

The BC Water & Waste Association  
**2024** Student Design Competition

**COMPETITION GUIDELINES**

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## Summary of Key Dates

November 1, 2023	BCWWA announces the 2024 Student Design Competition and publishes the Competition Guidelines to <a href="http://www.bcwwa.org">www.bcwwa.org</a>
<b>December 20, 2023</b>	<b>Deadline for teams to submit their Entry Application</b>
January 3, 2024	Teams are notified of application decision
January 30, 2024	Site visit for student teams – preferably at least one student from each team attends.
February 12, 2024	Deadline for submitting the project progress report (1 page). <i>Subsequent submissions will be monthly, hereafter this date.</i>
March 3,, 2024	Deadline for participating teams to submit the design report. <i>Digital submission only.</i>
March 08, 2024	Oral presentations by student teams
March 14, 2024	Judges announce top three teams
<b>April 2023 (to be confirmed)</b>	<b>Deadline for first place team to indicate interest to participate in the WEF SDC 2023 — details to follow later</b>

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## Introduction

The BC Water & Waste Association (BCWWA) Student Design Competition (SDC) promotes “real world” design experience for students interested in pursuing a career and/or education in water/wastewater engineering and sciences. Teams of students prepare and present a conceptual design that addresses the requirements outlined in design criteria established by a BC municipality.

The BCWWA SDC is based on the Water Environment Federation (WEF) SDC, held annually at the WEF Technical Exhibition & Conference (WEFTEC). The competition is intended to showcase the abilities and talents of students in colleges and universities across British Columbia who are interested in the water environment field.

Students have a semester to finalize their design with appropriate recommendations. The top team will be invited to present at the BCWWA Annual Conference & Trade Show and will receive complimentary delegate passes; team members may be asked to volunteer their time for approximately two four-hour shifts at the conference. Each year, the design criteria are created by a BC municipality, based on a real-world design problem. The design criteria can be found on the BCWWA’s website.

## How to Enter the Student Design Competition

1. To be eligible to participate in the BCWWA SDC, each team member must be:
  - A registered student (full-time or part-time) at a college or university in British Columbia (Please note: The competition is intended for senior students [3<sup>rd</sup>, 4<sup>th</sup> level and graduate] in the environmental, civil, chemical engineering or related fields, but junior students will be considered); and
2. To enter the competition, every team must:
  - Submit a BCWWA SDC Entry Form. Entry details are outlined on the BCWWA website;
  - Provide a unique team name. Team names must not incorporate any commercial trademarks or company names;
  - Designate a team leader;
  - Provide faculty advisor; and
  - Provide resumes for all team members.
3. There is no entry fee. A complimentary student membership will be provided to all participants.

## Student Teams

Projects are typically undertaken by teams, comprised of up to five (5) students from a BC college or university. Each team includes up to five (5) senior undergraduate students (3<sup>rd</sup> and 4<sup>th</sup> year) and/or graduate students. Exceptions may be made for junior level students at the discretion of the competition chair based on technical and academic background. Teams must submit justification of junior members with entry forms. There can be more than one team from each institution.

Note that only four (4) student members from each team may present at the BCWWA SDC. Each team should appoint a leader who will act as the coordinator of the project and be the liaison between the team and the BCWWA, faculty advisor and SDC Committee.

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## Scope of Work

The SDC is based on challenges related to the water environment, 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 is normally at the level of a senior undergraduate or graduate engineering/science student in a design or capstone course. Students are expected to work in teams with little assistance from an advisor and/or professor to perform the design work for the project and recommend a complete engineering solution.

It is anticipated that each student will need to provide a 3 to 5-hour time commitment per week for approximately four months.

### **SITE VISIT**

An important hallmark of an environmental engineer is the ability to design practical solutions. Hence, visiting sites and observing processes in the real world is an integral part of the SDC experience. There may be one mandatory site visit organized by the sponsoring municipality and the SDC committee. At least one member of the student design team is required to attend this site visit. Pre-approved travel expenses to attend the site visit may be reimbursed by the BCWWA up to a set amount, subject to SDC funding.

For in person site visits, student teams may be required to wear personal protective equipment (PPE) when visiting the site. Normally, the PPE required include CSA-approved steel-toe boots, vis-vests, construction hard hat, and safety glasses. In some cases, the site owners may be able to provide the construction hats and safety glasses only. However, in the event that there is not enough PPE available, the team members attending the site tour will be responsible for obtaining their own PPE.

Students are normally allowed to use their own cameras to obtain photographs on site. However, this is subject to approval from the sponsoring municipality.

### **PROJECT WORK**

In preparing for project completion, teams will:

- Perform the necessary calculations for the sizing of equipment and related costs;
- Submit a monthly progress report and final design report;
- Provide a final oral presentation;
- Deliver a complete solution for the project statement.

Students are expected to perform the design work for the project. The SDC is not intended to be an academic exercise, such as a research project or literature review. Although some initial literature review and/or research will be required, the bulk of the project should be the conceptual design engineering work including drawings, report sections and relevant calculations for the design. All design work should be submitted in the design report (notebook), clearly labeled and referenced.

There are two “deliverables” for the competition – a Design Notebook, and an Oral Presentation.

- A. A Design Notebook** (report) complying with the requirements set forth within the *WEF Student Design Competition Entry Guidelines* must accompany each entry. The design notebook typically includes:
- 1. Entry Form**
  - 2. Cover Page**
  - 3. Table of Contents**
  - 4. Abstract** – A brief summary of the design that does not exceed 200 words.
  - 5. Project Description** – A description of the project or program, including the following information:
    - A summary of the project team, including:
      - Each team member’s role in the effort.
      - The names of any other individuals that assisted in the effort.
    - A discussion of the design solution, not to exceed 20 pages. 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 clearly presented in the discussion. All elements shown on the judging form should be addressed.
    - Conceptual control narrative identifying how the equipment will operate to achieve or meet the process performance objectives.
  - 6. Drawings** – Provide a set of three drawings including the following:
    - Site layout drawing.
    - Equipment layout plan and section.
    - Process flow diagram.
  - 7. Supporting Documentation** – Provide drawings, calculations, tables, vendor submittals, cost estimates, and other voluminous documents, as appendices. All appendices must be referenced in the body of the report.
  - 8. References/Acknowledgements** – All references and resources used for this project shall be cited accordingly.
- B. Oral Presentation:** Each team’s presentation will be 20 minutes followed by a 10-minute question and answer period. The presentation should be in PowerPoint format (.PPT) and able to be loaded onto a general laptop available at the competition site. No time extension will be provided beyond the 20-minute presentation time and teams exceeding 20 minutes will be asked to end their 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 Attachments B and C). Pre-approved travel expenses to attend the oral presentation will be reimbursed by the BCWWA up to a set amount, subject to SDC funding.

Both the design notebook and oral presentations are subject to questioning during the question and answer period at the end of oral presentation. Questions will be primarily asked by the judges. However, questions from the audience may be permitted.

### **Communications Protocol**

Questions about the design project from the student teams must be forwarded to the SDC committee chair, who will obtain answers from sponsoring municipality if necessary. Answers will be distributed to all teams via Team Leaders. The identity of the teams asking questions will not be revealed.

The student design teams are not permitted to speak directly with the sponsoring municipal staff regarding the design competition. It is encouraged that students first obtain answers to questions from the available design literature, faculty advisors, consultant advisors and from the SDC committee chair, 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's faculty and consultant advisors, the students should check the published Q&A. If the question has not already been listed in any of the Q&A, and having exhausted all resources, then the student team leader should formulate the question and send it to the SDC committee chair and their team's faculty and consultant advisors. The SDC committee chair will, on a regular basis, share answers from the sponsoring municipality with all participants.

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.

### **Role of the Municipal Sponsor**

The municipal sponsor is a member of the committee and plays a pivotal role in developing the project statement and providing supporting documentation about the facility. They also usually sit as one of the four judges on the judging panel.

The role of the municipal sponsor is to:

- Brainstorm project statement ideas;
- Support the development of the final project statement, including providing supporting documentation;
- Host the facility tour for student teams; and
- Participate on the judging panel.

### **Role of Student Team Leaders**

Student team leaders will act as the coordinator of the project and be the liaison between the team and the BCWWA staff, faculty and consultant advisors, and SDC committee chair. Each team will select one leader from their team.

The role of the student team leader is to:

- Ensure a schedule for the team's work is created and adhered to;
- Coordinate communication with the BCWWA staff, faculty and consultant advisors, and the SDC committee chair;
- Distribute Q&A and other pertinent information to the team; and
- Ensure "deliverables" (design reports, WEF entry form and abstract) are completed and submitted before the deadlines.

### **Role of Faculty Advisors**

Faculty advisors (i.e., Professors) will act as a resource for student teams during the design stages of the competition. Each team will be able to select one faculty advisor for guidance, who will act as a mentor and set aside some of their personal time to provide general direction and basic assistance. Faculty advisors will not be a source to obtain solutions, as teams are intended to deliver project solutions independently.

Advisors typically allocate approximately two hours on a bi-weekly basis for mentoring. This represents a total of approximately 10 hours over the duration of the competition.

The role of the faculty advisor is to:

- Present and explain the project statement;
- Help students prepare for the site visit and ask the right questions;
- Guide students to commonly accepted design literature, as well as local, provincial and federal design standards;
- Participate in interim and final design review workshops with the students; and
- Assist students in preparing for the oral presentations, and for the question and answer period.

### **Role of Consultant Advisors**

Each team is permitted to seek out local engineering consulting firms for design help. Teams are encouraged to seek out consulting advisors from engineering consultants sponsoring the competition to assist in the 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 not be able to assist due to business demands or legal reasons.

Assistance the consultants may provide the design teams includes:

- Advice on cost information for commonly used materials and equipment, such as pipes, valves and concrete;
- Limited feedback on unit prices decisions; and
- Review of deliverables prior to submittal.

However, the consultants must not perform any of the following tasks for students:

- Check calculations;
- Write sections of the design report;
- Provide economic calculations;
- Provide treatment alternatives to consider;
- Select alternatives; or





- Interact daily with the team leader.

## Role of Vendors and Equipment Suppliers

As engineering designers, the student teams will require input from equipment suppliers to size the right units and obtain pricing information. However, the student teams must be aware that the equipment suppliers will not complete the design for students. The student teams will be responsible for design calculations and the selection and specification of all equipment.

Student teams must be aware that equipment suppliers may be occupied with other business priorities. Therefore, student teams should provide adequate time for suppliers to provide the technical and pricing information requested. To ensure there is adequate time for discussion with vendors, student teams should engage in preliminary discussions with equipment suppliers early during the design phase (January).

## Judging

The same individuals will judge both the design notebook and oral presentations. Typically, the judging panel consists of four individuals, each representing an academic institution or sponsoring company/municipality. However, the number of judges and specific affiliations may change from year to year.

Competing teams are allowed and encouraged to attend other team's presentations. 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 Attachments B and C).

## JUDGING CRITERIA

The BCWWA 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 Attachments B and C.

### 1. Design Notebook:

Technical. Was the notebook organized effectively with an 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 the project statement? Were creativity and innovation shown? Was knowledge of the subject demonstrated? Was the solution analyzed for economic feasibility; was this analysis presented? Was a bibliography and credit to resources and help presented? Is the solution constructible within the existing infrastructure? Does the control narrative present a feasible and logical means to operate and automate the process? Is the solution safe and reliable to meet the process objectives?

Presentation. Were visual aids (graphs, supporting info, pictures, etc.), presented clearly? Was correct grammar, spelling and technical writing employed? Was the formatting logical, including the 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 submission 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.

## **2. Presentation:**

Content. Was technical subject matter relevant to the design? To what extent was the subject of interest to a technical audience? Was credit given for source of material or contribution by others? How much knowledge of the subject was exhibited? Was work independent and original? Was the subject technical or general in nature?

Organization. Was there a novel approach taken on the subject? Was there sufficient background information provided in order to introduce the audience to the subject? Were facts developed in a logical and continuous sequence? Was there a definite conclusion and was it adequately based on the facts or data presented?

Delivery and Effectiveness. Were the words distinctly pronounced and was proper volume used to be heard by all? Was the presenters' vocabulary sufficient? Was their 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?

Discussion. Did the presentation evoke spontaneous questions from the panel? Did questions indicate the need for clarification of facts presented or were they merely seeking additional information? How readily and with what self-assurance did the speaker answer questions? Did the answers indicate knowledge of the subject beyond that disclosed in the original presentation?

## **Penalties**

Participating teams that do not comply with the guidelines set forth in this document may be subject to penalties. Penalties will be reflected as points against the total score for the design notebook and/or the presentation. Penalties include the following:

Failure to submit the progress report by the required deadline – **5 points**;

Failure to submit a design notebook within the guidelines set forth by WEF – **10 points**;

Failure to submit the final design notebook by the required deadline – **2 points per day, including weekends**, up to a maximum of seven days.

If a team submits their design notebook but later realizes that they have submitted the wrong package, they may be able to re-submit their package within a maximum of seven days of the original deadline, subject to approval by the BCWWA SDC committee. The team must provide a clear justification for the need to re-submit their package. In addition, the team will be subject to a penalty of 2 points per day to a maximum of 14 points. Any packages received after the closing deadline will not be accepted and the team will be disqualified (see below).

In the event that discrepancies are found between the digital copy of the design report on the CD and the hard copy, the hard copy shall override and will be the basis for evaluation by the judges.

Teams will be notified of the penalties they have received. The above penalties may be modified at the discretion of the BCWWA SDC committee.

### **Disqualification**

A participating team may be disqualified from the BCWWA SDC (even if they have completed their design work) if any of the following conditions apply:

- At least one representative from the team does not attend the mandatory site tour;
- The team does not submit their monthly progress reports;
- The team does not submit their design notebook by the deadline;
- Any of the team members is not a student member of WEF by the design submission deadline;
- A non-student, such as a working engineer, completes or provides significant input on the design for the team;
- The team is found to have engaged in plagiarism;
- Design software has been used (e.g., CAD software, process modeling, spreadsheets) without meeting the licensing requirements; or
- The team is found to have engaged in an act that, in the sole opinion of the BCWWA SDC committee, is regarded as unethical or dishonourable.

Disqualification will prevent a team from presenting at the BCWWA Annual Conference & Trade Show and at WEFTEC.

## Awards

The following awards are presented to the top teams participating in the BCWWA SDC. The awards are subject to change at the discretion of the BCWWA:

### ***First Place*** (see *Competing at WEFTEC* below)

- Award recognition plaque
- Financial aid towards student registration and part of travel expenses to WEFTEC
- Free WEF student membership for each team member, includes a complimentary BCWWA membership
- Invite to present, attend and volunteer at the BCWWA Annual Conference & Trade Show

### ***Second Place***

- Award recognition certificate
- Free BCWWA student membership for each team member

### ***Third Place***

- Award recognition certificate
- Free BCWWA student membership for each team member

The plaque awarded to the winning team becomes the property of that team's Student Chapter. If a college or university does not have a student chapter, the plaque should be presented to a department agreed upon by the team members (for example: Faculty of Engineering, Office of the Dean, Department of Civil Engineering, etc).

As student members of WEF for one year, participants will automatically become a student member of the BCWWA for the same period. As a member, the participants will receive numerous benefits including four editions of *Watermark* and e-newsletters containing industry news, access to the BCWWA job board, and discounted rates at BCWWA events.

The team awarded first place in the BCWWA SDC has the option to participate at WEFTEC. Prizes for the winner at WEFTEC will vary from year to year. Teams are encouraged to check the WEFTEC website for details about prizes and the schedule.

### ***All participants that complete the competition will receive:***

- A Certificate of Participation from the BCWWA Board

## Competing at WEFTEC

The first-place team of the BCWWA SDC will receive a one-time, fixed financial award to compete at WEFTEC on behalf of British Columbia. The monetary award will go towards WEFTEC registration, travel accommodation and meals for four students over a 3-day period. All expenses incurred for these items above and beyond the award value will be the responsibility of the team.

The team members will be responsible for registering themselves and making their own travel arrangements using the fixed financial award provided by the BCWWA. Each traveling team member will be responsible for obtaining the necessary entry visa to the United States (if required). Participation in the WEF SDC at WEFTEC does not guarantee they will be able to obtain entry visas into the United States. The maximum number of presenters at the WEF SDC is four; but additional student team members may register and attend WEFTEC.

The BCWWA SDC committee will not be involved in administering or organizing the competition at WEFTEC. However, the BCWWA SDC committee will liaise with the WEF SDC committee to facilitate the British Columbia team's participation in the WEF SDC.

Please note that participating in the WEF SDC is subject to the guidelines set by WEF. The BCWWA SDC and WEF SDC Guidelines are intended to be as close as possible. However, the rules, deadlines and requirements set out in the most recent WEF SDC guidelines document override the BCWWA SDC guidelines for purposes of participating in the WEF SDC.

If only one team participates in the BCWWA SDC, that team may compete at WEFTEC provided that they meet the WEF SDC guidelines and subject to approval by the WEF SDC committee. Similarly, any student teams participating in the BCWWA SDC that do not place first in BC may apply to the WEF SDC at their own cost. However, the final decision to participate is at the discretion of the WEF SDC committee.

If a student team does not participate in the BCWWA SDC but wants to participate in the WEF SDC, that team should apply directly to the WEF SDC and follow the guidelines set forth by the WEF SDC committee. In addition, the team will need to cover their own travel costs. *The BCWWA will not financially support any student teams that do not participate in the BCWWA SDC. The BCWWA will only support the first-place winning team of the BCWWA SDC.*



**ATTACHMENT**

**'A' ENTRY FORM**



**Entry Form**  
**BCWWA 2024 Student Design Competition**

Name of college or university: \_\_\_\_\_

Name of team (required): \_\_\_\_\_

Name of contact person (team lead): \_\_\_\_\_

Full Address (of team lead): \_\_\_\_\_

Phone \_\_\_\_\_

Email \_\_\_\_\_

Name of Faculty Advisor: \_\_\_\_\_

Faculty advisors' email: \_\_\_\_\_

Faculty advisors' phone: \_\_\_\_\_

**Name of Team Members:**

First and Last Name:	Email Address:	Name of Program:	Year and Level: (Undergrad, Grad)

Please forward your completed form by email to:  
Email: [SDC@bcwwa.org](mailto:SDC@bcwwa.org)

Application Deadline: **see main document for dates.**

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**ATTACHMENT 'B'**

**DESIGN NOTEBOOK SCORING**

**SHEET**





**SCORING SHEET**  
**BCWWA 2024 STUDENT DESIGN COMPETITION**

**DESIGN NOTEBOOK**

Name of Team (and University): \_\_\_\_\_

Project Title: \_\_\_\_\_

Judge: \_\_\_\_\_

**Technical - 70 pts**

Introduction, statement of problem, background information (5 pts)

Continuity, logical sequence of steps to solution (10 pts)

Conclusion, definite based on logical steps to solution (10 pts)

Solution feasible & logical for problem statement (15 pts)

Creativity, innovative approach, applicability (5 pts)

Knowledge of subject & content (10 pts)

Economic analysis, feasibility, presentation of economics (10 pts)

Bibliography, credit to resources & help (5 pts)

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**TOTAL (70 pts)** \_\_\_\_\_

**Notebook Presentation - 30 pts**

Visual aids (graphs, supporting info, pictures, etc.), presented clearly (10 pts)

Grammar, spelling & technical writing (10 pts)

Formatting, logical organization of report, table of contents (10 pts)

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\_\_\_\_\_

**TOTAL (30 pts)** \_\_\_\_\_

**Penalties** (*late submission, improper format, no Progress Report*) \_\_\_\_\_

**GRAND TOTAL (100 pts)** \_\_\_\_\_

**COMMENTS:**

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**ATTACHMENT 'C'**

**PRESENTATION SCORING**

**SHEET**

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SCORING SHEET
BCWWA 2024 STUDENT DESIGN

COMPETITION PRESENTATION

Name of Team (and University): \_\_\_\_\_

Project Title: \_\_\_\_\_

Judge: \_\_\_\_\_

Content - 45 pts

Technical subject matter relevant to design (20 pts)
Personal contribution, library research, innovative project (15 pts)
Knowledge of subject & content (10 pts)
TOTAL (45 pts)

Organization - 20 pts

Introduction, background (eliciting audience interest), objectives, presentation outline (5 pts)
Continuity, essential facts developed in a logical sequence (10 pts)
Conclusion, definite & based on facts (5 pts)
TOTAL (20 pts)

Delivery & Effectiveness - 25 pts

Vocal delivery, conversation vs. memorized, volume, pronunciation, timing (10 pts)
Body Language, eye contact with audience, distracting mannerisms (5 pts)
Visual aides' legibility & effectiveness (10 pts)
TOTAL (25 pts)

Discussion - 10 pts

1. Questions & Answers, clarification & spontaneous responses (10 pts)

GRAND TOTAL (100 pts)

COMMENT

Four horizontal lines for writing a comment.