

2nd ANNUAL WEAO STUDENT DESIGN COMPETITION

ENTRY GUIDELINES

August, 2009

INTRODUCTION

The Water Environment Association of Ontario (WEAO) Student Design Competition is intended to promote “real world” design experience for students interested in pursuing an education and/or career in water/wastewater engineering and sciences. This competition tasks individuals or teams of student members within WEAO to design and present a program meeting the requirements of the problem statement. This competition will be held at WEAO Annual Symposium on April 2010.

For More Information, contact:

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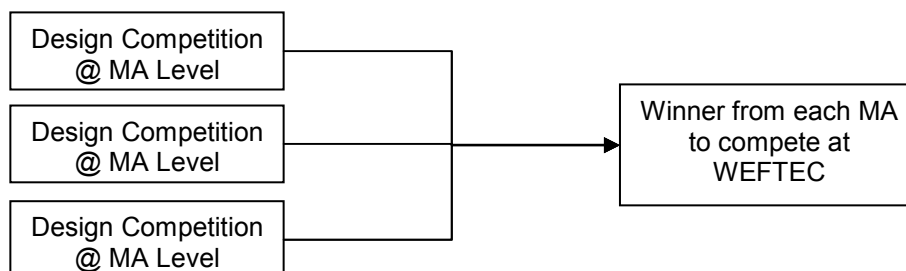
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The WEAO New Professionals Committee (NPC) is always looking for interested persons to help further the activities supported by the committees. If you are interested in helping or becoming a member please contact Charlie Chen.

BACKGROUND

The WEAO student design competition concept is based the Water Environment Federation (WEF) WEF® Student Design Competition, a competition held annually at WEFTEC. The WEAO Student Design Competition is intended to select a winning team among Universities and Colleges in Ontario that will compete at the WEF® Student Design Competition at WEFTEC in October 2010 in New Orleans, LA.

The WEAO NPC feels this competition promotes interest within students that will prove to be extremely valuable as they enter the professional world. WEAO NPC established a Coordination team to lead the effort in establishing a WEAO Student Design Competition (SDC) to be held at the WEAO Annual Symposium. It is the intent of the WEAO SDC Coordinators to promote this competition at the Member Association (MA) level. For the purpose of the WEF competition, WEAO is a Member Association of WEF. These guidelines represent a general guide to what the NPC envisions. Below is a schematic of the intent of this competition.



This year’s design problem has been kindly provided by The Regional Municipality of Durham. The problem involves the expansion of the Port Darlington Water Pollution Control Plant (WPCP). The WEAO NPC distributed the design problem to schools willing to participate and advertised it on WEAO’s Influents magazine and WEAO’s website. Interested student teams can have access to the same design problem statement and

information at <http://www.weao.org/sdc/>. Students are given one semester to finalize their design with the appropriate recommendations. Registered teams will be asked to present their solution at the WEAO Annual Symposium to be held in London, ON. The winner of the WEAO competition will be invited to compete at WEFTEC® later that year.

If only one school is willing to participate at the WEAO level, that school's student team may compete at WEFTEC® assuming they meet the guidelines set forth herein.

The WEF® Student Design Competition guidelines state that if schools are willing to participate but their MA does not host a WEA Student Design Competition, these schools may be invited to compete at WEFTEC® on a case-by-case basis at the discretion of the WEF® Student Design Competition Sub-Committee. Furthermore, it is at the discretion of each MA to adopt and/or change rules of these guidelines as needed to suit the MA in order to have a successful competition.

STUDENT DESIGN COMPETITION

The student design competition is based on problems relating to the environmental field. Problems such as sewer design (collection & distribution system analysis), wastewater treatment plant expansions, biological treatment, reuse, constructed wetlands, sustainability efforts, etc. The scope and extent of the project should be at the level of a senior or graduate engineering/science student in a design or capstone course. Students are expected to work with little assistance from an advisor and/or professor and the students are expected to work together as a team to recommend a solution. Students may use whatever references or resources they choose.

Students are expected to perform the necessary calculations for the project. This is not intended to be a research project or literature review. Although some initial literature review and/or research will be required, the bulk of the project should incorporate pertinent calculations for the design.

For example if the project involved a wastewater treatment plant expansion, judges should look that each team performed the following:

- Hydraulic profile
- Preliminary sizing of major equipment (aeration basins, clarifiers, chlorine contact chambers, etc.)
- Incorporate information from different manufacturers
- Population analysis to determine design flow rates
- Preliminary cost evaluation
- Decision matrix (provide why you ended up with that particular process or design etc.)

All of the design work should be submitted in the design notebook, clearly labelled and referenced. See below for information regarding the notebook.

Timeline:

Experience and conversations with students who have participated in this type of competition in the past indicated the need for the problem statement to be given approximately 3 to 4 months prior to the competition. A tentative timeline is shown below. It should be noted that the dates are given only as a guideline and may be adjusted to suit WEAO and/or student chapters participating. The WEF® Student Design Competition specific timeline is presented as well.

WEAO Student Design Competition

August 6, 2009	WEAO announces Student Design Competition, Guidelines.
October 31, 2009	Deadline for teams to submit the Entry Form. WEAO to distribute detail problem statement and post project background information on WEAO web site.
mid-Nov. 2009	Site visit (Port Darlington WPCP, Bowmanville Ontario).
April 1, 2010	Deadline for participating teams to submit the design notebook and at least the required num. of CDs. Package shall be postmarked no later than this date.
April 18, 2010	WEAO Student Design Competition held in London, ON - Presentations at WEAO Symposium.

WEF Student Design Competition

May 1, 2010	Selected WEAO team shall submit the completed Entry Form to WEF (exact date to be announced).
August 1, 2010	Selected WEAO team shall submit an abstract (brief summary of the design), not to exceed 200 words (exact date to be announced).
September 1 2010	WEAO team shall submit a package containing hard-copies of the design notebook and the required number of CDs. Package shall be postmarked no later than this date (exact date to be announced).
Oct. 2-6, 2010	WEFTEC® Student Design Competition (New Orleans, LA)

REQUIREMENTS OF THE WEAO STUDENT DESIGN COMPEITION

1. **TO BE ELIGIBLE**, each presenter must be a WEAO and WEF® student member who:

- **has** been selected by his/her student chapter to participate, and/or
- **has** been certified by the individual member association as a student member in good standing.

To be thus certified, a new WEAO / WEF® student member must have filed an application and paid the required dues before the first day of the month prior to the designated competition. The same holds true for continuing student members.

****The WEAO Student Design Competition Coordinators realize that schools willing to participate may not have a WEF® Student Chapter. Therefore, as long as the participants are WEAO and WEF® student members they will be allowed to participate.**

2. Student members who have graduated at the time of the WEFTEC® will be allowed to participate.

3. Teams may consist of more than four members, but only four student members may present.

4. There is no limit on number of teams per University or College to participate. Generally the winner of the WEAO Student Design Competition will be automatically invited to compete in the WEF® Student Design Competition. WEAO funding will reimburse only one team comprised of four (4) students for travel, lodging, meals and transportation to the WEF® Student Design Competition held at WEFTEC. Additional

teams may be selected based on availability at the discretion of the WEF® Student Design Competition Sub-Committee.

5. Student members will compete through written and oral presentations.
 - a. Written: A design notebook complying with the requirements set forth in this document must accompany each entry.
 - b. Oral: Each team's presentation will be 20 minutes followed by a 10-minute question and answer period. The presentation should be in PowerPoint format and able to be loaded onto a general laptop available at the competition site. Any time remaining or in excess of the 20 minutes may be added to or subtracted from the 10-minute question and answer period.
 - c. Both written and oral presentations are subject to questioning during the question and answer period. However, questioning is limited to the judging panel only.

ENTRY FEE

There is no entry fee for the competition.

PROFESSOR OR FACULTY ADVISOR

Each team will be able to select a professor or faculty advisor who will act as a resource and a coach (but not a source to obtain solutions from) and the advisor can ask directed questions to point the students in the right direction. Duties of the faculty advisor are:

- Present and explain problem statement
- Help students prepare for site visit and facility tour
- Guide students to commonly accepted design literature, local, provincial and federal design standards
- Act as the liaison for questions between the team and the SDC Coordinator
- Participate in interim & final design review workshops with students & Durham Region
- Ensure students send final design report in time
- Help students prepare for oral presentations and question and answer period

CONSULTANT ADVISOR

Each team are permitted to seek out local engineering consulting firms for design help. It is acceptable and encouraged for a Student Design Team's Advisor to share professional contacts with local engineering consultants with their team to assist in their mentoring process. In general, engineering consultants may volunteer to provide basic consulting assistance to the teams if asked, but students must take into consideration that engineering consultants may be unable to provide any help at all due to business demands or legal reasons.

Some services that consultants may provide the design teams include:

- Provide advice on cost information for commonly used materials and equipment, such as pipes, valves and concrete
- Provide limited feedback on unit prices decisions
- Review of deliverables prior to submittal

Tasks Not Expected:

- Check calculations
- Provide basic economic calculations
- Provide treatment alternatives to consider
- Select alternatives
- Conduct daily interaction with team leader

To ensure fairness in the competition, students will be required to submit project references with the final design report. The references list should include the names of consulting firms, manufacturers, and equipment vendors that assisted the student design team.

NATURE AND MANNER OF PRESENTATION

It is recognized that environmental professionals must possess a well-developed ability to communicate both orally and in writing. The competition is designed to emphasize the value of delivering both high quality written and oral technical presentations. Scoring of the design will be determined through an evaluation of both the competitors' written and oral presentation skills, along with the technical content of the problem solution. Written and oral skills will be evaluated separately and the scores will be added for the total score (see Scoring Sheet - Attachment B).

The written submission (submitted in electronic format) will be evaluated by the judges prior to the oral presentation. Scores on the written data will be submitted prior to the completion of the oral presentations. The written submission will be available to the judges during the oral presentation for their reference and questions may be posed to the teams based on information contained in the written submission.

DESIGN NOTEBOOK REQUIREMENTS

A vinyl, non-flexible, single volume, 1-inch three-ring binder shall be used to compile documents that describe the entry for judging. A CD containing an organized and easily viewed electronic copy of the design notebook shall also be created. An original hard-copy of the notebook and copies of the CD must be submitted to the Sub-Committee by the stated deadline. The number of CD copies must at least be equal to the number of competition judges, as the CDs will be distributed to the judges for evaluation prior to the oral presentations.

The project name, team name, and entrant's names shall be affixed to the spine and front of the design notebooks, as well as labeled on each CD. The design notebook and each CD shall include, in the following order:

1. **Entry Form** - Please use the original entry form supplied for hard-copy notebook.
2. **Abstract** – Provide a brief summary of the design, not to exceed 200 words.
3. **Project Description** – Provide a description of the project or program, including the following information:
 - A summary of the project team, including:
 - i. Each team member's role in the effort

- ii. The names of any other individuals that assisted in the effort
- A discussion of the design solution (not to exceed 5,000 words*). The discussion must cover the salient facts upon which the recommendation is made, give a clear analysis of the evaluation technique, and present a clear recommendation of action. Relevant data should be presented in the discussion in a clear form. All elements shown on the judging form should be addressed.
- Color diagrams, charts and photographs that reflect the unique features of the project. Each graphic/photo is to be identified with an appropriate descriptive caption.

***The number of words used in the discussion is checked to ensure compliance with the 5,000-word limit. Each word or grouped together symbols, abbreviations, etc., are counted as one word.**

4. Supporting Documentation – Provide drawings, calculations, tables, vendor submittals, cost estimates, and other voluminous documents, as appendices.

5. References

COMMUNICATIONS PROTOCOL

In general, teams' questions shall be forwarded to the SDC Coordinator, who will obtain answers from Durham Region. Answers will be provided on a continuously updated document posted on the WEAO web site (similar to a Frequently Asked Questions document). The exact address, username and password for the web site will be provided to the design teams once those participating student design teams have submitted their Entry Forms.

The student design teams are not permitted to speak directly with Durham Region staff regarding the design competition. It is encouraged that students first obtain answers to questions from the available design literature, team advisors, assisting consultant and from SDC Coordinator, in that order. Students are encouraged to use initiative and work independently as much as possible.

If students have questions that cannot be answered by consulting design literature, or the team advisors and assisting consultant, the students should check the FAQ document on the WEAO web site. If the question has not already been listed in the FAQ document, and having exhausted all resources, then the student lead should formulate the question and send it to the SDC Coordinator and their team advisor. The SDC Coordinator will, on a weekly basis, post answers from Durham Region on the FAQ document on the WEAO web site.

FACILITY SITE TOUR

There will be one mandatory facility tour organized by the WEAO NPC on a date to be announced. It will be required that at least one member of the student design team attend this facility tour. Travel expenses for participating team members will be reimbursed by WEAO through the Student Chapter's budget or by WEAO in case there is no student chapter formed.

CONDUCT OF THE CONTEST

The same individuals will judge throughout the contest. Ideally, the judging panel should be comprised of members of the sponsoring company/industry. Competing student

chapters may be allowed to watch another student chapter's presentation. The scoring sheet has been developed for the convenience of the judges in evaluating both the design notebooks and presentations and will be used by the judges as the basis for judging all the student teams (see Scoring Sheet - Attachment B).

JUDGING CRITERIA

WEAO is a multi-disciplined environmental professional organization dedicated to quality in practice of the profession. Accordingly, judging will be based on the elements outlined below and in the scoring sheets provided in Attachment B.

1. PRESENTATION:

- a. **Content.** Was technical subject matter relevant to design? To what extent was subject of interest to a technical audience? Was credit given for source of material or contribution by others? How much knowledge of subject was exhibited? Was work independent and original? Was subject technical or general in nature?
- b. **Organization.** Was there any novel approach to the subject? Was there sufficient background information provided in order to introduce the audience to the subject? Were facts developed in logical and continuous sequence? Was there a definite conclusion and was it adequately based on the facts or data presented?
- c. **Delivery and Effectiveness.** Were the words distinctly pronounced and was proper volume used to be heard by all? Did the contestant use proper English and was the vocabulary sufficient? Was personal appearance appropriate? Were there any distracting mannerisms? Was the manner of delivery (conversation, memorized, read from manuscript) satisfactory? If visual aids were used, how effectively were they used? Was the presentation completed within the time limit of 20 minutes?
- d. **Discussion.** Did the presentation evoke spontaneous questions from the panel? Did questions indicate the need for clarification of facts presented or were they merely of the type seeking additional information? How readily and with what self-assurance did the speaker answer questions? Did the answers indicate knowledge of subject beyond that disclosed in the original presentation?

2. DESIGN NOTEBOOK:

- a. **Technical.** Was the notebook organized effectively with Introduction, Statement of Problem, Background information, etc? Was a continuous, logical sequence of steps taken to solve the design problem? Was the solution feasible & logical for problem statement? Was creativity and innovative approach shown? Was knowledge of subject demonstrated? Was the solution analyzed for economic feasibility; was this analysis presented? Bibliography, credit to resources & help presented?
- b. **Presentation.** Were visual aides (graphs, supporting info, pictures, etc.), presented clearly? Correct grammar, spelling & technical writing? Logical formatting, organization of report, table of contents? The judges will have

the opportunity to comment on the design notebooks and presentations during the judging process. Judging scoring sheets and comments for each submittal will be made available to the corresponding team after the competition. Teams will not be allowed to view the entire scoring of any other team within the competition.

AWARDS

The following are possible awards that can be awarded, and are subject to change at the discretion of WEAO:

WEAO COMPETITION AWARD

PLACE	AWARD
1 st Place	<ul style="list-style-type: none"> • Award recognition plaque • Monetary award to cover student registration and travel expenses to WEFTEC (est. \$5,000) • 1-year free WEF Student Membership 2010
2 nd Place	<ul style="list-style-type: none"> • Award recognition plaque • Monetary award of \$400 • 1-year free WEF Student Membership 2010
3 rd Place	<ul style="list-style-type: none"> • Award recognition plaque • Monetary award of \$100 • 1-year free WEF Student Membership 2010
Other Participants	<ul style="list-style-type: none"> • Certificate • 1-year free WEF Student Membership 2010

For the team awarded First Place on the WEAO Design Competition, the team will be invited to participate at WEFTEC-10 in New Orleans, LA. WEFTEC design competition has the following suggested monetary awards for the top four teams: 1st place: \$2,500, 2nd place: \$1,500, and 3rd place: \$1,000.

WINNERS' OBLIGATIONS

- Obtain student WEF membership prior to attending WEFTEC (to ensure student registration rate at WEFTEC)
- Winning team shall compete at the WEF Student Design Competition at WEFTEC in October 2010, in New Orleans, LA.

PROJECT SUMMARY

Below is the summary of the design project statement that would be given to each registered student team in detail along with access to its background information. Note this is only given to provide students a general idea of the actual design project and its specific components. The detail design project statement may vary.

DESCRIPTION OF PROJECT

This year's design problem has been kindly provided by Durham Region. The problem statement involves the expansion of the Port Darlington WPCP. To obtain a copy of the Project Statement, and background information, please go to <http://www.weao.org/sdc/> and follow the link to the WEAO Design Competition. A summary is provided below.

The existing Port Darlington WPCP, servicing the Bowmanville Urban Area, has an annual average daily flow rate of 13,638 m³/d, and a peak flow rate of 34,095 m³/d. The design for the WPCP expansion is to be based on the Class EA findings completed in 2005. This project will examine design alternatives for the plant unit processes for the expansion to meet the design flows and effluent criteria.

PURPOSE

The purpose of the project is twofold:

- To develop the preliminary design and layout for the Phase 1 expansion of the Port Darlington WPCP to 27,276 m³/day ADF; and
- To identify alternative process and system solutions at concept design level for the subsequent Phase 2 expansion of the plant to 40,914 m³/day ADF,

Development of the conceptual design for Phase 2 expansion should explore feasibility of further expanding this plant against other options. Further expansion of the Port Darlington WPCP is however a reasonable option for Phase 2, particularly given the availability of land and the significantly higher capital costs of conveyance and treatment of flows at an alternative site.

Alternative solutions and recommendations for wastewater treatment processes to be implemented for Phase 2 and/or future expansions will be developed under at feasibility level with a preferred alternative selected with a conceptual design aiming at using this technical information for a future EA Study.

The recommended alternative for Phase 1 included the following treatment train for Phase I expansion:

- Screening
- Grit Removal
- Primary Treatment
- Conventional Activated Sludge (bioreactors designed for enhanced nitrogen removal)
- Secondary Clarification
- Phosphorous Removal
- Disinfection
- Anaerobic Digestion

KEY PROJECT COMPONENTS TO ANALYZE

- Existing key plant processes and auxiliary systems,
- Treatment alternatives and layout,
- Wastewater characteristics,
- Effluent criteria,
- Emergency power supply
- Noise and odour controls
- Implementation costs
- Operating and Maintenance Cost (O&M)
- Growth potential
- Implementation schedule

- Rehabilitation of affected areas
- All necessary utilities to be provided

The detailed scope of work is the following (as a minimum):

- Developing and finalizing basic design data for phase 1 and 2 of the project
- Selecting of treatment processes for sewage and sludge
- Developing process flow diagrams
- Developing facilities and site layout for phase 1 of the project
- Developing the updated hydraulic profile of the plant
- Defining operation and control strategies
- Selecting and specifying equipment
- Define sizes and requirements of process facilities
- Process design and sizing calculations
- Hydraulic calculations for sewage and sludge pumping stations, process liquid streams within the plant at minimum and peak flows
- Design reports
- Design drawings
- Cost estimate
- Project schedule

The following summarizes the project

- Expansion of the existing secondary treatment WPCP
- Provision of a new effluent disinfection facility
- Provision of a new biosolids storage facility
- Provision of a new hauled waste septage receiving station
- Provision of auxiliary systems to support plant expansion
- Instrumentation and SCADA control system

SUPPORT INFORMATION

Background documents and other information will be posted on the Design Competition's website: <http://www.weao.org/sdc/>

ATTACHMENT A

ENTRY FORM

ENTRY FORM

WEAO 2009 STUDENT DESIGN COMPETITION

SUBMIT ENTRY FORM BY OCTOBER 31, 2009

Name of University: _____

Address: _____

City: _____ Province: _____ Postal Code: _____

Phone: _____ Fax: _____

Name of Team Leader to Contact: _____

Address (*if different*): _____

City: _____ Province: _____ Postal Code: _____

Phone: _____ Fax: _____

Email: _____

Name of Faculty Advisor: _____

Address (*if different*): _____

City: _____ Province: _____ Postal Code: _____

Phone: _____ Fax: _____

Email: _____

Names of Team Members:

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

Notes:

- For the winning team that travels to WEFTEC in New Orleans, LA, only 4 team members will have their travel expenses covered.
 - Teams will also need to find an Industry Advisor (e.g. consulting firm), but this can be done after this entry form is submitted. This information will be requested at a later date.

ATTACHMENT B
SCORING SHEETS

**SCORING TALLY SHEET
2009 WEAO STUDENT DESIGN
COMPETITION**

Team:

Title:

	Notebook Score	Presentation Score	Total
Judge #1			
Judge #2			
Judge #3			
Judge #4			

SCORE
(Average of Totals)

**SCORING SHEET
2009 WEAO STUDENT DESIGN COMPETITION
PRESENTATION**

Name of University:

Title:

Judge:

Content - 45 pts

1. Technical subject matter relevant to design (15 pts)
2. Personal contribution, library research, innovative project (15 pts).....
3. Knowledge of subject & content (15 pts)

TOTAL (45 pts)

Organization - 20 pts

1. Introduction, background (eliciting audience interest), objectives, presentation outline (5 pts).....
2. Continuity, essential facts developed in a logical sequence (10 pts)....
3. Conclusion, definite & based on facts (5 pts)

TOTAL (20 pts)

Delivery & Effectiveness - 25 pts

1. Vocal delivery, conversation vs. memorized, proper volume, distinct pronunciation, timing (10 pts).....
2. Body Language, eye contact with audience, distracting mannerisms (5 pts).....
3. Visual aides legibility & effectiveness (10 pts)

TOTAL (25 pts)

Discussion - 10 pts

1. Questions & Answers, Clarification & spontaneous (10 pts)

GRAND TOTAL (100 pts).....

COMMENTS:
