TEXAS WATER 2018

WALTER CHIANG MAINTENANCE EVENT

2018 KSB Pump Maintenance Event (Revised 1/22/2018)

General Notes:

The pump servicing table shall be able to hold 250 lbs. at a minimum (pump weight approx. 230 lbs.)

If you are using the KSB Pump and Pump Station and have the water level at the minimum water level the unit will weigh approximately 2,225 lbs. The pump station is on 4 wheels thus the entire load is being carried by those 4 wheels. The floor loading where your event will take place needs to be able to handle the point loading of 560 lbs. per wheel at a minimum.

If you are using the KSB Pump, Pump Station, and control panel the water level in the tank must be a minimum of 25 inches, there is an indicator bar to let you know the minimum water level in the tank. If this minimum is not adhered to you will damage the pump. If you are using your own Pump, Pump Station, or control panel you need to ensure you are not running the pump dry or you will damage the pump. The tank can be any shape, size, or volume as long as the following criteria are met:

- **Pump Must be a minimum of 3" away from the inner tank wall**
- **The water level must be no less than 25" at all times**
- **The piping discharge needs to be parallel with the pump suction on this small of a scale.**

There are different units for power purposes:

460 volt unit must have 460 volt 3 phase power to run the unit; otherwise there will be damage to the KSB control panel and the KSB pump.

230 volt unit can utilize a 110 volt power source and you can run the pump and control panel. The unit must be plugged into an outlet with a minimum 15 Amp Breaker.

Moving forward all revisions to this document will be highlighted here.

Introduction:

The purpose of this event is to test the skills of a maintenance team to respond to trouble at a sanitary sewer lift station that has resulted in an alarm.

Premise:

A pump trouble alarm was received via the SCADA system at the Operations Control Center. A crew has been dispatched to troubleshoot the alarm. The teams will need to troubleshoot the

electrical control panel, troubleshoot and perform routine maintenance on the KSB submersible pump, and restore the pump station to normal operating condition.

You will have a 5 minute setup time for this event. You may move things on the table as you desire and set up the tool box as you desire. However all the tools in the tool box must start in the tool box and all tools/equipment on the table must start on the table. The only items that may be moved or touched during the 5 minute setup are the tool box, tools, and equipment on the starting table. The hoist, trolley, and gantry may be situated during the 5 minute setup however all pins must remain in. Hoist, trolley, and gantry must start and finish in the designated marked areas.

Tasks:

1) Troubleshoot Control Panel (Note: This must be done prior to locking out pump station)
    a. Go to the Voltage Test Station and confirm that the power voltage lights on the visible test point are lit up red.
    b. Communicate out loud “Voltage present at Pump Station”
    c. Open the door to the Voltage Test Station
    d. Use the multimeter to begin troubleshooting utilizing the voltage test points on the voltage test station.
        i. Power on the multimeter
        ii. Turn to AC
        iii. Use the multimeter to conduct the following tests. The tests are performed by putting the multimeter probes in the correct test point. The probes must be fully inserted into the test point. Be very careful while doing this testing to not touch the metal on the probes while they are in contact with the test points as they will be measuring live voltage and they will shock and/or harm you.
            1. Ground to Leg 1 Communicate out load “Ground to Leg 1 Voltage Ok”
            2. Ground to Leg 2 Communicate out load “Ground to Leg 2 Voltage OK”
            3. Ground to Leg 3 Communicate out load “Ground to Leg 3 Voltage OK”
            4. Leg 1 to Leg 2 Communicate out load “Leg 1 to Leg 2 Voltage OK”
            5. Leg 1 to Leg 3 Communicate out load “Leg 1 to Leg 3 Voltage OK”
            6. Leg 2 to Leg 3 Communicate out load “Leg 2 to Leg 3 Voltage OK”
    e. Once all six tests have been completed, close and latch the door to the Voltage Test Station and communicate out loud, “All voltage verified good”.
2) Lock out and tag out the pump station
    a. On lift station control panel, turn Pump 1 switch and Pump 2 switch to “Off” position.

b. Put the Pump 1 and Pump 2 Disconnects in the "Off" position
c. Put the Main Disconnect in the "Off" position
d. The Safety Supervisor must install a gang hasp, lock, and tag on the breaker switch. After the Safety Supervisor's lock has been installed, all remaining team members can lock out as necessary.
e. The Safety Supervisor must write the date and their initials on the label on the tag with the sharpie marker. It must be legible.
f. Once "A" through "E" above has been completed check Pump 1 for operation by turning the Hand-Off-Auto (HOA) switch to "Hand" to ensure that power has been locked out. Return the switch to the "Off" position.
g. Communicate out loud "Pump 1 locked out."
h. Once "A" through "E" above has been completed check Pump 2 for operation by turning the Hand-Off-Auto (HOA) switch to "Hand" to ensure that power has been locked out. Return the switch to the "Off" position.
i. Communicate out loud "Pump 2 locked out."

3) Close and Lock out 3" gate valve on pump discharge
   a. Task 2 must be complete prior to starting Task 3. Individuals must be locked out on the control panel prior to touching the valve to close it, install bonnet, or gang hasp.
   b. Close the 3" force main discharge gate valve at the pump station.
   c. Place red plastic lock out bonnet on the 3" gate valve hand wheel.
   d. The 3" lock out bonnet must be locked out with a gang hasp, lock, and tag.
   e. The Safety Supervisor must write their initials and date on the tag with the dry erase marker. It must be legible.
   f. Verify that the pump has stopped pumping water and valve is closed; communicate out loud "Valve is closed".
   g. After the Safety Supervisor's lock has been installed, all remaining team members can lock out as necessary.
4) Arc Flash Verification
   a. Go to the Voltage Test Station and confirm that there are No Lights on in the Power Display.
   b. Communicate out loud "Power confirmed secure"
   c. Open the door to the Voltage Test Station
   d. Using the multimeter conduct the following tests to confirm that no power is present and there is no arc flash concern. The tests are performed by putting the multimeter probes in the correct test point. Fully insert the probes into the test points.
      i. Ground to Leg 1 Communicate out load "Ground to Leg 1 Clear"
      ii. Ground to Leg 2 Communicate out load "Ground to Leg 2 Clear"

iii. Ground to Leg 3 Communicate out load “Ground to Leg 3 Clear”
iv. Leg 1 to Leg 2 Communicate out load “Leg 1 to Leg 2 Clear”
v. Leg 1 to Leg 3 Communicate out load “Leg 1 to Leg 3 Clear”
vi. Leg 2 to Leg 3 Communicate out load “Leg 2 to Leg 3 Clear”

e. Once all six tests have been completed, close and latch the door to the Voltage Test Station and communicate out loud, “All voltage is secured and no arc flash danger present”.

5) Control Panel Work
   a. Open the control panel (NOTE: Tasks 1 through 4 must be completed prior to opening the panel)
   b. Trip the breakers for each fuse
   c. Remove each fuse
   d. Using the multimeter check each fuse for continuity
   e. Reinstall each fuse, replacing any blown fuses with new working fuses. NOTE: You must check any replacement fuses for continuity as well to ensure they are good.
   f. Close the control panel.
   g. The multimeter must be turned to the off position and the remaining fuses must be placed back in the fuse box prior to the end of the event.
   h. Note: If you do not perform the continuity tests at the panel or directly in front of the fuse panel you must close the panel and lock at least one of the locks on the door.
6) Assemble Reid Gantry unit
   a. Reid Rapide gantry will start fully folded and retracted, with all pins in place. Team member(s) will remove pins, rotate each end support up and over to the underside of the gantry and pin in the proper locations. The legs on each end will also need to be unpinned, angled out and pinned in the proper locations. The gantry height will also need to be fully extended so that both riser bottoms are flush with the cross support on each leg. Ensure both bolts are installed on each end of the gantry. It does not matter which 2 of the 3 holes are used for the bolts when assembling the gantry.
   b. Install trolley and chain hoist on gantry. Trolley shall be installed in one of the three center holes of the gantry unit.
   c. Install chain hoist on trolley.
   d. Position gantry over the wet well, using a minimum of 2 people.
   e. Once in place lock the gantry wheels.
7) Pump Removal
   a. Once gantry wheels are locked connect the pump to the chain hoist.
   b. Using the chain hoist, remove the pump from the wet well.

c. Once the pump is raised to the desired level, you may unlock the gantry wheels. NOTE: The gantry wheels MUST be locked while the pump is being raised at all times.
d. You may now move the gantry with pump attached to the pump service table, using a minimum of 3 people. One person must be in contact with each end of the gantry and another person must be holding on to the pump to eliminate excessive swinging of the pump.

8) Pump Servicing
   a. Once in position over the pump service table lock the gantry wheels.
   b. Once the gantry wheels are locked, use the chain hoist to lower the pump to the pump service table.
   c. No tool may be in contact with the pump while it is being lowered or raised.
   d. For pump servicing you may place pump on its side or stand it back upright manually provided the pump remains in contact with the table at all times. You may not manually lift or move the pump in a manner that causes the pump to lose contact with the table.
   e. You may use the gantry and hoist to lay the pump on its side or stand it back upright if you so desire. If you need to move the pump in such a manner that it will lose contact with the table you MUST use the gantry and hoist.
   f. Remove the 10 mm volute hex socket bolts.
   g. Once the volute bolts are removed you must use the gantry and hoist to lift the pump out of the volute and lower the pump back down to the table. While lifting the pump out of the volute using the chain hoist you must use the dead blow hammer and/or the crowbar to help separate the volute from the pump, the pump shall not be lifted any higher than 2 inches off the table to separate the volute and pump using the dead blow hammer and/or the crowbar. Note: Do not place any tools, hands, fingers underneath the pump while performing this action as they will get damaged or hurt when the volute drops.
   h. Once the pump is back down on the table you may disconnect the hoist.
   i. Remove the 6 mm impeller hex socket bolt. You must use the dead blow hammer to block the impeller when removing this bolt. The individuals handling the impeller at any time must be wearing leather gloves.
   j. To remove the impeller, utilize the 8 mm impeller jacking bolt by threading it into the shaft (where the 6 mm impeller hex socket bolt was) and tighten it until the impeller is released and can be safely removed.
   k. Clean the intermediate casing/wear plate using the wire brush, by making 3 passes in a circular motion around the wear plate.

l. Install new F-Max Impeller and 6 mm hex socket bolt and torque to 35 ft. lbs. (47 Nm). Use Loctite (simulate) on the impeller bolt prior to inserting bolt. Communicate out loud "Loctite applied to impeller bolt". Use the dead blow hammer to block the impeller when torqueing. Be sure to use the correct torque wrench.
m. Using gantry and chain hoist lift pump back into volute housing.
n. Reinstall 10 mm volute hex socket bolts and torque to 40 ft. lbs. (54 Nm) in a crisscross pattern. Be sure to use the correct torque wrench.

9) Volute servicing
   a. Remove the guide claw by removing the four 24 mm bolts, nuts, and washers using the 24 mm socket and/or 24 mm combination wrench.
   b. Install rubber gasket/seal into the new guide claw.
   c. Install new guide claw and the four new 24 mm bolts, nuts, and washers using the 24 mm socket and/or 24 mm combination wrench. The nuts shall be tightened with a wrench or ratchet sufficient enough to prevent removal of nuts without the use of a wrench or ratchet.
   d. Install the old 24 mm bolts, nuts and washers back on the old guide claw, nuts must be on the guide claw studs and are to at least be flush with the bolt.

10) Wet well servicing
   a. Remove the two 9/16" bolts with washer, lock washer, and nut from the guide rail flange. Be careful to not drop any tools, bolts, washers, or nuts in the wet well. If you do drop them in the wet well, you will have to use the provided magnet and rope to retrieve from the wet well.
   b. Once the bolts in step A have been removed then you can remove the flange and both of the 2"stainless steel guide rails from the wet well.
   c. Remove the 9/16" nut on the guide rail flange to loosen the rubber compression fittings from each rail so you can remove the guide rails. Install new rubber compression fittings and new 2" stainless steel guide rails on the guide rail flange. Rubber compression fittings shall be tight enough that the rail does not slide up and down. You can now install the guide rail and flange back in the wet well. You will reuse the same 9/16" bolt, washer, lock washer, and nut to attach the flange to the cross member in the wet well. Ensure the standard washer is on the bolt head side and the lock washer is on the nut side. These shall be tight enough that there is no gap between the flange bracket and the cross member and they cannot be turned by hand.

11) Returning pump to service
   a. Once the Pump servicing, volute servicing, and wet well servicing have been completed you can return the pump to service.

b. Place the gantry over the pump servicing table and lock the wheels. The wheels must be locked prior to connecting the pump to the hoist.
c. Once wheels are locked, connect the pump to the hoist. Using the hoist raise the pump to the desired level.
d. Once the pump is raised to the desired level you may unlock the wheels. NOTE: At no time can the pump be raised or lowered using the hoist with the wheels unlocked.
e. You may now move the gantry with pump attached to the wet well, using a minimum of 3 people. One person must be in contact with each end of the gantry and another person must be holding on to the pump to eliminate excessive swinging of the pump.
f. Once into position over the wet well lock the wheels and begin lowering the pump using the chain hoist. You will need to guide the pump onto the guide rails.
g. Ensure you are lowering the pump in such a manner and angle that the volute seal/gasket is seated properly in the elbow and not pulled out.
h. Once pump is lowered into the correct place you may disconnect the hoist from the pump.
i. Once the pump is disconnected from the hoist you may unlock the gantry wheels.

12) Disassemble Reid Gantry Unit
a. Remove trolley and chain hoist.
b. After removal reinsert pins in the trolley just as it was during the start of the event.
c. Lower gantry to the proper level with two holes visible at the bottom and reinstall bolts hand tight. Bolts shall be installed in the top and bottom holes leaving the middle one open. The black nuts shall be installed facing outward from the gantry with the bolt head facing inward.
d. Reinstall all pins in gantry and trolley.
e. Fold Gantry up and return to starting position.
f. Trolley, Hoist and Gantry shall be in their initial starting position at the end of the event, and within the marked boxes. Touching the tape marks or over the tape marks is not acceptable.

13) Return 3” Gate Valve Back to Service
a. Remove locks, gang hasp, tags, and valve bonnet.
b. Fully open 3” gate valve.
c. Communicate out loud “Gate Valve is Open”.
d. Each individual that is locked out is responsible for removing their own lock; you may not remove the lock for another team member.
e. Safety Supervisor shall be last one to remove lock.
f. This task must be completed prior to turning the main disconnect to on.

14) Return Pump Control Panel back to Service.
    a. Remove locks, gang hasp and tags from main disconnect.
    b. Each individual that is locked out is responsible for removing their own lock; you may not remove the lock for another team member.
    c. Safety supervisor shall be last one to remove lock.
    d. Turn main disconnect back to On
    e. Using the multimeter conduct the following tests to verify proper voltage (since fuses were replaced) to ensure that no equipment damage can occur prior to energizing the pumps. The tests are performed by putting the multimeter probes in the correct test point. Fully insert the probes into the test points.
        i. Ground to Leg 1 Communicate out load "Ground to Leg 1 Voltage Ok"
        ii. Ground to Leg 2 Communicate out load "Ground to Leg 2 Voltage OK"
        iii. Ground to Leg 3 Communicate out load "Ground to Leg 3 Voltage OK"
        iv. Leg 1 to Leg 2 Communicate out load "Leg 1 to Leg 2 Voltage OK"
        v. Leg 1 to Leg 3 Communicate out load "Leg 1 to Leg 3 Voltage OK"
        vi. Leg 2 to Leg 3 Communicate out load "Leg 2 to Leg 3 Voltage OK"
    f. "E" above MUST be completed prior to proceeding to "G" through "K" below.
    g. Turn Pump 1 and Pump 2 disconnect back to On
    h. Turn Pump 1 HOA switch to Auto. Communicate out loud "Pump 1 in Auto".
    i. Turn Pump 2 HOA switch to Auto. Communicate out loud "Pump 2 in Auto".
    j. Hit the Pump 1 Start Button. Communicate out loud "Pump 1 is operational".
    k. Pump should start pumping water; if the pump does not pump water a penalty will be assessed. Team may attempt to troubleshoot and resolve the problem; if problem is resolved a penalty would not be assessed.
15) Prior to the end of the event all tools that started in the tool box must be back in the tool box and the tool box shall be latched. Any tools or equipment that started on the table must be returned to the table.
16) Return to starting line, once all team members have crossed the line the team captain shall indicate the team is done by communicating "Stop".
17) Lockout/Tagout Clarification: All four team members must lock out both the control panel and the valve. The only things that can be touched if you are not locked out are the gantry, the trolley and the hoist (provided the hoist is not connected to the pump), as well as the Control Panel only while completing Task 1. Only the safety supervisor is required to utilize a tag. Each person is responsible for installing and removing their own lock. You may not install or remove the lock of another individual. The Safety Supervisor shall use the red locks and shall be the first locks on and the last locks off.

18) Torque Wrench Use: Ensure you are using proper torque wrench technique (one hand on the head and the other on the grip at the end); do not use the torque wrenches in lieu of the ratchet. Only use them to torque.

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Tool List

Tool (Tool List)	Quantity	Make/Model/Manufacturer
Multimeter	1	Klein MM300 Manual Ranging Meter (USA Bluebook Item #58483, Fastenal Part # Klein MM300)
Gang Hasp	2	Panduit PSL-1013 1”
Valve Lock Out Bonnet	1	Condor Valve Lockout, Plastic Red (Model # 48KV22)
Lockout Tag	2	Condor Lockout Tag Plastic (Model # 48RU10)
Elastic Key Wrist Bands (Match colors of locks Red, Yellow, Green, Blue)	4	Amazon Shxstore 24 counts assorted color plastic wrist coil stretch keychain bracelet
Red Lockout Locks	2	Master Lock Alike Key Type, Steel Body Material (Model # 3KARED-0630)
Blue Lockout Locks	2	Master Lock Alike Key Type, Steel Body Material (Model # 3KABLU-0354)
Green Lockout Locks	2	Master Lock Alike Key Type, Steel Body Material (Model # 3KAGRN-0491)
Yellow Lockout Locks	2	Master Lock Alike Key Type, Steel Body Material (Model # 3KAYLW-0873)
½ in drive Ratchet	2	Kobalt 1/2 in Drive Quick Release Ratchet (Model # 87346)
Torque Wrench	2	CDI – ½ in Drive Click Type Torque Wrench 1 ft/lb graduation, 20-150 ft lbs (Model # 1503MFRPH)
9/16 in deep hand socket ½ in drive	1	Paramount ½ in drive, 9/16 in deep hand socket, 6 points (Model # PAR-R3718)
24 mm standard hand socket ½ in drive	1	GearWrench ½ in drive, 24 mm standard hand socket, 6 points (Model # 542270GR)
6 mm hand hex bit socket ½ in drive	1	GearWrench ½ in drive, 6 mm hand hex bit socket (Model # 80658)
8 mm hand hex bit socket ½ in drive	1	GearWrench ½ in drive, 8 mm hand hex bit socket (Model # 80736)
10 mm hand hex bit socket ½ in drive	1	GearWrench ½ in drive, 10 mm hand hex bit socket (Model # 80737)
3 Piece ½ in drive locking socket extensions	1	Tekton 3 – piece ½ in drive locking socket extensions (1-3 in, 1-6 in, 1-9 in) (Model #1606)
Wire Brush	1	Osborn 3 Rows x 19 Columns Stainless Steel Scratch Brush (Model # 0008300700)
Crowbar	1	Vaughan 15 in Carbon Steel Crowbar (Model # B215)

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Tool (Tool List)	Quantity	Make/Model/Manufacturer
Shop Rag	2	ProLine Cotton Towels (Model # S-99757)
9/16 in Combination Wrench	1	Kobalt 9/16 in Combination Standard (SAE) Wrench (Model # 85610)
24 mm Combination Wrench	1	Kobalt 24 mm Combination Wrench (Model # 85636)
Flat Head Screwdriver	1	Kobalt 3/8 in Flat Tip x 8 in Flat Screwdriver (Model # 324G88N)
Toolbox	1	Kobalt Portable 20.6 in Black Steel Lockable Tool Box (Model # HS20MHB-13)
Rubber Mallet	1	Stanley 21 oz head 2 in face diameter soft faced dead blow hammer 13” OAL, composite handle (Model # 57-532)
Loctite (empty)	1	Loctite 243 (bottle will be empty)
Sharpie	1	Sharpie Fine Point Black (Model #33001)

Pump Equipment

Item	Quantity	Make/Model/Manufacturer
KSB Submersible Pump	1	KSB Submersible Pump Model # KRTF 80-216/24XEG-S IE3
Pump Guide Claw with Volute Gasket	1	KSB Model # 19203126
F Max Impeller	1	KSB F Max Impeller Model # 01656725
Impeller Jacking Bolt	1	KSB Model # 01606440M
Mechanical Seal Upper (spare part)	1	KSB Model # 01046414
Mechanical Seal Lower (spare part)	1	KSB Model # 01046411

Gantry Equipment

Item	Quantity	Make/Model/Manufacturer
Gantry	1	Reid Porta-Gantry Rapide (Model # PGRS00500CA)
Gantry Trolley	1	Reid Porta- Gantry Closed Couple Trolley (Model # PGTXR00500)
Chain Hoist	1	Harrington Half Ton Mini Chain Hoist w/ 10 ft chain (Model # CX005-10)

Control Panel Equipment

460 Volt Panel

Item (460 Volt Panel)	Quantity	Make/Model/Manufacturer
Control Panel (Complete Unit)	1	KSB Model # KSBOPCH-460
Voltage Test Station	1	Grace Engineered Products (Model # VTS/EMS/0003)
Wall Mount Enclosure 24”H x 20”W x 8”D NEMA 12	2	WM242008NC
FC6A Plus PLC, 100-240 VAC 9 inputs/7 relay outputs	1	FC6A-C16R1AE
Analog Input Card 8 Point Thermistor Input	1	FC6A-J8CU1
HG1G 4.3" Color HMI with Black Bezel	1	HG1G-4VT22TF
Power Supply 30W 24VDC	1	PS5R-VC24
Pilot Light 24VDC Color: GREEN	2	APD-199DN-G-24V
3 Position Selector Switch 30mm	2	ASD320N
Pushbutton (GREEN) 30mm	2	ABD11-N-G
DC1 Variable Frequency Drive 2hp 480V 3 ph : In / 480V 3ph Out	1	DC1-344D1NN-A20CE1
MMP Rotary Frame B Motor Starter Protector 4-6.3A	1	XTPR6P3BC1
Rotary Disconnect Non-Fusible 3 Pole 16A UL508 A-Frame	2	R5A3016U
Rotary Disconnect Handle (Black) Size 00, N	2	SHB00N12
Shaft, 200mm (7.9"), use with Selector or Handles for R5/R9, 5X5	2	SF200SH5X5
Selector Handle NEMA 1, 3R, 4, 4X, 12 (black)	1	H4X-04B
Shaft, 30A Comp 200mm	1	SH1-200
Disconnect Switch 30A CC 3 Pole	1	RDF30CC-3
Fuse 15A Low Peak CC Time Delay	3	PLP-CC-15

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Item (460 Volt Panel)	Quantity	Make/Model/Manufacturer
Fuse 3A Type MDL	2	MDL-3-R
Fuse 1/2A Low Peak CC Time Delay	2	LP-CC-1/2
Fuse 1A Low Peak Time Delay	10	LP-CC-1/2
1 Pole 30A 600V Fuse Holder	7	CHM1DU
Control Transformer 75VA Pri: 240 x 480/230 x 460/220 x 440VAC Sec: 120/115/110VAC	1	TB-81201
Secondary Fuse Kit for Transformer	1	PL-79924
Primary Fuse Kit for Transformer	1	PL-112700
Terminal Blocks UT2.5	20	3044076
Terminal Blocks UT4	2	3044102
Terminal Block End Plate	2	3047028
Grounding Terminal Blocks	5	3044092
Grounding Terminal Blocks	1	442079
Terminal Block Marking Tabs	2	828734
End Anchors	13	800886
Din Rail 2 meters	1	801733
Terminal Block Jumpers	11	3030161
Heavy Con Connector Kit (For Connecting the Pump to the Control Panel)	1	1407711
Control panel Mounting Stand	1	MJM-17208-A-REV1

230 Volt Panel

Item (230 Volt Panel)	Quantity	Make/Model/Manufacturer
Control Panel (Complete Unit)	1	KSB Model # KSBOPCH-230
Voltage Test Station	1	Grace Engineered Products (Model # VTS/EMS/0003)
Wall Mount Enclosure 24"H x 20"W x 8"D Nema 12 (Back Panel Included)	2	WM242008NC

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Item (230 Volt Panel)	Quantity	Make/Model/Manufacturer
FC6A Plus PLC, 100-240VAC 9 Inputs / 7 Relay Outputs	1	FC6A-C16R1AE
Analog Input Card 8 Point Thermistor Input	1	FC6A-J8CU1
HG1G 4.3" Color HMI with Black Bezel	1	HG1G-4VT22TF
Power Supply 30W 24VDC	1	PS5R-VC24
Pilot Light 24VDC Color: GREEN	2	APD-199DN-G-24V
3 Position Selector Switch 30mm	2	ASD320N
Pushbutton (GREEN) 30mm	2	ABD11-N-G
DC1 Variable Frequency Drive 2hp 480V 3 ph : In / 480V 3ph Out	1	DC1-344D1NN-A20CE1
MMP Rotary Frame B Motor Starter Protector 4-6.3A	1	XTPR6P3BC1
Rotary Disconnect Non-Fusible 3 Pole 16A UL508 A-Frame	2	R5A3016U
Rotary Disconnect Handle (Black) Size 00, N	2	SHB00N12
Shaft, 200mm (7.9"), use with Selector or Handles for R5/R9, 5X5	2	SF200SH5X5
Selector Handle Nema 1, 3R, 4, 4X, 12 (black)	1	H4X-04B
Shaft, 30A Comp 200mm	1	SH1-200
Disconnect Switch 30A CC 3 Pole	1	RDF30CC-3
Fuse 15A Low Peak CC Time Delay	3	PLP-CC-15
Fuse 3A Type MDL	2	MDL-3-R
Fuse 1/2A Low Peak CC Time Delay	2	LP-CC-1/2
Fuse 1A Low Peak Time Delay	10	LP-CC-1/2
1 Pole 30A 600V Fuse Holder	7	CHM1DU
Control Transformer 75VA Pri: 240 x 480/230 x	1	TB-81201

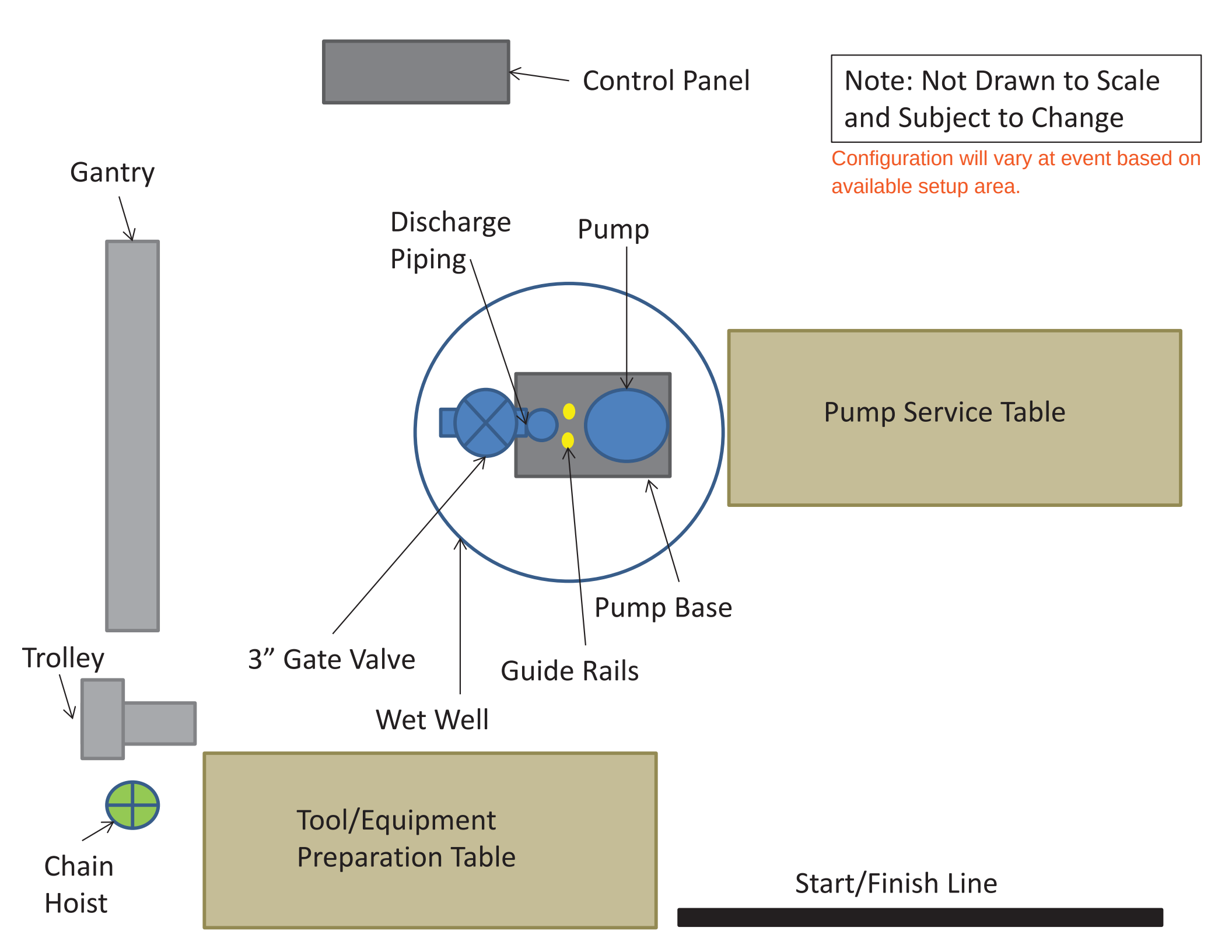
Item (230 Volt Panel)	Quantity	Make/Model/Manufacturer
460/220 x 440VAC Sec: 120/115/110VAC		
Secondary Fuse Kit for Transformer	1	PL-79924
Primary Fuse Kit for Transformer	1	PL-112700
Terminal Blocks UT2.5	20	3044076
Terminal Blocks UT4	2	3044102
Terminal Block End Plate	2	3047028
Grounding Terminal Blocks	5	3044092
Grounding Terminal Blocks	1	442079
Terminal Block Marking Tabs	2	828734
End Anchors	13	800886
Din Rail 2 meters	1	801733
Terminal Block Jumpers	11	3030161
Heavy Con Connector Kit (For Connecting the Pump to the Control Panel)	1	1407711
Control panel Mounting Stand	1	MJM-17208-A-REV1

Wet Well Equipment

Item (Wet Well Equipment)	Quantity	Make/Model/Manufacturer
Wet Well	1	Steel Plastics 48X36SIMSYS
Stainless Steel Guide Rails	4	Standard 2” rails
STUD 625 Stud 5/8 x 4” Plate Assembly	4	
70917 Nut Nylock 304SS 5/8”	4	
70376 Washer Flat 304SS 5/8” (18-8)	4	
STUD500 Stud 1/2-13 x 4" plate assembly	16	
70481 Nut Nylock 304SS 1/2"	16	
70357 Washer Flat 304SS 1/2" (18-8)	16	
70641 Valve Gate Brass 3"	1	
70669 Pipe 304SS Sch40 2"	10 ft	
70791 Pipe PVC Sch80 3"	5 ft	
70792 Adapter Male PVC Sch80 TXS 3"	2	
70793 Elbow 90 PVC Sch80 SXS 3"	2	
70815 Flange Socket Sch80 4" (Note: 2 pc Van Stone Style Flange)	1	
70088 Bolt HH 304SS 5/8"-11 x 3"	8	

2018 KSB Pump Maintenance Event (Revised 1/22/2018)

Item (Wet Well Equipment)	Quantity	Make/Model/Manufacturer
70377 Nut HH 304SS 5/8"	8	
70134 Gasket Flange 4" full face 1/8" thick SBR - Red rubber	1	
50291 Caster Rigid Phenolic 4" x 1 1/2"	2	
50292 Caster Swivel Phenolic 4" x 1 1/2"	2	
KSB-RB KSB 3" Rail Base	1	
KSB-UGB KSB Upper Guide Bracket for 2" Rails	1	
70887 Bushing PVC Sch80 SXS 4" x 3"	1	
70856 Bolt U Clamp Pipe 304SS 3" with 3/8" nylock nuts and washers	1	
EL45PVC-3 Elbow 45 PVC Sch80 SXS 3"	1	
G6220462 Boiler Drain Valve, 1/2" MPT X MPT	1	


Control Panel
Note: Not Drawn to Scale and Subject to Change
Configuration will vary at event based on available setup area.
Gantry
Discharge Piping
Pump
Pump Service Table
Pump Base
3” Gate Valve
Guide Rails
Wet Well
Trolley
Chain Hoist
Tool/Equipment Preparation Table
Start/Finish Line

Note: Not Drawn to Scale and Subject to Change