

## Greetings from the 2011 Operations Challenge Committee

The 2011 Texas State Championship will be held in Fort Worth this year. This year we be one of the first years in a long time where all our teams will be competing at the Division I level, thanks to the Austin Dillo XXpress winning Second Place overall in Division II in New Orleans. This year, the competition will be fierce as we will only be able to send the top three teams to WEF Nationals which will be held in October 2011 in Los Angeles.

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

**Sticking with the successful schedule of last year, we have again split the competition into two days.**

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.

These events are not possible without the dedication of several individuals and all our sponsors. Please be sure to acknowledge the contribution of our sponsors when you see them out and about.

**Be prepared to demonstrate your team sprit, professionalism, and dedication.**

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

Sincerely,

Jeff Sober  
WEAT Operations Challenge Committee Chair  
Cell: (214) 883-6263  
Email: [jsober@carollo.com](mailto:jsober@carollo.com)

Orren West  
WEAT PWO Board Member



***OPERATIONS CHALLENGE***  
***April 6<sup>th</sup> & 7<sup>th</sup> 2011***

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

***RULES AND REGULATIONS PACKET***

## SCHEDULES

Tuesday:	April 5, 2011		
	8:00 AM - 3:00 PM	Equipment Move-in	Exhibit Hall
Wednesday:	April 6, 2011		
	9:00 AM - 10:00 AM	Pre-Competition Meeting	Convention Center Hall 203A
	10:00 AM - 11:00 AM	Process Control Event	Convention Center Hall 203A
	1:00 PM - 3:00 PM	Laboratory Event	Exhibit Hall Competition Area
	4:00 PM - 5:00 PM	Victaulic Exhibition Event	Exhibit Hall Competition Area
Thursday:	April 7, 2011		
	9:45 AM	Team Check In	Exhibit Hall Competition Area
	10:00 AM - 2:00 PM	Maintenance Event	Exhibit Hall Competition Area
		Safety Event	
		Collection System Event (See rotating schedule)	
	2:15 PM - 3:00 PM	Texas Shoot Out	Exhibit Hall Competition Area
	3:15 PM - 3:45 PM	Awards Ceremony	Exhibit Hall Competition Area
Friday:	April 8, 2011		
	8:00 AM - 11:00 AM	Equipment take down and removal from exhibition area.	

## LOCATION

Texas Water 2011 WEAT/AWWA Joint Conference, Fort Worth, Texas.  
Fort Worth Convention Center  
1202 Houston Street  
Fort Worth, Texas 76102

## PURPOSE

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

## 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. The scores are a weighted average.

Five separate competitive events will be held:

1. **Pump Maintenance:** The purpose of this event is to test the knowledge and skill of each team to respond to separate and simultaneous "Moisture Reset" failure conditions for a WILO submersible pump and a WILO submersible mixer.
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 6th.
5. **Laboratory:** Perform all steps of an E. coli membrane filtration analysis using Hach products following all method requirements and aseptic techniques as outlined in the Hach m-ColiBlue24 method and Standard Methods 9222B, 18th Ed.

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.

## **SPONSORS**

This years sponsors are:

### *Event Sponsors*

Maintenance Event	Walter Chiang
Safety Event	Carollo Engineers
Process Control	Freese and Nichols
Laboratory	Hartwell Environmental
Collection Systems	AECOM
Exhibition Event	Victaulic

### *Platinum Sponsors*

## **AWARDS**

Awards are provided as follows:

### **Overall Champion Team:**

- Opportunity to represent Texas at the national WEF conference in October 2011
- Entry fee and travel expenses, as outlined in WEAT team travel procedures, will be paid by WEAT
- First Place Trophy Plaque
- Team Jackets

### **Overall Second Place Team:**

- Opportunity to represent Texas at the national WEF conference in October 2011
- Entry fee and travel expenses, as outlined in WEAT team travel procedures, will be paid by WEAT.
- Trophy Plaque
- Team Jackets

### **Overall Third Place Team:**

- Opportunity to represent Texas at the national WEF conference in October 2011  
(If State Operations challenge budget will allow)

**The Awards Ceremony will be held following the events for the day and will be presented in the Exhibit Hall Competition Area.**

**Winners of Each Event:**

- First Place Custom 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.

**ELIGIBILITY**

1. A maximum of 6 teams will be accepted for the 2011 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.

**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 100 points, and the worst time for the event is given a score of 25 points. The points awarded for team finishes between first and last place are based on a weighted average of their score versus the overall difference of the two outlying scores.
- 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.
- 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.

### **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.

### **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.

### **VICTAULIC EXHIBITION EVENT**

New this year, Victaulic has stepped forward to be a major supporter of our Texas Operations Challenge Program. We will hold an exhibition event on April 6, after the lab event. The event will be a timed race to see which team can replace a fitting in a process pipe in the fastest time. The competition will utilize Victaulic's Style 31 Grooved Fittings. Each Ops Challenge Team will participate by running the event in sets of two. (Each Utility team of four will run the event as two sets of two team members) The event will be judged based on raw time. The lowest time wins. The scores of each pair from each Utility Team will be averaged to get the Teams final score.

Awards and prizes will be given to the first, second, and third place teams.

This competition has no bearing or influence on the standard Operations Challenge Competition, and the results are not included in the final scores. This competition is designed to provide a friendly, competitiveness atmosphere among our teams. Victaulic has provided a generous donation to the program for this opportunity.

This event will take place on the competition floor, and every team is STRONGLY encouraged to participate. More details will follow.

## **CONTACTS**

<b>Position</b>	<b>Name</b>	<b>Email</b>	<b>Phone Number</b>
Competition Coordinator	Jeff Sober	<a href="mailto:jsober@carollo.com">jsober@carollo.com</a>	(972) 239-9949
Co-Coordinator	Orren West	<a href="mailto:orren.west@ci.austin.tx.us">orren.west@ci.austin.tx.us</a>	(512) 738-6757
Maintenance Event Coord.	Dawn Anderson	<a href="mailto:DANDERSON@cpyi.com">DANDERSON@cpyi.com</a>	(214) 796-9956
Laboratory Event Coord.	Mary Evans	<a href="mailto:mevans@premiermagnesia.com">mevans@premiermagnesia.com</a>	(903) 245-6316
Process Control Coord.	David Barker	<a href="mailto:APlusIndustrial2@aol.com">APlusIndustrial2@aol.com</a>	
Safety Event Coord.	Mike Young	<a href="mailto:YoungM@trinityra.org">YoungM@trinityra.org</a>	(214) 876-1479
Collection Systems Coord.	Andrew McBride	<a href="mailto:amcbride@saws.org">amcbride@saws.org</a>	(210) 393-6870

**WEAT Operations Challenge 2011  
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:** \_\_\_\_\_

**Optional Coach Designation**

The individual below is designated as "coach" and will receive 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 \$ **400.00** for each five member team. Roster members over five (any stand-by competitors) must pay an extra \$80.00 per person over 5. 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 #
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**Water Environment Association of Texas  
Operations Challenge 2011**

**This form is required for each team member competing in the Texas Water 2011 Operations Championship.**

I, \_\_\_\_\_, will participate in the Texas Water 2011 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 2011 Operations Championship. I agree that Texas Water 2011, the Water Environment Association of Texas (WEAT), American Water Works Association, Texas Section, Operations Championship Committee, Operations Challenge Sponsors, and any and all suppliers of products and equipment for Texas Water 2011 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 2011, the Water Environment Association of Texas (WEAT), American Water Works Association, Texas Section, Operations Championship Committee, Operations Challenge Sponsors, and any and all suppliers of products and equipment for the Texas Water 2011 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 2011 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.

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



# Freese and Nichols

## Process Control Event

The process control event for the 2011 Operations Challenge will be very similar to the 2010 WEFTEC event. The test content and layout will be essentially unchanged. The scoring system from last year will be used. There will be a mandatory process question.

### ***Overview***

The event consists of answering a number of multiple choice questions, some short math questions with multiple choice answers, and up to five operational type scenarios that have four to six questions each that may require considerable calculations. The event is timed, with a maximum of 25 minutes allowed for completion. The team can split up the test any way it chooses during the test. If a team completes the test before the end of the event, their actual time is recorded. The event should be viewed as an opportunity for a team to demonstrate their accumulated knowledge of wastewater treatment and skill in plant process control.

This year the test will include a mandatory problem set. The topic of the mandatory set will be announced by summer.

### ***Mandatory Problem***

The test will include a set of problems that must be answered. If no work is shown for a question, the score is -60, regardless of whether the correct answer is circled. Correct answers will receive 60 or 120 points if work is shown. Incorrect (or no answer circled) answers may receive partial credit for work shown.

### ***Process Scenario Categories***

The scenario problems will include the following processes:

- Collection system
- Odor control
- Energy management
- Lagoons

### ***Grading***

The tests will be graded as follows:

- multiple choice questions as: correct answer, incorrect answer, or no answer
- short math multiple choice questions as: correct, incorrect, or no answer as well as whether work is shown on test paper
- operational scenarios as: correct, incorrect, or no answer as well as whether work is shown on test paper.

### ***Scoring***

Scoring in the Process Control event consists of two components: time and correctness. The raw time is the actual time that a team requires to complete the test and return it to the Judge at their table. The time allotted for the test is 25 minutes. All teams that have not finished the test before time runs out will receive a raw time of 25 minutes (1500 seconds). Raw time will be used to determine a time bonus, which is added to the correctness component of the score to calculate the final score.

If a team's raw time is greater than 20 minutes, they receive a time penalty equal to one half of the difference between their raw time and 20 minutes. As an example, if a team has a raw time of 23 minutes and 45 seconds, their time penalty is  $(1425 \text{ seconds} - 1200 \text{ seconds})/2 = 112.5 \text{ seconds}$ . Since this is a penalty, 112.5 will be subtracted from their score.

If a team's raw time is between 15 and 20 minutes, they receive time bonus points equal to one half of the difference between their raw time and 20 minutes. As an example, if a team has a raw time of 16 minutes and 10 seconds, their time bonus is  $(1200 \text{ seconds} - 970 \text{ seconds})/2 = 115 \text{ seconds}$ . Since this is a bonus, 115 will be added to their score.

There is no additional time bonus for finishing earlier than 15 minutes. If a team finishes earlier than 15 minutes their time bonus will be based on a time of 15 minutes.

The correctness component of the score is based on the total of points awarded for correct answers and work shown. In the multiple choice and extended multiple choice sections, points are awarded only for correct answers, there are no penalties.

Points				
Test section	Correct answer <sup>1</sup>	No answer	Incorrect answer	Correct answer AND showing work
Multiple choice	10	0	0	N/A
Extended multiple choice	25/0		0	N/A
Short math multiple choice	0/0		25*	50/25*
Operational scenarios	0/60*		60*	120/60*
Mandatory questions	0/60		0/60*	120/60*

<sup>1</sup>For any math questions, there are no points for a correct answer if no work is shown.

\*Partial credit for showing work as described below

Note that for scenario questions partial credit is possible, even if an incorrect or no answer is circled.

If a Judge determines that a team member is not attempting to help with parts of the test, a 500 point penalty will be assessed for each non-participating team member.

A team's final score will be the sum of the time bonus (or penalty) and the points awarded for correct answers. The highest score will win the event.

### ***Partial Credit and Showing Work***

For any math section question, the team must write out the numbers used and show them in an equation form.

Example:

$$16 \text{ mg/l} \times 8.34 \times 2.4 \text{ MGD} = 320 \text{ lbs}$$

Simply putting down numbers does not count. The equation used must also be relevant to the question. i.e. there will not be credit for writing down the lbs formula when the question is about detention time.

For the math and operational scenario questions, if the grader feels that the work shown demonstrates correct and significant, but incomplete, progress towards the answer the work shown may receive the partial credit listed in the Points table. If the work shown uses a conceptually incorrect approach partial credit might not be awarded.

Note that in the Operational Scenarios, sometimes answers that are text rather than numbers may still require work to be shown. For example, if the correct answer for a problem is "the hydraulic loading rate is too high" then the work shown **must** include a calculation of the hydraulic loading rate.

### Scope

The questions will cover the following areas of wastewater treatment as well as general topics such as: pumping, maintenance, laboratory, safety, flow measurement, and metering:

Process Areas	Example Systems
Preliminary Treatment	Screening Grit Removal Flow Equalization
Odor Control	Wet Chemical Scrubbing Chemical Addition Biofilters
Primary Treatment	Primary Sedimentation Flow Equalization Clarification
Secondary Treatment Suspended Media	Activated Sludge Biological Nutrient Removal Clarification Sequencing Batch Reactors
Secondary Treatment Fixed Media	Trickling Filtration Biological Nutrient Removal
Advanced Treatment	Filtration Biological Nutrient Removal
Thickening	Gravity Belt Thickener Dissolved Air Flotation Gravity Thickening
Solids Stabilization Methods	Anaerobic Digestion Aerobic Digestion
Dewatering	Belt Filter Press Drying Beds Centrifuge Dewatering
Disinfection	Chlorination \ Dechlorination Ultraviolet Disinfection
Management and Support	Process Instrumentation Treatment Plant Security

### Resources

The following references will be used in creating and grading the test questions:

- Water Environment Federation Manual of Practice 11
- The monthly *Water Environment & Technology Operations Forum* WEF Skills Builder quiz: <http://www.wef.org/ConferencesTraining/SkillsBuilder/>
- The WEF/ABC study guide
- California State University Sacramento Operations of WWTPs volumes 1 & 2 and Advanced Waste Treatment
- Collections Systems questions will be based on the Sacramento Manual, Operations and Maintenance of Wastewater Collections Systems.
- Manual on the Causes and Control of Activated Sludge Bulking and Foaming, Jenkins, Richards & Daigger

Questions on Operations Central Certification Quiz on the WEF website are recommended as resource study materials.

Additional general study material includes:

- EPA design manuals, which can be obtained at <http://www.epa.gov/tbnrmr/>. Select *Browse* to see the full list of available documents. Only some are applicable to wastewater.
- Wastewater Engineering Treatment Disposal, and Reuse, Metcalf and Eddy, McGraw-Hill
- Note that these sources will NOT be used in creating or grading tests. They are listed for those interested in

additional sources of wastewater knowledge.

### ***Test Details***

- The multiple choice test will consist of 42 questions with four possible answers each, fifteen multiple choice questions requiring a small amount of math, and 20 questions where each answer is chosen from a list of 20 possible answers (extended multiple choice).
- Four or five process scenarios with four to six questions each are in the test. Teams may answer as many parts of any scenario that they desire.
- Formula sheets, reference books or any other material are not permitted.
- Team members may talk among themselves but may not be disruptive. Team work in solving problems is encouraged. Also consider that other teams may overhear your discussions.

### ***General Details***

- What will be supplied at the event: Answer sheet forms and scratch paper for calculations. We will also try to have a pencil sharpener available prior to the event but this is not guaranteed.
- Competitors must supply their own No. 2 lead pencils and calculators (calculators cannot have programming or printout capability)
- All four team members must be present before the start of the event.
- If a team is disqualified from the event they will receive a score based on the maximum time and every question left blank and no work shown.
- The test will have equivalent metric units of measure supplied in addition to the standard U.S. units.

### ***Notes***

- The exact number of questions may change slightly between now and the event. The points may also be adjusted to ensure test balance.
- The Judges will not have reference books available at the event; plan on bringing your own copies as needed. (No reference material can be used during the test)
- Process Control Event committee members will be available to discuss scoring of test questions the morning after the event.

# The Walter Chiang Maintenance Event

**See separate Event Rules Packet**

# Carollo Safety Event

## Situation:

You find a coworker at the bottom of a (confined space) lift station unconscious. You suspect he/she has been overcome with an unknown chemical gas or lack of oxygen. You immediately call for the in-plant rescue team. Immediately as soon as the team begins setting up the rescue effort another co-worker has a heart attack. This person is laying unconscious, one of the rescuer's calls 911 emergency services. An AED is available; the heart attack victim will need to have an airway established. His or her breathing and pulse is checked. There is no pulse, an AED is retrieved and administered. After administering one shock from the AED; 60 compressions (**2 sets of thirty**) are administered. After the compressions and according to the AED prompt, the victim's pulse returns, emergency services have arrived. Once the rescuer has completed these tasks the rescuer will place his/her lock and tag on the gang hasp.

## Directions:

**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. Part of the four minute check will include pre-adjusting harnesses including the victim's harness. 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 in starting position. 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. All questions will be answered during the pre-competition meeting. This is done to assure all teams receive the same instructions. **No equipment can be pre-assembled prior to the start. If anything has been pre-assembled, the head judge will instruct the team to disassemble the equipment prior to starting. If there is still pre-time left, then no penalty will be assessed, but if the four-minutes have been used up, a penalty of excessive pre-check will be assessed. All equipment must be placed back behind the line in the equipment storage area at the end of the four-minute equipment check.**

The team captain will notify the head judge as to which team member is the designated attendant for the initial lockout tagout. All printed and signed names of the entrant and qualified person may be made on the permit at this time; names must be legible. **Fill out the lockout tag** To avoid subjectivity, the judges will verify legible handwriting at this time. The power for the gas detector and blower will be left in the off position. The designated heart attack victim rescuer will be given a choice of L or XL latex gloves during the four minute check. The gloves can be placed in the pocket or but must be behind the designated line.

At the end of the four-minute time all team members must immediately move to the starting area.

- 1) Team members will start behind the designated starting line
- 2) The team captain will start the event by yelling, "Start"
- 3) One team member will immediately proceed to call 911 and rescue the heart attack victim. This team member cannot assist in any other part of the event until step 12 is complete. After step 12 is completed, their lock and tag can be placed on the gang hasp.
- 4) The entry person will put on full body harnesses.
- 5) One team member will turn on the detector and test the manhole atmosphere for 30 seconds using a gas detector and provided stopwatch.
- 6) One team member will place the electrical safety switch in the off or disconnected position.
- 7) **The Designated Attendant will be the first person to lockout the disconnect switch by using the gang hasp and their red colored 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.

- 8) The qualified person will fill out the confined space entry permit. The only entries required on the permit during the timed event are acceptable (safe entry levels) readings for oxygen, combustible gas and hydrogen sulfide.
- 9) Necessary team members will assemble the non-entry rescue system not over the manhole. The Safe Approach Davit Arm will be assembled and leveled meaning all four wheels must be off the floor or not touching the floor so the unit is stable. All pins must be in place and the unit leveled before entrant is attached to the Davit arm wench and SRL. Then move the Davit Arm over the manhole. The entry person with the safety harness on will be attached to the fall protection device (SRL). This must be done before the manhole safety cover is removed.
- 10) Remove the manhole safety cover.
- 11) 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 and turn the blower on. **The blower will operate.**
- 12) The fourth person will **immediately** find that a co-worker has collapsed from a heart attack and is unconscious. **This person will call 911 emergency services. The mechanics gloves will be taken off and replaced with disposable latex gloves.** The airway Breathing and Circulation will be assessed first (A.B.C.). The victim's pulse will be checked for 10 seconds. The AED Trainer unit will be used to start the victim's (half CPR mannequin) heart, The AED will prompt "Begin CPR" that is when the 60 compressions will be administered (count out each compression 1-30 two times) after the two sets of 30 compressions, emergency services will be assumed to arrive, then the AED is to be restored in the same condition as it was when started. The AED will be left next to the mannequin.

*Disclaimer\* these procedures were developed and written for the Operations Challenge Safety Event only. Please see your local American Heart Association and Red Cross for the exact CPR and AED national protocol or the protocol for your local area. We are not giving breaths at this time for sanitary reasons.*

- a. Using the phone, the designated heart attack victim rescuer will dial 911, and yell out 911 emergency services has been called.
  - b. Mechanics gloves will be removed and disposable latex glove will be used
  - c. Tilt head for airway, check victim for breathing (5 seconds counted out while looking at chest to see rise and fall or not) and a pulse (place two fingers over carotid artery, 10 seconds counted out, none will be found)
  - d. After the pulse is checked, The AED (trainer) cover will be opened up
  - e. The electrodes will be plugged in and the two paddles be placed properly on the victim
  - f. The remote will be plugged into the both the AED and Remote
  - g. Using the on/off button turn the AED unit on.
  - h. Once the unit prompts "Connect Electrodes"
  - i. Using the remote-press the paddle button or the top right button on the remote
  - j. The rescuer will administer the AED using the prompts from the AED unit
  - k. One simulated shock will be given from the AED Trainer
  - l. After the one shock is administered (it will prompt for CPR to begin),
  - m. Give the victim 60 compressions (2 sets of thirty), while giving the compressions count out 1- 30, \*note: each compression must be deep enough to create the click noise in the mannequin.
  - n. After the 60 compressions, it will be assumed the victim has recovered and emergency services have arrived. *(We will also assume that the emergency personnel will have their own AED unit with paddles, in real life the paddles would stay on the victim).*
  - o. Turn the AED unit off. Disconnect the paddles, place plastic cover back over the paddles and put the paddles back into the storage pouch. Put the storage pouch back into the cover of the AED unit. Close lid and shut snaps. Disconnect the remote and wind the cord up neatly, use the wire tie to keep the remote cord wound up. The AED will be stored next to the victim behind the designated line. See pictures.
  - p. After the AED is put away and the initial regulation gloves have been put back on the rescuer will place lock and tag on the gang hasp. Note the rescuer must place their lock and tag on the gang hasp before assisting in any other part of the event.
- 13) Entrant will be lowered into the manhole on the work seat with the Safe Approach winch. **The work seat will be raised to a height above the platform floor before the entrant can get on or off the work seat.**

- 14) When the entry person enters the manhole a third team member will continually monitor the fall protection lines until entry person are out of the manhole.
- 14) The entry person will put a full body harness on the victim. After the full body harness is on the victim and properly adjusted, the victim will be raised gently out of the manhole while the entrant will assist in guiding the victim from below. No lifting the victim from below.
- 15) The work seat is removed from the winch hook. Do not drop the work seat.
- 16) The winch hook is connected to the center "D" ring on the victim's harness.
- 17) Another team member will lift the victim using the winch.
- 18) Two team members will carry the victim to the chair in the designated area and begin the decontamination process. Do not drag the victim; all body parts must be off the ground (floor of the platform) 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.
- 19) The team member tending the fall protection system will assist in bringing up the entrant with the use of the work seat and the Safe Approach winch. The work seat must be lowered using the winch on the davit arm.
- 20) Team members will disassemble and store all equipment and store all equipment behind the line in the equipment storage area. The Davit Arm must be fully disassembled. Do not place the pins back into holes. **The winch cable must be within the length of the weight and hook.** The full body harness will remain on the entry person. Time will end when all team members cross the finish line and the team captain raises his/her hands above their heads and shouts "Stop."
- 21) All team members will stay in the start/finish area until released by the judges. Judges will collect the entry permit, stopwatch, harness, gas detector and lockout keys. Once the team as been released they will leave the competition area. The captain will be escorted to a waiting area for review of the event with the head judge.

### **Safety**

The manhole opening will be protected with a safety cover before a team accesses the platform. It must not be removed until the Davit Arm is fully assembled and in placed over the manhole. The entrant is completely and properly in the harness and attached to the SRL that are fully attached to the Davit Arm. The cover must be reinstalled on the manhole opening as soon as the entrant has been removed from the manhole and before the Davit Arm is removed from the manhole opening.

### **Atmosphere Tester**

Turn the meter on first; do not wait for the meter to fully start up. With one end of the hose attached to the meter place the other end of the hose 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. 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 entrant. It must remain in the confined space until the entrant is removed from the manhole. **A stopwatch will be provided to each team; this is for the team to time the 30-second atmosphere test.**

### **Blower Placement**

The blower must be placed 5 ft from the rim of the manhole prior to entry. There will be a square drawn around the perimeter of the manhole to allow the teams to correctly locate the blower. The blower may be placed at any point, outside the square the team wishes. **The blower power cord will be plugged in, and will be turned on and off at the appropriate times.**

### **Permit**

The only entries required on the permit during the event are acceptable readings 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 (considered safe for entry by OSHA) may be entered on the permit after the 30-second test. Readings will be written to the tenth. Example oxygen of 20 PPM will be written 20.0 PPM .Only one entrant may be

listed on the permit and allowed to enter the manhole. **Gloves may be removed from the hands of the person completing the permit and only while he/she is entering information on the permit.**

### **Victim's Harness**

**It will be up to each individual team to check or adjust the victims harness for proper fit by the team during the four minute check.** The full body harness on the victim must be tight enough to insure proper care of the victim.

### **Decontamination Procedures**

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

### **Heart Attack Victim Revival Using AED**

The victim is unconscious and there is not pulse

Use the ABC's

- a. Airway- Tilt the mannequins head back
- b. Breathing- look and listen for breathing (5 seconds)
- c. Circulation – Check for pulse (at least 10 seconds)

Turn on the AED (trainer unit) and follow the prompts

Place the two AED paddles on the victim correctly.

When prompted, give the victim one shock

When the prompt is given "begin CPR", begin the 2 set of thirty compressions (60 total) *Note: it will be assumed the victim's pulse and breathing has returned and emergency services has arrived.*

Turn the AED off

Remove the two paddles from the victim; put the protective plastic covers over the paddles, placed back in the plastic bag in which they were removed from. Place the bag that has the paddles back inside the AED lid pocket and close the lid. Neatly wrap up the remote cord and tie with plastic (bread type tie) The AED will be in the same condition as the start of the event.

The AED and Mannequin will stay together inside the designated boxed line.

The rescuers will replace the disposable latex gloves with the regulation gloves before assisting the rest of the team.

### **Personal Hygiene**

Do not place any thing into your mouth, i.e., gas detector, pencils, pens, or straps . This will result in a penalty.

### **Equipment Provided for Competition:**

- 16ft X 16ft platform (6ft height) with a 36 inch circular opening in the center of the floor.
- Full body mannequin (victim). Approx. weight 105 lbs.
- Phone to call emergency services
- One arm chair
- One clipboard
- One stopwatch
- Mounted phone
- One manhole safety cover manufactured by Safe Approach Inc.
- One General Duty Safety Switch, 100A, Square D Brand, Grainger Item 5B662
- One Gang hasp and 4 locks
- Four Lockout/tagout Tags
- Disposable latex gloves

### ***Safe Approach Items Description and Numbers***

Item Description	Number
Safe Approach Rescue/Retrieval Davit w/ Adjustable Base & 50' Retrieval Winch	00697-2

Pulley Block w/ Carabiner for 3-Way Recovery Unit	00697-PB
60' Self Retracting Lifeline w/ Rescue Winch Built In (3-Way Recovery Unit)	2360-01-01
Mounting Bracket for 3-Way Recovery Unit	00697-WSB
Universal Fit Full Body Harness w/ Shoulder D-Rings (S,M,L,XL)	7250-02-01
2X-Large Full Body Harness w/ Shoulder D-Rings	7250-02-01XL
Work Seat	8152

**USA Blue Book Item Description and Numbers**

One GasAlertMax Gas Detector	
One emergency Shower – horizontal Retrofitted with a vertical pipe 7” (+ or -) ft high	42580
One Axial blower w/canister & 15 ft of 8” hose	70186
One manhole saddle vent	42890
One universal saddle vent mount	42891
One 90 degree elbow for saddle vent	42898
Padlock Red	25595
Padlock Yellow	25596
Padlock blue	25597
Padlock Green	25598
Gang Hasp	25535
Four Lockout Tags	46162

**Annuvia Inc. Item Description and Numbers Contact:**

**Katie Demboski** *Business Development* [katie.demboski@annuvia.com](mailto:katie.demboski@annuvia.com) | [www.annuvia.com](http://www.annuvia.com)

**Annuvia, Inc.**

San Francisco Office  
 180 Montgomery Street, Suite 1120 | San Francisco, CA 94104  
**Ph** 866.364.7940 or cell # 415-710-6300 | **Fax** 415.283.4856

One AED Trainer Unit Medtronic LIFEPAK	<b>500T</b>
Half CPR Mannequin (CPR Prompt)	<b>Adult/Child</b>

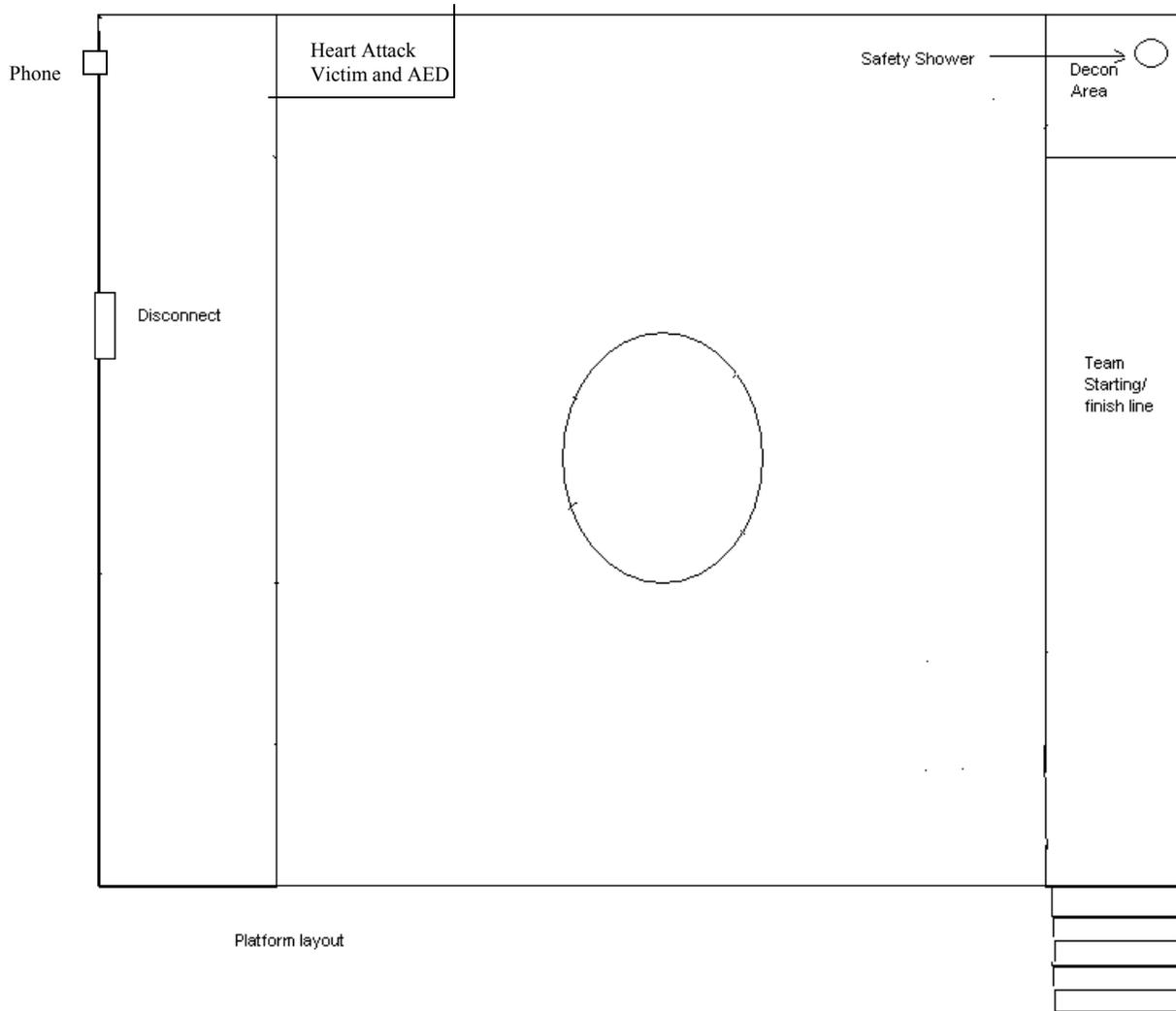
**Equipment Provided by Teams**

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

1. Steel-toed shoes ANSI rating Z41-PT99
2. Hardhats meeting ANSI standard ANSI Z89.1-2003 Type I or II (bump hats are not acceptable)
3. Safety glasses/goggles ANSI rating Z87.1-2003
4. Leather gloves, mechanics gloves. Gloves with fingertips removed, **holes in the glove are not acceptable.**
5. Pencil or pen to write on confined space permits

**Teams interested in acquiring their own equipment for practice**, contact David Kozlowsky Safe Approach, Inc. Ph: 207-345-9900, Safe Approach has agreed to a discount on the items they are providing. You will need to provide your team name, utility, and MA name. Please allow 4 to 5 weeks for delivery.

**Teams interested in acquiring their own equipment for practice**, contact Eric Pfeuffer at USA Bluebook 1-800-925-8399 Ext. 250. USA bluebook has agreed to a discount on the items they are providing. You will need to provide your team name, utility, and MA name.



## Judging Criteria

**Safety** Judges will stop competitors from competing if any unsafe actions are detected until corrections are made **Time will not stop, and judges will not identify the safety issue for the team.**

<b>Description of Penalties</b>
Excessive pre-check time
Second false start
Start not called out
Harness straps (leg, shoulder) not properly connected or properly adjusted
Turning on the gas Detector or the blower during the 4 minute check
Not turning on Gas Detector
Inserting gas detector hose in manhole improperly
Not performing atmosphere testing
Not performing atmosphere testing for 30 seconds
Reading recorded on permit before 30 second testing period ends
Breaking the plane of the manhole before the 30 second test is done
Gas detector leaves the confined space before entrant exits the space
No team member monitoring the confined space
Davit Arm not assembled properly
Davit Arm not level or one or more of the four points not making contact with the platform floor
Winch not used or connected to Davit Arm incorrectly
SRL not used or connected to Davit Arm incorrectly
Entry person not hooked to SLR before manhole safety cover is removed
Manhole cover removed before davit arm is over manhole
Harness not properly attached to SLR
Davit arm not centered over manhole
Blower not used
Blower not out of the perimeter square
Blower saddle not used
Blower 90° not used
Blower switch not on
Entrant not fully in work seat before being raised/lowered
Work seat not removed from winch to raise victim
All team members will start in the starting area. A penalty will be assessed to any team member who is standing outside that area, i.e., decontamination area.
Team member in the hole lifting victim
Throwing seat down to team member in the confined space
Moving victim in a manner that would injure a person
Dragging or Throwing the victim
Victim not in decontamination area
Attendant not monitoring entrant
Safety shower not Activated
Safe Approach cover not on manhole before tripod is moved
Improper lifting technique used
Equipment not disassembled at end of event
Any pin that is broken off or not attached at the end of the event

Equipment not properly stored at end of event
Equipment on or beyond the line
Cable not completely wound or over tight on winch or bird nested
Damaging the cable due to mis-use or abuse
Jumping into the manhole
Throwing/dropping/ abusing tools or equipment
Team members PPE not on during the event (except for writing on CS permit)
Hard hat not on head any time during the event (5 second rule exceeded)
Injuring a Judge
Injuring a team member
Lockout tag not signed/dated/loosing a key to a lock
Designated attendant was not the first person to place lock on gang hasp
Team did not notify the head judge who is the designated attendant
Any individual team member did not lock out gang hasp
Entry was made without three locks, locked on gang hasp
Rescuer did not call 911 Emergency Services
Not tilting the victims head back to open airway
Not checking for breathing or chest to rise and fall for 5 seconds or longer
Failure to check pulse
Not counting out the to 10 while taking the heart attack victims pulse
Failure to check pulse properly by placing two fingers over the carotid artery
Not placing the AED paddles in the correct position on the victim
Not shocking victim
Not turning off the AED Unit before storing it
Not giving full depth chest compression
Not counting out to two sets of thirty or giving the full 60 compressions
Plastic cover not placed over AED paddles
Paddles not put back inside the AED lid pocket
AED remote cord not would up or without the tie wrap at the end of the event
Heart attack rescuer not using disposable gloves
Not replacing disposable gloves with regulation gloves or locking out before helping team with the rest of the event

## Safety Event FAQ's

1. **Can the Safe Approach safety cover be removed from the manhole before the Davit Arm is over the manhole?**  
No - It must be removed after the Davit Arm is fully assembled and leveled before it is over the manhole and must be back over the manhole before removing the Davit Arm system form above the manhole opening.
2. **When can the permits be signed?**  
During the 4-minute equipment check.
3. **Who can remove PPE during the event?**  
The only person allowed to remove PPE during the event is the person writing the gas reading on the permit. Anyone else will be penalized except for the 5-second rule on hard hats. Definition of the 5-second rule is when a hardhat falls off the head, that person must stop working immediately, pickup the hardhat and place it back on their head. If this is not completed in 5 seconds a penalty will be assets. The rescuer will take his/her approved gloves off and put the disposable latex gloves to revive the victim. Although when the rescuer is finished he/she must put the mechanics gloves back on in order to proceed with the event.
4. **What are approved gloves?**  
Leather gloves, mechanics' gloves. Gloves with fingertips removed, hole(s) in the glove are not acceptable. Latex gloves will be provided for the rescuer. \* note- there is nothing that says that the approved gloves cant be put on over the latex gloves after the rescue is completed; however, the latex gloves must be off before the event begins.
5. **Who is timing the 30-second air check and how?**  
The Team will do the 30 second time for the air check. A judge will be checking the marks on the hose for proper placement. This judge will also observe the 30-second timing for accuracy. The judge will not comment to any team member, it is the team's responsibility to do the test of a full 30 seconds.
6. **Can the air sampling tube be placed through or under the manhole safety guard? Yes**
7. **When can the blower adapter be placed in the opening?** After the safety cover has been removed. The blower must be completely assembled with the diffuser inserted into the manhole and turned on before a team member enters the confined space.
8. **Can one or more safety appliance be mounted on the Davit Arm prior to placement over the opening?**  
The complete fall protection system, Davit Arm, SRL, one Safe Approach winch must be completely setup before it is placed over the manhole. This includes mounting all safety appliances. - Per the directions Step number 8
9. **Is the Davit Arm disassembled at the completion of the event? Yes**  
Are ALL of the safety appliances removed from the Davit Arm upon completion of the event? Yes, SRL and the Safe Approach winch must be removed from the Davit Arm at the end of the event. Every piece of equipment will be behind the equipment line, with the exception of the harnesses they may remain on the entry persons and the victim.

10. **Can a team member "physically handle" the cable and lift a person or victim out of the confined space without using the winch?** No - Should the cable slip this would injure the person. The penalties for injuring anyone are very high.
11. **Who determines what is "legible" for the printed names?** The printed names must be able to be read by the judges. This will be done during the 4-minute equipment check.
12. **Can a team go under the platform to check the harness on the mannequin during the four-minute equipment time check?** Yes
13. **Must an entrant remain connected to the SRL while placing the safety cover back on the manhole?** Yes
14. **Can someone other than the entrants remove and replace the safety cover?** Yes
15. **Will the SRL and Safe Approach winch be in their bags/boxes when the event begins?** No
16. **Will the hose be attached to the gas meter at the beginning of the event?**  
No
17. **What are the dimensions of the starting/stopping, decontamination and the equipment storage areas?**  
The start/stop line is 3ft wide X11 ft long. The decontamination area is 3 ft wide X 5 ft `long. The equipment storage area is 3 ft wide X 16 ft long.
18. **What is the definition of dropping/abusing tools or equipment?**  
Dropping tools or equipment from a distant that could damage it. Abusing tools is doing anything that could damage the equipment.
19. **The attendant can replace the porta-cover when all entrants are out. Is this correct?** Yes
20. **The attendant can insert and remove the ventilation equipment from the manhole as long as he does not break the plane. Is this correct?**  
Yes
21. **When does the person start administering to the heart attack victim?**  
See step 12
22. **Does the person attending to the heart attack victim place a lock on the lockout hasp?**  
Yes, once he /she is completed step 12 (A-P)
23. **After using the AED paddles should the plastic covers be put away?**  
After the AED use is done all parts of the AED will be put away just the way they were before the event started.
24. **Can the person doing the rescue assist the team after he/she is done with the rescue?**  
Yes, that person must lock out, put on the mechanics gloves in order to proceed.
25. **Can the LOTO tags be filled out and signed during the four minute check?**

Yes. A full signature will be needed for each tag.

**26. Can we have LOTO keys in our possession before the event starts?**

No, the keys will remain in the four locks keyhole behind the line. Once the LOTO is placed on the gang hasp, the key will be kept with each individual. Each team member will maintain custody of their key and have it at the end of the event to turn into the head judge.

**27. What defines the person locking out?**

Each individual person must place their lock and tag onto the gang hasp and pull out their key, A penalty will be assessed for anyone other than the person in possession of the lock to place it on the gang hasp and take the key out.

**28. Is it ok if the meter does not work, can the attendant or person using the meter just say "meter is on"?**

Only if the meter malfunctions

**29. Can the equipment start to be put away even if CPR is still being administered to the heart attack victim?**

Yes, as long as the victim in the hole has been rescued and the entrant is out of the manhole.

**30. During the safety event can the latex gloves be worn under the mechanics gloves at the start?**

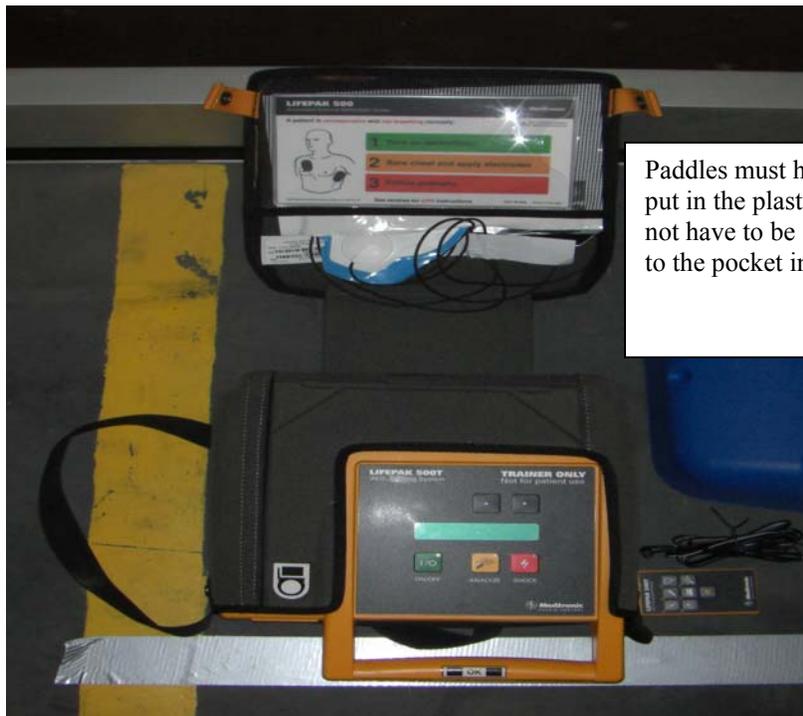
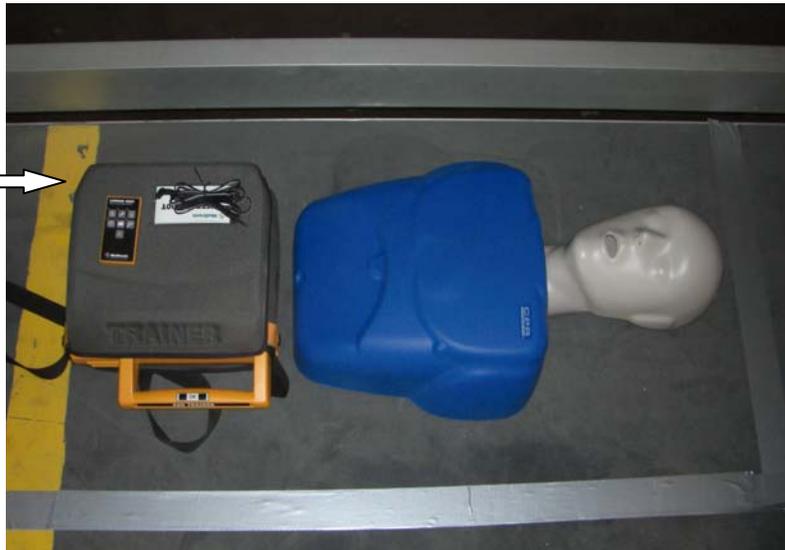
No, the mechanics gloves will be on at the beginning of the event, removed and the latex gloves put on. However, if or when the CPR rescuer is finished and is in position to help out with the rest of the event, he/she may put the mechanics gloves on over the latex gloves.

**31. Can the paddles be connected to the AED electrodes during set up?**

The electrodes will be connected to the paddles for you.

Pictures: This first picture is what the victim and AED should look like at the beginning and end of the event. The mannequin and AED can be placed in any direction as long as they are behind the designated boxed line.

Note\*  
The cord for the remote is neatly wound and tied with a wire tie.



Paddles must have plastic cover on them put in the plastic pouch (the pouch does not have to be sealed) be and placed into to the pocket inside the AED lid.

<b>WEAT 2010 Safety Event</b>	
<b>Confined Space Entry Work Permit</b>	
<b>A. Site Information: PLEASE PRINT</b>	
Confined Space Id. Number:	
Team name:	
Designated Entry Team Leader:	
Designated Team Attendant:	
Description of work to be performed:	
<b>B. Protective And Emergency Equipment Needed</b>	
Yes	No
Gloves <input checked="" type="checkbox"/>	
Boots <input checked="" type="checkbox"/>	
Harness/Davit Arm Hoist	<input checked="" type="checkbox"/>
Atmospheric Tester	<input checked="" type="checkbox"/>
Blower	<input checked="" type="checkbox"/>
Hard Hat/Coveralls	<input checked="" type="checkbox"/>
Ventilated/Purged	<input checked="" type="checkbox"/>
<b>C. Atmospheric Tests</b>	
Explosive Gases	LEL
Oxygen	%
H <sub>2</sub> S (Hydrogen Sulfide)	PPM
CO (Carbon Monoxide)	PPM
(Note: if alarm sounds vent space for 15 minutes with power ventilator and retest. If alarm sounds again continue to ventilate and retest until atmosphere meets allowable limits)	
Test accomplished by:	
<b>D. Sign Off</b>	
Entrant Signature:	
Entrant Signature:	
Attendant's Signature:	

## **Hartwell Environmental LAB EVENT 2011**

**Event:** Perform all steps of an E. coli membrane filtration analysis using Hach products following all method requirements and aseptic techniques as outlined in the Hach m-ColiBlue24 method and using Standard Methods 9222B, as a reference for the filtration method.

### **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:**

*Teams must supply their own safety glasses (required) & calculators.*

- Sterile petri dishes / Sterile pads (come as a set that will be separated for the event)
- Sterile membrane filters with grids
- Forceps (2 per table)
- Small beaker with alcohol (100 ml)
- Alcohol Burner
- Membrane filtration apparatus (suction flask doubled, tubing, suction pump)
  - Pump
  - Suction Flasks (x2)
  - Tubing
  - Rubber Stopper (x1)
  - Glass Tube or 10 ml pipet
- Incubator
- Petri dish rack for incubator
- Pen type colony counter
- Colony tally counter

- Sharpies
- m-ColiBlue24 ampules
- Funnel assembly
- Hach buffer dilution water pillows
- 1 ml sterile pipettes (individually wrapped)
- 10 ml sterile pipettes (individually wrapped)
- Safety bulbs (x3)
- 100 ml bottles with sterile water (x2)
- Sterile 25 ml cylinders (x2)
- Sterile 100 ml Cylinders (x2)
- Autoclave bags with ties (Twist ties)
- Calculator
- Bin for autoclave bags (Dish washing type bin)
- Autoclave tape
- QC sample tubes (x2)
- Sample tube rack
- Squeeze bottle with isopropyl alcohol (x1)
- 1 liter squeeze bottle for dilution water. (x1)
- 1 liter sterile water bottles, glass (x2)
- Autoclave wrap (Like Fisher 11-890-1, 18"x18")
- Bottle of dilute "bleach" solution
- Paper towels
- Nail clippers (for opening pillows)
- Bottle containing sample (x1)

### **Setup:**

Anyone involved with the set up, preparation of samples and plates, funnel assembly, squeeze bottles etc... must clean hands once before touching anything by rubbing hands with isopropyl alcohol from the isopropyl squeeze bottle. **The team member wiping the designated work area does not have to clean their hands before doing so, but must clean their hands *after* cleaning the designated work area unless they are only reading plates, calculating, or prepping for autoclaving.** Hands do not have to be cleaned for reading of plates, calculation of plates, or preparation for autoclaving.

The vacuum pump is to be turned on ONCE at the beginning of the event (step 2 of "Blank Preparation") and off (Section XIII) at the end of the event. To control the vacuum on the pump during the event, a valve will be installed on the hose where it is attached to the pump. Turning this valve applies and releases the vacuum.

### **I. Preparing Petri Dishes**

Clean the designated work area ( 15" x 24", outlined with tape) BEFORE STARTING by squirting a small amount of the dilute bleach solution onto the work area and then wiping area dry.

All dishes must be labeled legibly on the underside using a sharpie marker provided as outlined below. This must be done to all Petri dishes before any lids are removed.

1. Label one dish as "positive QC".

2. Label one dish as “negative QC”
3. Label one dish as “Effluent 100 mL”
4. Label one dish as “Effluent 10 mL”
5. Label one dish as “Effluent 1 mL”
6. Label one dish “Blank”

## **II. Use sterilized forceps to place a sterile absorbent pad in each petri dish and replace lid.**

1. To sterilize forceps, dip them in the beaker labeled “alcohol” and hold over alcohol burner for a count of two (one one-thousand, two one-thousand). FOR SAFETY, BURNERS WILL NOT ACTUALLY BE BURNING.
2. Using the forceps, pick up an absorbent pad at the edge and place one in each petri dish.
3. Remove the lid immediately before placement of the pad, and replace the lid immediately after placing the pad. To avoid contamination, never place lid on the table.

## **III. Add m-ColiBlue24 media to each dish.**

1. Invert m-ColiBlue24 ampule 3 times (count 1, 2, 3), remove cap and pour 1 ampule evenly over the absorbent pad in each dish.
2. Replace the petri dish lid immediately after adding the ampoule. Never place lid on the table.

## **IV. Set up the membrane filter and funnel.**

1. Unwrap sterile funnel apparatus. DO NOT TOUCH THE INSIDE OF THE FUNNEL OR THE BOTTOM FILTER SEAT. These areas must remain “sterile”.
2. Place the bottom part of the funnel into the suction flask.
3. Sterilize forceps, dip them in the beaker labeled “alcohol” and hold over alcohol burner for a count of two (one one-thousand, two one-thousand).
4. Unwrap a sterile filter. Avoid touching it with your hands.
5. Use the sterile forceps to grasp the filter at an edge, and lay the filter centered on the filter seat GRID SIDE UP.
6. Attach top part of funnel to bottom.

## **V. Preparation of sterile water.**

1. Prepare buffer solution by shaking each pillow 3 times (invert 3x, count 1, 2, 3). Add 1 potassium phosphate pillow & 1 magnesium chloride pillow to 1 liter sterile dilution water.
2. Cap bottle and repeat step one with a second 1 liter bottle of sterile water so that there are two liters prepared dilution water when completed. At this point the bottles with dilution water are normally autoclaved, but we will skip this part.

3. Un-wrap sterilized 1 liter squeeze bottle. Invert 1 bottle of sterile dilution water bottle 3 times (count 1, 2, 3) to mix. Without touching the lip of the bottle, the inside of the lid, or any part that goes into the squeeze bottle, aseptically pour sterile dilution water into the squeeze bottle. Replace lid on sterile water bottle, and attach lid of squeeze bottle. Do not touch the nozzle tip of the squeeze bottle.

## **VI. Blank preparation**

1. Using sterile water from the squeeze bottle, add a small amount of sterile water to funnel.
2. **Turn vacuum pump on.** Using the valve on the pump to apply and release pressure, apply vacuum to funnel assembly. (This is where you check to see if the assembly is “tight” and that no water is seeping out between the top and bottom part of the assembly). Once the dilution water has passed through, release the vacuum.
3. For the dish labeled “Blank”: Mix a 1 liter bottle marked “Sterile Dilution Water” by inverting 3 times (count 1, 2, 3).
4. Using a sterile 100 mL cylinder, aseptically measure out 100 mLs of sterile water from the dilution water bottle and pour into the filter funnel.
5. Apply vacuum. Once water has passed through the filter, release the vacuum.
6. Remove top of filter assembly. Place on inside surface of the original sterile filter wrapper.
7. Sterilize forceps, dip them in the beaker labeled “alcohol” and hold over alcohol burner for a count of two (one one-thousand, two one-thousand).
8. Grasp the filter on the edge. Remove the lid to the dish labeled “Blank”. Place the filter into the dish by inserting the filter against the inside edge of the dish against the pad, grid side up and use a rolling motion to exclude any air from between the filter and pad until the filter is laying flat. Make sure that the filter touches the entire pad. Replace petri dish lid.
9. Invert petri dish.

## **VII. Sample preparation**

1. Shake the sample bottle 20 times prior to each filtration.
2. Sterilize forceps, dip them in the beaker labeled “alcohol” and hold over alcohol burner for a count of two (one one-thousand, two one-thousand).
3. Use the sterile forceps to grasp a new filter at the edge, and lay the filter centered on the filter seat GRID SIDE UP.
4. Attach top part of funnel to bottom.
5. Using sterile water from the squeeze bottle, add a small amount of sterile water to funnel.
6. Apply vacuum to seat filter. Once the dilution water has passed through, release the vacuum.

7. For the dish labeled “1 mL”: Mix the 1 liter bottle marked “Sterile Dilution Water” by inverting 3 times (count 1, 2, 3).
8. Using a sterile 10 mL pipette, add 10 mLs of the dilution water from the dilution water bottle to the filter funnel.
9. Shake sample 20 times. Using a sterile 1 mL pipette, add 1 mL of sample to the dilution water in funnel.
10. Apply vacuum to funnel only after sample has been added to the dilution water.
11. Once sample has passed through filter, Use a sterile cylinder to add 20 mLs of sterile dilution water to the funnel.
12. Once the 20 mLs has passed through the filter, add another 20 mLs of dilution water. After that passes, add a third volume of 20 mLs of dilution water to the filter.
13. Once the third volume has passed, release the vacuum.

#### **VIII. Transfer the filter to a sterile petri dish.**

1. Remove top of filter assembly. Place on inside surface of the original sterile filter wrapper.
2. Sterilize forceps, dip them in the beaker labeled “alcohol” and hold over alcohol burner for a count of two (one one-thousand, two one-thousand).
3. Grasp the filter on the edge. Remove the lid to the dish labeled “1 mL”. Place the filter into the dish by inserting the filter against the inside edge of the dish against the pad, grid side up and use a rolling motion to exclude any air from between the filter and pad until the filter is laying flat. Make sure that the filter touches the entire pad. Replace petri dish lid.
4. Invert petri dish.

#### **IX. Rinse filter assembly.**

1. Replace the funnel on the filter seat.
2. Apply vacuum and using the squeeze bottle rinse the inside walls of the filter funnel for a count of 3 (count one one-thousand, two one-thousand, three one-thousand).
3. Release the vacuum.

#### **X. Sections VII, VIII are repeated for the 10 mL sample:**

1. Sterilize forceps, dip them in the beaker labeled “alcohol” and hold over alcohol burner for a count of two (one one-thousand, two one-thousand).
2. Use the sterile forceps to grasp a new filter at the edge, and lay the filter centered on the filter seat GRID SIDE UP.
3. Attach top part of funnel to bottom.

4. Using sterile water from the squeeze bottle, add a small amount of sterile water to funnel.
5. Apply vacuum to seat filter. Once the dilution water has passed through, release the vacuum.
6. For the dish labeled “10 mL”: Mix the 1 liter bottle marked “Sterile Dilution Water” by inverting 3 times (count 1, 2, 3).
7. Using a sterile 10 mL pipette, add 10 mLs of the dilution water from the dilution water bottle to the filter funnel.
8. Shake sample 20 times. Using a sterile 10 mL pipette, add 10 mL of sample to the dilution water in funnel.
9. Apply vacuum to funnel only after sample has been added to the dilution water.
10. Once sample has passed through filter, Use a sterile cylinder to add 20 mLs of sterile dilution water to the funnel.
11. Once the 20 mLs has passed through the filter, add another 20 mLs of dilution water. After that passes, add a third volume of 20 mLs of dilution water to the filter.
12. Once the third volume has passed, release the vacuum.
13. Remove top of filter assembly. Place on inside surface of the original sterile filter wrapper.
14. Sterilize forceps, dip them in the beaker labeled “alcohol” and hold over alcohol burner for a count of two (one one-thousand, two one-thousand).
15. Grasp the filter on the edge. Remove the lid to the dish labeled “10 mL”. Place the filter into the dish by inserting the filter against the inside edge of the dish against the pad, grid side up and use a rolling motion to exclude any air from between the filter and pad until the filter is laying flat. Make sure that the filter touches the entire pad. Replace petri dish lid.
16. Invert petri dish.

## **XI. Preparation of the 100 mL sample**

Section IX and section VII 1-5 are repeated:

1. Replace the funnel on the filter seat.
2. Apply vacuum and using the squeeze bottle rinse the inside walls of the filter funnel for a count of 3 (count one one-thousand, two one-thousand, three one-thousand). Release the vacuum.
3. Sterilize forceps, dip them in the beaker labeled “alcohol” and hold over alcohol burner for a count of two (one one-thousand, two one-thousand).
4. Use the sterile forceps to grasp a new filter at the edge, and lay the filter centered on the filter seat GRID SIDE UP.
5. Attach top part of funnel to bottom.
6. Using sterile water from the squeeze bottle, add a small amount of sterile water to funnel.
7. Apply vacuum to seat filter. Once the dilution water has passed through, release the vacuum.
8. For the dish labeled “100 mL”, shake sample 20 times and pour out 100 mLs of sample into an unused sterile cylinder.

9. Pour the 100 mLs of sample into the filter assembly.
10. Apply vacuum to funnel only after sample has been added to the filter assembly. Rinse the graduated cylinder 3x with sterile water and pour through filter.
11. Once sample has passed through filter, Use the sterile cylinder to add 20 mLs of sterile dilution water to the funnel.
12. Once the 20 mLs has passed through the filter, add another 20 mLs of dilution water. After that passes, add a third volume of 20 mLs of dilution water to the filter.
13. Once the third volume has passed, release the vacuum.

**XII. Follow section VIII to place filter in dish labeled 100 mL**

**XIII. Repeat section XI for 100 mLs of the E. coli (positive) QC which can be poured straight from the bottle into the funnel. See preparation of QC samples below.**

Repeat section XI for 100 mLs of the P. aeruginosa (negative) QC which can be poured straight from the bottle into the funnel. *See preparation of QC samples below.*

**Once all samples have been filtered, turn the vacuum pump completely off.**

**XIV. Preparation of QC samples.**

1. Label 2 bottles of sterile water. Label one as “E. coli” (positive QC), and the other “P. aeruginosa” (negative QC).
2. Remove rehydrated bacteria tubes from incubator.
3. Invert tubes 3 times (count 1, 2, 3).
4. Open tube and aseptically transfer rehydrated E. coli to bottle marked E. coli.
5. Re-cap bottle and shake for a count of 3(count 1, 2, 3).
6. Open tube and aseptically transfer rehydrated P. aeruginosa to bottle marked P. aeruginosa.
7. Re-cap bottle and shake for a count of 3(count1, 2, 3)

Place inverted petri dishes in incubator. Complete Bench Sheet (Date, analyst initials, time in incubator, sample volumes, and appropriate incubator temperature.)

**XV. Reading plates**

1. Remove the 6 samples from the incubator which have been incubating for 24 hours.
2. Count the number of blue colonies on each plate and record in the appropriate box on the bench sheet provided.
3. Calculate the colony count for each sample according to section XVI and record in the appropriate box on the bench sheet.

4. Record the results for the two QC samples and the blank as either “Positive Growth” or “Negative Growth” on the bench sheet.
5. Place dishes in an autoclave bag, seal with a twist tie, and mark with a piece of autoclave tape. Place in the “to be autoclaved” bin.

**Dispose of all trash (used pipettes, wrappers, empty dilution water pillows) in the container marked “Trash” which will be located on the table near the vacuum pump.**

**XVI. Calculations:**

1. From the 3 sample filters (1, 10, & 100 ml), select filters with 20-80 **BLUE** colonies. Total number of blue colonies on the plate cannot be greater than 200. *If total number of **BLUE** colonies is greater than 200, record as TNTC (Too Numerous to Count) in the appropriate box.*
2. If only one filter meets the requirement of 20-80 **BLUE** colonies, use the following equation:

$$\frac{\text{\# of BLUE colonies}}{\text{Total Volume of Sample (s)}} \times 100 = \text{E coli / 100 mL}$$

3. If more than one filter meets the requirements of 20-80 **BLUE** colonies, sum the number of colonies and sample volumes for the plates which meet the 20-80 requirement, and use the above equation. OMIT ANY PLATES OUTSIDE OF THE 20-80 RANGE.

**XVII. A 10 question multiple choice quiz will be included. The quiz may cover holding times, incubation temperatures, and short definitions related to microbiology work.**

**AECOM**  
**Collection System Event**

Information to Follow

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