8"		50 gpm
	10		21' 8"		
	15		21' 8"		
	20		21' 8"		
	25		21' 8"		
	30		21' 8"		
	35		21' 8-1/4"		
	40		21' 8"		
	45		21' 8-1/4"		
	50		21' 8-1/4"		
	55		21' 8-1/2"		
	60		21' 8-1/2"		
	70		21' 8-1/2"		
	80		21' 8-1/4"		
	90		21' 8-1/2"		
	120		21' 8-1/2"		
	150		21' 8-1/4"		
	180		21' 8-1/2"		
	210		21' 8-1/4"		
	240		21' 8-1/4"		
Recovery	5 min		19' 8-1/2"		
	10		'		
	15		'		
	20		'		
	25		'		
	30		'		

Specifications Vertical Turbine Pump Submersible

House Well No. 2 ; M-1

A. Scope

This specification covers a deep well submersible turbine pump with above ground discharge and furnished with suitable driver and accessories as specified herein. The pumping unit shall be designed and furnished in accordance with the latest hydraulic institute and AWWA specifications for submersible turbine pumps.

B. Service Conditions

The pump shall be designed and constructed to operate satisfactorily with a reasonable service life, when installed in a typical continuous turbine pump application. The pump shall be the product of, and manufactured by Goulds Pumps, Inc. Other manufacturers will be considered providing the unit offered is an approved equal in all respects to the brand and model preferred by the customer. Factory pump curves for alternate pumps shall be submitted with the bid.

C. Operating Conditions

Design conditions: 15 Gallons per minute

Design head: 152 Feet total dynamic head (TDH)

Minimum pump efficiency of: Percent

Maximum allowable speed: 3450 RPM

Liquid to be pumped: Water

Pump bowl setting: 43 Feet

Well diameter I.D.: 6 Inches

106507412

3/4 H.P 230 volt

1. PHASE

D. Pump Construction

1. **Bowl assembly:** the intermediate bowls, and discharge adapter shall be flanged type constructed from close grained cast iron, and shall conform to ASTM designation A48, class 30. They shall be free from sand holes, blow holes, or other faults and must be accurately machined and fitted to close tolerances. The intermediate bowls shall have vitra glass lined waterways for maximum efficiency and wear protection. All intermediate bowls shall be of identical design for interchangeability.

A thrust ring shall be above the top impeller to prevent excessive vertical upthrust. Threaded intermediate bowls will be allowed on bowl sizes 8" and smaller. To ensure quality and consistency of product, cast iron components must be produced in a foundry owned by the pump manufacturer.

2. **Impellers:** the impellers shall be constructed from ASTM B584 Silicon Bronze and shall be the enclosed, (or semi-open) type. They shall be free from defects and must be accurately cast, machined, balanced, and filed for optimum performance and minimum vibration. Impellers are to be standard product of the pump manufacturer and not contain special workmanship to temporarily increase efficiency. They shall be securely fastened to the bowl shaft with taper locks of C1045 steel (or 416SS).

3. The discharge adapter shall be provided with a non-soluble grease packed bronze bearing, extending through the top bowl into and through the discharge adapter and topped with a threaded cast iron cap or plug to protect the bearing from abrasives. The adapter should be such that the bearing can be easily removed through the top of the adapter housing.

4. The inlet motor adapter shall be a minimum of class 40 cast iron and shall contain an extra long bronze bearing. The inlet area shall have a net open area of at least four times the eye of the impeller and shall be protected with a 304 stainless steel screen.

5. **Wear rings:** pumps 6" and larger shall (or shall not) be fitted with replaceable wear rings of bronze material in the motor adapter and intermediate bowls. Wear rings shall have the minimum practical clearance to the mating cylindrical surface of the impeller to provide adequate sealing independent of vertical positioning of the impellers.

6. The bowl shaft shall be constructed from ASTM A582 type 416 stainless steel. It shall be precision turned, ground and polished and shall be supported by water lubricated bronze bearings, or optional fluted rubber bearings.

7. The motor coupling shall be of stainless steel and shall conform to NEMA specifications and be capable of transmitting the total torque and total thrust of the bowl assembly in either direction of rotation.

Column Pipe Sch 80 PVC

The column pipe shall be ~~grade A steel pipe~~, in 20 feet (or random) lengths, with the ends machined with 8 threads per inch with $\frac{3}{4}$ " taper. Inside diameter of the pipe shall be such that the head losses shall not be over 5 feet per 100 feet of pipe, and shall weigh not less than _____ lbs/ft. Pipe shall be connected with threaded sleeve type steel couplings.

F. Submersible Cable

Pump cable shall be sized to limit the voltage drop to no more than 5%. The cable shall have three separate conductors and a ground and shall be included in a single continuous jacketed assembly.

The insulation shall be water and oil resistant, and suitable for continuous immersion. The cable should be the length of the column pipe plus 20 feet to extend from the well plate to the pump electrical controller. The cable should be adequately secured to the column pipe by plastic ties, or other non metallic means, at 10 foot intervals. # 10-3 w/GRB

G. Submersible Surface Plate

The surface plate shall be of fabricated steel. The plate shall incorporate a long radius elbow welded securely to a 150 lb. steel ANSI 1 1/4" flange and shall rigidly support the total weight of the motor, bowl assembly, column pipe, cable, and column of water. The cable outlet shall have a cable seal of adequate size to accommodate the cable size. Threaded vent and drawdown holes shall be provided.

H. Submersible Electric Motor

The motor shall be a heavy duty _____ canned type or wet wound of NEMA design for 4", 6" and 8" motors, 3450 RPM. The motor shall be capable of continuous operation under water at the specified conditions outlined above.

A suitable thrust bearing shall be incorporated in the lower end of the motor adequate to receive the entire hydraulic thrust load of the pump unit plus the weight of the rotating parts regardless of the direction of rotation. The motor shall have a 1.15 service factor, and suitable for use on a 230 volt, ~~single~~ phase, 60 cycle electric service.

The motor leads shall be protected against the pump end with a 304 stainless steel cable guard held in place with stainless steel banding. As the motor lead exit the top of the cable guard it shall be properly protected to prevent damaging or cutting the lead by the cable guard material.



60 Hz 4" Submersible Pumps

MODEL GS

5GS, 7GS, 10GS,
13GS, 18GS, 25GS



SPECIFICATIONS

Model	Flow Range GPM	Horsepower Range	Best Eff. GPM	Discharge Connection	Minimum Well Size	Rotation [Ⓛ]
5GS	1.2 - 7.5	1/2 - 2	5	1 1/4"	4"	CCW
7GS	1.5 - 10	3/4 - 3	7	1 1/4"	4"	CCW
10GS	3 - 16	1 1/2 - 5	10	1 1/4"	4"	CCW
13GS	4 - 20	1 1/2 - 3	13	1 1/4"	4"	CCW
18GS	6 - 28	3/4 - 5	18	1 1/4"	4"	CCW
25GS	8 - 33	1 - 5	25	1 1/4"	4"	CCW

[Ⓛ] Rotation is counterclockwise when observed from pump discharge end.

FEATURES

- **Powered for Continuous Operation:** All ratings are within the working limits of the motor as recommended by the motor manufacturer. Pump can be operated continuously without damage to the motor.
- **Field Serviceable:** Pump can be rebuilt in the field to like new condition with common tools and readily available spare parts. **NOTE: The Model GS has left hand casing threads.**
- **Sand Resistant Construction:** Field proven over almost four decades, face clearance design and floating impellers for an extremely abrasion resistant configuration.
- **Stainless Steel Metal Parts:** AISI types 302, 303 and 304 are corrosion resistant, non-toxic and non-leaching.
- **FDA Compliant Non-Metallic Parts:** Impellers, diffusers and bearing spiders are constructed of a glass filled engineered

- composite. This material is corrosion resistant and non-toxic.
- **Discharge Head:** High profile precision cast 303 stainless steel for superior strength and durability. Cast in loop for safety line
- **Motor Adapter:** Precision cast 303 stainless steel is extremely rigid for accurate alignment of liquid end to motor. Generous space for removal of motor mounting nuts with regular open-end wrench.
- **Bowls:** Stainless steel for strength and abrasive resistance.
- **Check Valve:** Built in check valve constructed of stainless steel and low compression, FDA compliant, BUNA rubber for excellent abrasive resistance and quiet, efficient operation.
- **Stainless Steel Casing:** Polished stainless steel is attractive and durable in the most corrosive water.
- **Hex Shaft Design:** Six sided shafts for positive impeller drive.

- **Shaft Coupling:** Exposed for ease of field alignment to motor shaft and to check pump rotation.
- **Urethane Upper and Middle Bearings:** Fluted design for free passage of abrasives and excellent resistance to sand damage.
- **Franklin Electric Motor:**
 - Corrosion resistant stainless steel construction through 2 HP, stainless steel casing with nickel plated gray iron end bells on motors over 2 HP.
 - Built-in surge arrestor is provided on single phase motors through 5 HP.
 - Stainless steel splined shaft.
 - Hermetically sealed windings.
 - Replaceable motor lead assembly.
 - UL 778 recognized.
 - NEMA mounting dimensions.
 - Control box is required with 3 wire single phase units.
 - Three phase units require a magnetic starter with three leg protection. Magnetic starter and heaters must be ordered separately.
- **Agency Listings:** All complete pump/motor assemblies are UL778 and CSA listed and complies with ANSI/NSF std. 61. All 4" Franklin Electric Motors are UL778 recognized.

"GS" SERIES MATERIALS OF CONSTRUCTION

Part Name	Material
Discharge Head	AISI 303 SS
Check Valve Poppet	AISI 304 SS
Check Valve Seal	BUNA, FDA compliant
Check Valve Seat	AISI 304 SS
Check Valve Retaining Ring	AISI 302 SS
Bearing Spider - Upper	Glass Filled Engineered Composite
Bearing	Urethane, FDA compliant
Klipring	AISI 301 SS
Diffuser	Glass Filled Engineered Composite
Impeller	Glass Filled Engineered Composite
Bowl	AISI 304 SS
Intermediate Sleeve [Ⓛ]	AISI 304 SS, Powder Metal
Intermediate Shaft Coupling [Ⓛ]	AISI 304 SS, Powder Metal
Intermediate Bearing Spider [Ⓛ]	Glass Filled Engineered Composite
Intermediate Bearing Spider [Ⓛ]	AISI 303 SS
Bearing	Urethane, FDA compliant
Stem	AISI 304 SS
Spacer	AISI 304 SS, Powder Metal
Screws - Cable Guard	AISI 304 SS
Motor Adapter	AISI 303 SS
Casing	AISI 304 SS
Shaft	AISI 304 SS
Coupling	AISI 304 SS, Powder Metal
Cable Guard	AISI 304 SS
Suction Screen	AISI 304 SS

[Ⓛ] Used on pumps over 24 stages.

[Ⓛ] Used on models with 27 stages or larger.

AGENCY LISTINGS

Canadian Standards Association

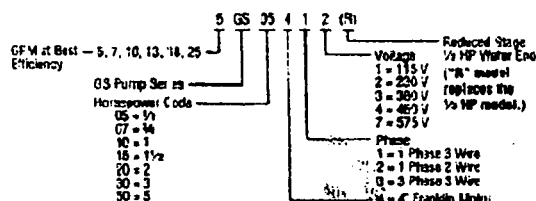
Underwriters Laboratories
Classified ANSI/NSF 61-1992

Goulds Pumps is ISO 9001 Registered.

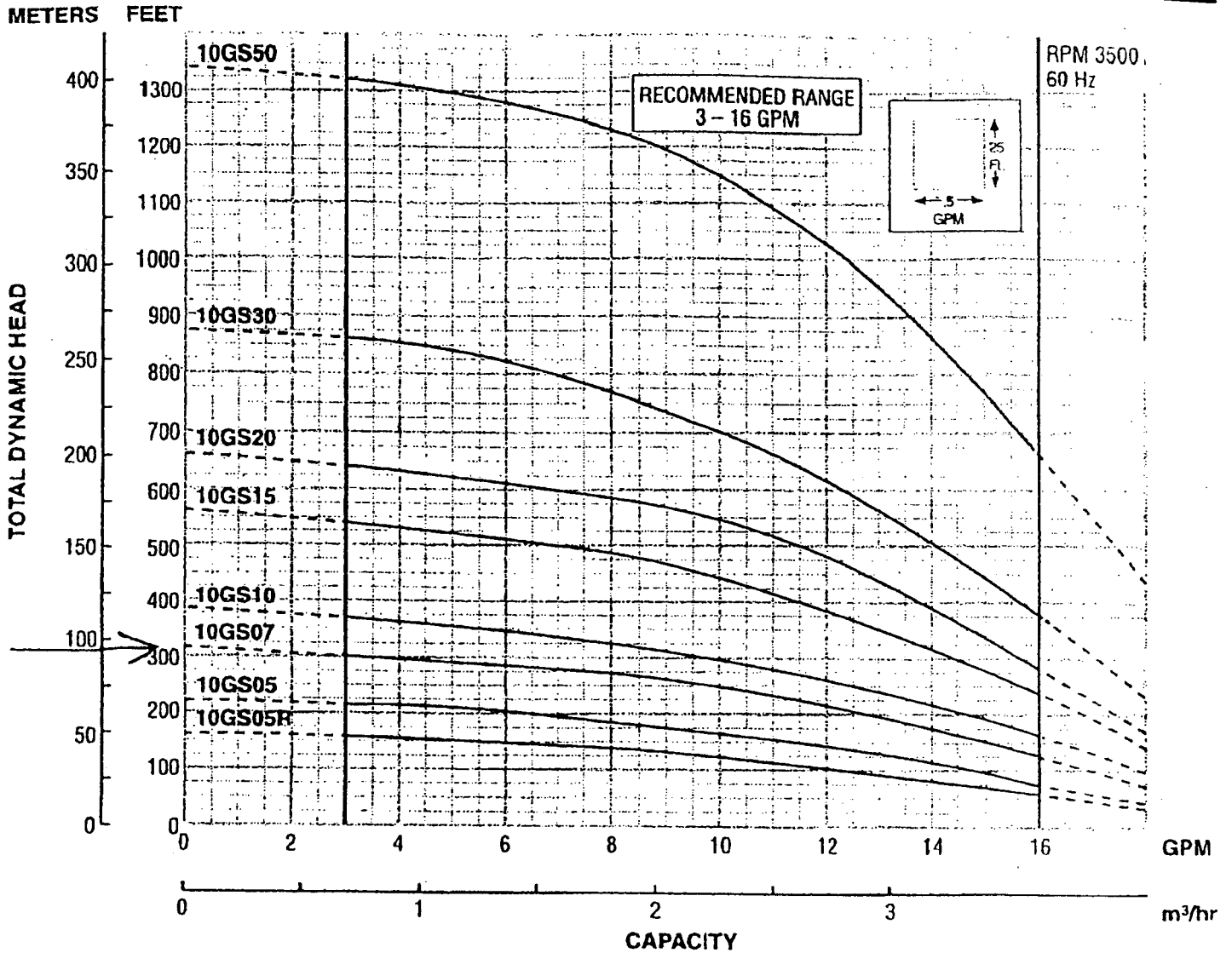
Goulds Pumps



ORDER NUMBER CODE

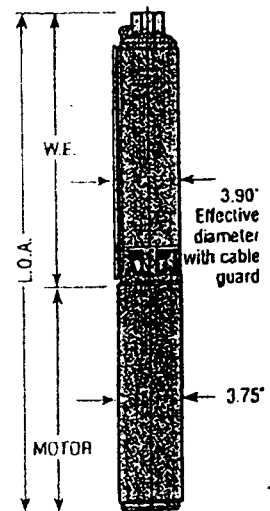


Model 10GS



DIMENSIONS AND WEIGHTS

Model	HP	Phase	Stages	Length (Inches)			Weight (lbs.)		
				W.E.⊙	Motor	L.O.A.⊙	W.E.	Motor	Total
10GS05412R,22,11,21⊙	¼R⊙	1	.5	9.6	9.5	19.1	6	18	24
10GS05412,22,11,21	¼	1	7	11.0	9.5	20.5	7	18	25
10GS07412,22	¾	1	10	13.0	10.7	23.7	8	20	28
10GS10412,22	1	1	12	14.4	11.8	26.2	9	23	32
10GS15412	1½	1	17	17.9	13.6	31.5	11	28	39
10GS15422	1½	1	17	17.9	15.1	33.0	11	31	42
10GS15432	1½	3	17	17.9	11.8	29.7	11	23	34
10GS20412	2	1	20	20.0	15.1	35.1	12	30	42
10GS20432,34	2	3	20	20.0	13.6	33.6	12	28	40
10GS30412	3	1	27	26.0	23.5	49.5	15	52	67
10GS30432,34	3	3	27	26.0	20.6	46.5	15	43	58
10GS50142	5	1	42	36.3	29.5	65.8	20	69	89
10GS50432,34	5	3	42	36.3	23.6	59.9	20	53	73



⊙ Reduced stage ¼ HP pump/water end for low head applications. This model replaces the ¼ HP water end.
 ⊙ W.E. = water end or pump without motor.
 ⊙ L.O.A. = length of assembly - complete pump - water end and motor.

SELECTION CHART

Horsepower Range 1/2 - 3, Recommended Range 3 - 16 GPM, 60 Hz, 3500 RPM

Pump Model	HP	PSI	Depth to Water in Feet/Ratings in GPM (Gallons per Minute)																																
			20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	340	380	420	460	500	540	580	620	660	700	740	780	820					
10GS050	1/2	0			15.6	14.0	12.4	10.4	6.5																										
		20	15.4	13.5	11.5	9.2	6.0																												
		30	13.0	11.1	8.0	4.0																													
		40	11.0	7.9	3.0																														
		50	7.0																																
		60																																	
10GS05	1/2	0	61	53	44	34	26	18	10																										
		20		15.9	14.9	13.8	12.5	10.8	8.3	4.8																									
		30	15.7	14.6	13.5	12.3	10.5	7.8	4.0																										
		40	14.5	13.4	12.0	10.3	7.5	3.0																											
		50	13.0	11.5	9.8	7.2																													
		60	11.3	9.0	6.4																														
10GS07	3/4	0	89	81	72	63	55	46	37	29	20	11																							
		20				15.8	15.0	14.0	13.0	12.3	11.2	10.2	8.5	6.0																					
		30			15.7	14.8	13.9	12.8	12.0	11.0	9.8	8.2	5.5																						
		40		15.6	14.7	13.8	12.7	11.9	10.8	9.7	8.1	5.2																							
		50	15.3	14.4	13.5	12.6	11.6	10.5	9.4	7.5	4.8																								
		60	14.3	13.4	12.5	11.5	10.3	9.0	7.0	4.0																									
10GS10	1	0	130	121	113	104	95	87	78	69	61	52	43	35	26	17	9																		
		20					15.7	14.9	14.3	13.5	12.7	11.7	10.6	9.6	8.1	6.5																			
		30				16.0	15.6	14.8	14.2	13.3	12.5	11.6	10.4	9.4	7.8	5.5	3.0																		
		40			16.0	15.5	14.7	14.1	13.2	12.4	11.5	10.3	9.1	7.4	5.0	3.0																			
		50		15.3	14.6	13.9	13.0	12.3	11.3	10.1	8.9	7.0	4.3																						
		60	15.8	15.2	14.5	13.7	12.8	12.0	11.0	10.0	8.6	6.7	4.0																						
10GS15	1 1/2	0	158	150	141	132	124	115	106	98	89	81	72	63	55	46	37	20																	
		20								15.7	15.3	14.8	14.4	13.3	12.2	10.9	9.3	7.1	3.0																
		30								15.9	15.5	15.2	14.6	14.2	13.5	13.1	12.6	11.3	9.7	7.6	4.0														
		40							15.8	15.5	15.1	14.6	14.2	13.5	13.0	12.5	11.8	10.3	8.8	6.0															
		50					15.7	15.4	14.9	14.5	14.0	13.4	12.8	12.3	11.7	11.0	9.4	7.4	3.4																
		60				15.7	15.3	14.8	14.4	13.9	13.3	12.8	12.2	11.6	10.9	10.1	8.1	5.6																	
10GS20	2	0																																	
		20												15.9	15.5	15.3	14.8	14.1	13.2	12.2	11.0	9.9	8.0	5.2											
		30												15.8	15.4	15.1	14.7	14.4	13.5	12.7	11.7	10.3	8.8	6.5											
		40											15.8	15.4	15.1	14.7	14.4	14.0	12.9	12.2	10.9	9.5	7.8	3.9											
		50								16.1	15.7	15.3	15.0	14.6	14.2	14.0	13.4	12.5	11.5	10.1	8.5	6.0													
		60						16.0	15.7	15.3	14.9	14.5	14.2	13.8	13.4	12.8	11.8	10.7	9.1	7.2	3.4														
10GS30	3	0																																	
		20																	15.7	15.1	14.5	13.9	13.2	12.5	11.8	10.9	9.9	8.8	7.2	5.4					
		30																	15.9	15.4	14.8	14.2	13.4	12.8	12.0	11.3	10.3	9.3	8.1	6.2	3.8				
		40																	15.9	15.6	15.0	14.4	13.8	13.1	12.4	11.5	10.8	9.7	8.6	7.1	4.7				
		50																16.0	15.8	15.6	15.3	14.7	14.1	13.3	12.7	11.9	11.0	10.2	9.1	7.8	6.0	3.0			
		60															16.0	15.8	15.5	15.2	14.8	14.3	13.7	12.9	12.3	11.4	10.6	9.6	8.3	6.8	4.5				
Shut-off PSI																		284	275	267	258	249	232	215	197	180	163	145	128	111	94	76	59	42	24

Horsepower Range 5, Recommended Range 3 - 16 GPM, 60 Hz, 3500 RPM

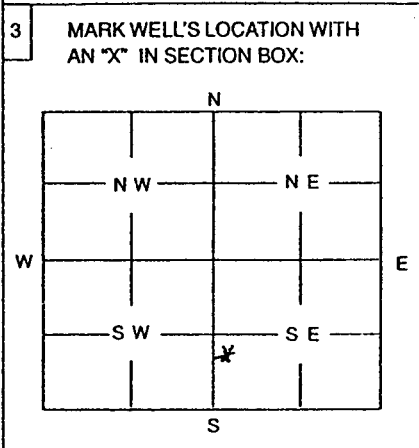
Pump Model	HP	PSI	Depth to Water in Feet/Ratings in GPM (Gallons per Minute)																										
			440	480	520	560	600	640	680	720	760	800	840	880	920	960	1000	1040	1080	1120	1160	1200	1240	1280	1320				
10GS50	5	0						16	15.5	15.2	14.9	14.5	14	13.5	13	12.5	12	11.5	10.8	10.2	9.5	8.5	7	5.2					
		20						15.9	15.4	15.1	14.8	14.5	13.9	13.4	12.9	12.4	11.9	11.3	10.7	10.1	9.4	8.2	6.8	4.3					
		30						15.6	15.2	14.9	14.6	14.2	13.7	13.1	12.6	12.1	11.6	11.0	10.4	9.8	8.8	7.5	6.0	3.0					
		40					15.8	15.3	15.1	14.7	14.4	13.8	13.3	12.8	12.3	11.8	11.2	10.6	10.0	9.2	7.9	6.6	4.1						
		50					15.5	15.2	14.9	14.6	14.1	13.6	13.0	12.5	12.1	11.5	10.9	10.3	9.7	8.6	7.3	5.6							
		60				15.7	15.3	15.0	14.7	14.3	13.7	13.2	12.7	12.2	11.7	11.1	10.5	9.9	9.0	7.7	6.5	3.2							
Shut-off PSI					346	329	312	294	277	260	242	225	208	191	173	156	139	121	104	87	69	52	35	17					

Well Abandonment Records

1 LOCATION OF WATER WELL: County: <u>Geary</u>	Fraction <u>NW 1/4 SW 1/4 SE 1/4</u>	Section Number <u>27</u>	Township Number <u>11 S</u>	Range Number <u>SE</u>
---------------------------------------------------	-----------------------------------------	-----------------------------	--------------------------------	---------------------------

Distance and direction from nearest town or city street address of well if located within city?
EAST OF MARSHALL FIELD AIR BASE

2 WATER WELLOWNER: RR #, St. Address, Box #: City, State, ZIP Code :	Robert More 1100 Racetrack Rd. Junction City Ks 66441	<u>OLD HOUSE WELL M-1</u> Board of Agriculture, Division of Water Resources Application Number:
----------------------------------------------------------------------------	-------------------------------------------------------------	-------------------------------------------------------------------------------------------------------



4 DEPTH OF WELL 40 ft

WELL'S STATIC WATER LEVEL 18 ft.

WELL WAS USED AS:

<input checked="" type="checkbox"/> 1 Domestic	5 Public Water Supply	9 Dewatering
2 Irrigation	6 Oil Field Water Supply	10 Monitoring Well
3 Feedlot	7 Domestic (Lawn & Garden)	11 Injection Well
4 Industrial	8 Air Conditioning	12 Other

Was a chemical / bacteriological sample submitted to Department? Yes No

If yes, mo/day/yr sample was submitted

Water Well Disinfected: Yes No

5 TYPE OF BLANK CASING USED:

1 Steel	3 RMP (SR)	5 Wrought	7 Fiberglass	9 Other (Specify below)
<input checked="" type="checkbox"/> 2 PVC	4 ABS	6 Asbestos-Cement	8 Concrete Tile	

Blank casing diameter 5 in. Was casing pulled? Yes No If yes, how much

Casing height above or below land surface 24 in.

6 GROUT PLUG MATERIAL: 1 Neat cement 2 Cement grout 3 Bentonite 4 Other

Grout Plug Intervals: From 40 ft. to 0 ft., From ft. to ft., From to ft.

What is the nearest source of possible contamination: N/A

1 Septic tank	6 Seepage pit	11 Fuel storage	16 Other (specify below)
2 Sewer lines	7 Pit privy	12 Fertilizer storage	
3 Watertight sewer lines	8 Sewage lagoon	13 Insecticide storage	
4 Lateral lines	9 Feedyard	14 Abandoned water well	
5 Cess Pool	10 Livestock pens	15 Oil well/Gas well	

Direction from well? How many feet?

FROM	TO	PLUGGING MATERIALS
<u>0</u>	<u>40</u>	<u>NEAT CEMENT</u>

7 CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was plugged under my jurisdiction and was completed on (mo/day/year) SEPTEMBER 4, 2002 and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. 581 This Water Well Record was completed on (mo/day/year) SEPT 23, 2002 under the business name of CAYNE WESTERN by (signature) [Signature]

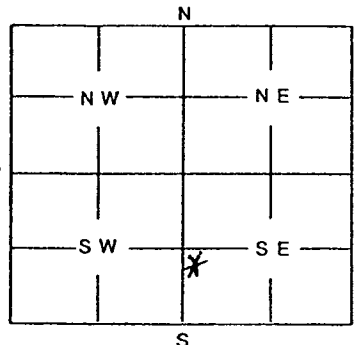
INSTRUCTIONS: Use typewriter or ball point pen. Please press firmly and print clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Bureau of Water, Topeka, Kansas 66620-0001. Telephone: 785/296-3565. Send one to Water Well Owner and retain one for your records.

1	LOCATION OF WATER WELL:	Fraction	Section Number	Township Number	Range Number
	County: <u>Geary</u>	<u>NW 1/4 SW 1/4 SE 1/4</u>	<u>27</u>	<u>11 S</u>	<u>5 E</u>

Distance and direction from nearest town or city street address of well if located within city?
EAST of MINKSAU FIELD Ave BASE

2	WATER WELL OWNER:	<u>Roger Thompson</u>	<u>Well R-1</u>
	RR #, St. Address, Box #:	<u>2100 Racetrack Rd.</u>	Board of Agriculture, Division of Water Resources
	City, State, ZIP Code :	<u>Junction City Ks 66441</u>	Application Number:

3	MARK WELL'S LOCATION WITH AN "X" IN SECTION BOX:	<u>40</u> ft												
	WELL'S STATIC WATER LEVEL <u>20</u> ft.													
	WELL WAS USED AS:													
	<table border="0"> <tr> <td>1 Domestic</td> <td>5 Public Water Supply</td> <td>9 Dewatering</td> </tr> <tr> <td>2 Irrigation</td> <td>6 Oil Field Water Supply</td> <td>10 Monitoring Well</td> </tr> <tr> <td>3 Feedlot</td> <td>7 Domestic (Lawn & Garden)</td> <td>11 Injection Well</td> </tr> <tr> <td>4 Industrial</td> <td>8 Air Conditioning</td> <td>12 Other <u>RECOVERY</u></td> </tr> </table>	1 Domestic	5 Public Water Supply	9 Dewatering	2 Irrigation	6 Oil Field Water Supply	10 Monitoring Well	3 Feedlot	7 Domestic (Lawn & Garden)	11 Injection Well	4 Industrial	8 Air Conditioning	12 Other <u>RECOVERY</u>	
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3 Feedlot	7 Domestic (Lawn & Garden)	11 Injection Well												
4 Industrial	8 Air Conditioning	12 Other <u>RECOVERY</u>												
	Was a chemical / bacteriological sample submitted to Department? Yes No <input checked="" type="checkbox"/>													
	If yes, mo/day/yr sample was submitted													
	Water Well Disinfected: Yes <input checked="" type="checkbox"/> No													



5	TYPE OF BLANK CASING USED:										
	<table border="0"> <tr> <td>1 Steel</td> <td>3 RMP (SR)</td> <td>5 Wrought</td> <td>7 Fiberglass</td> <td>9 Other (Specify below)</td> </tr> <tr> <td>2 PVC</td> <td>4 ABS</td> <td>6 Asbestos-Cement</td> <td>8 Concrete Tile</td> <td></td> </tr> </table>	1 Steel	3 RMP (SR)	5 Wrought	7 Fiberglass	9 Other (Specify below)	2 PVC	4 ABS	6 Asbestos-Cement	8 Concrete Tile	
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2 PVC	4 ABS	6 Asbestos-Cement	8 Concrete Tile								
	Blank casing diameter <u>5</u> in. Was casing pulled? Yes No <input checked="" type="checkbox"/> If yes, how much										
	Casing height above or below land surface <u>24</u> in.										

6	GROUT PLUG MATERIAL:	<input checked="" type="radio"/> Neat cement	2 Cement grout	3 Bentonite	4 Other																			
	Grout Plug Intervals:	From <u>40</u> ft. to <u>0</u> ft.,	From	to	From																			
	What is the nearest source of possible contamination:	<u>N/A</u>																						
	<table border="0"> <tr> <td>1 Septic tank</td> <td>6 Seepage pit</td> <td>11 Fuel storage</td> <td>16 Other (specify below)</td> </tr> <tr> <td>2 Sewer lines</td> <td>7 Pit privy</td> <td>12 Fertilizer storage</td> <td></td> </tr> <tr> <td>3 Watertight sewer lines</td> <td>8 Sewage lagoon</td> <td>13 Insecticide storage</td> <td></td> </tr> <tr> <td>4 Lateral lines</td> <td>9 Feedyard</td> <td>14 Abandoned water well</td> <td></td> </tr> <tr> <td>5 Cess Pool</td> <td>10 Livestock pens</td> <td>15 Oil well/Gas well</td> <td></td> </tr> </table>	1 Septic tank	6 Seepage pit	11 Fuel storage	16 Other (specify below)	2 Sewer lines	7 Pit privy	12 Fertilizer storage		3 Watertight sewer lines	8 Sewage lagoon	13 Insecticide storage		4 Lateral lines	9 Feedyard	14 Abandoned water well		5 Cess Pool	10 Livestock pens	15 Oil well/Gas well				
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	Direction from well?	How many feet?																						

FROM	TO	PLUGGING MATERIALS
<u>0</u>	<u>40</u>	<u>NEAT CEMENT</u>

7	CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was plugged under my jurisdiction and was completed on (mo/day/year) <u>SEPTEMBER 4, 2002</u> and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. <u>581</u> This Water Well Record was completed on (mo/day/year) <u>SEPT 23, 2002</u> under the business name of <u>LANE WESTER</u> by (signature) <u>[Signature]</u>
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INSTRUCTIONS: Use typewriter or ball point pen. Please press firmly and print clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Bureau of Water, Topeka, Kansas 66620-0001. Telephone: 785/296-3565. Send one to Water Well Owner and retain one for your records.

1	LOCATION OF WATER WELL: County: <u>SEARCY</u>	Fraction <u>NW 1/4 SW 1/4 SE 1/4</u>	Section Number <u>27</u>	Township Number <u>11 S</u>	Range Number <u>5E</u>
---	--------------------------------------------------	-----------------------------------------	-----------------------------	--------------------------------	---------------------------

Distance and direction from nearest town or city street address of well if located within city?
EAST OF MARSHALL FIELD AIR BASE

2	WATER WELL OWNER: RR #, St. Address, Box #: City, State, ZIP Code :	<u>Roger Thompson</u> <u>2100 Racetrack Rd.</u> <u>Junction City Ks 66441</u>	<u>Well R-2</u> Board of Agriculture, Division of Water Resources Application Number:
---	---------------------------------------------------------------------------	-------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------

3	MARK WELL'S LOCATION WITH AN "X" IN SECTION BOX:															
<table border="1"> <tr><td colspan="3">N</td></tr> <tr><td>NW</td><td></td><td>NE</td></tr> <tr><td>W</td><td></td><td>E</td></tr> <tr><td>SW</td><td>X</td><td>SE</td></tr> <tr><td colspan="3">S</td></tr> </table>		N			NW		NE	W		E	SW	X	SE	S		
N																
NW		NE														
W		E														
SW	X	SE														
S																

4	DEPTH OF WELL <u>38.50</u> ft												
	WELL'S STATIC WATER LEVEL <u>13.</u> ft.												
	WELL WAS USED AS:												
	<table border="0"> <tr> <td>1 Domestic</td> <td>5 Public Water Supply</td> <td>9 Dewatering</td> </tr> <tr> <td>2 Irrigation</td> <td>6 Oil Field Water Supply</td> <td>10 Monitoring Well</td> </tr> <tr> <td>3 Feedlot</td> <td>7 Domestic (Lawn & Garden)</td> <td>11 Injection Well</td> </tr> <tr> <td>4 Industrial</td> <td>8 Air Conditioning</td> <td>12 Other <u>RECOVERY</u></td> </tr> </table>	1 Domestic	5 Public Water Supply	9 Dewatering	2 Irrigation	6 Oil Field Water Supply	10 Monitoring Well	3 Feedlot	7 Domestic (Lawn & Garden)	11 Injection Well	4 Industrial	8 Air Conditioning	12 Other <u>RECOVERY</u>
1 Domestic	5 Public Water Supply	9 Dewatering											
2 Irrigation	6 Oil Field Water Supply	10 Monitoring Well											
3 Feedlot	7 Domestic (Lawn & Garden)	11 Injection Well											
4 Industrial	8 Air Conditioning	12 Other <u>RECOVERY</u>											
	Was a chemical / bacteriological sample submitted to Department? Yes No <input checked="" type="checkbox"/>												
	If yes, mo/day/yr sample was submitted												
	Water Well Disinfected: Yes <input checked="" type="checkbox"/> No												

5	TYPE OF BLANK CASING USED:										
	<table border="0"> <tr> <td>1 Steel</td> <td>3 RMP (SR)</td> <td>5 Wrought</td> <td>7 Fiberglass</td> <td>9 Other (Specify below)</td> </tr> <tr> <td>2 PVC</td> <td>4 ABS</td> <td>6 Asbestos-Cement</td> <td>8 Concrete Tile</td> <td></td> </tr> </table>	1 Steel	3 RMP (SR)	5 Wrought	7 Fiberglass	9 Other (Specify below)	2 PVC	4 ABS	6 Asbestos-Cement	8 Concrete Tile	
1 Steel	3 RMP (SR)	5 Wrought	7 Fiberglass	9 Other (Specify below)							
2 PVC	4 ABS	6 Asbestos-Cement	8 Concrete Tile								
	Blank casing diameter <u>5</u> in. Was casing pulled? Yes No <input checked="" type="checkbox"/> If yes, how much										
	Casing height above or below land surface <u>24</u> in.										

6	GROUT PLUG MATERIAL: <input checked="" type="radio"/> Neat cement 2 Cement grout 3 Bentonite 4 Other																				
	Grout Plug Intervals: From <u>38.50</u> ft. to <u>0</u> ft., From ft. to ft., From to ft.																				
	What is the nearest source of possible contamination: <u>N/A</u>																				
	<table border="0"> <tr> <td>1 Septic tank</td> <td>6 Seepage pit</td> <td>11 Fuel storage</td> <td>16 Other (specify below)</td> </tr> <tr> <td>2 Sewer lines</td> <td>7 Pit privy</td> <td>12 Fertilizer storage</td> <td></td> </tr> <tr> <td>3 Watertight sewer lines</td> <td>8 Sewage lagoon</td> <td>13 Insecticide storage</td> <td></td> </tr> <tr> <td>4 Lateral lines</td> <td>9 Feedyard</td> <td>14 Abandoned water well</td> <td></td> </tr> <tr> <td>5 Cess Pool</td> <td>10 Livestock pens</td> <td>15 Oil well/Gas well</td> <td></td> </tr> </table>	1 Septic tank	6 Seepage pit	11 Fuel storage	16 Other (specify below)	2 Sewer lines	7 Pit privy	12 Fertilizer storage		3 Watertight sewer lines	8 Sewage lagoon	13 Insecticide storage		4 Lateral lines	9 Feedyard	14 Abandoned water well		5 Cess Pool	10 Livestock pens	15 Oil well/Gas well	
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4 Lateral lines	9 Feedyard	14 Abandoned water well																			
5 Cess Pool	10 Livestock pens	15 Oil well/Gas well																			
	Direction from well? How many feet?																				

FROM	TO	PLUGGING MATERIALS
<u>0</u>	<u>38.50</u>	<u>NEAT CEMENT</u>

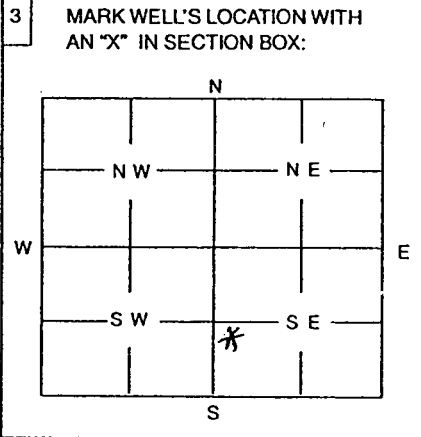
7	CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was plugged under my jurisdiction and was completed on (mo/day/year) <u>SEPTEMBER 10, 2002</u> and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. <u>581</u> This Water Well Record was completed on (mo/day/year) <u>SEPT. 23, 2002</u> under the business name of <u>LAYNE WESTERN</u> by (signature) <u>[Signature]</u>
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INSTRUCTIONS: Use typewriter or ball point pen. Please press firmly and print clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Bureau of Water, Topeka, Kansas 66620-0001. Telephone: 785/296-3565. Send one to Water Well Owner and retain one for your records.

1	LOCATION OF WATER WELL: County: <u>SEASKY</u>	Fraction <u>NW 1/4 SW 1/4 SE 1/4</u>	Section Number <u>27</u>	Township Number <u>11 S</u>	Range Number <u>SE</u>
---	--------------------------------------------------	-----------------------------------------	-----------------------------	--------------------------------	---------------------------

Distance and direction from nearest town or city street address of well if located within city?
EAST OF MARSHALL FIELD AIR BASE

2	WATER WELL OWNER: RR #, St. Address, Box #: City, State, ZIP Code :	<u>Roger Thompson</u> <u>2100 Racetrack Rd.</u> <u>Junction city Ks 66441</u>	<u>Well R-3</u> Board of Agriculture, Division of Water Resources Application Number:
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4 DEPTH OF WELL 29 ft
WELL'S STATIC WATER LEVEL 13 ft.

WELL WAS USED AS:

1 Domestic	5 Public Water Supply	9 Dewatering
2 Irrigation	6 Oil Field Water Supply	10 Monitoring Well
3 Feedlot	7 Domestic (Lawn & Garden)	11 Injection Well
4 Industrial	8 Air Conditioning	12 Other <u>RECOVERY</u>

Was a chemical / bacteriological sample submitted to Department? Yes No

If yes, mo/day/yr sample was submitted

Water Well Disinfected: Yes No

5 TYPE OF BLANK CASING USED:

1 Steel	3 RMP (SR)	5 Wrought	7 Fiberglass	9 Other (Specify below)
<input checked="" type="radio"/> PVC	4 ABS	6 Asbestos-Cement	8 Concrete Tile	

Blank casing diameter 5 in. Was casing pulled? Yes No If yes, how much

Casing height above or below land surface 24 in.

6 GROUT PLUG MATERIAL: Neat cement 2 Cement grout 3 Bentonite 4 Other

Grout Plug Intervals: From 29 ft. to 0 ft., From ft. to ft., From to ft.

What is the nearest source of possible contamination: N/A

1 Septic tank	6 Seepage pit	11 Fuel storage	16 Other (specify below)
2 Sewer lines	7 Pit privy	12 Fertilizer storage	
3 Watertight sewer lines	8 Sewage lagoon	13 Insecticide storage	
4 Lateral lines	9 Feedyard	14 Abandoned water well	
5 Cess Pool	10 Livestock pens	15 Oil well/Gas well	

Direction from well? How many feet?

FROM	TO	PLUGGING MATERIALS
<u>0</u>	<u>29</u>	<u>NEAT CEMENT</u>

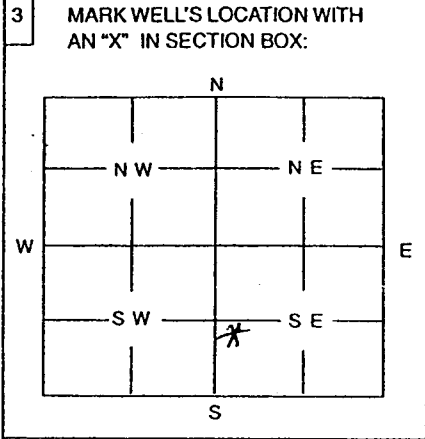
7 CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was plugged under my jurisdiction and was completed on (mo/day/year) SEPTEMBER 10, 2002 and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. 581 This Water Well Record was completed on (mo/day/year) SEP 23, 2002 under the business name of LAINE WESTERN by (signature) [Signature]

INSTRUCTIONS: Use typewriter or ball point pen. Please press firmly and print clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Bureau of Water, Topeka, Kansas 66620-0001. Telephone: 785/296-3565. Send one to Water Well Owner and retain one for your records.

1	LOCATION OF WATER WELL:	Fraction	Section Number	Township Number	Range Number
	County: <u>GOODY</u>	<u>NW 1/4 SW 1/4 SE 1/4</u>	<u>27</u>	<u>11 S</u>	<u>5 E</u>

Distance and direction from nearest town or city street address of well if located within city?
EAST of MARSHALL FIELD AIR BASE

2	WATER WELL OWNER:	<u>Roger Thompson</u>	<u>Well No. R-4</u>
	RR #, St. Address, Box #:	<u>2100 Racetrack Rd.</u>	Board of Agriculture, Division of Water Resources
	City, State, ZIP Code :	<u>Junction City Ks 66441</u>	Application Number:



4	DEPTH OF WELL	<u>68</u> ft	
	WELL'S STATIC WATER LEVEL	<u>21</u> ft	
	WELL WAS USED AS:		
	1 Domestic	5 Public Water Supply	9 Dewatering
	2 Irrigation	6 Oil Field Water Supply	10 Monitoring Well
	3 Feedlot	7 Domestic (Lawn & Garden)	11 Injection Well
	4 Industrial	8 Air Conditioning	12 Other <u>RECOVERY</u>
	Was a chemical / bacteriological sample submitted to Department?	Yes No <input checked="" type="checkbox"/>	
	If yes, mo/day/yr sample was submitted	
	Water Well Disinfected:	Yes <input checked="" type="checkbox"/> No	

5	TYPE OF BLANK CASING USED:
	1 Steel 3 RMP (SR) 5 Wrought 7 Fiberglass 9 Other (Specify below)
	<u>2</u> PVC 4 ABS 6 Asbestos-Cement 8 Concrete Tile
	Blank casing diameter: <u>1 1/4</u> in. Was casing pulled? Yes No <input checked="" type="checkbox"/> If yes, how much
	Casing height above or below land surface: <u>28</u> in.

6	GROUT PLUG MATERIAL:	<u>1</u> Neat cement 2 Cement grout 3 Bentonite 4 Other		
	Grout Plug Intervals:	From <u>68</u> ft. to <u>0</u> ft., From ft. to ft., From to ft.		
	What is the nearest source of possible contamination:	<u>N/A</u>		
	1 Septic tank	6 Seepage pit	11 Fuel storage	16 Other (specify below)
	2 Sewer lines	7 Pit privy	12 Fertilizer storage	
	3 Watertight sewer lines	8 Sewage lagoon	13 Insecticide storage	
	4 Lateral lines	9 Feedyard	14 Abandoned water well	
	5 Cess Pool	10 Livestock pens	15 Oil well/Gas well	
	Direction from well?	How many feet?		

FROM	TO	PLUGGING MATERIALS
<u>0</u>	<u>68</u>	<u>NEAT CEMENT</u>

7	CONTRACTOR'S OR LANDOWNER'S CERTIFICATION:	This water well was plugged under my jurisdiction and was completed on (mo/day/year) <u>SEPTEMBER 10, 2002</u> and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. <u>581</u> This Water Well Record was completed on (mo/day/year) <u>SEPT 13, 2002</u> under the business name of <u>CAYNE WESTERN</u> by (signature) <u>[Signature]</u>
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Appendix 5: Photographic Log

Photographic Record

Site Name: Ft. Riley Alternate Water Supply
Contract Number: DACW41-95-D-0022
Site Location: Ft. Riley, Junction City, KS
Delivery Order #: 0012
Bay West, Inc. Job #: J970236

Photographer: Phil Dula
Date/Time: 12/17/01
Direction: SE

No.: 1

Description: Existing truck water fill station prior to construction. This structure was removed and replaced.



Photographic Record

Site Name: Ft. Riley Alternate Water Supply
Contract Number: DACW41-95-D-0022
Site Location: Ft. Riley, Junction City, KS
Delivery Order #: 0012
Bay West, Inc. Job #: J970236

Photographer: Keith Ellis
Date/Time: 10/13/02
Direction: N

No.: 2

Description: Replacement water truck fill station with 10 x 20 concrete pad and lighting.



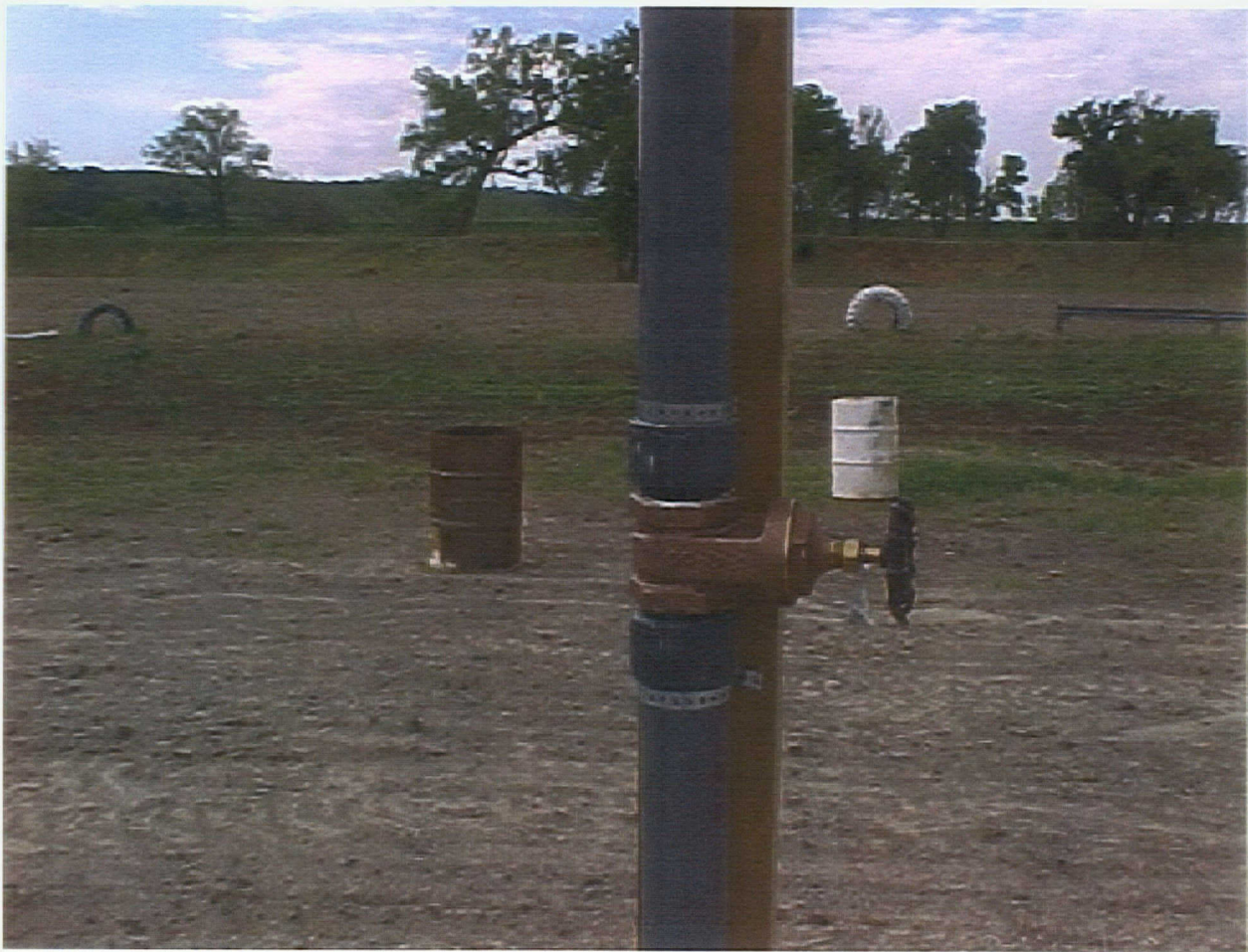
Photographic Record

Site Name: Ft. Riley Alternate Water Supply
Contract Number: DACW41-95-D-0022
Site Location: Ft. Riley, Junction City, KS
Delivery Order #: 0012
Bay West, Inc. Job #: J970236

Photographer: Keith Ellis
Date/Time: 10/13/02
Direction: S

No.: 3

Description: New water truck fill station detail of 3" valve.



Photographic Record

Site Name: Ft. Riley Alternate Water Supply
Contract Number: DACW41-95-D-0022
Site Location: Ft. Riley, Junction City, KS
Delivery Order #: 0012
Bay West, Inc. Job #: J970236

Photographer: Keith Ellis
Date/Time: 7/24/02
Direction: NA

No.: 4

Description: Existing conditions of plumbing fixtures in the pit area restrooms.



Photographic Record

Site Name: Ft. Riley Alternate Water Supply
Contract Number: DACW41-95-D-0022
Site Location: Ft. Riley, Junction City, KS
Delivery Order #: 0012
Bay West, Inc. Job #: J970236

Photographer: Keith Ellis
Date/Time: 7/24/02
Direction: NA

No.: 5

Description: Existing conditions of plumbing fixtures in the pit area restrooms.



Photographic Record

Site Name: Ft. Riley Alternate Water Supply
Contract Number: DACW41-95-D-0022
Site Location: Ft. Riley, Junction City, KS
Delivery Order #: 0012
Bay West, Inc. Job #: J970236

Photographer: Keith Ellis
Date/Time: 7/24/02
Direction: NA

No.: 6

Description: Existing conditions of plumbing fixtures in the pit area restrooms



Photographic Record

Site Name: Ft. Riley Alternate Water Supply
Contract Number: DACW41-95-D-0022
Site Location: Ft. Riley, Junction City, KS
Delivery Order #: 0012
Bay West, Inc. Job #: J970236

Photographer: Keith Ellis
Date/Time: 8/17/02
Direction: E

No.: 7

Description: Removed piping from exterior of pit area restrooms. Piping terminated approximately 6 feet from vault box and did not serve as supply line to grandstand area as assumed in USACE design.



Photographic Record

Site Name: Ft. Riley Alternate Water Supply
Contract Number: DACW41-95-D-0022
Site Location: Ft. Riley, Junction City, KS
Delivery Order #: 0012
Bay West, Inc. Job #: J970236

Photographer: Keith Ellis
Date/Time: 8/17/02
Direction: NA

No.: 8

Description: Close-up of waterline believed to have supplied water to grandstand area (photo 6).



Photographic Record

Site Name: Ft. Riley Alternate Water Supply
Contract Number: DACW41-95-D-0022
Site Location: Ft. Riley, Junction City, KS
Delivery Order #: 0012
Bay West, Inc. Job #: J970236

Photographer: Keith Ellis
Date/Time: 12/17/02
Direction: NW

No.: 9

Description: Plaza Speedway parking lot area concession stand building prior to initiating construction activities.



Photographic Record

Site Name: Ft. Riley Alternate Water Supply
Contract Number: DACW41-95-D-0022
Site Location: Ft. Riley, Junction City, KS
Delivery Order #: 0012
Bay West, Inc. Job #: J970236

Photographer: Keith Ellis
Date/Time: 10/22/02
Direction: W

No.: 10

Description: Installed 3 Phase wire and 480V/transformers for R-1 well (new pole)



Photographic Record

Site Name: Ft. Riley Alternate Water Supply
Contract Number: DACW41-95-D-0022
Site Location: Ft. Riley, Junction City, KS
Delivery Order #: 0012
Bay West, Inc. Job #: J970236

Photographer: Keith Ellis
Date/Time: 10/22/02
Direction: NW

No.: 11

Description: Completed racetrack replacement well & control panel with protective poles



Photographic Record

Site Name: Ft. Riley Alternate Water Supply
Contract Number: DACW41-95-D-0022
Site Location: Ft. Riley, Junction City, KS
Delivery Order #: 0012
Bay West, Inc. Job #: J970236

Photographer: Keith Ellis
Date/Time: 10/22/02
Direction: E

No.: 12

Description: Racetrack replacement well & control panel. Located in parking area.



Photographic Record

Site Name: Ft. Riley Alternate Water Supply
Contract Number: DACW41-95-D-0022
Site Location: Ft. Riley, Junction City, KS
Delivery Order #: 0012
Bay West, Inc. Job #: J970236

Photographer: Keith Ellis
Date/Time: 10/22/02
Direction: SE

No.: 13

Description: Power cut-off for racetrack replacement well and meter.



Photographic Record

Site Name: Ft. Riley Alternate Water Supply
Contract Number: DACW41-95-D-0022
Site Location: Ft. Riley, Junction City, KS
Delivery Order #: 0012
Bay West, Inc. Job #: J970236

Photographer: Keith Ellis
Date/Time: 8/28/02
Direction: NA

No.: 14

Description: Installed vault and piping servicing parking lot area building.



Photographic Record

Site Name: Ft. Riley Alternate Water Supply
Contract Number: DACW41-95-D-0022
Site Location: Ft. Riley, Junction City, KS
Delivery Order #: 0012
Bay West, Inc. Job #: J970236

Photographer: Keith Ellis
Date/Time: 8/28/02
Direction: NA

No.: 15

Description: Vault for water connection and drain valves with cover for parking area building.



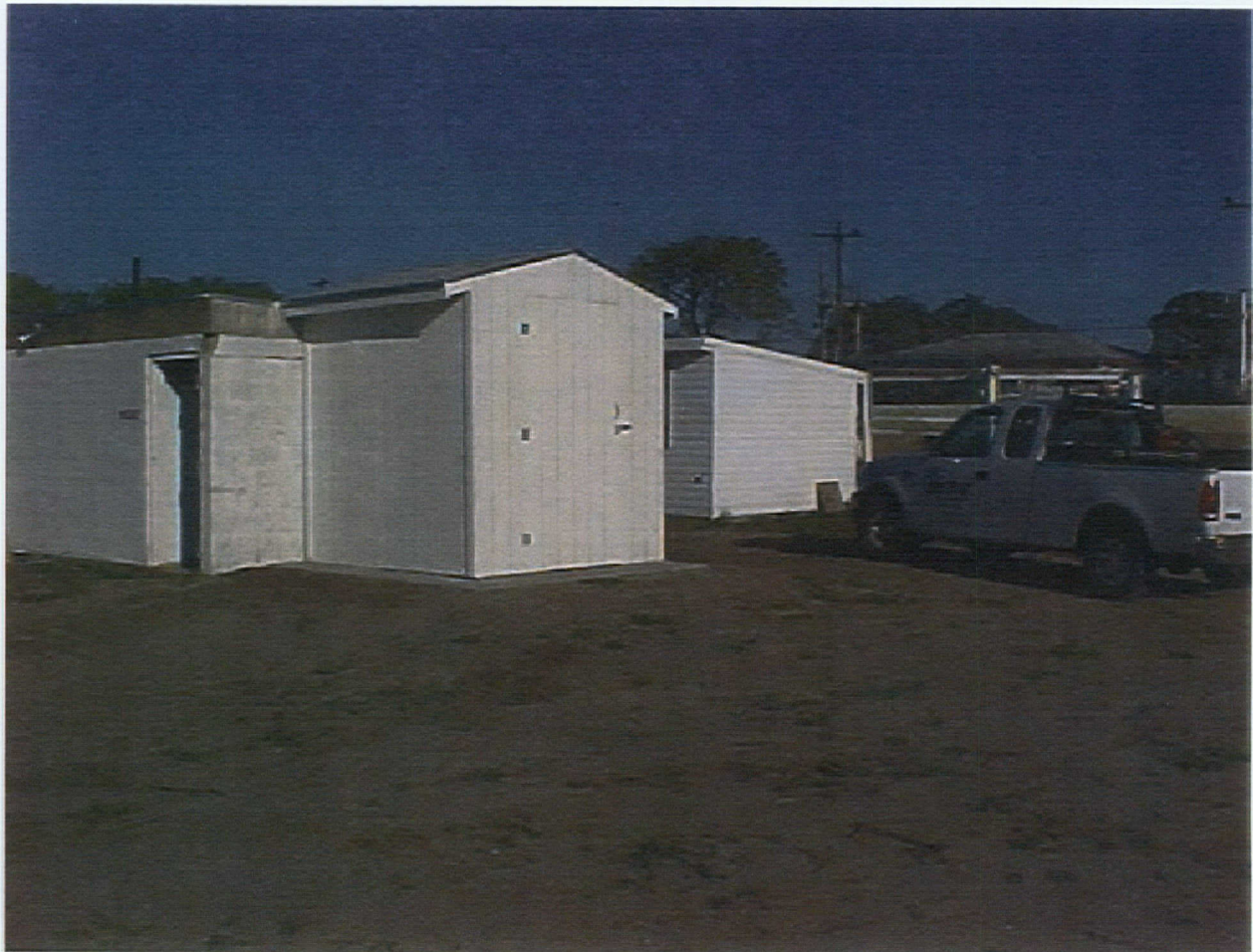
Photographic Record

Site Name: Ft. Riley Alternate Water Supply
Contract Number: DACW41-95-D-0022
Site Location: Ft. Riley, Junction City, KS
Delivery Order #: 0012
Bay West, Inc. Job #: J970236

Photographer: Keith Ellis
Date/Time: 9/13/02
Direction: N

No.: 16

Description: Hydropneumatic tank building constructed adjacent to pit area restrooms.



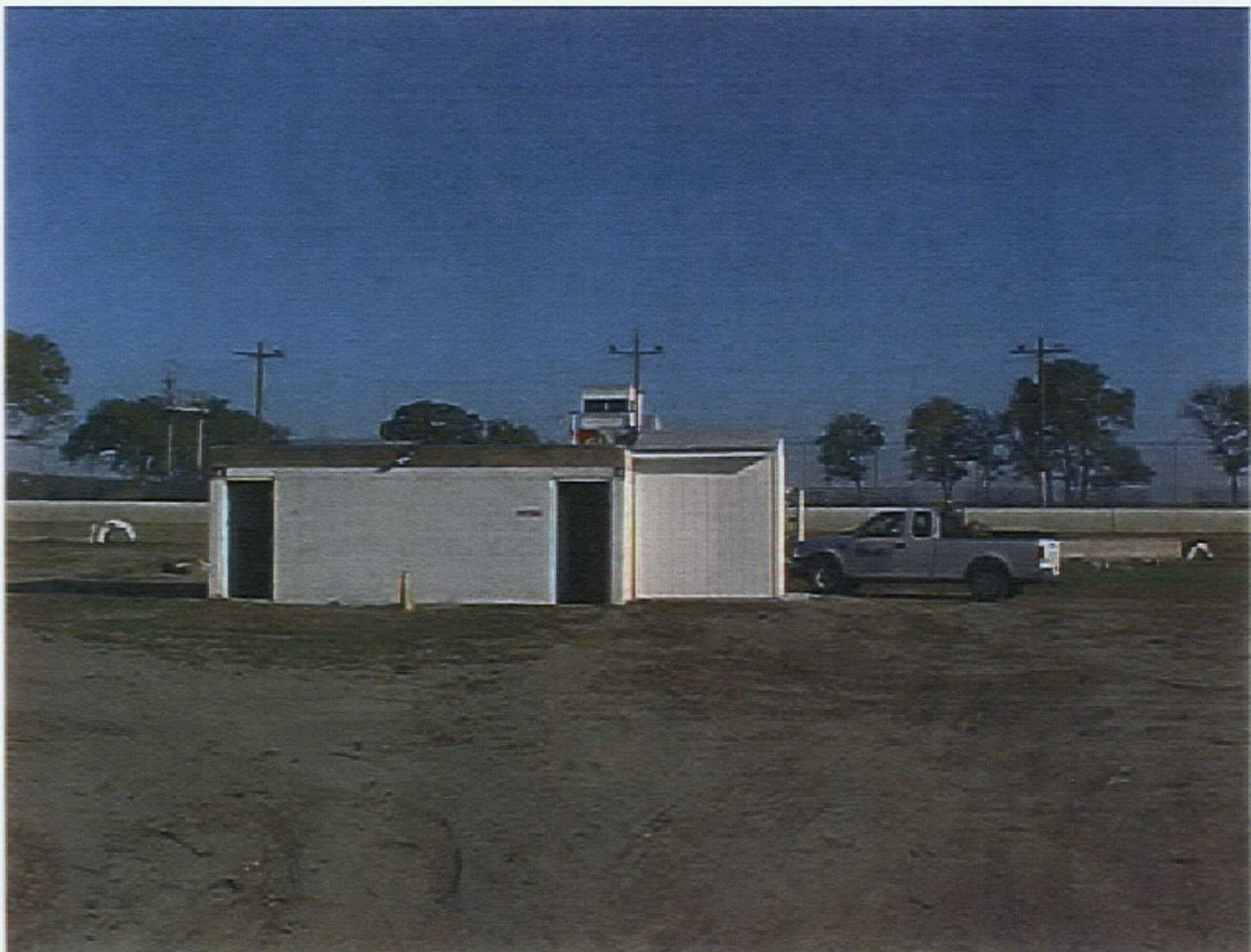
Photographic Record

Site Name: Ft. Riley Alternate Water Supply
Contract Number: DACW41-95-D-0022
Site Location: Ft. Riley, Junction City, KS
Delivery Order #: 0012
Bay West, Inc. Job #: J970236

Photographer: Keith Ellis
Date/Time: 9/13/02
Direction: NE

No.: 17

Description: View of pit area restrooms with completed hydropneumatic tank building.



Photographic Record

Site Name: Ft. Riley Alternate Water Supply
Contract Number: DACW41-95-D-0022
Site Location: Ft. Riley, Junction City, KS
Delivery Order #: 0012
Bay West, Inc. Job #: J970236

Photographer: Keith Ellis
Date/Time: 9-13-02
Direction: W

No.: 18
Description: 528 gallon hydropneumatic pressure tank.



Photographic Record

Site Name: Ft. Riley Alternate Water Supply
Contract Number: DACW41-95-D-0022
Site Location: Ft. Riley, Junction City, KS
Delivery Order #: 0012
Bay West, Inc. Job #: J970236

Photographer: Keith Ellis
Date/Time: 9/13/02
Direction: NA

No.: 19
Description: Vault in hydropneumatic tank building.



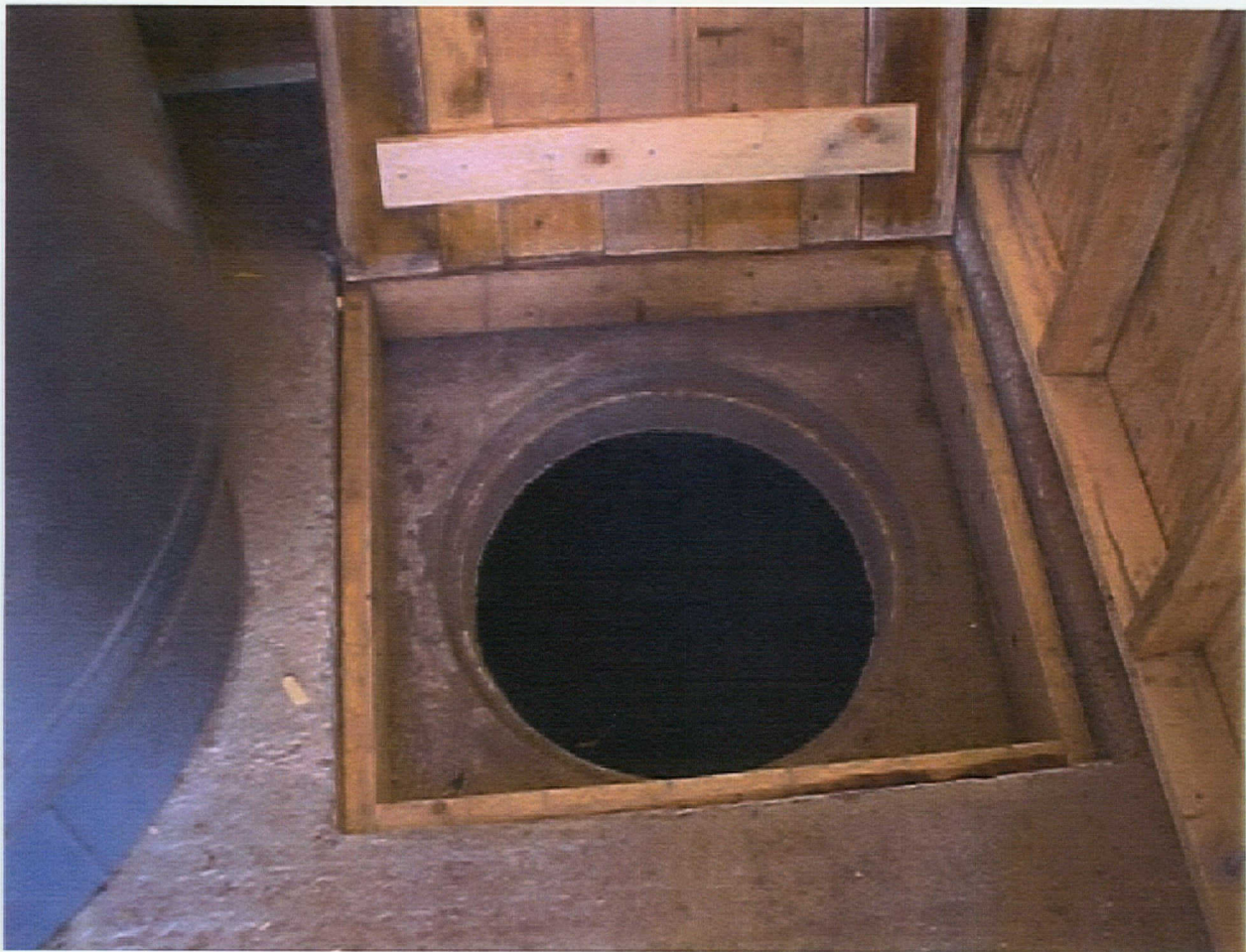
Photographic Record

Site Name: Ft. Riley Alternate Water Supply
Contract Number: DACW41-95-D-0022
Site Location: Ft. Riley, Junction City, KS
Delivery Order #: 0012
Bay West, Inc. Job #: J970236

Photographer: Keith Ellis
Date/Time: 9/13/02
Direction: NA

No.: 20

Description: Vault entrance for access to subsurface piping and drain valves at hydropneumatic tank building.



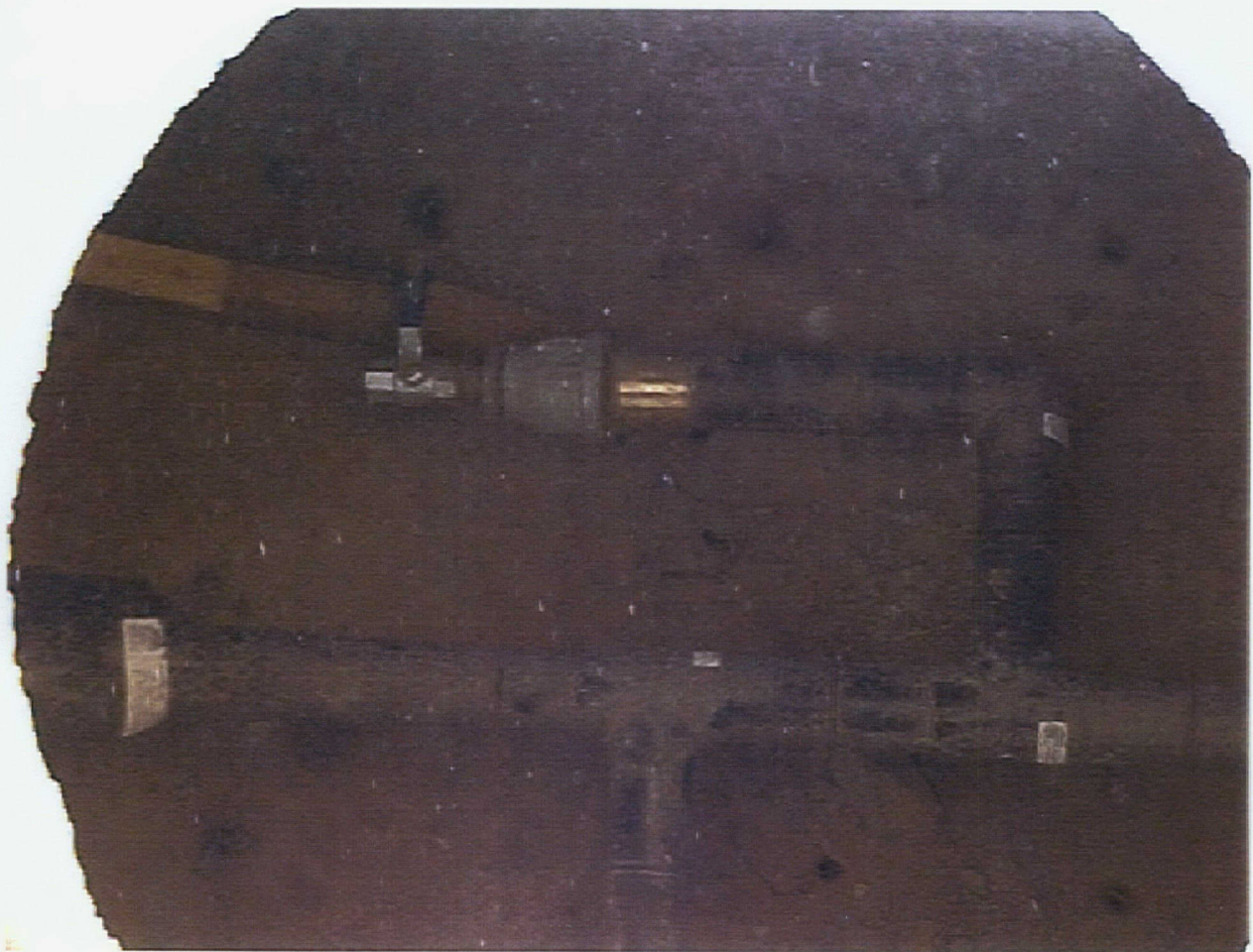
Photographic Record

Site Name: Ft. Riley Alternate Water Supply
Contract Number: DACW41-95-D-0022
Site Location: Ft. Riley, Junction City, KS
Delivery Order #: 0012
Bay West, Inc. Job #: J970236

Photographer: Keith Ellis
Date/Time: 9/13/02
Direction: NA

No.: 21

Description: View of pipe junction in vault with ball valve for draining system at hydropneumatic tank building.



Photographic Record

Site Name: Ft. Riley Alternate Water Supply
Contract Number: DACW41-95-D-0022
Site Location: Ft. Riley, Junction City, KS
Delivery Order #: 0012
Bay West, Inc. Job #: J970236

Photographer: Keith Ellis
Date/Time: 9/13/02
Direction: W

No.: 22

Description: View of interior 2" piping to hydropneumatic tank.



Photographic Record

Site Name: Ft. Riley Alternate Water Supply
Contract Number: DACW41-95-D-0022
Site Location: Ft. Riley, Junction City, KS
Delivery Order #: 0012
Bay West, Inc. Job #: J970236

Photographer: Keith Ellis
Date/Time: 9/13/02
Direction: NA

No.: 23

Description: Pressure gauge and switch for hydropneumatic tank.



Photographic Record

Site Name: Ft. Riley Alternate Water Supply
Contract Number: DACW41-95-D-0022
Site Location: Ft. Riley, Junction City, KS
Delivery Order #: 0012
Bay West, Inc. Job #: J970236

Photographer: Keith Ellis
Date/Time: 10/22/02
Direction: W

No.: 24

Description: Installed vault to shut off valve for grand stand area concession building.



Appendix 6: Electronic Deliverables

- **Site Photos**
- **As Built –CADD File**