

SME & NSSGA Student Design Competition



2021-2022 COMPETITION INFORMATION AND RULES



Table of Contents

1	Student Design Competition Basic Information.....	2
1.1	Introduction	2
1.2	Basics of Competition	2
1.3	Phase 1.....	2
1.4	Phase 2.....	2
2	General Competition Rules	4
2.1	School Eligibility.....	4
2.2	Team Size, Makeup and Eligibility	4
2.3	Coaches and Outside Assistance.....	4
2.4	Competition Problem Statements and Conditions.....	4
2.5	Competition Data and Materials	5
3	Phase 1	6
3.1	Problem Solution.....	6
3.2	Time Limits.....	6
3.3	Solution Organization	7
3.4	Scoring	8
4	Phase 2	9
4.1	Attendance	9
4.2	Equipment.....	9
4.3	Room Setup.....	10
4.4	Preparation Time	10
4.5	Presentation.....	10
4.6	Attire	10
4.7	Scoring	10
4.8	Awards	10
5	Questions	12
5.1	Phase 1.....	12
5.2	Phase 2.....	12
6	Competition Timeframe.....	13
7	Team Registration	14
8	Statement of Confidentiality and Honor.....	15
9	Benefits of Participating in the Student Design Competition	16

1 Student Design Competition Basic Information

1.1 Introduction

The Student Design Competition was introduced in the fall of 2004 and culminated at the 2005 SME Annual Meeting and Exhibit in Salt Lake City, UT. It is a two-Phase competition involving a technical design Phase and an oral presentation Phase based on an aggregate mining industry design problem. It was felt that combining these two categories provided the basis for most engineering work once the students enter the mining industry. In this way the students can be involved in a “real world” engineering problem and solution prior to graduation. Teams are judged on presentation skills, creativity, understanding of aggregate mining processes, and thoughtful methodology.

1.2 Basics of Competition

Students majoring in mining and mineral engineering, civil engineering, geology, business, or any other field related to the aggregate mining industry may compete. The competition can serve as one of the activities for SME and NSSGA student chapters but will not be limited to those universities sponsoring student chapters. Any university capable of fielding a team of six undergraduate students is welcome to compete.

The competition will take place in two Phases. The first Phase is an on-campus, “set time limit” competition during the fall semester. A faculty advisor, or team coach, will closely monitor each team for rule enforcement and time worked. The purpose of the first Phase is to simulate an engineering solution prepared for the chief engineer of a company. Judges selected from the industry will evaluate the written solutions, which will make up 40% of the final score.

During the second Phase, held at the SME Annual Conference and Expo, each team will receive the competition problem at the same time and prepare an oral presentation to a panel of judges describing their solution. The judging panel will also question the team on their solution. The purpose of the second Phase is to simulate a presentation to company leadership. The score from the second Phase will reflect 60% of the final score. The top three high scoring teams (combined Phase 1 and Phase 2 scores) will receive awards for first, second, and third place.

1.3 Phase 1

The first Phase will take place at the individual universities under the guidance of the faculty advisor/team coach. This Phase may be completed by each team during any 21-day period between Monday, September 13, 2021 and Wednesday, November 25, 2021. The judging will be completed and the results of the first Phase announced in January 2022. The teams moving onto Phase 2 will be announced in alphabetical order and the numerical scores will not be shared with the other teams. Up to six teams will participate in the final round; however, the Student Design Competition (SDC) Committee reserves the right to adjust this number prior to announcement of the preliminary round results. In either case, all teams participating in Phase 1 of the competition should prepare to attend the 2022 SME Annual Conference and Expo in Salt Lake City, Utah for the final Phase.

1.4 Phase 2

Note regarding COVID: At this time we are not anticipating any interruptions due to COVID, but realize that the annual SME meeting is still several months away. If any changes arise, advisors and teams will be notified as early as possible.

The second Phase will be held at the 2022 SME Annual Conference and Expo in Salt Lake City, Utah. The competing teams will be given a problem expanding upon the first Phase problem. The teams will have a set amount of time to evaluate the problem, formulate a solution, provide for alternative solutions, and prepare an oral presentation of their design. This evaluation will be given orally to the group of judges drawn from industry who also evaluated the first round solution submissions. The second Phase score will then be combined with the first Phase score to select the first, second, and third place finishers.

2 General Competition Rules

2.1 School Eligibility

Student teams must be enrolled in undergraduate degree programs related to the aggregate mining industry at a college or university.

2.2 Team Size, Makeup and Eligibility

Each competing team will consist of up to **six undergraduate student members of SME who must remain undergraduate students for the entire competition**. Each team member must be a member of SME in good standing. Contact Mona Vandervoort, Education Coordinator with SME, for assistance with SME membership registration or questions (vandervoort@smenet.com). Students who have previously been awarded an undergraduate degree may still compete as long as:

1. The previously awarded degree is not in the mining, mineral, geology, or civil disciplines.
2. They are currently enrolled in an aggregate related, undergraduate degree program and will remain enrolled through the entire competition.
3. They obtain written permission from the SDC Committee.

Teams will register for the competition through the through "Submit Team Information" button on the Student Design Competition page of the SME website, <http://www.smenet.org/students/student-competitions/student-design-competition>. If there are any issues with the registration process, please contact both Tyler Faulkner (tfaulkner@carlsonsw.com) and Marion King (marion.king@imerys.com). Please allow at least 3 business days between team registration and desired start date.

In the event that a team member must drop out of the competition for any reason, the SDC must be notified in writing by the faculty advisor/coach and include the following: school, team name, individual's name, date, replacement member (if wanted) and reason the member is withdrawing from the competition. Another undergraduate student sponsored by the same school may continue in the withdrawn team member's place from that time on provided that SDC is notified in writing of the change. **No more than one replacement per team will be allowed during each Phase of the competition**. The balance of time that remained for the student that is replaced will be the only time allowed for the new team member to work on the problem solution.

2.3 Coaches and Outside Assistance

Each team shall have a faculty advisor/coach that will monitor the team in Phase 1 and will accompany the team to Phase 2 of the competition. Once the competition begins, the coach's role is limited to ONLY ensuring the competition rules are being followed.

During each Phase of the competition, **no** direct input from anyone outside the team (phones calls, emails, etc.) shall be allowed after the problem-solving period begins. Passive use of the Internet as a search tool for additional reference information will be acceptable. Contacting the SDC committee for clarification or for questions is allowed.

2.4 Competition Problem Statements and Conditions

Each team will be presented with the problem statement. These materials represent the entire problem statement and scope of work. Questions during Phase 1, if any, may ONLY be directed to the SDC, which will determine if there is an appropriate answer. Questions during Phase 2 will be communicated directly to the SDC committee at the competition site. It shall be the discretion of the SDC committee whether a response is given to any question. Any answers to questions during Phase 2 will only be communicated to the team that asks the question.

Each team must strictly adhere to the specific time frames, deadlines, schedules, locations, or conditions set forth in the problem. There shall be no outside contact or assistance from any group, individual, association, contractor, or other outside entity. Failure to follow any of these rules may be cause for rejection, reduction in points or even disqualification from the competition.

During Phase 2, no team or team member may enter the problem presentation room or view a presentation until *after* that team has given its presentation. Competition members will not be allowed to ask questions. Violation of these rules shall be cause for immediate disqualification from the competition. If competition members choose to watch subsequent presentations, please respect the team presenting and refrain from discussions among audience members.

2.5 Competition Data and Materials

This competition uses data from actual aggregate mining companies. This is real data and will therefore represent the type of information you will have as a mining engineer in the future. The company that donated the information has hundreds of thousands of dollars invested in the data and is proprietary to that company. Therefore, the data should be respected and not reproduced or used for any other purposes without approval from the SDC committee. This requirement includes use of the data for senior design or capstone projects.

If students are looking for senior design or capstone project data, please contact Andrew Storey (astorey@luckstone.com). A number of companies from previous competitions have generously allowed the SDC committee to share historic SDC Competition data with students for this purpose.

3 Phase 1

The SME/NSSGA Student Design Competition will be held in two Phases with the preliminary Phase held on the respective team's campus and the final Phase held in conjunction with the 2022 SME Annual Conference and Expo. Competing teams are comprised of up to 6 undergraduate student members of SME and 1 faculty advisor.

In Phase 1, the teams work on campus to provide a written solution, in English, to the competition problem provided by competition officials (referred to from here on as SDC). The teams have 35 hours per student to work a solution to the problem with the time worked closely monitored by a faculty advisor/team coach approved by SDC. Each team will have any 21 consecutive day period of their choosing from the time the problem is given to the team to the last date available to work to submit their solution. During that time, the faculty advisor and team can schedule the 35 hours whenever it best fits the students' schedules (as long as it occurs within a 21 consecutive day period). A panel of judges from SME-member companies will judge the solutions submitted. There will be no "extra credit" given for early submissions. The deadline for submitting the design will be Wednesday, November 25, 2021 unless an extension is permitted in writing by the SDC.

COVID Update: Teams are required to follow their school's COVID policies.

3.1 Problem Solution

The solution submitted during this Phase should be as complete as allowed by the time constraints. Although specific details may not be finalized and designed to a "procurement or construction level", enough design must be conveyed to ensure adequate confidence in the project. Actual design of specific items may be omitted from the solution as long as an adequate description of the item is presented along with an approach for its resolution (e.g. it may be sufficient to give generalized design information, for example, a 3.5 yd³ loader might be specified without detailing the make or model).

The solution should convey enough information to define the mine design, and it should be more detailed than a simple conceptual design. The presentation of the data should be approached as if the group is handing over the design to the senior engineer at the company.

While there is no limit on the size of the submitted solution, students are advised that longer reports are not always better. Keep in mind that the goal of this competition is to simulate a "real world" engineering problem. Company leadership, as well as the competition judges, are impressed by a well thought out, clearly communicated, and concise solution. All information included in the report should provide support to the problem and not provide filler that is unrelated to your solution.

3.2 Time Limits

Each team may take a total of 35 hours per student to read the problem information, generate a solution, and create an organized report stating conclusions and recommendations. The total of 35 hours can be spread out over a 21 consecutive day time period. A recommended distribution of the **35 hours** is as follows:

- 5 hours to read the problem, formulate a plan of attack, and break down into subgroups
- 20 hours to work the problem, address design issues, and formulate solutions
- 10 hours to formulate the memo, write detailed descriptions of design solutions, translate (in necessary), and put finishing touches on design package.

Once the problem has been distributed to the student team by the on-campus team advisor, the advisor shall initiate the 21 day period. During this time, the team shall work as a group of individual in an isolated environment,

away from all people not involved with the competition. If hours are not being counted toward each person's 35-hour limit, the members cannot work on the project and cannot discuss ideas and sections of the project.

COVID Update: With the understanding that a lot of teams may be working remotely, time spent working on virtual communication or software access issues will not count toward the 35 hours.

At the end of the 35 hours (cumulative), the solution and completed report/letter will be given to the advisor. The advisor or designated team member must then submit the report to the SDC. *Please submit the solution electronically, in PDF form, through the Student Design Competition page of the SME website, <http://www.smenet.org/students/student-competitions/student-design-competition>.* If there are any issues with this submission process, please contact both Tyler Faulkner (tfaulkner@carlsonsw.com) and Marion King (marion.king@imerys.com).

Each individual team member is limited to 35 hours. That is to say, the time may not be distributed among the team members in an amount greater than 35 hours. One person cannot work 50 hours while another person compensates by only working 20 hours to reach an average of 35 hours. It is 35 hours per person. The team does not have to meet together for 35 consecutive hours, but each person cannot work more than 35 hours cumulative.

A question regarding this rule was posed at a previous competition and is reprinted below with SDC's answer.

Q: Quote, "When the team is not in session the members cannot work on the project and cannot discuss ideas and sections of the project." Does this mean that one or two members of the team cannot work within their individual 35 hour limit on their own on some aspect of the project and bring their results to the full team meeting and does the full team always have to meet together for anything to be done on the project?

A: Team members, individually or in small groups, may work on their assigned portion of the project at any time during the 21-day period in which they are within their 35-hour limit. It is not required that the full team be present at once for any work to be allowed on the project or for the team to be considered "in session". The quote that you mentioned may be better interpreted as: "When any member of the competition team is not charging time against their 35-hour work limit, they cannot work on the project and cannot discuss ideas, sections, or anything related to the project with anyone, including themselves."

For example, if one team member is to work on the mine design, another the processing plant design, and the rest on other portions of the project, they do not have to work together or even at the same time; however, whatever time they do work on the project must be documented and count against their 35 hours and must occur within the 21-day work period. Also, if for example, two team members have an impromptu discussion after a class regarding the project, they may do so as long as they count their time.

3.3 Solution Organization

The design team should allow ample time in the 35 hours to complete a report addressed to the project engineer or board of directors describing their conclusions and recommendations. All solution materials should be submitted to the SDC in electronic format (PDF). The report should include all appropriate references and formulas to support the solution. All backup material/calculations should be included with the submission. The teams should submit their solution in PDF format through the Student Design Competition page of the SME website,

<http://www.smenet.org/students/student-competitions/student-design-competition>. Time is allowed outside of the 35-hour work time for transmitting the PDF.

3.4 Scoring

The student design team will be scored in Phase 1 based on team solution presentation and format, problem solution, and overall project design. The Phase 1 score counts for 40% of the total score for the competition. The breakdown for scoring will be as such:

- Team Presentation - 15% of Phase 1 score
 - Spelling/Grammar (10/15%)
 - Neat/Clear/Precise (5/15%)
- Problem Solution and Approach – 75% of Phase 1 score
 - Accurately supported by equations and references (25/75%)
 - Correct/Accurate solution (45/75%)
 - Environmental Aspects
 - Feasibility/Simplicity of Design
 - Reserve Calculation
 - Logically Sequenced Mine Plan
 - Good Engineering Judgment
 - Documented Assumptions
 - Thought process easily understood (5/75%)
- Overall Project Design - 10% of Phase 1 score
 - Uniqueness of design/solution and organization

4 Phase 2

COVID Update: At this time we are not anticipating any interruptions due to COVID, but realize that the annual SME meeting is still several months away. If any changes arise, advisors and teams will be notified as early as possible.

Phase 2 will be conducted at the 2022 SME Annual Conference and Expo in Salt Lake City, Utah. In this Phase, the design team will prepare a presentation to support their solution to a given problem and present it to the panel of judges who will be acting as the Board of Directors of the operating company. The team should be prepared to answer questions about their design solution to the “Board” who will have previously reviewed and judged the individual teams’ written solutions from the first Phase. The specific problem that the design team will have to solve and present will be given to the teams on Friday afternoon/evening prior to the 2022 SME Annual Conference and Expo. They will then have until a pre-determined time on the following Sunday morning to work on their solutions and presentations. Each team will then be given approximately 45 minutes in which they will make their presentations. The order in which the presentations will occur will be randomly selected.

4.1 Attendance

After the results of Phase 1 are announced in January, each of the top six teams will receive an Attendance Confirmation Form. This form must be completed and returned to the SDC by the date specified in order to confirm your participation in Phase 2. If your team does not submit the form before the deadline, SDC will assume that your team is unable to attend the competition and will open your spot to the next highest-scoring team.

Each team participating in Phase 2 must physically be present during the competition; no team will be allowed to give their presentation via Skype or any other video/audio conferencing device. Also, it is strongly suggested that teams stay at hotels within walking distance to their provided Phase 2 workrooms.

Teams attending Phase 2 are required to be student members of SME and register for the 2022 SME Annual Conference and Expo. Each team participating in Phase 2 will be completely responsible for all travel arrangements to and from Salt Lake City, lodging arrangements while in Salt Lake City, and conference registration for the 2022 SME Annual Conference and Expo. The SDC is not responsible for any of this planning or cost.

4.2 Equipment

A *maximum* of one computer per participant, and one printer, one plotter, and one scanner per team is allowed. All copying, printing, and scanning will be up to the individual teams. Each team should allow ample time to make any desired prints or copies. Delays caused by copy room personnel or equipment **will not** be considered by the judges as an acceptable excuse. If access to the Internet is required then it will be up to the individual teams to ensure that they have the proper equipment to do so. The SDC will make every effort to ensure access to the internet during Phase 2, and as much notice as possible will be given if internet access cannot be provided. If availability of internet is questionable, the SDC will determine the appropriate alternative.

A computer projection device, podium, and microphone will be supplied by the SDC for team presentations. The teams should be prepared with their own computer as a backup. The SDC will not provide internet access for the presentations. Furthermore, any additional equipment required for a presentation should be coordinated through the competition coordinator. There may be additional charges for internet access or additional presentation room set up. These charges must be paid in advance by the requesting team.

4.3 Room Setup

The SDC will furnish a work room for each team with enough tables and chairs for each member of the team. Ample workspace is available in each work room for two extra tables (possibly three) and chairs. Work tables and chairs may be rented at the Hotel for use during the competition. Table rental fees, with security deposits, must be paid in advance. Whatever equipment and publications brought to the work rooms are the responsibility of the individual team. Furniture in the work rooms must remain during the competition.

4.4 Preparation Time

The design team will have from the time the problem is distributed on Friday afternoon until the team's specified presentation time on Sunday morning to work on their solution/presentation. The presentations will begin Sunday morning (exact schedule will be determined closer to the presentation time). The team will be expected to prepare for the presentation in their work room. The advisor and SDC personnel will supervise this Phase.

4.5 Presentation

Each design team should be prepared to give a 20-25 minute presentation with a 20-25 minute question and answer period immediately following the presentation. The teams can give their presentations in any media they desire, whether by MS PowerPoint, MS Word, hard copies, etc., as long as the presentation can be projected onto a screen for the audience to see. All team members should be active in the presentation process, with no less than half the team talking during the main presentation (if there is an odd number of people in a team, round up).

4.6 Attire

The design team should wear at least business casual clothing during the presentation.

4.7 Scoring

The student design team will be scored in Phase 2 based on Presentation, Solution, and Question/Answer Session. The Phase 2 score counts for 60% of the total score for the competition. The breakdown for Phase 2 scoring will be as follows:

- Presentation (50% of Phase 2 score)
 - Visual Displays (10/50%)
 - Speaking Skills (10/50%)
 - Team member participation (10/50%)
 - Quality of Presentation (20/50%)
- Solution (30% of Phase 2 score)
- Question/Answer Session (20% of Phase 2 score)

4.8 Awards

The final score will be determined by a 40/60 combination of the Phase 1 and Phase 2 scores, respectively. Up to six teams will compete in Phase 2; however, the SDC Committee reserves the right to adjust this number as events develop.

Cash prizes will be awarded for the top three teams, and they are as follows:

- First Place: \$2,000 and Plaque for School
- Second Place: \$1,500 and Plaque for School
- Third Place: \$1,000 and Plaque for School

The cash prizes may change as the competition budget is finalized.

5 Questions

5.1 Phase 1

If questions arise during Phase 1, an e-mail should be sent to both Tyler Faulkner (tfaulkner@carlsonsw.com) and Marion King (marion.king@imerys.com) explaining the question. Questions must be sent to both contacts above to ensure a prompt response. Both the question and answer will be forwarded to all other teams as appropriate.

The committee will review the questions and a response will be issued as appropriate. An effort will be made to answer the questions in a timely manner; however, as all of the teams will be working the problem on different schedules than the SDC, it may take up to 48 hours for a response. Neither the 21-day working period nor 35-hour time limit will be extended due to delays in the SDC responding to questions

5.2 Phase 2

During the second Phase of the competition the SDC will be available during normal business hours to answer questions by the competing teams. The SDC may decline to answer individual questions during this Phase of the competition. If the SDC does provide an answer, the question and answer will not be communicated to the other teams. However, if a team finds an error in the problem or data provided, this information will be communicated to all teams.

One of the aspects of being an engineer is the ability to make supported assumptions; the teams are encouraged to do this. As in practice, not all information is provided in detail and requires assumptions to be qualified, and some extraneous detail may be needed. However, all assumptions should be detailed out and supported.

6 Competition Timeframe

The 2021-2022 Student Design Competition is scheduled as follows:

Phase 1 Begins	Monday, September 13, 2021
Last Day to Submit Phase 1 Problem Solutions to SDC Committee	Wednesday, November 25, 2021
Results of Phase 1 Presented to Teams	Early January, 2022
Phase 2 Begins	Friday, February 25, 2022
Phase 2 Presentations and Awards	Sunday, February 27, 2022
2022 SME Annual Conference and Expo	Begins Sunday, February 27, 2022

7 Team Registration

Teams will register for the competition through the through “Submit Team Information” button on the Student Design Competition page of the SME website, <http://www.smenet.org/students/student-competitions/student-design-competition>. If there are any issues with the registration process, please contact both Tyler Faulkner (tfaulkner@carlsonsw.com) and Marion King (marion.king@imerys.com). Please allow at least 3 business days between submittal of the registration and the Phase 1 start date.

8 Statement of Confidentiality and Honor

When registering your team online (through the Student Design Competition page of the SME website, <http://www.smenet.org/students/student-competitions/student-design-competition>), you will be asked to check a box indicating your agreement with the following statement of Confidentiality and Honor. You will not be able to register for the competition without agreeing.

On my honor, I agree to act with integrity during the Student Design Competition. I agree to follow all competition rules. I will not discuss the competition outside of the design team or outside the hours of competition. I will not seek any outside opinions or assistance during this competition from anyone, including professors, peers, friends, family, or aggregate/mining professionals. I will not share any information given in the Problem with persons unaffiliated with the SME/NSSGA Student Design Competition at any time. I have also read and understand the rules surrounding this competition. I understand that violating these rules can lead to deduction of points or disqualification.

9 Benefits of Participating in the Student Design Competition

One of the major benefits of participating in the SME/NSSGA Student Design Competition is being able to show yourself off to a large list of corporate sponsors. The reason corporations sponsor the event is to have a look at the future of the mining industry, you!

The SDC would like to give you an opportunity to submit your résumé to the sponsoring companies. The SDC will create a résumé book to distribute to any company that sponsors the event. If you would like, you can submit your résumé to Andrew Storey, astorey@luckstone.com, by Wednesday, November 25, 2021, so your résumé can be added to the book.