“Infrastructure Reimagined”

2022 Rules

Table of Contents

This document, also available on the ASCE Student Conferences page of the ASCE Website, defines the 2022 ASCE Innovation Contest and the rules for both the student symposium and Society-wide finals competition levels.

Requests for Information (RFI) should be sent to student@asce.org with the subject line "ASCE Innovation Contest RFI." Clarifications will be posted to the ASCE Innovation Contest Collaborate site (https://collaborate.asce.org/communities/community-home?CommunityKey=c874e311-52af-4e00-bdd1-024b2448d196&GUID=a8bf5789-961d-4ed9-8aeb-ef165fcaebbb) on every other Friday, starting September 24, 2021 until February 11, 2022. Each post will address the questions received from the previous two weeks through the Wednesday before (11:59 pm EST).

The rules are intended to stimulate creative infrastructure solutions using the five ASCE Future World Vision cities as a backdrop and point of reference. Students and teams should read these rules thoroughly and seek clarifications, as necessary.

Section 1: Mission and Overview

The mission of the 2022 ASCE Innovation Contest is to develop an innovation that addresses one (or more) of the UN Sustainability Goals as envisioned fitting into the Future World Vision Project, "Infrastructure Reimagined." Participating teams will develop and pitch their innovation to the judges and at a minimum provide proof-of-concept for its feasibility and innovative potential. The closer your innovation is to having a proof of concept and a business plan, the more persuasive the result.

The competition expects the teams to identify, develop, investigate feasibility, and show a business plan for visionary innovations to address infrastructure challenges. Some limited examples of what has been submitted in the past include (but are not limited to): automation, integration of technology (artificial intelligence (AI), Internet of Things (IoT), sensors, computer vision), prefabrication and modular construction, large-scale 3D printing, alternative financing models and more. The innovation could be a proprietary solution that creates a new business line or an open source solution that supports humanity over wealth. Visionary innovations have the potential to reshape our infrastructure and construction processes and to create a dramatic improvement in how quickly infrastructure can be built, rebuilt, and reused.

Teams are expected to be student-led and should include interdisciplinary collaborations. The competition will be judged by a panel of industry and academic experts. Solutions that can be described as "radical", "out-of-the-box", "transformational", "unconventional", or "breakthrough" are encouraged. The proposed solutions should be carefully thought out, researched, and carried out as a student team effort with a feasible work plan and should be presented through the various types of required deliverables. The use of advanced technologies, including those from disciplines outside of engineering such as digital tools, technologies, and virtual representations are welcome to illustrate the proposed ideas via these deliverables. Prototypes of solutions are also welcomed.

To inspire participants and assist them with imagining potential future infrastructure challenges, ASCE is providing access to the Future World Vision concept development website. This website provides access and visual examples of extensive research conducted for the development of the five worlds connected to the FWV project and will help the students identify potential problems before they focus on potential solutions or sets of alternate solutions. Participants need to register for access to this site. See Appendix E for details about how to register for access.

The benefits of the ASCE Innovation Contest are connecting student-led teams to industry and academia leaders and at the same time identifying and developing a broad and robust community of civil engineers who have expertise in innovative and entrepreneurial thinking. This contest also provides the opportunity for students to meet with and be coached by forward thinkers who are developing today's innovative solutions.

The ASCE Student Chapters are the source of our industry's future innovation. The goal of the ASCE Innovation Contest is to connect the best students in our ASCE communities with our best industry thinkers and futurists.

The path to this outcome has several components.

1. To educate students about the thought process and elements needed to bring an idea to market. Having a great idea is not enough to solve future engineering challenges. Developing the idea into a usable and marketable solution requires innovative engineering, business functions as well as collaboration and communication. The benefits of this innovation-focused contest include identifying and developing a civil and environmental engineering community that has skills and success in innovative and entrepreneurial thinking.
2. To provide students an opportunity to explore and collaborate with experts to develop an idea. Before any student member or student chapter decides to participate in the ASCE Innovation Contest, the most important assets needed are faculty, industry, and student advisors who are willing to talk with, mentor, and challenge the team as it develops an innovative idea into a viable innovative solution.
3. To provide students a competitive space that includes feedback for improvement and opportunity to take their idea to the next level of competition.
    a. 1st place winning teams at the ASCE Student Symposium level will be invited to participate in a virtual mentoring program that will be during the end of the 2022 Spring semester with an additional official mentoring meeting to place close to the end of August 2022.
    b. The cohort of winning teams from the student symposia will participate virtually in the Society-wide semifinals. The semifinal presentations will be recorded, and the resulting video will be shared with convention attendees, which is a public facing venue.
    c. Following the virtual semifinal round of competition, teams will be selected to compete in person at the live Society-wide finals competition to present their pitch. More details will be provided in Spring 2022.
    d. Winners will be announced at the ASCE Convention Awards Ceremony and Closing Awards event.
    e. The student symposium winning pitch will presented during the Convention closing event.

Your challenge, should you choose to accept it, is to reimagine infrastructure in the future by creating an innovative solution that addresses one of the UN Sustainability Goals.

Section 2: Problem Statement

ASCE seeks out visionary innovations that can be used to stimulate communities and fields of study, pursue new infrastructure directions, or address critical civil and environmental engineering (CEE) problems. The ASCE Innovation Contest encourages students to follow a blue sky ("sky's the limit") approach to their innovation. Those who participate in this competition are unconstrained in their efforts and encouraged to submit revolutionary thoughts that are developed, presented, and used to stimulate new activities and directions to help solve the problems associated with the built environment.

We are looking for innovations that offer big improvements in the built environment and infrastructure. These improvements can be immediate or may range over a period of no more than thirty years. Recently, for example, there have been huge advances in materials and technology. CEE needs to incorporate these advancements to meet, for example, the Grand Challenge of 50% reduction in lifecycle costs. Innovations in the use of materials, use of new materials, development of new construction methods because of new materials or automation, AI, or robotics, infrastructure funding innovation (e.g., decentralized finance, or "Deify"), etc., and sustainable methodologies are all included as possible focus points for an innovation in this competition.

For 2022, teams will use the Future World Vision and the five concept cities associated with this initiative as the backdrop and technical point of reference for their innovation that addresses one (or more) of the UN Sustainability Goals. Information about these cities and the technologies used to develop them will be made available to each participating team.

The Future World Vision project illustrates how CEE is changing at an extraordinary rate. This is due to several large-scale and impactful disruptors, including rapid advances in technology and major social injustice, health, and economic stressors facing the world and, subsequently, the built environment. All contestants are expected to conduct themselves using the highest ethical standard and address safety criteria throughout the development of their innovation. (For reference, ASCE Policy Statements on Safety are PS282, PS290, PS350, PS351 and PS 424.)

The ability to take known research and extrapolate how that will influence industry trends 20-30 years into the future requires creativity, critical thinking, and academic rigor. Addressing the UN Sustainability Goals will help CEE address the impact the built environment can have on sustainability. Visionary thinking is necessary to develop ideas and solutions that are timely, engaging, innovative, exciting, and beneficial to society. Students can play an important role in the development of these solutions through their education and involvement with ASCE student competitions such as the ASCE Innovation Contest.

You are the inventors, innovators, and imaginers - what will YOUR infrastructure solution be, how will YOU make it happen, how will YOU ensure it adheres to appropriate societal and engineering ethics, and how will it change the way we live?

Section 3: Judging

The ASCE Student Symposium host will recruit judges. Three to five are recommended. Judges should have experience in innovation and incubating new ideas if possible and do not necessarily need to be civil engineers. Local support for the ASCE Innovation Contest is an essential element for the ongoing development of the contest and the development of an innovative community within CEE. Contact ASCE if you need additional clarification or help with recruiting judges.

The judging panel should include educators, professionals, and individuals with knowledge of innovation, sustainability, and the built environment. The symposium host will coordinate with ASCE to provide contestants with instructions for how to submit their final video (recorded presentation or other video) via a unique link to ASCE's Cerberus ftp server and to in turn give judges access to the submitted material. Judges will have access to the submissions at a minimum of one week prior to the start of the Symposium. Judges will be expected to conduct an initial review of the submitted content and be prepared to complete all scoring within the time provided during the judging of this contest as organized by the ASCE Student Symposium host.

All submission materials must be submitted no later than posted deadlines determined by each student symposium host. These deadlines will be at least one week prior to the start of the particular ASCE Student Symposium.

The contest submission, which is not public-facing, will be held in the ASCE Cerberus ftp server and kept confidential throughout the judging process. Judges are required to sign a Non-Disclosure Agreement to help protect the student teams' intellectual property. Complete submissions consist of a 5-minute video that addresses the three judging categories: 1) Innovation and Creativity, 2) Value Proposition and Relevance, 3) Efficiency and Feasibility. The video can be a recorded PowerPoint presentation, an edited Zoom video, a "marketing" production video, or any presentation captured in a video format.

The students are encouraged to use innovative and broad-based ideas in the development and portrayal of the proposed solution. Resources are provided in the Appendices. Teams are expected to give themselves the best chance at success by taking the time to review the judging criteria, considering the 17 Sustainability Goals, exploring the Future World Vision concept site, searching the ASCE Library for recent papers on topics they are considering, and using their imagination to extrapolate future needs and how they will use future technologies to develop their proposed solution. Every point counts. The margin between teams with high scores are often very small. Winning is often by a fraction of a point. Make sure that your team captures every point possible.

Judging should consider the innovative nature and completeness of the presentation of the ideas.

Section 4: Scoring

A contest submission must address these three scoring areas with a persuasive and interesting presentation. This competition relies heavily on your ability to present an original, innovative infrastructure solution in a professional, engaging, and persuasive manner. Scoring will be based not only on the proposed solution, but also on your approach to presenting your solution to the panel. As with any professional proposal, you control the message you want to convey.

The four areas of scoring and overall weighting are as follows:

Scored using the video submission.

1. Innovation and Creativity (40%)
2. Value Proposition and Relevance (25%)
3. Efficiency and Feasibility (25%)

Scored during the live presentation at the ASCE Student Symposium by the judging panel:

4. Communication (10%)

4.1. Recording Data and Submitting Scores

Scoring data shall be recorded for each team that competes. Examples of the official judging form are included in Appendix C. Judging forms will be available for download from the ASCE's Cerberus ftp server no later than 1 January 2022.

4.2 Elements of the Competition

There are two parts of the competition: the video presentation submitted before the conference, and the live conference presentation when scoring will focus on the elements of communication and ability to respond to judge's questions. Note that the video presentation can be created in many forms or processes. For example, it can be a recorded Zoom presentation, a voice over recorded PowerPoint presentation, a custom edited video, etc. The goal is for the judges to be able to watch the "presentation" as a video stream.

4.3. Overall Submission for the Competition

The overall submission (video and oral presentation) will be judged on the following elements on a scale of 1=inferior to 10=excellent in four areas: 1) the level of innovation and creativity, 2) value to society/customer, 3) feasibility, and 4) team communication of the unique and creative properties of their solution. Expectations and descriptions of those judging criteria are as follows:

4.3.1. Innovation and Creativity (40%)

We are looking for creative solutions, preferably new approaches to an innovation that provides more than a small improvement. Lower scores will be given to entries which are not next generation solutions which are incremental, or

an iteration of existing solutions. Higher scores will be given to entries that skip a generation of existing solutions and those that use out-of-the-box new approaches to solve a problem.

4.3.2. Value Proposition and Relevance (25%) - How is the innovation valuable to society/customers?

We are trying to solve big problems, not just make life incrementally easier for the customer. By way of an analogy, think of the value of painkillers vs. multi-vitamins. One is addressing a big issue/pain point and the other is routine maintenance. We are looking for painkiller solutions that provide substantial problem-solving, not just a couple of improvements. Is the innovator building a daily supplement or a cure for cancer? Is the innovator addressing one of the things that keeps customers/society up at night or just a nice-to-have solution? The submission will receive higher scores if it addresses big problems with large beneficiaries or cost and/or time savings in methodology and receive lower scores for just nice-to-have solutions.

4.3.3. Efficiency and Feasibility (25%) - Is the innovation technically feasible?

We want to showcase, promote, and reward not just for an innovative solution but also entries that have thought through the technical feasibility of their innovation. Provide information to support your innovation, including test result summaries and/or prototypes proving the veracity of the solution. Lower scores will be given to an innovation that does not appear to have realistic technical success. Higher scores will be given to innovations that demonstrate the success of the technological solution (through tests, pilot products, sales, etc.).

Does the innovation have a scalable business plan or open source approach? We want to showcase, promote, and reward forward-thinkers who do more than just come up with a great idea, and reward those who thought about the challenges of developing the innovation for mass application for private commercialization or as an open source path for adoption by multiple users. Even if the market plan or open source adoption plan is long, expensive, or difficult, a well-thought-out plan is important for this category. Lower scores will be given to plans that only consider potential market size. Higher scores will be given to plans that determine a real market, price sensitivity (if appropriate), distribution models, have a broad societal impact, and have considered the innovation's life cycle.

4.3.4. Communication (10%)

Has the team communicated the unique and creative properties of their infrastructure solution?

Contest winners are often less than a full point apart. Gaining the full 10% of this score is essential to a team's chances for moving forward to the semifinals and finals of this contest.

A good presentation will clearly exhibit or consider the following:

1. Critical thinking, including the ability to integrate different perspectives and "connect the dots" between disparate data points.
2. An ability to communicate and articulate an idea.
3. Demonstration of industry-specific knowledge, though there is no penalty for making assumptions when necessary (e.g., unknown facts, future trends, demands).
4. It is appropriate to question underlying assumptions presented by others who may have examined the problem, if you are convinced a different perspective is appropriate.
5. All things being equal, innovations with broad application will generally be scored higher.

In summary, we are interested in how well you communicate your ability to think through the problem, collaborate with team members and outside resources to develop options, identify competitors, and provide and defend your infrastructure solution and its unique characteristics.

4.4 Contest Video Submission

This video must be submitted by posted deadlines by each ASCE Student Symposium host.

In addition to the elements outlined in the Overall Submission (4.3), the submission will be judged for its ability to communicate the innovation clearly and concisely. This includes thoroughness and completeness as it describes and explains the identified infrastructure issue and the proposed, "reimagined infrastructure" solution to address the issue. The proposal must contain the following elements:

- Background and problem statement for the identified issue.
- Explanation of how the proposed solution could address the identified UN Sustainability Goal(s) as well as any applicable additional societal challenges or needs related to using new techniques or innovations such as (not limited to): high-tech construction, robotic assembly, advanced materials, sustainable methodology, AI, etc.
- Discussion of how this proposed solution takes advantage of modern or future technology.
- Discussion of how it will appeal to the affected group including all stakeholders. Recognizing that multiple socioeconomic groups should be engaged, share results of any testing, surveys, demonstrations, proof of concept, research, etc., that was conducted or found to address this item. The timeframe over which your innovation will be implemented will determine the number of assumptions needed. You may make assumptions, when necessary, based on future trends and projected

demands. Make sure to provide your basis and foundation of information from which you have developed your assumptions.
- Discussion of resources required to enact this solution (this can be general in nature, or more specific and include cost estimates).
- Anticipated engineering and societal value of the proposed solution, and references.

This video entry is an opportunity for the team to demonstrate the thought process used for the development of their solution. Teams are encouraged to use their notes from the provided worksheet or other resources to completely discuss any aspects of their proposed solution that addressed the problem statement and goals of the competition.

4.5 Presentation and Interview with Judging Panel

Each team or individual will be scheduled to participate in the required live presentation part of the competition with the judging panel. You will have 4-6 minutes to present your innovation and the judges will have 5-7 minutes for questions. The content you present shall communicate the approach and team effort on identifying and developing the innovation solution. Although not required, teams are encouraged to incorporate video elements, posters, props, charts, etc. to make the presentation. This will be followed by questions from the judges. Teams are encouraged to use technology as part of this presentation. Each presentation will be judged on how well it communicates the unique characteristics and creativity of the innovation, its value proposition and relevance to society, and its efficiency and feasibility.

Each ASCE Student Symposium host that elects to offer the ASCE Innovation Contest, will announce the specific date and time for their ASCE Innovation Contest. All student symposium hosts are expected to follow and implement the rules and expectations outlined in this document.

Exact dates for the ASCE Innovation Contests and the submission deadlines are determined and posted by each ASCE Student Symposia host and will be at least one week prior to the start of the particular ASCE Student Symposium. Please refer to the symposia host for submission deadlines and other contest details as submission deadlines may be as early as 3 weeks before the competition. Contest appointments will be organized and managed by the host.

All live presentations shall be conducted in a professional manner (defined as a presentation which a professional engineer would give to a prospective client). Teams are encouraged to be entrepreneurial in conveyance of their proposed solution. Oral presentations shall be presented in English. The presentation order shall be randomly selected before the competition begins and subject to scheduling and time availability of teams, judges, and student symposium host representatives. The oral presentations, including the question and answer period, shall be open to the public for viewing. Following the oral presentation, questions by members of the audience may be allowed if the venue and time permits.

Section 5: Awards and Recognition from the Student Symposium level to the Society-wide finals at the ASCE Convention

The winners of the ASCE Innovation Contest shall be determined by compiling a team's total number of points.

First place winning teams at the ASCE Student Symposium level, that meet the eligibility requirements in Section 7, are eligible to compete at the Society-wide finals competition, which begins with a virtual semifinal with individual presentation appointments scheduled in late August/early September 2022 time frame. Teams that achieve high enough quality presentations in the Society-wide semifinals will be invited to participate in the Society-wide finals event at the ASCE Convention. Quality of presentations is determined through a scoring process similar to the scoring outlined for the Student Symposia competitions by a team of expert judges and comments from coaches as needed.

The path to the Society-wide semifinals

a. 1st place winning teams at the ASCE Student Symposium level will be invited to participate in a virtual mentoring program at the end of the 2022 Spring semester with an additional official mentoring meeting to place close to the end of August 2022. This virtual mentoring experience will provide more in-depth coaching and education about how to develop their innovation into a viable market concept. Winning teams will continue to develop their presentations in preparation for the Society-wide finals competition that takes place during the ASCE Convention, Fall 2022.
b. The cohort of winning teams from the student symposia will participate virtually in the Society-wide semifinals. The semifinal presentations will be recorded, and the resulting video will be shared with convention attendees, which is a public facing venue. The semifinal presentations will be recorded, and the resulting video will be shared with convention attendees, which is a public facing venue.
(A public-facing document or video is one that is created for the public. It describes the innovation without revealing proprietary information.)

Advancing to the Society-wide finals

a. Following the virtual semifinal round of competition, teams will be selected to compete in person at the live Society-wide finals competition to present their pitch. These Society-wide finalist teams will have representatives attend the ASCE Convention and compete for the 1st, 2nd, and 3rd place awards. At this time, we plan to host at least the top ten team representatives at the in person Society-wide finals competition and hope to expand. More details will be provided in Spring 2022.
b. Winners will be announced at the ASCE Convention Awards Ceremony and Closing Awards event.

c. The winning team of the 2022 ASCE Innovation Contest will be recognized, and their winning pitch will be presented (live--preferred, or recorded) during the Convention closing event.

All winning teams at the ASCE Student Symposium level start at the same base line for the next phase (Semi-finals). Scores from the ASCE Student Symposium level are not brought forward for inclusion into the Society-wide semifinals or finals calculation. The summer coaching program provides each team one-on-one meetings with industry experts to discuss their innovation and receive feedback. Participants will have the opportunity to ask questions as a group with other contestants as well as during individual team breakout sessions. They have the support of ASCE staff throughout the summer to assist with requests which may include and are not limited to scheduling a virtual practice session for feedback on voice levels, presentation techniques -- anything except feedback and comments related to technical content. In the ASCE Student Innovation Contest summer coaching and resources program, feedback on technical content is only received during the one-on-one coaching sessions or from judges' comments and questions.

Each winning team at the ASCE Student Symposium level has the opportunity to be invited to the in person Society-wide finals competition where they will compete at the ASCE Convention, October 23-26, 2022, in Anaheim, CA. Winning teams that participate in the Society-wide semifinals and at the convention will be expected to make a poster for display online and at the convention. Additional details related to participating in the Society-wide finals competition will be provided in the Spring of 2022.

ASCE shall award at least $3,000 in cash prizes to the ASCE Student Chapter of the Society-wide finals competition winning teams.

Total prizes shall be distributed as follows:

- 1st place overall winner: $1,500 and trophy
- 2nd place overall winner: $1,000 and trophy
- 3rd place overall winner: $500 and trophy

Changes to the level of financial rewards will be announced no later than April 30, 2022.

Section 6: Ethics

This competition is to be conducted with the highest regard for ethical responsibility per ASCE's Code of Ethics. All members of ASCE, regardless of their membership grade or job description, commit to all of the ethical responsibilities in this Code. All ASCE members and students should make themselves familiar with ASCE's Code of Ethics (https://www.asce.org/ethics/).

Section 7: Eligibility

Only one entry per college or university may compete in the ASCE Innovation Contest. A college or university may compete in only one ASCE Student Symposium. The teams, representing an ASCE Student Chapter in good standing, shall be led by undergraduate CEE students, and may be advised by faculty and/or graduate students. Multi-disciplinary teams are encouraged and preferred; however, the innovation must focus on an improvement, solution, cost savings etc. related to the CEE industry and the built environment. All student team members, regardless of academic major, must be in good standing with their ASCE Student Chapter and be Society-level ASCE student members during all or part of the fall through spring of the current competition academic year. Teams are encouraged to engage experts on and off campus in other engineering fields, such as architecture, social sciences, and the humanities, to develop ideas and solutions that are timely, engaging, innovative, exciting, and beneficial to society.

ASCE Student Chapters hosting symposia may invite Official Guest teams, which are teams from colleges or universities that have an official ASCE Student Chapter that is not assigned to any Student Conference. Official Guest teams are eligible (if they meet the other requirements, including eligibility standards to advance to Society-wide finals) to be invited to the Society-wide competition. Official Guest teams may compete in only one student symposia per year. ASCE Student Services shall be notified by the ASCE Student Symposium host school of an Official Guest team prior to the start of the student symposium. Notification can be by e-mail to student@asce.org. Conference assignments and student symposium host chapters are listed at https://www.asce.org/communities/student-members/conferences.

7.1. Levels of Competition

There are two main levels of competition: first the ASCE Student Symposium level, and then the Society-wide finals competition level. The finals level has two steps--first a virtual semifinal which requires a 4-6 minute presentation and a poster image and the finals which requires a 1-2 minute investor pitch that will be delivered in person during the ASCE Convention. The ASCE Convention is a global platform where student symposium winners will be given the opportunity to share their innovation with an international audience. In the event that a team qualifies for the finals event and is restricted from sending a team representative to the ASCE Convention, ASCE will provide the opportunity to virtually deliver their final investor pitch.

7.2. Required Conduct and Advancement to Semifinals and Finals Competition

All participants shall act professionally and respectfully at all times. Failure to act appropriately can result in sanctions, disqualification, and loss of invitations to future student symposium competitions or Society-wide finals competitions. The inappropriate use of language, use of alcohol, uncooperativeness, or general unprofessional or unethical behavior will not be tolerated.

To advance to the Society-wide semifinals and finals competition, teams must meet ASCE eligibility standards(see https://www.asce.org/communities/student-members/conferences/eligibility), participate in the coaching resource program, and

participate in the virtual Society-wide semifinals competition and receive a score in the semifinals high enough to place as one of the top ten teams. Scoring in the student symposium competitions is not calculated in the semifinals or finals competition scoring. Additional details related to participating in the Society-wide finals competition will be provided in Spring 2022.

At the end of the student symposium ASCE Innovation Contest, the student symposium host student chapter shall promptly submit the completed official scoring spreadsheet for a conference competition to **student@asce.org**. Teams will not be invited to the Society-wide semifinals competition until this spreadsheet is received and eligibility is confirmed.

Section 8: Safety

All participants are responsible for complying with all campus protocols and procedures including but not limited to COVID-19 guidelines related to in-person meetings, masking, social distancing, etc., at all times in connection with planning, preparation, or participation in the competition.

Given the continually changing environment surrounding COVID-19, virtual competition provisions are provided in the rules and may be activated in coordination with ASCE.

Safety is our highest priority and risk of personal injury will not be tolerated. Students should use safe practices in any competition test procedures, proof of concept exercises, or any activities associated with ideas and exercises related to their competition entries and should seek appropriate instruction and supervision as necessary to maintain health and safety.

Safety criteria and considerations related to submitted innovations and their connection to the built environment, if applicable, are expected to be included in the recorded submission. For information about safety in the built environment, please refer to the ASCE website for more information.

For reference, please review ASCE Policy Statements on Safety are PS282, PS290, PS350, PS351 and PS 424)

Section 9: Student Symposium Host Requirements and information

The ASCE Innovation Contest is accessible and feasible for all student chapters to participate in and host.

Student and Student Chapter Logistics

1. People
    a. Before any student or student chapter decides to participate in the ASCE Innovation Contest, the most important assets needed are faculty, industry, and student advisors who are willing to talk with the team and

challenge the team as it develops an innovative idea into a viable innovative solution.

b. There will be ASCE Innovation Contest experts to provide assistance to advisors who may want some ideas about how to coach a student team through the thought process of developing an innovation. Additional resources are included in the Appendices.

2. Materials required to participate in the competition and availability of these materials.
    a. A good innovative idea, and a diverse team of dedicated students.
    b. Students need to think through the innovation idea. They can develop a conceptual innovation or an innovation ready for market, but a vetted innovation is not required.
    c. A contest submission which consists of a recorded presentation that communicates information about their innovation.

3. Equipment, particularly specialized equipment, needed to participate in the competition and availability of the equipment.
    a. A computer and access to the internet
    b. Access to a web camera
    c. A microphone may be useful but not required

4. Space requirements
    a. Space on a computer hard drive for large video files

5. Cost analysis and impact to student chapters
    a. Upper and lower bound estimates to prepare for and participate in both a student symposium competition and Society-wide competition finals.
        - Cost for Students or Student Chapters – this depends on the specific requirements of the host symposium, but no special requirements other than a computer.
        - Cost for Society-wide finals – ASCE will provide some travel stipends for teams traveling to the ASCE Convention. There may be additional travel related costs depending on how many people plan to attend. Access to the ASCE Convention and some meals will be provided.

    b. Effect of student chapter budget on educational and/or competitive outcomes
        - The ASCE Innovation Contest has gained a lot of interest with the ASCE Student Chapter communities over the past two years. Hosting this contest may attract students to their student chapter and this contest may provide students with a project opportunity that could connect to their academic work.

Student Symposium Host Requirements

Local support for the ASCE Innovation Contest is an essential element for the ongoing development of the contest and the development of an innovative community within CEE. The Student Symposium Hosts are expected to provide volunteer judges.

1. *Materials required to host the competition.*

   None.

2. *There is no special equipment needed to host the competition*. Only a computer, projector and a room for presentations and judging.

3. *Competition venue/space requirements*

   The ASCE Innovation Contest easily adapts to either a virtual or in person venue. If the student symposium host offers an in person competition, the contest needs a room and seating. If the student symposium contest is 100% virtual, then the host needs a presentation platform such as Teams or Zoom and to coordinate access with student and volunteer participants.

4. *There are no special risks that hosts, and participants should be aware of.*

5. *Cost analysis and impact to student chapter hosts. Low-end and high-end for hosting the competition.*

   Costs are related to the general costs incurred by the student symposium hosts that may be related to food or breaks offered to student and volunteer participants. A virtual contest may also include specific costs that should be considered before deciding.

9.1 Marketing and Encouragement.

The student symposium host is expected to promote this contest and encourage schools to participate.

9.2 Local judging support is needed.

Local support for the ASCE Innovation Contest is an essential element for the ongoing development of the contest and the development of an innovative community within CEE. ASCE has access to qualified judges and the virtual venue of this competition allows more flexibility of participation from this existing group; however, the student symposium hosts are expected to provide volunteer judges to participate in the in person or virtual judging event.

The ASCE Innovation Contest team will assist by providing head judge training. Dates and times for training sessions will be announced in January 2022.

APPENDICES

Appendix A: ASCE Innovation Contest Advisory Committee

2022 ASCE Innovation Contest Advisory Committee

The Innovation Contest Advisory Committee members are strong supporters of the Future World Vision initiative, innovation in civil engineering, and the mission and purpose of ASCE. The Innovation Contest is a project developed to support innovation in civil engineering education, attract students to civil engineering, and support all of the efforts connected to the Future World Vision. The members are innovative thinkers and leaders capable of posing ideas that can grow the contest, help ASCE become an innovation leader and help populate the committees and events related to innovation as well as represent constituencies.

Committee members provide oversight of several supporting committees along with providing their insight and expertise throughout the contest season. Committee members are welcome and encouraged to become more involved in on-going contest activities.

This committee determines the innovation challenge(s), guides the rules and general outline of contest related activities from student symposium program launch in September through to the finals event that takes place during the ASCE Convention. They will be the leaders of the sub-committees that will advocate and support the judges and advisors that participate throughout the student symposium universe.

Organization	**Name and Credentials**
Co-Chairs	
University of Nebraska.....	Daniel G. Linzell, Ph.D., P.E., F.SEI, F.ASCE
NC State University	Marc I. Hoit, Ph.D., F.SEI, F.ASCE
Committee Members	
Carnegie Mellon Univ.....	Burku Akinco, Ph.D., M.ASCE
Glenn R. Bell Consulting.....	Glenn R Bell, P.E., S.E., CP, F.SEI, Dist.M.ASCE
Thornton Tomasetti.....	Raymond Daddazio, P.E., F.EMI, M.ASCE
Pennoni..	Jesse T. Gormley, P.E., ENV SP, M.ASCE
Nat'l Security Consultant.....	Raymond Andrew Heider
Palisades Group.	Eva Lerner-Lam, M.ASCE
University of New Orleans ...	Norma Jean Mattei, Ph.D., P.E., F.SEI, Pres.17.ASCE
University of S. California.....	Lucio Soibelman, Ph.D., F.ASCE

If you would like to communicate with the Innovation Contest Committee with questions, comments, great ideas, or an interest to be more involved in innovation contest related activities, please contact the ASCE staff support team.

Carol Vargas, cvargas@asce.org and Robin Crews, rcrews@asce.org

Appendix B: Team registration form for access to FWV concept website

Registration is required to gain access to the password for this website.

Please send an email to innovationcontest@asce.org

Subject Line: Request access to the Future World Vision Concept website.

Please provide in the email:

1. The Student Symposium your school is connected to, the name of our school.
2. Your name, role in the team and email address.
3. The names and email addresses of your team members.
4. The name and email address of your faculty advisor.

Registration to the site is required so that we are able to communicate with users throughout the contest with updates related to accessing the site.

We expect to be changing the host for the FWV Concept Website sometime towards the end of October. We need this registration information to help us communicate with registered users any issues or changes with the site that may need to be brought to their attention. Examples of changes include site address changes, password changes, and possible interruption in access while we are changing hosts.

The use of this site is by permission only. It is a concept site which means that some links may not work. Users enter and explore the site on their own. No guidance, other than what is included in this document, will be provided.

Appendix C: Examples from the Excel Scoring Workbook

The contest scoring is managed by an Excel workbook. The images below are taken from the workbook. Instructions are provided in the READ ME sheet.

The READ ME sheet outlines the purpose and requirements for each Excel Worksheet.

2022 Innovation Contest Scoring Workbook **READ ME First Instructions. These instructions provide information related to what needs to be filled in by the user/users (most likely Head Judge and individual Judges.** **The sheets are protected. If password is needed, use ASCE.**
The Head Judge is responsible for managing a judge scores and for delivering the Final Scoring Sheet (Tab 3) as a PDF to Jupmeyer@asce.org and cvargas@asce.org. The judging panel should include educators, professionals, and individuals with knowledge of innovation, sustainability, and the built environment. Judges will be expected to conduct an initial review of the submitted content and be prepared to complete all scoring within the time provided during the judging of this contest as organized by the ASCE Student Symposium host. Please refer to the 2022 Innovation Contest Rules document for mre information. Any judge connected with a participating school must excuse themselves from judging that paticular submission due to a conflict of interest.
This workbook has 6 tabs -- including this READ ME tab.
1. School Information -- The cells highlighted in YELLOW, need to be filled in by either the Host school and/or the head judge. The information provide will populate throughout the other sheets.
2. Judge Scoring Sheet -- This sheet will be managed by the Head Judge. Judges need to submit/communicate their scores to the Head Judge. This form has cells to contain scores for all judges. All calculations are embedded. As scores are entered, the scores are first averaged across all judge scores in that category and then calculated as part of the total score. The correct number of judges is critical for this process. The sheet defaults at 5 judges. If you have less than 5 judges, then place the correct number in the yellow highlighted box and only use the 1st three judge columns.
3. Final Scoring Sheet -- Final scores will automatically fill these cells. The Head Judge or person submitting the information has to put their name in highlighted box at the bottom of the printable form (line 28 cells A-D) and sort the table by total scores Largest to Smallest, (Lines 6-25 cells F-H). Print or save the form as a PDF and submit the information according to instructions on the form and any specific requirements requested by the Student Symposium Host.)
Tabs 4 and 5 are individual scoring sheets for judges. Please do not print or share the judging sheets until all of the information is loaded into the Student Symposium info worksheet; which includes, the Student Symposium Name, names and contact information for each Team participation, the number of schools participating etc. Information is set up to populate fields throughout all other sheets. If you share these sheets prior to having all ofthe infomration loaded properly, it will not show up on any of the Judge Scoring sheets or the Final Scoring Sheet. Once all Student Symposium detailsare loaded, these worksheets may be shared with the head judge and the individual judges. Worksheet #4 is set up to be used on a computer and has all calculations embedded into the sheet. In the event that a judge does not have access to a computer, Worksheet #5 provides the specific calculations required and can be printed for manual entry.

School Symposium Information Worksheet

Once all information is loaded into this worksheet, the information will populate the appropriate fields throughout all other worksheets. Below is an example of Page 1 and Page 2 if printing is needed.

2022 Innovation Contest – Schools Participating and contact information

2022 Innovation Contest – Schools Participating and contact information

These cells automatically populate all scoring sheets.

Student Symposium Name	
# of Participating Schools in Innovation Contest	

Once data is entered, the submission number and school name will automatically populate the Judge scoring sheet.

Submission Number		School Name	School Contact First Name	School Contact Last Name	School Contact email
Submission	1				
Submission	2				
Submission	3				
Submission	4				
Submission	5				
Submission	6				
Submission	7				
Submission	8				
Submission	9				
Submission	10				
Submission	11				
Submission	12				
Submission	13				
Submission	14				
Submission	15				
Submission	16				
Submission	17				
Submission	18				
Submission	19				

2022 Innovation Contest – Schools Participating and contact information

2022 Innovation Contest – Scho

These cells automatically populate all scoring sheets.

Student Symposium Name	
# of Participating Schools in Innovation Contest	

Once data is entered, the submission numb

Submission Number		School Contact Phone	Student Chapter	Faculty Advisor	Faculty Advisor Email
Submission	1				
Submission	2				
Submission	3				
Submission	4				
Submission	5				
Submission	6				
Submission	7				
Submission	8				
Submission	9				
Submission	10				
Submission	11				
Submission	12				
Submission	13				
Submission	14				
Submission	15				
Submission	16				
Submission	17				
Submission	18				
Submission	19				

Head Judging Score Sheet

This worksheet is designed for use by the Head Judge only. Scores loaded into this spreadsheet populate the final score sheet that is submitted by the Head Judge or other designee. Below is a sample for Page 1. The document is set up to accommodate 19 teams. If you need to print out the Head Judge Scoring sheet, it will print each page including the scoring details in the columns on the left.

2022 Innovation Contest Head Judge Scoring Sheet	
Student Symposium Name	0
# of Participating Schools in IC	0
Total Number of Judges scoring - default set at 5. If less than 5 change this number accordingly to update the scoring.	5

			Judge Score Input: (low = 1, High = 10)						Total # of Judges
			Submission 1						
			0					Input total # of Judges in cell J6	5
Time of scoring	Category	Judging Guidelines	Judge 1	Judge 2	Judge 3	Judge 4	Judge 5	Average	Percent of total
Scored prior to contest	Innovation and Creativity	4.3.1 of Rule Book. 40% of total score. Scored using submitted. Lower scoring will be given to entries with next generation, incremental, or iteration of existing solutions. Higher scoring will be given to entries that skip a generation of existing solutions and those that use out-of-the-box new approaches to solve a problem.	0	0	0	0	0	0	0
	How valuable is the innovation to society/customer?	4.3.2. of Rule Book. 25% of total score. We are trying to solve big problems, not just make life incrementally easier for the customer. By way of an analogy, think of the value of painkillers vs. multi-vitamins. One is addressing a big issue/pain point and the other is routine maintenance. We are looking for painkiller solutions that provide substantial problem-solving, not just a couple of improvements. Is the innovator building a daily supplement or a cure for cancer? Is their innovation addressing one of the things that keeps customers/society up at night or just a nice-to-have solution? The submission will receive higher scores if it addresses big problems with large benefits/value or cost and/or time savings in methodology and receive lower scores for just nice-to-have solutions.	0	0	0	0	0	0	0
	How technically feasible is the innovation?	4.3.3. of the Rule Book. 25% of total score. We want to showcase, promote, and reward not just for an innovative solution but also entries that have thought through the technical feasibility of their innovation. Provide information to support your innovation, including test result summaries and/or prototypes proving the veracity of the solution. Low scoring will be given to an innovation that does not appear to have realistic technical success. Higher scoring will be given to innovations that demonstrate the success of the technological solution through tests, pilot projects, sales, etc.)	0	0	0	0	0	0	0
							Pre-Contest Score		0
Scored during contest	Communication and Presentation	4.4.4. of Rule Book. 10% of the final score. Has the team communicated the unique and creative properties of the civil structure solution? A good submission will clearly exhibit or consider the following: - Critical thinking, including the ability to integrate different perspectives and "connect the dots" between disparate data points. - An ability to communicate and/or solve a problem. - Demonstration of industry-specific knowledge, though there is no penalty for making assumptions when necessary (e.g., unknown facts, future trends, constraints). - If an appropriate question underlying assumptions presented by others who may have nuances of the problem, if you are convinced a different perspective is appropriate. - All things being equal, innovations with broad application will generally be scored higher.	0	0	0	0	0	0	0
					0		Total Contest Score		0

Final Overall Score Document

This is where the final scoring is captured for each team. Each team's final scores are generated from the 2nd Worksheet, titled, "2. Head Judge Scoring Sheet". This sheet is filled out exclusively by the Head Judge.

Instructions for this sheet includes the need to sort the scores on a separate table which will then populate this part of the worksheet according to highest score. The entire table shows the ranking of all teams participating and the teams that fall in the greyed area are the top three (3) scoring teams.

Please print as a PDF and send to Jupmeyer@asce.org and cvargas@asce.org

Student Symposium Name	0
# of Participating Schools in Innovation Contest	0

Final Overall Score Sheet

Place	Score	School
1	0	0
2	0	0
3	0	0
4	0	0
5	0	0
6	0	0
7	0	0
8	0	0
9	0	0
10	0	0
11	0	0
12	0	0
13	0	0
14	0	0
15	0	0
16	0	0
17	0	0
18	0	0
19	0	0

Submitted by:

Individual Judge Scoring for use with a computer.

2022 Innovation Contest Individual Judge Score Sheet–Computer Input					
Student Symposium Name		0	0		
# of Participating Schools in IC		0			
			Indv. Judge Score Input * (low = 1, High = 10)		
			Team Name and Number from School Info Sheet		
Judge Name and email			0	0	0
Time of scoring	Category	Judging Guidelines	1	2	3
Scored prior to contest	Innovation and Creativity	4.3.1 of Rule Book. 40% of total score. Scored using submitted . Lower scoring will be given to entries with next generation, incremental, or iteration of existing solutions. Higher scoring will be given to entries that skip a generation of existing solutions and those that use out-of-the-box new approaches to solve a problem.	0	0	0
	How valuable is the innovation to society/customer?	4.3.2. of Rule Book. 25% of total score. We are trying to solve big problems, not just make life incrementally easier for the customer. By way of an analogy, think of the value of painkillers vs. multi-vitamins. One is addressing a big issue/pain point and the other is routine maintenance. We are looking for painkiller solutions that provide substantial problem-solving, not just a couple of improvements. Is the innovator building a daily supplement or a cure for cancer? Is the innovator addressing one of the things that keeps customers/society up at night or just a nice-to-have solution? The submission will receive higher scores if it addresses big problems with large beneficiaries or cost and/or time savings in methodology and receive lower scores for just nice-to-have solutions.	0	0	0
	How technically feasible is the innovation?	4.3.3. of the Rule Book. 25% of total score. We want to showcase, promote, and reward not just for an innovative solution but also entries that have thought through the technical feasibility of their innovation. Provide information to support your innovation, including test result summaries and/or prototypes proving the veracity of the solution. Low scoring will be given to an innovation that does not appear to have realistic technical success. Higher scoring will be given to innovations that demonstrate the success of the technological solution (through tests, pilot products, sales, etc.).	0	0	0
Pre-Contest Event Scoring					
		Innovation = 40% of total	0	0	0
		Value = 25% of total	0	0	0
		Feasibility = 25% of total	0	0	0
		Submittal--pre-contest presentation	0	0	0
Scored during contest	Communication and Presentation	4.3.4. of Rule Book. 10% of the final score. Has the team communicated the unique and creative properties of their infrastructure solution? A good submission will clearly exhibit or consider the following: - Critical thinking, including the ability to integrate different perspectives and "connect the dots" between disparate data points. - An ability to communicate and articulate an idea. - Demonstration of industry-specific knowledge, though there is no penalty for making assumptions when necessary (e.g., unknown facts, future trends, demands). - It is appropriate to question underlying assumptions presented by others who may have examined the problem, if you are convinced a different perspective is appropriate. - All things being equal, innovations with broad application will generally be scored higher.	0	0	0
JUDGE NAME OR NUMBER		Communications Score 10% of total	0	0	0
		Total Contest Score	0	0	0

Individual Judge Scoring Sheet -- for printing and manual use

2022 Innovation Contest Individual Judge Score Sheet -- Printable					
Student Symposium Name		0			
# of Participating Schools in IC		0			
Requires Judge to calculate values manually			Indiv. Judge Score Input (low = 1, High = 10)		
			Team Name and Number from School Info Sheet		
Judge Name and email			0	0	0
Time of scoring	Category	Judging Guidelines	1	2	3
Scored prior to contest	Innovation and Creativity	4.3.1 of Rule Book. 40% of total score. Scored using submitted . Lower scoring will be given to entries with next generation, incremental, or iteration of existing solutions. Higher scoring will be given to entries that skip a generation of existing solutions and those that use out-of-the-box new approaches to solve a problem.			
	How valuable is the innovation to society/customer?	4.3.2. of Rule Book. 25% of total score. We are trying to solve big problems, not just make life incrementally easier for the customer. By way of an analogy, think of the value of painkillers vs. multi-vitamins. One is addressing a big issue/pain point and the other is routine maintenance. We are looking for painkiller solutions that provide substantial problem-solving, not just a couple of improvements. Is the innovator building a daily supplement or a cure for cancer? Is the innovator addressing one of the things that keeps customers/society up at night or just a nice-to-have solution? The submission will receive higher scores if it addresses big problems with large beneficiaries or cost and/or time savings in methodology and receive lower scores for just nice-to-have solutions.			
	How technically feasible is the innovation?	4.3.3. of the Rule Book. 25% of total score. We want to showcase, promote, and reward not just for an innovative solution but also entries that have thought through the technical feasibility of their innovation. Provide information to support your innovation, including test result summaries and/or prototypes proving the veracity of the solution. Low scoring will be given to an innovation that does not appear to have realistic technical success. Higher scoring will be given to innovations that demonstrate the success of the technological solution (through tests, pilot products, sales, etc.).			
Pre-Contest Event Scoring					
		Innovation = 40% of total=(Value*0.4)*10			
		Value = 25% of total =(Value*0.25)*10			
		Feasibility = 25% of total =(Value*.025)*10			
	Submittal–pre-contest presentation=(Sum of lines 12-14)				
Scored during contest	Communication and Presentation	4.3.4. of Rule Book. 10% of the final score. Did the team communicated the unique and creative properties of their infrastructure solution? A good submission will clearly exhibit or consider the following: - Critical thinking, including the ability to integrate different perspectives and "connect the dots" between disparate data points. - An ability to communicate and articulate an idea. - Demonstration of industry-specific knowledge, though there is no penalty for making assumptions when necessary (e.g., unknown facts, future trends, demands). - It is appropriate to question underlying assumptions presented by others who may have examined the problem, if you are convinced a different perspective is appropriate. - All things being equal, innovations with broad application will generally be scored higher.			
JUDGE NAME OR NUMBER		Communications Score 10% of total = (Value*0.1)*10			
		Total Contest Score= Sum of Line 19 and line 15			

Appendix D: Scoring Rubric

This RUBRIC is provided to assist a judge with evaluating the submission. It connects the information provided in the rule to a ten (10) point scale. The questions provided are provided as samples and judges may have their own version of questions to use when evaluating a submission. It is also valuable for judges to discuss submissions as a group so that the experience and knowledge of the group as a whole may assist with the final evaluation.

Judges' scores are averaged. The final score is calculated according to each area's percentage of the total score.

Innovation and Creativity

4.3.1 of Rule Book. 25% of the total score. Scored using submitted presentation. Lower scores will be given to entries with next generation, incremental, or iteration of existing solutions. Higher scores will be given to entries that skip a generation of existing solutions and those that use out-of-the-box new approaches or other technologies or different engineering disciplines to solve a problem.

JUDGING CRITERIA	SCORING 1-3	SCORING 4-5	SCORING 6-8	SCORING 9-10
INNOVATION AND CREATIVITY 25% Scored prior to the contest event.	Not a very unique approach to solving a problem. Very minor extension to existing techniques	Incremental improvement or adaptation of an existing solution. Has some new aspects, but minor.	Creative improvement or adaptation (next generation) of an existing solution. Will render the existing technique or solution much more useful and will attract people's attention.	Out of the box approach to solving a problem. Skips a generation of existing solutions. New or never been applied to this type of problem. One of a kind solution and could change the industry.

Value Proposition and Relevance - How valuable is the innovation to society/customers?

4.3.2. of Rule Book. 25% of the total score. Scored using submitted presentation. We are trying to solve big problems, not just make life incrementally easier for the customer. By way of an analogy, think of the value of painkillers vs. multi-vitamins. One is addressing a big issue/pain point and the other is routine maintenance. We are looking for painkiller solutions that provide substantial problem-solving, not just a couple of improvements. Is the innovator building a daily supplement or a cure for cancer? Is the innovator addressing one of the things that keeps customers/society up at night or just a nice-to-have solution? The submission will receive higher scores if it addresses big problems with large beneficiaries or cost and/or time savings in methodology and receive lower scores for just nice-to-have solutions.

JUDGING CRITERIA	SCORING 1-3	SCORING 4-5	SCORING 6-8	SCORING 9-10
VALUE TO SOCIETY OR CUSTOMER 25% Scored prior to the contest event.	Solution addresses a very small or narrow scope problem that has limited impacts. Nice to have but not needed by very many people and/or cost/complexity is too high for results obtained.	Solution addresses a regional or relatively narrow problem that has a somewhat limited impact. A small but reasonable number of people or corporations would be interested but still a niche market.	Solution addresses a relatively significant problem that could improve life cycle costs, time savings, or environmental improvements, etc. Large market and interest by many.	Solves a big problem that could have a major impact on improving life cycle costs, societal benefits, time savings, or environmental improvements, etc. Has a large number of beneficiaries. Could create an entire industry or new approach to the problem at a huge cost or complexity savings. Value and demand are obviously there.

Efficiency and Feasibility - How technically feasible is the innovation?

4.3.3. of the Rule Book. 25% of the total score. Scored using submitted presentation. We want to showcase, promote, and reward not just an innovative solution but also entries that have thought through the technical feasibility of their innovation. Provides information to support the innovation, including test result summaries and/or prototypes proving the veracity of the solution. Lower scores will be given to an innovation that does not appear to have realistic technical success. Higher scores will be given to

innovations that demonstrate the success of the technological solution (through tests, pilot products, sales, etc.).

JUDGING CRITERIA	SCORING 1-3	SCORING 4-5	SCORING 6-8	SCORING 9-10
TECHNICALLY FEASIBLE 25% Scored prior to the contest event.	Not very realistic chance for technical success. No evidence of technical validation through modeling, testing, prototyping, etc. Lacks a realistic business plan for Implementing the proposal. Only potential market size is addressed.	Appears to have some potential for technical success based upon arguments or analogies presented, but there has been no scientific modeling, testing or prototyping performed yet. A rudimentary business plan that requires a lot more development.	Appears to have reasonable potential for technical success based upon some modeling, testing, or prototyping validation. The innovation has a business plan, but it does not address all of the factors that should be considered.	Very high potential for technical success. Based on successful testing, prototypes, or early market successes. The team communicates how the innovation is or could be scalable, has a real market, and cost sensitivity distribution models. LCC considerations and benefits are addressed.

Communication - Has the team communicated the unique and creative properties of their infrastructure solution?

4.3.4. of Rule Book. 10% of the final score. Scored during contest presentation.

A good submission will clearly exhibit or consider the following:

- Critical thinking, including the ability to integrate different perspectives and "connect the dots" between disparate data points.
- An ability to communicate and articulate an idea.
- Demonstration of industry-specific knowledge, though there is no penalty for making assumptions when necessary (e.g., unknown facts, future trends, demands).
- It is appropriate to question underlying assumptions presented by others who may have examined the problem, if you are convinced a different perspective is appropriate.
- All things being equal, innovations with broad application will generally be scored higher.

. JUDGING CRITERIA	SCORING 1-3	SCORING 4-5	SCORING 6-8	SCORING 9-10
COMMUNI-CATION 10% Scored during the contest event.	Problem statement could have been stated more clearly. The objective needs to be more clearly identified. Presentation/ presenter is lacking sufficient knowledge, confidence, or clarity. No clear or obvious market.	Presentation does a fair job at presenting the problem statement and identifying the objective of the innovation. More background information and supporting evidence should have been provided. Market has been mentioned but no real numbers or proof it exists.	Presentation's content was relatively strong in most respects. The presentation was ok, but not stellar. The market has been explored, parallel products compared, some survey or interest shown - already sold some product. Content shows that the presenter has thought through the problem.	Excellent presentation that communicates an innovative solution with broad applications and its unique characteristics. Connects all of the dots. Demonstration of industry specific knowledge. Logical assumptions were made when necessary. The presenter questioned underlying assumptions by others and provided logical conclusions supporting his/her/team perspective. Market is clearly explained. Product is in the hands of investors or beta testers.

The Judging RUBRIC is available as a separate document.

Appendix E: Innovation discovery/exploration questions worksheet

This document is provided as a guide to help the participating teams develop their innovation. There are many elements to taking a great idea and turning it into a viable innovation. After the team has answered and worked through the steps outlined below, they will have a valuable outline that will help them organize and develop their final contest entry.

2022 Contest Theme: “Propose an innovation that addresses one (or more) of the UN Sustainability Goals as envisioned fitting into the Future World Vision Project, “Infrastructure Reimagined.”

Step 1: Initial exploration

Review your resources and as a team discuss which of the United Nations sustainability goals, and what elements of the Future World Vision are of interest, resonate, or inspire the group to learn more.

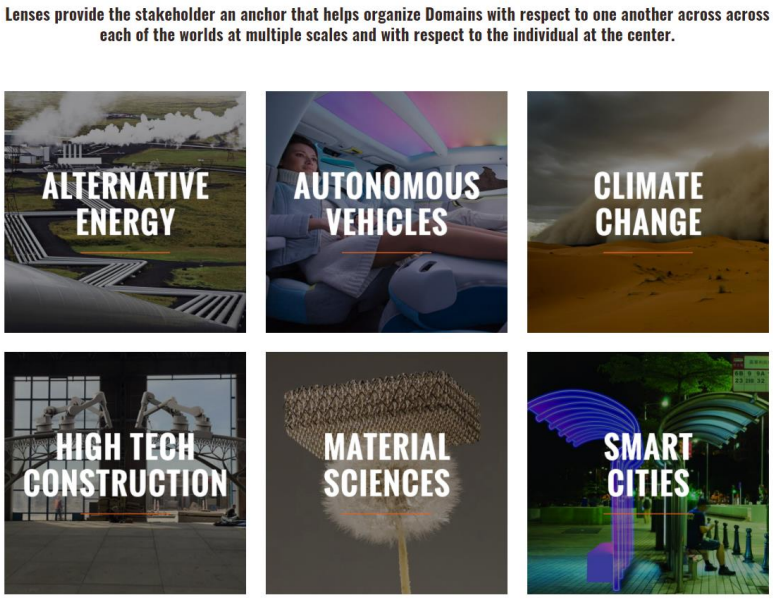
United Nations 17 Sustainability Goals: Which goals are of most interest to your team?

For more information visit the website: https://sdgs.un.org/goals

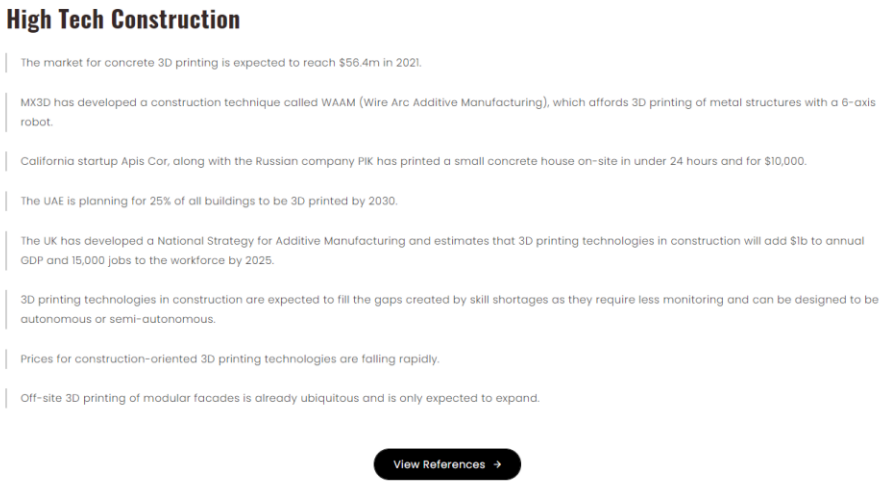
Future World Vision Concept Website: This site is separate and distinct from the .futureworldvision.org site. The concept site was created to provide a dynamic visual illustration and demonstration of the 5 possible multidimensional worlds for ASCE's Future World Vision project.

"At the center of the ASCE and Experimental Discovery Phase is the creation of five holistic, multi-dimensional worlds that brings to life the future of civil engineering through compelling human narratives and evocative visuals. These worlds serve as an emergent foundation and resource that demonstrate how civil engineering can become a central component of aspirational but achievable futures".

The site provides six lenses from which to consider as each world is explored.



Each lens provides details and connects to the reference page to review sources. Below is the information connected to High Tech Construction.



.

Complete Step 1

- List the sustainability goals of most interest to your group.
- List areas, concepts or City Worlds from the Future World Vision site of most interest.

Step 2: Brainstorm opportunities

Discuss as a team, big opportunities for innovation that are connected to your sustainability goals of interest and how those opportunities are connected to one of the Future World Vision Cities. Keep in mind that your innovation does not need to connect directly to the FWV scenarios. Team are provided the FWV concept website to help inspire participants and assist them with imagining potential future infrastructure challenges.

You are the inventors, innovators, and imaginers - what will YOUR infrastructure solution be, how will YOU make it happen, how will YOU ensure it adheres to appropriate societal and engineering ethics, and how will it change the way we live?

Step 3: Where does your innovative idea fit in the list below?

Select the answers that best match your innovative idea.

There is no correct answer, but you should explore each item on the list with your team. For example, what big problem will your innovation solve, what are the significant benefits it will deliver, what customer will think it is nice to have?

- It is nice to have
- It solves a big problem
- It makes a significant change in the way things are done by saving money and/or reduces time to delivery
- It is an incremental innovation
- It is a disruptive innovation

Keep in mind: Lower scores will be given to entries with next generation, incremental, or iterations of existing solutions. Higher scores will be given to entries that skip a generation of existing solutions and those that use out-of-the-box new approaches to solve a problem.

Step 4: Highlight your creativity

1. Describe your innovation and its creative and technological attributes.
2. How does your innovation perform better, faster or at a lower cost than its competitors?

Why is this important? The submission will receive higher scores if it addresses big problems with large beneficiaries or cost and/or time savings in methodology and receive lower scores for just nice-to-have solutions.

Step 5: Value to society and/or customer. Describe the solutions your innovation delivers.

Think about your innovation in terms of the solutions and value it delivers to industry.

Go deeper than listing the specific problem or problems it will solve. Think about the need it addresses, and if that need translates across a broad spectrum of situations.

If your innovation is able to translate across a broad spectrum of situations, then your solution will be relevant to more customers. Value and relevance will also exist if your innovation saves significant time to delivery and/or a significant cost for materials. Explore as many opportunities as possible for your innovation to deliver value.

1. Have you considered the social impact connected to your innovation?
2. How does your innovation connect to these topics and others you may have identified?

Step 6: Technically feasible

You have identified solutions that your innovation brings to market, now think about its feasibility and efficiency.

Review the technical attributes of your innovation. What tests would you devise to prove the value of your innovation? Low scoring will be given to an innovation that does not appear to have realistic technical success. Higher scoring will be given to innovations that demonstrate the success of the technological solution.

The time frame over which your innovation will be implemented will determine the number of assumptions needed. You may make assumptions, when necessary, based on future trends, and projected demands.

For example, you may make the assumption that the climate associated with your city will experience extreme storms and your innovation has a solution associated with mitigating the effects of extreme storms. Stating the assumption is not enough, you need to provide your basis.

Step 7: Some additional questions to consider.

1. What are the manufacturing costs to make your innovation? How many can you make at one time? How long does it take to manufacture each batch?
2. Briefly describe the cost of materials and time required to build your innovation with the current resources available. Once your innovation is delivered to market, what, if any, support services or materials does your innovation need to perform as expected?

3. What is the life cycle of your innovation from its initial build to its end of service? At what price will you sell it and how can you prove that the market will pay that price?
4. Is your innovation scalable?

   You might have a great idea for an innovation, but investors need to know how fast you can scale up your manufacturing to meet a growing demand. In the previous question you discussed the right now cost to manufacture your innovation.

   Now describe what resources and expertise will you need to scale up?

   Discuss what you will need to deliver more of your innovations to market and in less time.

   How will these changes improve your profit margin?

5. How many competitors are in your market?
6. What other solution choices exist, if any, and how does your innovation surpass these competing options?
7. Once your innovation comes to market, describe its impact.
8. What are some potential follow-on innovations or benefits that may result from the industry's adoption of your innovative solution?

Good Luck!

Appendix F: Tips from the Experts

We reached out to our industry leaders and asked them to answer several questions related to innovation. Their responses are below.

How do you identify something as innovative in civil engineering?

- It provides a solution or approach to a solution that brings new technology and/or new thinking about an infrastructure-environment challenge.
- Something that is either new to civil engineering (has not been done before) or something that makes a current process or material in civil engineering more effective, resilient, sustainable, or efficient.
- Something that is different and valuable. Value can be more efficient, faster, better quality or less resources. It has to be measurable.
- Innovation may be incremental; step change; and/or systemic (industry/world affecting).
- Idea or invention converted into a good or service that creates value for which customers will pay.

Please provide examples and/or resources for innovation to help someone learn more about this topic.

- Development of a robot for rebar-tying on bridge surfaces.
- Expanding use of drones for infrastructure and environmental assessment, project tracking. Monitoring of vibrations in infrastructure and use of machine learning for related near-real-time structural health assessment.
- Development of nanomaterial delivery systems for plant fertilization to reduce nutrient runoff.
- Automated evaluation of video images with AI techniques for traffic assessment, ground movements, changes in pavement, etc.
- Taking advantage of projects in low-income communities to attract apprentices in trades from low-income communities.
- Using composites for reinforcing as it weighs less and is more resistant to corrosion. Or building composite aerospace structures as they are lighter weight and more durable.

- Videos of and books by Clayton Christensen.

Please share one or two examples that exemplify creativity in civil engineering.

- Tuned mass damper in the Citigroup Center
  https://en.wikipedia.org/wiki/Citigroup_Center
- (2) Summerset at Frick brownfield redevelopment
  https://en.wikipedia.org/wiki/Summerset_at_Frick_Park
  https://www.cmu.edu/steinbrenner/brownfields/Case%20Studies/pdf/Summerset%20-%20Nine%20Mile.pdf
- Mobile LIDAR scanning for topography or as-built conditions 3D CADD
- 3D model-based definition in the construction industry, done properly could enable a 25% reduction in the total non-recurring engineering costs of a new project.
- Immersed tube tunnels; floating permanent bridges; cable-stayed bridges; supertall structures; seismic dampeners.....but none systematically changed the industry or the world
- Halley VI Research Station; Bridge cable dehumidification systems; tall, supertall and mega tall buildings.

What does it mean for an innovation to be valuable and relevant to the industry?

- Innovations improve project performance, including quality of life for people and communities that benefit from the projects. Innovations also typically, but not always, reduce project capital and lifecycle costs.
- It must provide value to the owner and civil engineer and be "allowed" by codes and standards. An innovation that is not permitted is not relevant.
- It is not enough for it to be valuable. It still has to have an implementation strategy which will ensure the cost and time savings are actually harvested.
- It delivers benefits not previously achievable (function; quality; cost; schedule; safety); there is a broad-based demand and use for the innovation.
- Solves a real problem, and people will pay for it.

Please share your thoughts with our innovators that will help them find a market for a great idea.

- Good ideas that provide timely solutions will find a way to market. Increasingly, communities and institutions are developing new support structures for innovators. Persistence and hard work will be required, but there will be a way forward for a good idea.
- The Transportation Research Board is great for transportation innovations. National organizations are also helpful (APWA, ARTBA, ACI, AASHTO, AWWA, WEF).
- Need to be able to explain how this new concept can actually be used and the savings achieved.
- Focus should be on early stage capital. Money talks and they don't let good ideas (commercially attractive) walk.
- Start with a ubiquitous problem and ensure the solution aligns with the market's existing value chain.

Please share some words of wisdom about innovation and the CE industry.

- Because of the scale of civil and environmental engineering projects, the number of stakeholders involved, and the primacy of public health and safety, there are many constraints to innovation in our field. There has been continuous innovation in our field, however, and the need for innovation has never been greater. If we promote and support innovation, and encourage looking beyond constraints to develop new approaches, we in CE can lead innovation in our field rather than waiting for others to bring it to us.
- No idea is a bad idea, and all innovation starts with a risk-taker solving a problem in a non-traditional way.
- The CE Industry is lagging relative to other industries like aerospace and computer science. The CE industry could substantially benefit by examining what has been successfully implemented in other industries and look at how to leverage these ideas.

- The industry requires a stronger focus on systemic innovation. Open innovation is increasingly attractive to crowdsource ideas, expertise and funding. Use "flat" questions (don't pre-suppose the nature of a solution).
- Process innovations are lower hanging fruit; most of the CE product-related innovations face regulatory hurdles. Historically, the CE industry shared their good ideas and did not "protect".