

Greetings from the 2009 Operations Challenge Committee

The 2008 Texas State Championship will be held in Galveston this year. With the TRA CReWSers winning the National Competition in 2008 we will be able to send four teams from Texas to the WEF competition in Orlando, **pending funding**.

Enclosed are the "**RULES AND REGULATIONS**" for this year's competition. Please read the complete packet carefully. If you have any general questions, I will try to answer them for you. Specific details on the competition will be made available to you at the Pre-Competition meeting.

PLEASE NOTE changes to this year's schedule!

Keep in mind as you prepare for this year's competition that, education, teamwork, pride, and professionalism is what the Operations Challenge is all about.

Be prepared to demonstrate your team spirit, professionalism, and dedication.

If you need any information or if I can assist in any way, please let me know.

Sincerely,

John Bennett
WEAT PWO and Challenge Event Coordinator



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WATER ENVIRONMENT ASSOCIATION OF TEXAS

WATER ENVIRONMENT



ASSOCIATION OF TEXAS

OPERATIONS CHALLENGE

April 15th & 16th 2009

***PROMOTING EXCELLENCE AND PROFESSIONALISM IN
WASTEWATER OPERATIONS***

RULES AND REGULATIONS PACKET

I. SCHEDULES:

Tuesday: April 14

8:00 am – 3:00 pm - Move in equipment, Exhibit Hall

Wednesday: April 15

10:00 am - 12:00 pm - Pre-Competition Meeting/ Process Control Test – Viewfinders Terrace, 9th floor

1:00 pm – 3:00 pm - Laboratory event – Competition area

Thursday: April 16

10:00 am - Team Check in at Safety Event

10:15 am – 2:00 pm - Competition

2:15 pm – 3:00 pm - Texas Shoot Out

3:15 pm – 3:45 pm - Awards ceremony at Safety Event

Friday: April 17

8:00 am - 11:00 am - Equipment take down and removal from exhibition area.

II. LOCATION

Texas Water 2009 WEAT/AWWA Joint Conference, Galveston , Texas.
Competition will be held in the Moody Gardens Conference Exhibit area.

III. PURPOSE

To recognize excellence and professionalism in wastewater treatment, operations, maintenance, laboratory, safety and collection systems personnel.

IV. NATURE OF THE COMPETITION

All teams will compete in all events. Each event will be judged and scored separately against established criteria. The scores of all events will be totaled and the champion team will be selected based on the scores.

Five separate competitive events will be held:

1. **Pump Maintenance:** Teams will be required to do various maintenance procedures and electrical tasks on a Goodwin portable pump. The Wilo EMU pump that will be used at the WEFTEC competition in 2010 will be available as a demonstration unit (more details to come).
2. **Collection System:** Teams will be required to cut out a section of an 8" PVC sewer pipe with water flowing through it, drill and install a 4" service saddle in the replacement pipe, cut and install the replacement section with couplings and program an auto sampler.
3. **Safety:** Teams will be required to rescue a downed co-worker from a simulated manhole. Team members will set up a retrieval system, two members will perform a permit required confined space entry, place retrieval harness on the downed co-worker and remove him from the manhole.
4. **Process Control:** Teams will solve problems from four of eight types of operational wastewater technologies. The four types will be announced when you pick up your packet on April 13th
5. **Laboratory:** Perform all steps of a BOD analysis using **ORION** equipment following all method requirements as outlined in Standard Methods 18th edition 5210B, with the exception of using transfer pipettes instead of wide bore volumetric for planting seed correction series and sample.

Each event will be timed separately and all team members are expected to participate. Further details, such as supplied equipment specification, equipment to be supplied by competitors, and examples of judging criteria is supplied in this packet.

Process Control will be the first event for each team, immediately following the pre-competition meeting on Wednesday April 15th at 10:00 am

V. AWARDS

Awards are provided as follows:

Overall Champion Team:

- Opportunity to represent Texas at the national WEF conference in October 2009
- Entry fee and travel expenses, as outlined in WEAT team travel procedures, will be paid by WEAT.
- Trophy Plaque
- Team Jackets

Overall Second Place Team:

- Trophy Plaque
- Team Jackets
- Opportunity to represent Texas at the national WEF conference in October 2009

Overall Third Place Team:

- Opportunity to represent Texas at the national WEF conference in October 2009
(If Operations Challenge Budget Will Allow)

Overall Fourth Place Team

- Opportunity to represent Texas at the national WEF conference in October 2009
(If Operations Challenge Budget Will Allow)

The Awards Ceremony will be held following the events for the day and will be presented at the Safety Event.

Winners of Each Event:

- Trophy for the event

Each Team Member:

- Commemorative Texas Operations Challenge T-shirt and certificate of participation plus eight hours of general training credits from the TCEQ.

VI. ELIGIBILITY

1. A maximum of 6 teams will be accepted for the 2009 competition.
2. Entries will be accepted on a first come first served basis until the maximum is reached.
3. Teams must be composed of no less than four members.
4. Teams must be composed of the same four individuals for all five events.
5. Members of a team may come from the same employer or from multiple employers.
6. Individual team members must meet the qualifications described below.

QUALIFICATIONS

Individual team members will be persons actively employed by a responsible operating wastewater entity or its agent, at a facility site on a day-to-day basis. Furthermore, they must be actively employed in the operations/maintenance of the collection system, treatment facility, or laboratory facilities provided for them.

The intent is that team members will be those actually involved in wastewater operations, laboratories, pretreatment, or maintenance functions. Individual entrants will be checked for compliance with this intent.

VII. JUDGING

- Each event will be scored by the time required to perform the event, plus timed penalties for procedural and safety violations. The final time, adjusted for penalties, will be converted to a "point" score. The best time for each event is worth 1 point, next best time 2 points, etc. Total points scored for all five events will rank the teams.
- Judges will be trained volunteers from the WEAT membership and sponsors. Judges cannot compete or assist teams. Judges from the same employer as the team or team member will abstain from judging their "home" team. (When possible)
- Teams will compete concurrently in each event. There will be one or more judges per team per event, with a separate head judge for each event.
- Team captains will be informed of their teams infractions immediately following the completion of their event. However, they will not be told of their overall penalty time. This information will be made available upon written request after the competition.
- Disagreement with a judge's ruling will be handled as follows:
The team captain will speak with the event judge; any team member wanting to communicate with a judge must do so through his team captain in order to reduce confusion. All team members except for the Captain are required to leave the event area while a challenge to the judge's decision is being made. Failing resolution with the event judge, a team may petition the Event Coordinator, for the particular event in question to act as an arbitrator. Any protest of the Event Coordinator's decision must be made immediately, in writing to the Chair of the Operations Challenge committee. Attempts will be made to settle the protest as soon as is practical. There will be a fifteen (15) minute time limit for protest. Protest will not be accepted after fifteen (15) minutes past completion of event being protested. It is requested that throughout this process courtesy and professionalism be extended to all parties involved. Failure to render courtesy to judges and event staff can result in penalty time being assessed to, or disqualification of, the offending team.

VIII. EQUIPMENT AND SUPPLIES

The Water Environment Association of Texas and its conference exhibitors will supply all equipment required for the competition except for calculators, tape measures and personal items such as safety shoes, gloves, safety glasses and hard hats as specified in the specific event rules. The contestants must supply these items.

IX. COMPETITION TIMING

Each team will be allowed 20 minutes for each event from the time the team is scheduled to start. This includes a maximum of 5 minutes, prior to the competition of the event, for the team to make preparations for that event. Teams will be expected to assist event coordinators and judges in resetting the event for the next team as required.

**WEAT Operations Challenge 2009
Team Entry Form**

(Please Type or Print Neatly)

Utility: _____

Team Name: _____

Team Member/Captain: _____ DL #: _____

Address: _____

City/State/Zip: _____

Day Phone # _____ Email _____

Team Member: _____ DL #: _____

Address: _____

City/State/Zip: _____

Team Member: _____ DL #: _____

Address: _____

City/State/Zip: _____

Team Member: _____ DL #: _____

Address: _____

City/State/Zip: _____

Part 2. Optional Coach Designation

The following individual is designated as "coach" and will receive copies of all mailings sent to the Captain.

Name: _____ DL #: _____

Address: _____

City/State/Zip: _____

Day Phone # _____ Email _____

Part 3. Entry Fee

Enclosed is a team entry fee of \$ **200.00**. We understand that this entry fee does not cover travel or hotel expenses of team members. No teams will be allowed to participate until this fee is paid in full.

Signed: _____ Date: _____

Team Captain/Manager/Supervisor

Printed Name: _____

| For WEAT Use Only | \$Received | Date Received | Check # |
|-------------------|------------|---------------|---------|
|-------------------|------------|---------------|---------|

**Water Environment Association of Texas
Operations Challenge 2009**

This form is required for each team member competing in the Texas Water 2009 Operations Championship. Have form available at pre-competition meeting

I, _____ . Will participate in the Texas Water 2009 Operations Championship competition. I acknowledge that while participating in any and all events, which make up the Operations Championship, I will encounter the risk of injury or accident. I hereby accept and assume all such risks and danger incidental to my participation in the 2009 Operations Championship. I agree that Texas Water 2009, the Water Environment Association of Texas (WEAT), American Water Works Association, Texas Section, Operations Championship Committee and any and all suppliers of products and equipment for Texas Water 2009 Operations Championship are not liable for any injuries I may sustain resulting from any and all such risks and danger. I hereby release, acquit and discharge Texas Water 2009, WEAT, Texas Section AWWA the Operations Championship Committee and any and all suppliers of products and equipment for the Texas Water 2009 Operations Championship from all claims and demands of whatever nature, actions and causes of action, damages, cost, loss of service, expenses and compensations on account of or in any way growing out of personal injuries and/or property damage having already resulted or to result at any time in the future as a result and by reason of my participation in the Texas Water 2009 Operations Championship.

Signature: _____

Name (Please Print): _____

Date: _____

This form must be completed by each team member

Please bring a copy of this form to the pre-competition meeting on April 15th:

Failure to do so will result in disqualification from the event.

**Water Environment Association of Texas
Operations Challenge 2009
T-shirt Order Form**

Team Utility: _____

Team Name: _____

Team Member Name (**Please Print**)

T-shirt Size
(M, L, XL, ect.)

| | |
|-------------------------|---------------|
| 1. _____ Team Member | _____ Size |
| 2. _____ Team Member | _____ Size |
| 3. _____ Team Member | _____ Size |
| 4. _____ Team Member | _____ Size |
| 5. _____ Coach | _____ Size |

Please return completed form with your Team Entry Form and payment to:

Attn: Cheryl Smith
Association Manager
Water Environment Association of Texas
2619 Jones Road, Suite C
Austin, Texas 78745
Phone: 512-693-0060 Fax: 512-693-0062
Email: cheryl@weat.org
Website: www.weat.org

Freese and Nichols

Process Control Event

OVERVIEW

This year's Process Control Event consists of 48 general multiple-choice questions, 25 extended multiple choice questions, 10 math multiple choice questions and 4 process scenarios with 3 – 6 questions each.

REFERENCES

The multiple choice portions of the exam will be based on the certification quizzes in:

- WEF Operations Forum magazine, 1997 – 2008
- WEF/ABC Wastewater Operator's Guide to Preparing for the Certification Examination
- California State University Sacramento Operations of WWTP Volume I and II
- Advanced Waste Treatment
- WEF Manual of Practice – MOP 11
-

Collection systems questions may also be based on:

- California State University Sacramento Operations and Maintenance of Wastewater Collection Systems Volume I & II
- WEF/ABC Collection Systems Operators' Guide to Preparing for the Certification Examination

Process scenarios will be based on the WEF Manual of Practice – MOP 11 in four (4) of the following areas. The four (4) categories will be provided in your team packet on March 25th.

- Activated Sludge
- Bio-solids Disposal
- Biological Nutrient Removal Systems
- Collection System
- Composting
- Disinfection
- Filtration
- Management and Support
- Primary Treatment
- Solids Stabilization Methods
- Trickling Filter
- Thickening

In addition to process specific information, scenarios that deal with general topics within the subject category could include: pumping, maintenance, laboratory, safety, odor control, flow measurement, metering, and maintenance.

SCORING

General Multiple Choice – 48 questions

- 10 points for correct answer

Extended Multiple Choice – 25 questions

- 25 points for correct answer

Math Multiple Choice – 10 questions

- 50 points for correct answer and showing work

- 25 points for correct answer and partial work shown*
- 0 points for no answer, incorrect answer, or correct answer with no work shown

Process Scenarios – 4 scenarios with 3 to 6 questions each.

- 120 points for correct answer and showing work
- 60 points for correct answer and partial work shown*
- 0 points for only correct answer and no work shown

Partial credit and showing work

- Math Multiple Choice – To receive partial credit, the team must write out the numbers used and show them in an equation form using relevant formulas.
- Process Scenarios – if the grader feels that the work shown demonstrates correct and significant, but incomplete, progress towards the answer the work shown may receive partial credit. Partial credit is possible, even if an incorrect or no answer is given.

TIME

Minimum time: 15 minutes

Target time: 20 minutes

Maximum time: 25 minutes

Teams that finish before the 20 minute target time will have the difference in time added to their score, based on 0.5 points per second. Teams that finish before the minimum time of 15 minutes will not receive additional points above the minimum time points.

The Walter Chiang Maintenance Event

The purpose of this event is to test the skills of a maintenance/operating team to respond to a lift station pumping outage. A Godwin Dri-Prime® model CD100M 4" diesel driven solids-handling trailer mounted pump-set will be used to respond to the need for an emergency back up pump at a lift station. The maintenance portion of the WEFTEC Operations Challenge is focused on the routine maintenance and operation of the CD100M 4" pump in preparation for use at a lift station.

Premise

Pump 1 at a duplex lift station has shut down due to excessive amp draw. Pump 2 is still operating properly, but the decision has been made to place the Godwin Dri-Prime® pump at the station as a back up to Pump 2, therefore allowing Pump 1 to be removed and repaired. The Godwin Dri-Prime® pump will be connected to the lift station and will be operated via two float controls in the lift station inlet manhole in the event of a failure to pump 2.

Prior to positioning the Dri-Prime® pump at the station, routine maintenance must be performed on the CD100M 4" pump to ensure proper operation while in service at the lift station.

The WEFTEC Operations Challenge will consist of performing routine maintenance on the Dri-Prime® pump, positioning it at the lift station and installing suction and discharge hoses from the pump to the lift station inlet manhole and flanged force main tie-in gate valve. Automatic float controls will be connected to the Godwin Dri-Prime® pump to allow for unattended operation (starting and stopping).

Important

Reliable running of portable pumping equipment is the goal, so caution must be exercised to avoid damage to the pump, engine or any parts associated with the challenge. Deductions will be made for damage to pump, engine parts, hoses, fittings or any other equipment used in the challenge.

A skid will be provided containing the lift station inlet manhole opening, discharge tie in point and lift station control panel.

Introduction

During an initial 5-minute period, the team will have an opportunity to look over the unit and check the toolbox for its contents. The team will be allowed to pre-sort the tools and remove them from their individual pouch or tray, but the tools must stay in the toolbox until the event begins. Supplies, hoses, and fittings may be arranged within the designated start area. Team members may not touch the pump unit, portable control panel, or lift station during this time. Lockout locks will be assigned to team members during this time period. The event begins with all team members behind a designated starting line. Once the event has begun, the toolbox, tray, and various spare parts may be moved to the pump area. The electrical controls of lift station Pump 1 must be tagged out before any team member may touch the discharge point of the station. Furthermore, the discharge tie in gate valve must be closed and locked via a bonnet and multiple lockout hasp prior to any team member touching the discharge tie in piping. All tools and supplies used must be stored prior to the completion of the event.

Note the Following:

- Appropriate safety attire such as steel toe boots, hardhats (bump caps are not acceptable) and safety glasses must be worn.
- Safety gloves must be worn (latex gloves are acceptable) at all times during the event.
- Mechanics' gloves (example: leather) must be worn by any team member involved in the closure of quick disconnect fittings on suction and discharge hoses.

- Personal protective equipment must be worn at all times, if a glove is torn, or hard hat falls off, the team member must replace it immediately or severe penalty will be assessed.
- The torque wrench must be set to 40 foot-pounds during the initial 5-minute period.
- Cords on the portable control panel may be coiled and re-hung on the hooks during the 5-minute period. The air supply hose for the vacuum pad test may also be recoiled and replaced to original start position.
- Any reason to stop the event due to equipment failure could result in a restart from the beginning, as decided by the team Captain and Head Judge.
- If the Head Judge stops the event due to abuse or misuse of tools or equipment, time will continue to run. Depending on the severity of the situation, penalty time could be added on to the event time in addition to the time the team was stopped.
- Failure to perform any task will result in severe penalties.
- Failure to communicate tasks performed out loud as specified in the following task list will result in penalties. When directed to count seconds out loud, always use “one-one-thousand, two one-thousand, three one-thousand”, etc. Counting the number of times you are doing a task can be “one-two-three”, etc.
- Upon finishing the event, all team members are asked to remain outside of the challenge curtain area until the judges have finished scoring and evaluating the team’s performance. When finished, the Head Judge will review the event and scoring results with the Team Captain.
- Judges are asked to supply the team captain with their raw time in minutes and seconds. The event scorekeeper will do actual tabulation, conversion and reporting of the finished time.

NOTE:

A 20-minute time limit has been imposed for the completion of all required tasks. If, at the 20-minute mark, teams have not progressed through task number 32, the event will be stopped and penalties will be assessed for all uncompleted tasks.

The Walter Chiang Maintenance Event Required Task Summary

Engine Servicing

1. Disconnect and clean battery terminals.
2. Reconnect positive battery cable.
3. Check oil level in engine crankcase using dipstick.
4. Drain oil from diesel engine.
5. Replace oil filter on diesel engine.
6. Pump fresh oil into crankcase.
7. Re-check oil level in engine crankcase using dipstick.
8. Bleed water from primary fuel filter.
9. Replace secondary fuel filter on diesel engine.
10. Verify fuel level in tank and dye test.
11. Replace air filter on diesel engine.
12. Visually check coolant level in radiator.

Pump Servicing

13. Check mechanical seal oil level on pumpend.
14. Grease pump bearing brackets (10 pumps).
15. Remove and inspect venturi assembly.
16. Remove braided air compressor outlet line.
17. Remove ejector housing on pumpend.
18. Inspect and clean ejector housing screen.
19. Check ejector ball in ejector housing.
20. Reassemble ejector housing.
21. Reinstall venturi assembly.
22. Reattach air compressor outlet line.
23. Replace air compressor air filter.
24. Remove and inspect Non Return Valve (NRV) ball and seat.
25. Inspect volute and NRV drain valves; ensure both are in closed position.

Trailer Inspection

26. Inspect trailer hitch and safety chains.
27. Check wheel bearings and lug nuts.
28. Check air pressure in tires.
29. Check operation of jack stand.

Vacuum pad test

30. Reconnect negative battery cable to battery.
31. Bleed air from fuel system.
32. Perform vacuum test on pump

Pump hookup at lift station

33. Lock out Pump 1 at lift station.
34. Lock out 4" gate valve at force main tie-in.
35. Position Dri-Prime® pump at lift station and lower rear jack stand.
36. Install discharge hose from pump to tie in point.
37. Install suction hose from pumpend to manhole.
38. Position automatic control floats.
39. Plug float control panel wire into portable pump control panel and test.
40. Remove lock bonnet on lift station discharge tie in point.
41. Place safety tape around manhole opening.
42. Communicate to team that task has been completed.
43. Return to designated start line and signal completion.

The Walter Chiang Maintenance Event Description Breakdown

Engine Servicing

1. Disconnect and clean battery terminals.
 - Use 7/16" wrenches to open battery box.
 - Use ½" wrench to disconnect negative battery terminal.
 - Communicate out loud that the negative terminal has been disconnected.
 - NOTE: The negative battery cable must be removed prior to performing any tasks on the pump or engine. This includes placing tools or supplies on the unit. You may perform trailer or lift station tasks prior to disconnection.
 - Use ½" wrench to disconnect positive battery terminal.
 - Use battery terminal/post cleaning brushes to clean terminals and posts, verbal 2 second count ("1-one thousand, 2-one thousand") for brushing each terminal and each post.
2. **Reconnect positive battery cable.**
 - Use ½" wrench to connect positive battery cable.
 - Close battery box cover, do not install/tighten bolts.
3. **Check oil level in engine crankcase using dipstick.**
 - Pull dipstick and clean with shop towel.
 - Reinsert dipstick and pull to check level.
 - Verbalize level as read on dipstick ("Crankcase full").
4. **Drain oil from diesel engine.**
 - Place funnel under oil pan drain plug.
 - Remove oil pan drain plug using 7/8" open-end wrench.
 - Open ball valve.
 - Drain waste oil into "Used oil" 5-gallon container with funnel (simulation, crankcase will be dry). Verbal 10 second count for draining.
 - Close ball valve.
 - Reinstall drain plug, hand-tight, then using 7/8" open-end wrench tighten ½ turn past hand tight.
5. **Replace oil filter on diesel engine.**
 - Remove new filter to be installed from box.
 - Remove old oil filter by hand.
 - Place used oil filter in box of new filter to simulate proper disposal of used filter.
 - Lubricate o-ring on new oil filter (dip finger in "Used Oil" and run around o-ring on new oil filter).
 - Screw new oil filter on to diesel engine hand tight only.
 - Write hour meter and date of servicing with dry-erase marker on the end of the new oil filter.

6. Pump fresh oil into crankcase.

- Remove plastic oil fill port cap from the top of the valve cover by hand.
- Pump fresh oil into crankcase fill port for 10 pumps using Oil dispenser pump, count out loud “one-two-three”
- Screw plastic fill port cap on diesel engine hand tight.

7. Re-check oil level in engine crankcase using dipstick.

- Pull dipstick and clean with shop towel.
- Reinsert dipstick and pull to check level.
- Verbalize level as read on dipstick as “Crankcase full”.

8. Bleed water from primary fuel filter

- Loosen plastic wing nut on bottom of clear plastic primary fuel filter two full turns by hand.
- Verbal 2 second to drain water into plastic quart container from bottom of primary fuel filter
- Tighten plastic wing nut on bottom of fuel filter two full turns by hand.

9. Replace secondary fuel filter on diesel engine.

- Remove new fuel filter from box.
- By hand, remove old fuel filter and place in new filter box to simulate proper disposal.
- Install new fuel filter and tighten hand tight.

10. Verify fuel level in tank and dye test.

- Remove fuel fill cap on tank by hand.
- Verify level of fuel in tank with the fuel gauging stick.
- Place dye check (simulated, container is empty) on end of fuel gauging stick.
- Dip fuel-gauging stick into tank with dye solution to detect water in fuel. Verbalize “No water in fuel”.
- Wipe dye check from fuel-gauging stick with shop towel and store.
- Correctly replace fuel fill cap hand tight.

11. Replace air filter on diesel engine.

- Remove new air filter from box.
- Open clips on plastic filter housing.
- Remove old air filter and place “used” filter in new filter box for disposal.
- Install new air filter properly and close housing.

12. Visually check coolant level in radiator

- Warning: Do not remove radiator cap if engine is running or warm.
- Remove filler cap.
- Visually inspect that coolant level is at the bottom of the filler neck.
- Communicate out loud that “Radiator full”.
- Replace filler cap hand tight.

Pump Servicing

13. Check mechanical seal oil level on pumpend.

- Remove breather/fill cap on mechanical seal.

- Use engine oil dipstick to check level in seal cavity.
- Wipe dipstick with shop towel and replace in engine.
- Replace breather/ fill cap on seal cavity, tighten hand tight.

14. Grease pump bearing brackets (10 pumps).

- Clean grease fitting on bearing bracket with shop towel.
- Clean grease gun zircon adapter with shop towel.
- Attach grease gun to pumpend bearing bracket grease fitting.
- Fill bearing bracket with grease (10 pumps, count out loud).
- Wipe excess grease from grease relief fitting.
- Wipe excess grease from grease gun fitting.

15. Remove and inspect venturi assembly.

- Loosen shoulder bolt using 17mm socket.
- Use small pry bar to remove venturi.
- Inspect inlet top to venturi for carbon fouling. Communicate out loud “No carbon fouling”.
- Inspect venturi o-rings for wear or cuts. Communicate out loud “O-rings OK”.
- Set venturi aside on trailer deck until reassembly in step 21.
- Note: Penalty will result if venturi is reinstalled prior to ejector housing removal and reinstallation.

16. Remove braided air compressor outlet line.

- Use 1-5/16” open-end wrench as a hold back to retain compressed air inlet fitting on priming housing while using a 1-1/16” open-end wrench to loosen and remove compressed air line.
- Inspect hose end outlet of braided compressed air outlet hose for carbon fouling. Communicate out loud “No carbon fouling”.
- Leave compressed air line detached.

17. Remove ejector housing on pumpend.

- Loosen and remove four 13mm nuts on ejector housing studs.
- Lift ejector housing off pumpend.

18. Inspect and clean ejector housing screen.

- Remove screen from ejector housing.
- Clean screen with wire brush to remove debris (4 strokes each side of screen, count out loud).

19. Check ejector ball in ejector housing

- Inspect ejector ball for free movement housing to ensure the ball is not stuck.
- Gently shake housing and listen for free movement of the ball.

20. Reassemble ejector housing.

- Place ejector housing and screen back on pump housing.
- Install four 13mm nuts and tighten with socket wrench using a torque pattern.

21. Reinstall venturi assembly

- Insert venturi into ejector housing, with hose clamp on the side, clear of the volute.
- Tighten 17mm shoulder bolt to retain venturi.
NOTE: Do not over tighten!

22. Reattach air compressor outlet line.

- Use 1-5/16" and 1-1/16" wrenches to tighten compressed air line on ejector housing.
NOTE: Brass fittings: do not over-tighten. May cause rounding of hex nut.

23. Replace air compressor air filter.

- Remove new filter from box
- Remove clips on pumpend air compressor filter housing.
- Remove old air compressor inlet filter.
- Install new filter, install lid and clamps.
- Place "old" filter in box.
- Remove and inspect Non Return Valve (NRV) ball and seat.
- Unscrew four eyebolts on lid of NRV tank with pry bar.
- Use dead blow hammer to break seal on lid.
NOTE: Do not strike lid too hard: cast iron may crack.
- Remove Non Return Valve (NRV) ball and inspect for damage.
- Roll NRV ball on flat floor surface to check for out-of-round.
- Inspect NRV ball seat in tank by shining the flashlight into the tank.
- Remove, inspect and reinstall gasket on top of NRV tank.
- Replace NRV tank lid.
- Screw on four eyebolts and tighten with pry bar ½ turn past hand tight using torque pattern.

24. Inspect volute and NRV drain valves; ensure both are in closed position.

- Open and close drain valve on volute to ensure proper operation.
- Open and close drain valve on NRV tank to ensure proper operation.

Trailer Inspection

25. Inspect trailer hitch and safety chains.

- Inspect safety chains for damage or wear, communicate out loud "chains OK".
- Snap spring clips on safety chains to check for proper operation.

26. Check wheel bearings and lug nuts.

- Remove plastic cap from bearing buddy.
- Clean grease fitting on wheel bearings with shop towel.
- Clean grease gun zircon adapter with shop towel.
- Pump 5 pumps of grease into each wheel grease fitting (count out loud).
- Clean grease fitting on wheel bearings with shop towel.
- Replace plastic cap on wheel bearings.
- Clean grease gun zircon adapter with shop towel.
- Tighten 13/16" lug nuts on both wheels to 40 foot-pounds using a torque pattern.

27. Check air pressure in tires.

- Use tire pressure gauge to check tire pressure, communicate out loud, "Tire pressure set to 50 p.s.i." for each tire.

28. Check operation of rear jack stand.

- Clean grease fitting on rear jack stand using shop towel. Note: the rear stand is the one without the wheel.
- Clean grease gun zircon adapter with shop towel.
- Grease rear jack stand with three pumps; count out loud.
- Clean grease fitting on rear jack stand.
- Clean grease gun zircon adapter.
- Swing rear jack stand into vertical position.
- Rotate crank down 5 times to assure proper operation.
- Rotate crank up 5 times to retract rear jack stand.
- Swing rear jack stand into horizontal position for towing.

Vacuum Pad Test

29. Reconnect negative battery cable.

- Use ½" wrench to connect negative battery cable.
- Communicate out loud that the negative terminal has been reconnected.
- Close battery box cover.
- Note: This step must be completed prior to bleeding the air from the fuel system and performing the vacuum pad test.
- Use 7/16" wrenches to tighten the cover.

30. Bleed air from fuel system

- Turn key switch to "on" position for a 2 second count to bleed air from fuel system.

31. Perform vacuum test on pump

- Use compressed air line supplied and attach it to the spring loaded air chuck connection on pump air compressor.
- On control panel of diesel engine, depress low oil pressure shutdown override and turn key switch to start engine (simulation) hold button for 5-second count (count out loud).
- Raise RPM to 1800 by rotating throttle 90° counter-clockwise 4 times (count out loud)
- Open, then close volute drain valve to ensure it is in closed position.
- Install vacuum pad on pump suction. Hold pad on suction for 10-second count (count out loud).
- Lower RPM to idle by turning throttle 90° clockwise 4 times (count out loud) and turn key switch to "Off" position.
- Remove compressor airline from air chuck fitting on the pump air compressor.
- With hands off, start a 5-second count (out loud) allowing the residual vacuum to hold the pad on the pump suction.
- Open volute drain valve to relieve the vacuum.

Pump hookup at lift station

32. Lock out and tag out Pump 1

- On lift station control panel, turn Pump 1 switch to “Off” position.
- The Safety Supervisor must turn off breaker and install hasp, lock and tag on Pump 1 breaker switch.
- The Safety Supervisor must write the date and their initials on the tag with the dry erase marker.
- Check Pump 1 start switch for operation by turning to “Hand” to ensure that power has been locked out. Return the switch to the “Off” position.
- Communicate to team members that Pump 1 has been successfully locked out.

33. Lock out 4” gate valve at lift station

- Check that the 4” discharge gate valve on lift station is closed, by opening one full turn & closing valve.
- Place red plastic lock out bonnet on 4” gate valve hand wheel.
- The Safety Supervisor must lock out valve with hasp, lock and tag.
- The Safety Supervisor must write their initials and date on the tag.
- After the Safety Supervisor’s lock has been installed, all team members who are installing hoses or floats, or working on lift station hook-up must place their locks on the hasp.

34. Position pump at lift station and use rear jack stand to level pump.

- All engine, trailer, and pump maintenance tasks must be completed prior to moving the pump into place for hookup at the lift station.
- Remove 4 wheel chocks from under trailer tires.
- Remove all tools and supplies from pump for “towing” to lift station.
- Use at least two team members to move pump close enough to lift station to make the hose connections.
- Replace 4 wheel chocks under trailer tires. May be done after discharge hose is connected.
- Use the rear jack stand to level pump for optimal fuel and oil distribution.
- Set and check level with small torpedo level by placing the level on the gas tank by the rear jack stand (facing front to rear) to watch for level while adjusting.

35. Install discharge hose from pump to tie in point.

- Install catch pan under discharge tie in point.
- Remove 4” male quick disconnect cap from discharge tie in point check valve.
- Inspect condition of o-ring on female inlet side of check valve quick disconnect fitting, communicate out loud “o-ring OK”.
- Attach discharge hose to check valve quick disconnect fitting.
- Check condition of o-ring on female quick disconnect adapter on discharge hose, communicate out loud “o-ring OK”.
- Attach 90° quick disconnect elbow to pump discharge quick disconnect fitting.
- Attach discharge hose to 90° quick disconnect elbow.
- Open & close NRV drain valve to check that it is in closed position.

36. Install suction hose from pumpend to manhole.

- Check condition of o-ring on suction of pumpend prior to attaching suction hose, communicate out loud “o-ring OK”.
- Install suction hose to pumpend with quick disconnect fitting.
- Check that volute drain valve is closed, by opening and closing.
- Check condition of o-ring on suction hose prior to attaching suction screen communicate out loud “o-ring OK”.
- Connect suction screen to suction hose.
- Lower suction hose with suction screen into manhole within 6 inches of bottom.

37. Position automatic control floats.

- Using at least two team members, move the portable control panel to marked position to hook up floats and controls.
- Position automatic control floats in manhole with low level float (red) at bottom of wet well, within 4 inches, but not touching the bottom.
- Position high level float (yellow) approximately 3 feet above bottom of wet well, with the float and weight inside the manhole near the top.
- Secure floats in position with tie wraps on the bar at the top of manhole.

38. Plug float control panel wire into portable pump control panel and test.

- Plug float control panel wire into control panel and tighten screw connection.
- Make sure pump control key is in the “Off” position so that the portable pump control panel can operate the pump automatically.
- Place switch on portable control panel to “Test” position.
- Test run engine (simulation) for 5 seconds (count out loud).
- While in “Test”, to simulate correct pumping speed of 1500 – 1700 RPM, set the throttle by rotating 90 degrees counterclockwise 3 times, counting out loud.
- Move switch on portable control panel to “Auto” position.

39. Remove lock bonnet on lift station discharge tie in point

- Team members whose locks are on the valve bonnet must remove their locks prior to the Safety Supervisor removing their lock from the hasp on the bonnet.
- Remove bonnet from gate valve on discharge point of lift station. May be done by any team member.
- Open gate valve.

40. Place safety tape around manhole opening.

- Drop stakes into pockets on skid.
- Place yellow safety tape around four corners of lift station to secure area during the lift station bypass.
- Ensure that tape is sufficiently tight so that it will not fall.

41. Communicate to team that task has been completed.

- Return all tools to toolbox.
- Return all supplies and discards to proper area.

42. Return to designated start line and signal completion.

- All team members must be beyond the starting point line before team captain can call an end to the event.

Provided Tools and Equipment List

(subject to change)

Tools

| | |
|---|-----------------------------|
| Toolbox | Battery post/terminal brush |
| Toolbox lock | Tire pressure gauge |
| ½" Drive Torque Wrench | Grease gun with fitting |
| ½ " Drive socket wrench set SAE 3/8" through 1-¼" | Funnel |
| Combination wrench set 7/16" through 1- ¼ " | 5-gallon container |
| 7/16" combination wrench | Catch pan |
| 8" pliers dikes (side cutter) | Plastic Quart container |
| 13mm socket wrench, ½" drive | Shop Towels (2) |
| 17mm socket wrench, ½" drive | Lock-out hasps (2) |
| Small pry bar | Lock sets (4) |
| Dead blow hammer | Lock-out tags |
| Flashlight | Tie wraps (12" long) |
| Fuel gauging stick | 4" Gate valve lock bonnet |
| Small torpedo level | Yellow safety barrier tape |
| Wire Brush | Fuel dye check (simulated) |
| 1- 5/16" combination wrench | Dry Erase Markers (2) |
| ½" drive ratchet, 3" extension, & breaker bar | |

Equipment

Godwin CD100M Dri-Prime® pump, trailer mounted, diesel drive
 Automatic Control Panel with two floats
 4" x 8' Suction hose with fittings
 4" Suction Screen
 4" x 3' Discharge hose with fittings
 4" flanged check valve with bolts and nuts
 Lift Station Skid (see illustration)
 Vacuum pad with vacuum gauge
 Wheel chocks (4)

Team Name: _____

Team # _____

Engine Servicing

- ___ () Battery terminals not cleaned properly
- ___ () Batt. terminal not reconnected properly
- ___ () Work on pump/eng prior to neg. cable off
- ___ () Battery box not closed or bolted
- ___ () Oil level in crankcase not checked properly
- ___ () Removed oil filter prior to draining oil
- ___ () Failed to drain oil properly or for 10 count
- ___ () New oil filter o-ring not lubricated
- ___ () Date & hours not written on oil filter
- ___ () Old oil/fuel/air filter not properly disposed
- ___ () New oil not pumped in or for 10 count
- ___ () Primary fuel filter not drained properly
- ___ () Container not used when draining fuel
- ___ () Oil/Fuel filter not replaced properly
- ___ () Over/under tightening oil/fuel filter
- ___ () Fuel level in tank not checked
- ___ () Fuel not dye checked for water properly
- ___ () Fuel cap not replaced/properly
- ___ () Engine air filter not replaced properly
- ___ () Radiator level not checked/properly

Pump Servicing

- ___ () Mechanical seal oil not checked properly
- ___ () Bearing bracket not greased (10 pumps)
- ___ () Grease fitting not cleaned properly
- ___ () Venturi not inspected for carbon fouling
- ___ () O-rings on venturi not checked
- ___ () Air comp. hose not checked for fouling
- ___ () Ejector screen not cleaned for 8 strokes
- ___ () Ejector housing ball not checked properly
- ___ () Air compressor filter not changed properly
- ___ () NRV tank gasket not checked properly
- ___ () NRV ball and seat not checked properly
- ___ () Dead blow hammer not used
- ___ () Pry bar not used for NRV eyebolts
- ___ () Volute/NRV valves not checked or proper
- ___ () Engine fuel system not bled for 2 count
- ___ () Bleed air before battery hooked up
- ___ () Failure to use torque pattern

Trailer Inspection

- ___ () Safety chains/hooks not checked/snapped
- ___ () Grease fitting not cleaned properly
- ___ () Wheel bearings not greased properly
- ___ () Wheel lug nuts not torqued properly
- ___ () Air pressure in tire not checked
- ___ () Jack stand not greased properly- 3 pumps
- ___ () Jack stand not rotated down & up 5 turns
- ___ () Wheel chocks R & R incorrectly/untimely
- ___ () Trailer not leveled at job site
- ___ () Jack stand not positioned correctly
- ___ () Trailer moved prior to completing all maint.
- ___ () Improper pump move/not using 2 persons

Vacuum Pad Test

- ___ () Engine started prior to battery hook-up
- ___ () Override switch not held during engine start
- ___ () Key not turned to start
- ___ () RPM not raised/lowered properly
- ___ () Volute drain valve not open/close properly
- ___ () Air not supplied to venturi for 10 seconds
- ___ () Vac pad not tested for 5 seconds or use hand
- ___ () Engine not turned off after vacuum pad test
- ___ () Vacuum pad not released properly
- ___ () Air supply line not disconnected properly

Pump Hook Up At Lift Station

- ___ () Pump 1 not locked out properly
- ___ () Information not entered on lock-out tag
- ___ () Gate valve not locked out properly/all locks
- ___ () Drain pan not installed under blind flange
- ___ () Discharge hose not properly installed
- ___ () O-ring on hoses and fittings not checked
- ___ () 90° Elbow not properly installed
- ___ () Suction hose/screen not properly installed
- ___ () Suction hose not set properly in manhole
- ___ () Floats not set properly/secured in manhole
- ___ () Auto control wire not installed properly
- ___ () Auto panel improperly moved
- ___ () Auto panel improper test or not in "auto"
- ___ () Valve bonnet or locks not removed
- ___ () Valve not checked 1 turn or opened fully
- ___ () Safety tape/pole not installed properly/falls

General observations

- ___ () Loose bolt, nut, clip or any fastener
- ___ () Over-tighten any fastener
- ___ () Failure to communicate out loud any task
- ___ () Tool used for other than intended purpose
- ___ () Tools not stored properly or box left unlocked
- ___ () Oil/pumpage spilled
- ___ () Tools left on pump or immediate area
- ___ () Supplies not properly retrieved/stored
- ___ () PPE violation
- ___ () Lock-out procedure violated
- ___ () Abuse of tools or equipment
- ___ () Not using a tool specified in rules

Accepted by: _____
(Team Captain)

Raw Time: + _____ min. _____ sec. _____ hund.

Penalty Time: = _____ min. _____ sec. _____ hund.

Total Time: _____ min. _____ sec. _____ hund.

Head Judge: _____

Abatix/BW Safety Event

SITUATION

You find a coworker at the bottom of a manhole unconscious. You suspect he has been overcome with an unknown chemical. You immediately call for the in-plant rescue team.

DIRECTIONS

Team members will start at a designated starting line.

- One team member will start the event by yelling, "Start" or "GO"
- Two team members will put on full body harnesses.
- One team member will turn on the detector and test the manhole atmosphere for 30 seconds using a gas detector and stop watch provided
- One team member will place the electrical safety switch in the off of disconnected position.
- The Designated Attendant will be the first to lock out the disconnect by using the gang hasp and their lock and tag. Each additional team member will place their lock and tag on the gang hasp. Note: No one will enter the manhole until all four locks are locked in place on the gang hasp. At the end of the event the disconnect will remain locked and tagged out, each team member will maintain custody of their key and have it at the end of the event to turn into the head judge.
- Disconnect will be placed on the handrail in the center of the equipment area. This cannot be moved.
- The qualified person will fill out the confined space entry permit. The only entries required on the permit during the timed event are acceptable reading for oxygen, combustible gas and hydrogen sulfide.
- Necessary team members will assemble the non-entry rescue system not over the manhole. Extend legs to 7ft; adjust the safety leg chain. Completely install the Salalift winch, and two self-retracting lifelines one on the leg and the other on the eyebolt at the top of the tripod. Then move the tripod over the manhole. The entry persons with the harnesses on will be attached to the fall protection devices. This must be done before the manhole safety cover is removed.
- Remove the manhole safety cover.
- Install the blower saddle vent into the manhole; attach the 90-degree fitting to the saddle.
- Place the blower 5-ft from the manhole and attach the blower hose to the 90-degree fitting.
- Turn on Blower. This must be verbalized before entry.
- Entrants will be lowered into the manhole (one at a time) on the work seat with the Salalift winch. Make sure the work seat clears the plane of the manhole, entering or exiting.
- When the team members with the harnesses enter the manhole a third team member will continually monitor the fall protection lines. Until both entry persons are out of the manhole.
- The team members entering the manhole will put a full body harness on the victim. This can only be done once both entrants are down in the manhole.
- After the full body harness is on the victim one entrant will be raised from the manhole on the work seat, with the Salalift winch, to assist in removing the victim from ground level (on top of the platform). The other entrant will assist from below.
- The work seat is removed from the winch. Do not drop the work seat.
- The winch hook is connected to the "D" ring on the victims harness.
- Another team member will lift the victim using the Salalift winch.
- Two team members will place the victim in the chair in the designated area and begin the decontamination process. Do not drag the victim, all body parts must be off the ground while

moving the victim to the chair. Activate the shower by pulling the shower handle to its furthest position downward. The body harness will remain on the victim.

- The team member tending the fall protection system will assist in bringing up the second entrant with use of the work seat and the Salalift winch. The work seat must be lowered using the Salalift winch. Replace manhole safety cover. Cover must be installed by entrant still hooked to SRL.
- Team members will disassemble and store all equipment in the area where the equipment was stored at the beginning of the event. Tripod legs must be fully retracted. The full body harnesses may remain on the victim and the two-team members.
- Time will end when all team members cross the finish line and the team captain shouts, "Stop".

SAFTEY

The manhole opening will be protected with a safety device when a team accesses the platform. It must not be removed until the tripod is in place and the two entrants are in the harnesses and attached to the SRLs that are fully attached to the tripod. The cover must be reinstalled on the manhole opening as soon as the second entrant has been removed from the manhole, and before the tripod is removed from the manhole opening.

FOUR MINUTE EQUIPMENT CHECK

The team will be allowed onto the platform to check all competition equipment and supplies for four minutes prior to the actual start of the event. All equipment must remain in the same location as shown on the drawing. Printed names and signed names of the entrants and qualified person may be made on the permit at this time. The head judge will inform the team captain when the four minutes are completed. At this time all team members must immediately move to their starting area. If all equipment problems have not been resolved by this time, they will be addressed with the team members in their starting positions. A delay at this point is cause for a penalty. Judges will not answer team questions during the four-minute inspection time or during the event.

ATMOSPHERE TESTER

Turn the meter on first. With the hose attached to the meter place the other end into the manhole. There will be two marks on the hose. One should be through the manhole (under the platform floor) with the other mark above the manhole rim (above the platform floor). Once in this position the 30-second test will begin. No other work can be done by the tester during this time. The team member using the meter must remain with the meter and keep track of their time. Once the initial test is completed remove the hose from the manhole and from the meter. The gas meter must enter the manhole with the first entrant. It must remain in the confined space until the last entrant is removed from the manhole.

BLOWER PLACEMENT

The blower must be placed 5 ft from the rim of the manhole prior to entry. There will be a circle drawn around the perimeter of the manhole to allow the teams to correctly locate the blower. The blower may be placed at any point of the perimeter the team wishes. The blower power cord will not be plugged in, but the switch must be turned on and left on.

PERMIT

The printed names and signatures of the entrants and qualified person may be entered on the permit during the four-minute equipment inspection time. The only entries required on the permit during the event are acceptable reading for oxygen, combustible gas and hydrogen sulfide. These three entries must be

made after the 30 second test and before anyone breaks the plane of the manhole. Do not wait for the readings on the gas meter. Any acceptable reading may be entered on the permit after the 30-second test. Only two entrants may be listed on the permit. Gloves may be removed from the hands of the person completing the permit only while he/she is entering information on the permit.

VICTIMS HARNESS

The full body harness on the victim must be tight enough to insure proper care of the victim; that is no more than a fist under the chest strap in the center of the chest. The harness will be adjusted by the teams for proper fit

DECONTAMINATION PROCEDURES

Place the victim in the armchair below the emergency shower. Activate the shower by pulling the handle to the furthest position downward.

GENERAL HYGINE

Do not place anything into your mouth, i.e., gas detector pencils, pens or straps.

EQUIPMENT PROVIDED FOR COMPETITION

1. 16ft X 16ft platform (7ft height) with a 36-inch circular opening in the center of the floor.
2. Full body mannequin (victim).
3. One arm chair
4. One clipboard
5. USA BLUEBOOK ITEMS USA BLUEBOOK #
 - One Salalift Winch and Tripod System 65133
 - w/ 60 ft. galvanized cable winch & 7 ft tripod 3911-3403402
 - Self-Retracting Lifeline (SRL) 50 ft. 65152
 - One carabiner self-locking snap hook for SRL 42860
 - One Blueblock Winch/SRL w/50 ft. galvanized cable 42861
 - One tripod leg mount pulley 42862
 - One tripod leg mount bracket 42862
 - Three ExoFit Harness – Vest type w/"D" rings
 - (1) Small 65113
 - (2) Large 65115
 - One work seat w/belt 65157
 - Large 42715
 - One GasAlertMax Gas Detector 42580
 - One emergency Shower – horizontal 70186
 - Retrofitted with a vertical pipe 7"7' (+ or -) ft high 42890
 - One Axial blower w/canister & 15 ft of 8" hose 42891
 - One manhole saddle vent 42898
 - One universal saddle vent mount
 - One 90 degree elbow for saddle vent
 - One Manhole Safety Cover
 - One square D 100 A disconnect
 - One Gang Hasp
 - Four lockout tags
 - Padlock Red (25595)
 - Padlock Yellow (25596)
 - Padlock Blue (25597)
 - Padlock Green (25598)

EQUIPMENT PROVIDED BY TEAMS

Teams will be required to supply and wear, as appropriate, the following:

1. Steel-toed shoes.
2. Hard hats.
3. Safety glasses/goggles.
4. Leather gloves.
5. Pencil or pen to write on confined space permits.

JUDGING CRITERIA

This is a timed event with seconds added for severity of items not performed, or performed improperly.

Judges will stop competitors from using equipment until corrections are made if an unsafe condition exists. Time will not stop!

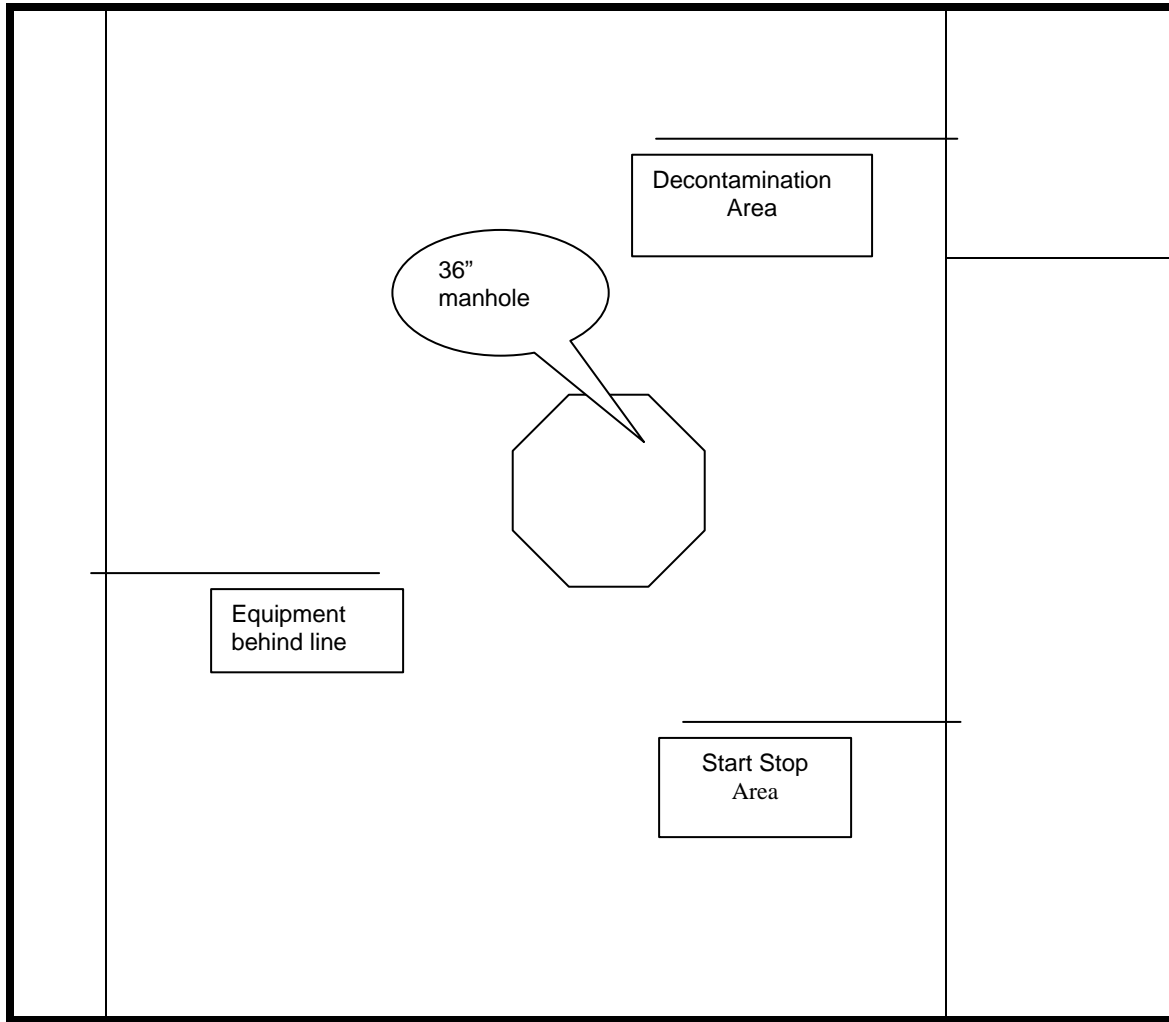
EXAMPLES OF PENALTIES

- Not performing atmosphere testing for 30 seconds
- Inserting the gas detector hose in the manhole improperly
- Non-acceptable (unsafe) gas level entered on the permit

- Pins not inserted in the tripod or winches completely
- Placing the victim face down in the manhole
- Falling/jumping into the manhole, plus any injuries sustained
- Twisting the victim in a manner that would further injure a person
- Manhole safety cover removed before the entrants are safely connected to the SRLs
- Entrants in the manhole without the gas detector
- A team member not designated as an entrant breaking the plan of the confined space with any part of their body
- Throwing/dropping tools or equipment
- Cable not completely wound on winch
- Injuring a judge
- Equipment stored on the line at the end of the event
- Designated attendant was not the first to lock out on gang hasp
- Team did not notify the head judge who is the designated attendant
- Entry member did not lock out on gang hasp
- Entry was made without all four locks, locked on gang hasp

NOTE: This list and instructions are subject to change.

Safety Platform



Hartwell Environmental Laboratory Event

EVENT: Perform all steps of a BOD analysis using ORION equipment following all method requirements as outlined in Standard Methods 18th edition 5210B, with the exception of using transfer pipets instead of wide bore volumetrics for planting seed correction series and sample.

General Notes:

1. Team Captain tells the Lead judge they are ready to begin and the Lead judge says "START" to signal the beginning of the event. The Lead judge and one other judge will be the timekeepers.
2. Event is complete when all tasks have been completed and Team Captain hands in the work sheets to the Lead judge and says the team is finished.
3. To ensure a fair contest and to avoid challenges, judges will not speak to contestants while the event is being performed.
4. The Event Coordinator will settle disputes with input from the event judges.
5. All team members must participate in the event, but are not limited to performing only one task.
6. After the event, the Event Coordinator may explain to the Team Captain what was done incorrectly, but will NOT reveal penalty points or total score.
7. Team members may ask judges questions before the beginning of the event, but the judge may choose not to answer the question, depending on the type of question asked.

ALL STEPS OF THE PROCEDURE MUST BE PERFORMED FROM MEMORY. NO BOOKS OR PRINTED MATERIALS ARE ALLOWED IN THE LABORATORY COMPETITION AREA.

MATERIALS REQUIRED:

- WTW Oxi 197I Dissolved Oxygen Meter
- WTW StirrOx G Dissolved Oxygen Probe with Integrated Stirrer and air calibration vessel
- WTW inoLab pH 730 Laboratory pH Meter
- WTW SenTix pH Probe

Sample

GGA Solution
pH Buffer Solution 7
Stir Plate and Stir bars
pH Probe stand
Stir Bar retriever
Deionized Water (DI) in Wash Bottle
Kim Wipes
Beakers-100-250mL
Safety Glasses
Nitrile or Latex Disposable Gloves
300ml BOD bottles
Liquid Seed Material
Waste Container
Pipet Washer
BOD Dilution Water in a carboy with spout
Wash bottle containing BOD Dilution Water (2)
Kim-Wipes
2, 5, 10, and 25mL transfer pipets

6mL volumetric pipet
Pipet bulb
50mL graduated cylinder
Glass BOD bottle stoppers
Plastic BOD bottle caps
Timer with 20 second reset capability
Calculator
Sharpie Marker

Setup

Teams will have two minutes before beginning the event to organize items on the tables. These items are limited to Sample, GGA Solution, wash bottles, kimwipes, paper towels, beakers, BOD bottles, waste containers, pipets, pipet bulb, 50mL graduated cylinder, glass BOD bottle stoppers, plastic BOD bottle caps and sharpie marker. The lead judge will time setup. At the end of the setup time the judge will say "TIME", team members must remove their hands from the table. Judges will then place bench sheets facedown on the tables. See "General Notes #1" above for instructions on starting the event.

Numbering and Labeling Bottles

This must be completed before any sample, seed material or dilution water can be placed in BOD bottles.

All BOD bottles must be labeled and/or numbered using a sharpie marker according to the numbers on the bench sheet.

1. Label one BOD bottle as "BLANK" and with the bottle number according to the bench sheet provided.
2. Label four BOD bottles as "SEED 1", "SEED 2", "SEED 3" and Seed 4" and with the bottle number according to the bench sheet provided.
3. Label one BOD bottle as "GGA" and with the bottle number according to the bench sheet provided.
4. Label the remaining four BOD bottles to be used for sample planting with the bottle number **only** according to the bench sheet provided.

Determine pH of sample is between 6.00 and 8.00
Sample pH must be determined before the sample can be planted

1. Mix the sample by gently inverting 5 times (5X). Rinse a beaker one time with a small amount of sample and pour approximately 50-75 mL of the sample into a beaker.
2. Remove pH probe from soaking solution; rinse with DI and blot dry using a kimwipe.
3. Place the beaker containing the sample on the stirplate, add a stir bar, stir gently, and lower the probe into sample.
4. Press "RUN/ ENTER". "AR" will flash while the meter is stabilizing. "AR" will stop flashing once the meter is stabilized, and the sample pH will be displayed. NOTE: As per national, there will be a timer set for 20 seconds for this procedure.
5. Record the pH reading, unit of measure (su), date, time, analyst on worksheet
6. Remove the pH probe from sample, rinse with DI, blot dry and return to soaking solution

Once the pH of sample has been determined to be 6.00-8.00, the sample is ready to be planted.

Preparing a Blank and Seed Correction Series
Penalties will be assessed for blowing out pipets

Blank Preparation

1. Rinse the bottle labeled as “BLANK” one time with dilution water.
2. Fill the bottle with dilution water from the carboy without entraining air by tilting the bottle on a 45-degree angle. Fill only half way up the frosted neck of the bottle.

Seed Correction Series Preparation

1. Rinse the bottles labeled as “SEED 1”, “SEED 2”, “SEED 3”, and “SEED 4” one time with dilution water.
2. Using a 5mL transfer pipet and bulb, rinse the pipet once with seed material, then transfer 5mL of seed material from the beaker on the stir plate into the “SEED 1” bottle
3. Using a 10mL transfer pipet, rinse the pipet once with seed material, then transfer 10mL of seed material from the beaker on the stir plate into the “SEED 2” bottle
4. Using a 25mL transfer pipet, rinse the pipet once with seed material, then transfer 15mL of seed material from the beaker on the stir plate to the “SEED 3” bottle
5. Using the same 25mL transfer pipet, transfer 20mL of seed material from the beaker in the stir plate to the “SEED 4” bottle
6. Place all dirty pipets in the pipet washer.
7. Fill the bottles with dilution water from the carboy without entraining air by tilting the bottle on a 45-degree angle. It is acceptable to fill bottles only partially out of the carboy then top off with the wash bottle containing dilution water to prevent loss of seed material during filling. Fill bottles half way up the etched glass neck of the bottle. Penalties will be assessed for overfilling bottles.

These bottles can now have the Initial DO readings recorded. The DO meter must be air calibrated before taking any Initial DO readings.

Plant, seed and fill bottles for the GGA Standard and BOD sample
Sample cannot be planted until the pH has been determined to be 6.00-8.00.
Penalties will be assessed for blowing out pipets

GGA Standard

1. Rinse the bottle labeled “GGA” one time with dilution water.
2. Gently mix GGA standard by inverting 5 times, then rinse a small beaker one time with the GGA standard, pour approximately 50mL into the beaker.
3. Using a 6mL volumetric pipet, rinse one time with GGA standard then transfer 6mL of the GGA standard into the BOD bottle.
 - The outside of the pipet must be wiped dry with a kimwipe before dispensing into the bottle.
 - Pipet must be allowed to drain into the bottle- do not blow out.
 - Touch tip of pipet to the side of the bottle to ensure the appropriate volume has drained.
 - Proper use of a volumetric pipet will result in a small amount of solution remaining in the pipet.
4. Using a 2mL transfer pipet, rinse one time with seed material, then transfer 2mL of seed material from the beaker on the stir plate containing seed material into the GGA bottle.
5. Fill the bottle with dilution water from the carboy without entraining air by tilting the bottle on a 45-degree angle. It is acceptable to fill bottle only partially out of the carboy then top off with the wash bottle containing dilution water to prevent loss of seed material and standard during filling. Fill bottle to half way up the etched glass neck of the bottle. Penalties will be assessed for overfilling bottles.

Sample

1. Rinse bottles numbered for planting the sample once with dilution water.
2. Gently mix sample by inverting 5 times, rinse a large beaker one time with the sample, then pour approximately 200 ml of the sample into a large beaker.
3. Align the bottles numbered for sample planting from lowest to highest number.

4. Using a 5ml transfer pipet, rinse one time with sample, then transfer 5mL of the sample from the beaker to the first bottle (lowest number) using a transfer pipet and bulb.
5. Transfer 2mL of seed material from the beaker on the stir plate containing seed material into the bottle using a using the same 2mL transfer pipet used to seed the GGA standard.
6. Fill the bottle with dilution water from the carboy without entraining air by tilting the bottle on a 45-degree angle. It is acceptable to fill bottles only partially out of the carboy then top off with the wash bottle containing dilution water to prevent loss of seed material and sample during filling. Fill bottle to half way up the etched glass neck of the bottle. Penalties will be assessed for overfilling bottles.
7. Using the next bottle, repeat steps 4-6 using a 10mL pipet to transfer 10 ml of sample.
8. Using the next bottle, repeat steps 4-6 using a 25mL pipet to transfer 20mL of sample.
9. Using the last bottle, repeat steps 4-6 using a 50mL graduated cylinder that has been rinsed with sample one time to transfer 35mL of sample.
10. Place all dirty pipets in the pipet washer.

These bottles can now have the Initial DO reading recorded. DO meter must be air calibrated before taking any Initial DO readings.

Calibrating the DO meter and determining Initial DO readings

Calibration

1. The meter will already be turned on and the DO probe will be in the calibration vessel
2. Perform Air calibration:
 - Press “**CAL**” once “**O₂ CAL**” will be displayed on the meter.
 - Press “**RUN/ENTER**”. “**AR**” will begin flashing.
 - When “**AR**” stops flashing and “**S**” appears, meter calibration is complete.
 - Press “**M**” to switch to the “**Measuring Mode**”

Determining Initial Do

- Blank, Seed Series, GGA and Sample bottles must all be read
 - The DO probe must remain in each bottle for at least 20 seconds before the Initial DO can be recorded.
1. Remove the DO probe from the calibration chamber and rinse with dilution water.
 2. Place the probe in the BOD bottle labeled “BLANK”.
 3. Turn on the stirrer by pressing the button on the side of the probe. Ensure there are no air bubble adhering to the membrane
 4. Press “START” on the timer to begin the 20-second bottle reading time.
 5. Record the initial DO in mg/L on the bench sheet in the appropriate space after the probe has been in the bottle at least 20 seconds as indicated by the timer.
 6. Turn off the stirrer, remove the probe from the blank bottle and place it in the first “SEED” bottle, turn on the stirrer, press “START” on the timer to begin the 20-second bottle reading time.
 7. While the reading for the “SEED” bottle is stabilizing complete Step 8 for the “BLANK”
 8. Stopper and cap the bottle:
 - Using the wash bottle containing dilution water refill the bottle to half way up the etched glass neck of the bottle without creating bubbles or entraining air.
 - Gently place glass stopper in bottle without causing bubbles or entraining air.
 - Using the wash bottle containing dilution water fill the neck of the bottle to create a water seal.
 - Place a plastic cap over the glass stopper to create an air seal.
 9. Complete steps 2-8 for all other “SEED” bottles.
 10. Once all “SEED” bottles have been completed, rinse the probe with the dilution water wash bottle over the waste container before continuing.
 11. Place the rinsed probe in the “GGA” bottle. Repeat steps 3-5 and 8. Rinse the probe with the dilution water wash bottle over the waste container before continuing.

12. Place the rinsed probe in the first "SAMPLE" bottle. Repeat steps 3-8 for each bottle until all sample bottles have been completed.
13. After all bottles have been read, rinse the probe with dilution water using the wash bottle gently blot the membrane and lower assembly of the probe dry and replace in the air calibration chamber.
14. Complete benchsheet and fill in Date, Time of Completion and Analyst

Calculating BOD Blank, Seed Correction and Sample Values

A worksheet will be provided. This worksheet will have initial DO (IDO) values and final DO (FDO) values for a Blank, a seed correction series, and at least one sample. All results are to be reported in mg/L. Standard Methods 5210B specifies DO depletion criteria for BOD. Only calculate bottles that have depleted at least 2 mg/L or greater DO ($IDO-FDO \geq 2$), and has 1 mg/L or greater DO remaining ($FDO \geq 1$), except for the BLANK. Volume of seed material used in GGA and sample bottles will be 2mL

BLANK

Blank depletion = IDO-FDO

SEED CORRECTION

*Seed Correction bottle = (IDO - FDO) x mL seed material used in bottles / mL seed material
Only calculate bottles meeting depletion criteria*

Seed Correction (SC) = Average of all seed correction bottles calculated

GGA AND SAMPLE

BOD in mg/L = [(DO-FDO)- SC] x 100 / % Sample or GGA

% Sample or GGA= [Volume planted] / 3

Final Sample Result = Average of all results calculated for the sample

AECOM

Collection System Event

Collection System Event

The event simulates connecting a 4-inch PVC lateral sewer to an existing 8-inch PVC sewer pipe while in service (the 'wet' pipe), and the programming of an automatic sampler.

- Drill a 4.5-inch diameter hole in the 'dry' PVC pipe.
- Cut out and remove a measured length from both the 'wet' and 'dry' PVC pipes. The section cut from the 'dry' pipe will include the 4.5-inch hole, and will be used to replace the section removed from the 'wet' pipe.
- Install a service saddle connection in the 4.5-inch hole, and secure with hose clamps.
- Install the replacement length of 8-inch PVC pipe SDR 35 (complete with service saddle) into the 'wet' PVC pipe, and secure with flexible repair couplings and hose clamps.
- Program the automatic sampler per the defined procedure.

What is provided:

- A 6-foot length of PVC pipe strapped to a steel stand, ready for cutting. Water will be flowing through this length of pipe during the event (the 'wet' pipe).
- A 6-foot length of PVC pipe strapped to another steel stand, ready for cutting (the 'dry' pipe).
- Toolbox.
- Hand drill (non-ratcheting brace) with a LENOX 4.5-inch circular cutting blade (model 72L), or equivalent.
- One 4-inch service saddle with attached gasket.
- Four flexible repair couplings.
- Two LENOX saw handles with two 18" PVC saw blades (model HS F180), or equivalent.
- Two speed wrenches with sockets.
- Hose clamps.
- Tape measure and marker. Teams have the option to use their own tape measure and marker. Additionally, teams have the option to either carry the tape measure and marker into the event on their body or have the items placed in the tool box during the three minute set-up period. However, whichever way the team decides, the tape measure and marker must end the event in the same manner, either on the body or in the tool box.
- Hach Sigma Model 900MAX automatic sampler with all required accessories.
- Automatic sampler instruction sheet.

What you will be judged on:

- The time taken to complete the event.
- The tightness of your completed connections. The 'wet' pipe connections will be checked for water tightness at 3 psig for 30 seconds.
- The accuracy of the automatic sampler programming and the drawn sample.
- Compliance with any instructions given or procedures required.
- Safety.

Required procedures:

- During the three minute event set-up period prior to the event, each team must ensure that all necessary tools are provided, and that all the tools and equipment to be used in the event are in satisfactory condition. Only the 'wet' may be marked during this pre-event set-up period.
- Each team member is to wear all required safety equipment throughout the event, and compete in a safe manner. Gloves may be removed only when operating the control panel of the sampler.
- The straps holding the PVC pipe to the stands may not be loosened during the event.
- The PVC pipe sections strapped to the stands may not be moved laterally by the competitors.
- The team captain will start the event by signaling the judges.
- The 4.5-inch hole must be drilled in the section originating from the 'dry' PVC pipe, using the hole saw provided.
- The lengths of PVC pipe must be cut out using the LENOX saws provided. All cuts must be completed within the framework of the pipe table.
- The saddle must be mounted to the appropriate replacement PVC pipe section and properly secured in place with the hose clamps provided.
- The automatic sampler must be programmed correctly using the data provided on the attached instruction sheet. Teams 1 through 9 must remember to enter a 0 before their team number, for example; 01, 02, 03 and so on. Should a programming error lead to programming lockout, the required password to unlock the program menu is "9000".
- All tools must be placed (not dropped or thrown) in the toolbox after use. The toolbox lid is to be closed and latched, and the toolbox must be replaced in its original location. Tools must be placed in the tool box and not thrown.
- The team captain will signal the judges when the event is over.

The judges will then:

- Record the elapsed time.
- Check the sewer service replacement section for water tightness. The 'wet' PVC pipe will be allowed to fill until water flows from the outlet end. At this point, the discharge valve will be closed and the pressure increased to 3 psi. Time penalties will be added for any leakage that occurs within 30 seconds.
- Check the accuracy of the programming of the automatic sampler and verify that a proper sample was taken.
- Add any other penalties incurred during the event to the total score and pass the information on to the Event Coordinator.

What you will provide:

- Hard hat, safety glasses or goggles, safety boots or shoes, protective gloves.
- Enthusiasm!

Remember:

- While sawing activity is occurring on a pipe table, no other activity is permitted on the same table. This means no touching of the pipe or any part of the table. Only one person (at a time) may operate the brace and bit assembly used to drill the 4½ inch hole, with no additional forces being transmitted to the tool in use by any other team member(s).
- Team members may not place their hand inside the hole created by the hole saw while the 'dry' pipe is still being cut.
- No running or jumping.
- No punching of the 4.5 inch hole saw coupon.

- No team member is permitted to stand on the side of the 'wet' table for safety purposes. Specifically, imaginary planes exist running from the walls of the end of the 'wet' pipe in both directions and shall not be violated.

Collections Systems Event Hach Sigma 900MAX Sampler

SET-UP PROCEDURE

| | |
|--|----------------------|
| 1. Press "ON" key | |
| 2. Press "MAIN MENU" key | |
| 3. Select "SETUP" | Press white soft key |
| 4. Select "MODIFY ALL TIMES" | Press white soft key |
| 5. Select "CLEAR ENTRY" to clear Number of Bottles | Press white soft key |
| 6. To select the Number of Bottles, press number "1" key to enter one bottle | |
| 7. Select "ACCEPT" to move to the next screen | Press white soft key |
| 8. To select Bottle Volume, press number "3" key to enter three gallons | |
| 9. Select "ACCEPT" to move to the next screen | |
| 10. To select Intake Tube Length, press number "6" key to enter six feet | Press white soft key |
| 11. Select "ACCEPT" to move to the next screen | Press white soft key |
| 12. Select "CHANGE CHOICE" until Intake Tubing Type 3/8" Vinyl is displayed | Press white soft key |
| 13. Select "ACCEPT" to move to the next screen | Press white soft key |
| 14. Select "CHANGE CHOICE" until Program Lock DISABLED is displayed | Press white soft key |
| 15. Select "ACCEPT" to move to the next screen | Press white soft key |
| 16. Select "CHANGE CHOICE" until Program Delay DISABLED is displayed | Press white soft key |
| 17. Select "ACCEPT" to move to the next screen | Press white soft key |
| 18. Select "CHANGE CHOICE" until Sample Collection TIME-PROPORTIONAL is displayed | Press white soft key |
| 19. Select "ACCEPT" to move to the next screen | Press white soft key |
| 20. Select "CLEAR ENTRY" to clear Interval | Press white soft key |
| 21. To select one minute Interval, press number "1" key | |
| 22. Select "ACCEPT" to move to the next screen | Press white soft key |
| 23. Select "CHANGE CHOICE" until Take First Sample says IMMEDIATELY is displayed | Press white soft key |
| 24. Select "CHANGE CHOICE" until Run Mode says STOP AFTER LAST SAMPLE is displayed | Press white soft key |
| 25. Select "CLEAR ENTRY" to clear Samples To Collect | Press white soft key |
| 26. To select one Sample To Collect, press number "1" key | |
| 27. Select "ACCEPT" to move to the next screen | Press white soft key |
| 28. Select "CHANGE CHOICE" until Liquid Sensors say ENABLED is displayed | Press white soft key |
| 29. Select "CLEAR ENTRY" to clear Sample Volume | Press white soft key |
| 30. To select 100ml Sample Volume, press number "1" , "0" , and "0" keys | |
| 31. Select "ACCEPT" to move to the next screen | Press white soft key |

| | |
|---|----------------------|
| 32. Select " CLEAR ENTRY " to clear Intake Rinses | Press white soft key |
| 33. To select zero Intake Rinses, press number " 0 " key | |
| 34. Select " ACCEPT " to move to the next screen | Press white soft key |
| 35. Select " CLEAR ENTRY " to clear Sample Retries | Press white soft key |
| 36. To select one Sample Retry, press number " 1 " key | |
| 37. Enter your team number by pressing the numeric keypad for Site ID (Teams 1-9 must enter 01, 02, 03 and so on.) | |
| 38. Select " ACCEPT " to move to the next screen | Press white soft key |

SCREEN SHOULD NOW SHOW:

Time and Date **ADVANCED SAMPLING**

DO YOU WISH TO YES
ACCESS THE ADVANCED
SAMPLING FEATURES
NO

| | |
|---|----------------------|
| 39. Select " NO " to move to the next screen | Press white soft key |
|---|----------------------|

SCREEN SHOULD NOW SHOW:

Time and Date ****MAIN MENU****

----- **DISPLAY DATA** **SETUP** ----- **OPTIONS** **STATUS** -----

READY TO START (Flashing)

| | |
|---|--|
| 40. Press the " RUN STOP " key and press any key to start the program | |
|---|--|

SCREEN SHOULD NOW SHOW:

Time and Date ****MAIN MENU****

****PREPURGE****
TO HALT SAMPLING PRESS ANY
KEY, TWICE

RUNNING

The purpose of this procedure is to create a sampling program for a composite sample (1 bottle), with a volume of 3 gallons, with an intake tube length of 6ft, intake tube type 3/8" Vinyl, with no Program Lock (Disabled), with no program delay, type of sampling or collection Time-Proportional, at an interval of 1 minute, taking the sample immediately, and stopping after the last sample, samples to collect 1, and a sample volume of 100ml, 0 intake rinses, 1 sample retry, and Select Site ID by entering your team number. No Advanced options are needed.

After the sampling sequence is completed sampling history will show Sampling Complete.

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END OF DOCUMENT