



**ASME
STUDENT
DESIGN
COMPETITION**

OFFICIAL ASME Student Design Competition Q&A Updated March 7, 2021

Official responses to questions supersede original competition statements as well as any earlier question responses where there is contradiction. The questions are numbered sequentially as responded to, Answer 1 is the earliest response.

Information about the ASME E-Fests can be found at: efests.asme.org

Questions about the 2021 ASME SDC will only be accepted until February 28th. The final version of the Q&A will be posted in the first week of March.

Question 83: What are the dimensions (size) of the arrows for the playing field?

Answer 83: See Rule #4. The arrow spacing should be comparable to Figure 1 in the competition rules - spread over the middle half of the Playing Field. The individual arrows should be large enough and with contrasting color to be easily seen on your videos.

Question 82: To clarify Q&A #72, can we change the design of the device between the March 26th Competition Compliance video and the April 2nd Preliminary Performance video? If so, can the device be changed such that the battery no longer has the ability to be charged from the light or fan? If this is not allowed, are other modifications allowed that still follow every rule (unlike the battery no longer being able to be charged)?

Answer 82: The device used in the performance videos must be the same device presented in the compliance video. Teams can repair or adjust their device between competition rounds, but it must be the same device as the compliance video. Teams definitely cannot remove charging capabilities. As per Rule #8, "all devices must be capable of recharging the AAA battery..." However, the device may be designed so that it can switch between charging the battery and using a second energy storage method.

Question 81: Right out of the package, the AmazonBasics 800mAh batteries seem to have a voltage of 2.29V. However, our store-bought charger recharges these batteries to slightly above this voltage (2.30V - 2.35V range). Rule 5 states that " Each competition round will start with the AAA battery fully charged," so what is the definition of "fully charged?" Is there an exact voltage that the battery must start at, or does it not matter?

Answer 81: The battery used at the start of each competition round may be fresh out of its packaging or fully charged by using an unaltered commercial battery charger.

Question 80: Is the person controlling the robot allowed to move around?

Answer 80: Yes. The team member controlling the device may move around the exterior of the Playing Field and may only enter the Playing Field if the device's power source becomes depleted and the device must be moved to the Charging Zone.

Question 79: How much error is permitted in the design of the 1/2 kg plates for the competition?

Answer 79: Each plate must weigh 500 ± 10 grams.

Question 78: Can we pick up the wind/light source from one charging station and place it on another charging station?

Answer 78: No. See Rules #5 and #7.

Question 77: Is it compulsory to use a RC controller for controlling our device or can the bot be bluetooth controlled?

Answer 77: Either. See Questions #40 and #48.

Update February 17, 2021

Question 76: Can we touch the device when it is in the charging station. Like we use two batteries, one on the device while it is moving and other in the charging zone so that it can charge in the time being. And when the device reaches the charging zone, we interchange the two batteries.

Answer 76: No. The charging of the battery must be done on the device itself and only a single battery may be used during the demonstration.

Question 75: The Lasko fan model given in the problem statement draws 165W, but in the Q&A document, it is mentioned that if we are unable to obtain the Lasko fan, we need to buy a fan that draws no more than 114W. Is this discrepancy a mistake? Because if not, that would mean that those who're unable to obtain the given fan will have to work with a fan that provides less power, and hence the wind energy harnessed would inherently be less.

Answer 75: While the Lasko fan is rated for 165W, it will draw less power, especially if the fan is new. Any 20 inch (about 51 cm) fan rated for 165 W or less is an acceptable substitute for the fan specified in the competition rules. If the power rating specifications of the fan are not available, the power draw should be measured to ensure that it is no more than 114W.

Question 74: Can we start from the charging station, like first charge the robot then take the load?

Answer 74: No. See Rule #5 and Rule #9.

Question 73: Can we use 1/2 kg steel plates of any dimension or does it specifically need to be (8 x 8 x 1) cm ?

Answer 73: See Question #64.

Question 72: Our team does not intend to charge the battery during the competition and instead use a capacitor. According to rule 8, if we manually switch the circuit to a form that can charge the battery when we demonstrate it to the reviewer, is this a violation?

Answer 72: No modifications to the device are permitted during the setup prior to the demonstration or during the demonstration itself. However, such modifications are permitted when the device is being inspected and various aspects of the device are being certified.

Question 71: When we demonstrate that we are able to charge the battery according to Rule #8, are we required to charge a dead battery?

Answer 71: No. It is not required that the battery start in a fully discharged state, teams must only show that the solar or wind collection systems are providing charging energy to the battery.

Question 70: Can we trigger a switch by putting a steel plate onto it?

Answer 70: Energy may not be added to the device during the loading of the weights (see Question #12) but a device may be designed with a sensor or sensors to recognize that the weights have been loaded.

Question 69: Can we use the light from the ceiling to generate energy when we are not in the charging zone?

Answer 69: See Question #25.

Question 68: The energy sources, namely a 500W Utilitech Portable Halogen Work Light with Floor Stand and a Lasko model 3300 20" Wind Machine Fan with 3 speed settings are also not available in our region in our country. Can we use alternative sources?

Answer 68: See Question #37 and Question #50.

Question 67: The batteries specified are not available in our country, India, in our region. Can we use some other company batteries with similar specifications?

Answer 67: Yes. See Question #59.

Question 66: What is the procedure of unloading the weights from the robot? Is it to be manual or automated?

Answer 66: Manual. See Question #61.

Question 65: How do we prove whether the solar and wind can charge the battery if we will be starting with a fully charged battery at the beginning of the competition?

Answer 65: Each team will be required to show that their device is capable of charging a battery in a separate process prior to the demonstration. The team should have a partially depleted battery to show that their device can charge it.

Update January 29, 2021

Question 64: I am not able to find (8x8x1) cm plates of weight 1/2 kg, can our weight dimension vary if we keep the weight of each plate as 1/2 kg?

Answer 64: Yes, each team should fabricate their own set of weights to be used for device development and for the competition. The steel plates should closely match the specific geometry so that each will weigh one half of a kilogram.

Question 63: Is the March 26 deadline for the video submissions for the competition or just a preliminary inspection of the project?

Answer 63: Per Rule #15 of the [updated competition rules](#), each registered team must submit a video by March 26, 2021 so that judges may certify their (1) playing field, (2) sizing box, (3) weights, (4) power sources, (5) AAA battery, and (6) recharge capability. Videos demonstrating device performance will be required by April 2, 2021.

Question 62: Since our remote controller can be powered by a separate battery, if we have a radio receiver or antenna on the robot can it too be powered by a separate battery?

Answer 62: No. All systems on the device must be powered by the same AAA battery. This includes but is not limited to propulsion, steering, and control.

Question 61: We would like to know if the plates we use after they are dropped off at the unloading zone can be walked back to the loading zone to be moved again by the robot?

Answer 61: Yes. After weights have been successfully transferred to the Weight Unloading Zone, they may be manually returned to the Weight Loading Zone by a team member in order to be reused.

Update January 22, 2021

Question 60: Does the robot have to be remotely controlled or can a tethered control with a wire connecting the device and the handheld controller be used?

Answer 60: Per Rule #6, each device must be remotely controlled using a wireless communication method.

Question 59: AAA batteries from Amazon basics are not available in our country. So is there any alternative that we can use?

Answer 59: If the recommended batteries are not available, teams should use comparable pre-charged, generic rechargeable AAA batteries with an 800 mAh rating.

Question 58: If we are using a solar panel, should the solar panel move with the device or are we allowed to keep it in the charging area as the bot moves in the field?

Answer 58: The solar panel must be an attached piece of your device. See Question #3.

Question 57: I am the Team Lead for SDC at SRM Institute of Science and Technology, Chennai, India. Our team is looking forward to the competition and giving our best to it. We have been able to work as much as we can remotely, but now to work further, the whole team has to be present with each other physically for various works such as fabricating/building the vehicle, making the playing field, video recording etc. Given the present condition due to the pandemic and COVID restrictions that are still prevailing in India, it is hard for the team members to travel and also be physically present around each other. Due to these circumstances, I would like to

ask, is there any other alternative for the team to still participate in the competition or a way in which you can suggest or recommend us to work.

Answer 57: ASME and the SDC Committee recognize that this year's competition is going to be a logistical challenge, and we encourage all participants to be as cautious and follow all possible COVID guidelines. While it can be difficult to physically gather as you normally would have in the past, we encourage the combined use of remote and in-person activities to reduce the need for travel and potential for spreading COVID. The playing surface can be built wherever it is most convenient, as long as it can satisfy competition rules. Building and early testing can take place anywhere as well. The first deadline for actually recording and submitting a video to ASME will be March 26, with another video due April 2. There are no time constraints for when you record these videos, as long as you submit them on time. Try to plan this out to make it possible to do these things with a minimum of people together at any time.

Project time management is important all of the time, it is perhaps more important than ever with the 2021 SDC. But also keep in mind that many of your competitors are facing the same problems. So keep working hard and smart on your competition device.

Question 56: Can we use the AAA battery and capacitors to store as well as power the device?

Answer 56: Yes. The only energy in the device at the start of each round is a fully charged AAA battery. Capacitors may also be used in the design of the device but must be discharged at the start of each round. See Questions #1, #18, #49, and #52.

Question 55: Answer 42 and Rule 6 state that "each device must be controlled by an RC remote controller" and that the nature of this control is up to the team. For the device to be "controlled," do the RC remote controller and receiver have to be in communication throughout the entire round in every single moment of time, or is it acceptable for them to only communicate at certain points in the round?

Answer 55: There is no requirement regarding the specific details of the communication between the controller and the device. However, loss of communication will result in the same time penalty incurred when a device's power becomes depleted.

Question 54: When our robot is at the unloading area, is there any specific path or any specific condition to be fulfilled while going to the charging station?

Answer 54: No.

Question 53: Initially our robot will start in the loading area. Please elaborate on how the robot will get to the charging station.

Answer 53: Devices will start in the Loading Area with a fully charged battery per Rule #5. See Question #39.

Question 52: Can we use capacitors to power motors?

Answer 52: See Question #1 and #49.

Question 51: Can we place a solar panel on the top of the robot and the light be placed on a stand for the charging station?

Answer 51: The light used to provide solar energy can not be modified and must be placed onto the ground next to the Charging Zone. See Question #30.

Question 50: Is 20 inches the maximum limit for the fan wingspan or does it have to be specifically 20 inches?

Answer 50: The fan used to provide wind energy must have a 20 inch diameter (or the closest metric equivalent). See Question #37.

Question 49: Can capacitors be used to store energy separate from the AAA battery?

Answer 49: Yes. See Question #1.

Question 48: Can Bluetooth be used to remotely control the device?

Answer 48: Yes. See Question #40.

Question 47: Can a team maneuver their device into the charging zone while it is carrying weights?

Answer 47: If a device travels into the Charging Zone while carrying weights, the weights must be removed and returned to the Loading Area. See Question #10.

Question 46: Can additional batteries be used in the design of the device?

Answer 46: No. See Question #27.

Question 45: What is the charging limit for the device in the charging area?

Answer 45: The time spent by a device within the Charging Zone is left to each team to decide. See Question #41.

Question 44: What is the minimum distance between boundaries and halogen lights?

Answer 44: The light and fan specified in the rules are to be placed at the boundaries of the Charging Zone so that they are at the boundary of the zone but do not extend into the zone.

Updated December 18, 2020

Question 43: For the light source, are we allowed to adjust the angle that it is set at?

Answer 43: The light source must be unmodified and placed onto the ground next to the Charging Zone. Each team may adjust the angle of the light to best suit their device's configuration so long as these adjustments are consistent with the intended function of the unmodified light source.

Question 42: Do we need to have active communication with the robot or can it be autonomous?

Answer 42: Per Rule #6, each device must be controlled by an RC remote controller. However, the nature of the control provided by the controller is left to the discretion of each team so long as it is in compliance with all relevant rules and Q&A.

Question 41: When the car leaves the charging area, the car will cycle the internal energy, is it okay?

Answer 41: Once a device has left the Charging Zone, the propulsion and control of the device will be powered by the AAA battery and/or any other storage mechanisms used to store the energy collected within the Charging Zone. A team may decide when to return their device to the Charging Zone. A team may choose to return to the Charging Zone as many times as they like within the limited time of each round. Time spent with the device in the Charging Zone will count toward the time limit of each round.

Updated December 4, 2020

Question 40: Are we permitted to control the robot using an infrared controller and receiver?

Answer 40: Teams may choose any wireless communication method to control their device during the competition. It is recommended that students ensure that the chosen communication method will not be affected by other signals which may be present during the competition.

Question 39: Is the car in the charging area during the race?

Answer 39: At any time during the competition, a team may maneuver their device into their assigned Charging Zone to charge their device. If a device becomes stranded in the playing field after its power source has been depleted, it may be manually placed in the Charging Zone and recharged after the incurred time penalty has elapsed.

Question 38: Can we define the height of the halogen light according to ourself or is it to be fixed at a specific height?

Answer 38: In order to maintain consistency across all competitors, the light source must be placed onto the floor next to the Charging Zone. Devices should be designed to account for a light source that is approximately 12" (30.5cm) in height.

Question 37: What should we do if the Power source (500 W utilitech halogen light or Lasko model 3300 20" Wind Machine Fan) mentioned in the problem statement is not available?

Answer 37: It is acceptable to use a similar halogen work light with a power rating of no more than 500W to replace the specified Utilitech light source. It is also acceptable to replace the Lasko fan with a similar 20" fan which draws no more than 114W. Judges will require the original documentation for both power sources to certify them for the competition.

Question 36: Are there restrictions on who can register for this event? What's the max and min for team size.

Answer 36: Per Rule #1, all team members must be undergraduate engineering students (of any engineering discipline) and ASME members (asme.org -> ASME Membership). There is no

limit on team size but each student may only participate on one team and contribute to the development of one device.

Question 35: How does a team go about registering for the Student Design Competition?

Answer 35: See Question #22.

Updated November 13, 2020

Question 34: May I use any shape of 0.5 k for the load?

Answer 34: No. See Question #28.

Question 33: Can we use more than one battery in our device?

Answer 33: No. See Question #27.

Question 32: If the event is virtual, how are teams going to participate?

Answer 32: An updated version of the official competition rules will be available shortly on the E-Fest website to address the virtual only event. All participating teams will be responsible for having a set of weights and preparing a complete Playing Field for the competition. If a school has multiple teams, all teams will run separately, but the teams may share a Playing Field and competition materials.

Question 31: Do we have to build a walking robot or can a robot with wheels be used?

Answer 31: Each team may choose the propulsion method (wheels, walking, tank treads, hovercraft air-cushion, etc.) for their device however flying devices are not permitted.

Question 30: Are we allowed to suspend the light source above the Playing Field or does the light have to be on the ground next to the Playing Field?

Answer 30: In order to ensure uniform condition for all competing teams, the unaltered solar energy source must be placed on the ground next to the Charging Zone. All Playing Fields must be set up indoors. See Question #25.

Question 29: If we are using a handheld controller, can this controller be powered by a separate source other than the robot battery?

Answer 29: Yes. See Rule #6.

Question 28: Is there a restriction on the combination of weights that can be used to reach the total of 5 kg? Can weights other than ½ kg be used?

Answer 28: Per Rule #9, each team will be responsible for providing 10 steel weights with geometry of 8cm x 8cm x 1cm which will weigh approximately 0.5 kg. A device must securely carry between one and ten of these weights for each trip between the Weight Loading Area and the Weight Unloading Area.

Question 27: Should we use only one battery cell or we can use more?

Answer 27: One battery. See Rules #5 and #6.

Question 26: If the use of capacitors in the circuit design is permitted by Questions #1 and #18, how will the judges be able to determine if any unauthorized power is stored in the device at the start of each round of the competition?

Answer 26: Teams will be required to demonstrate to the judges that their device does not have any stored energy before the AAA battery is installed. When the device is in the Charging Zone, the collected energy may be stored in the AAA battery or in any other component of the device.

Question 25: Is the device allowed to collect energy while outside of the charging zone while it is transporting the weights?

Answer 25: A team's device may continue to collect energy after leaving the Charging Zone, however per Rule #7 lights and fans must be turned off when the device is not in the Charging Zone. Teams will be required to operate their devices on a course that is indoors so that direct energy from the sun is not available.

Updated October 30, 2020

Question 24: Since most simple micro controllers run on 3.3V or 5V, can we use a separate power source to run the code and control the robot, or does everything need to run off the AAA battery?

Answer 24: Per Rules #5 & #6, a single AAA battery must be used to power the propulsion of your device as well as all control functions. These limitations may require the use of a more simplified control system than teams have used in previous SDC competitions and/or the use of a power converter.

Question 23: Since the competition will be conducted remotely, what are the guidelines regarding the surface of the Playing Field?

Answer 23: Per Rules #4 & #17, each team should find a flat area of sufficient size for the testing of their device and for the competition. The boundaries and features of the Playing Field can be placed by using tape or by any other manner which ensures that they will be clearly visible to the competing team, the on-site judges, and in the video recording.

Question 22: How would I go about registering a team for the 2021 SDC?

Answer 22: Registration will soon be available through the E-Fest web-site.

Updated October 16, 2020

Question 21: When the device is in the charging zone and has completed charging, can it be manually placed at the starting loading zone or must it be remotely returned?

Answer 21: After the device has been charged in the Charging Zone, it must move to the Weight Loading Zone under its own power. Team members may only manually remove the device from the Playing Field if its power becomes fully depleted at which point the device is placed in the Charging Zone and a time penalty is incurred.

Question 20: Must a path of arrows be utilized, i.e., if we wanted to simply maneuver from loading to unloading in the blue areas (crossing 0 arrows) will points still be awarded?

Answer 20: Per the equations provided with Rules #10 and #11, moving from the Weight Loading Zone to the Weight Unloading Zone without crossing an arrow in the direction the arrow is pointing will result in an Arrow Scoring Factor of zero and a Trip Score of zero. At least one arrow must be properly crossed in order to earn a non-zero Trip Score.

Question 19: Referencing Figure 1: Playing Field on page 4 of the Project pdf, are there any penalties for utilizing the blue "free" space in the diagram?

Answer 19: The blue area in Figure 1 represents the 5m x 5m playing field. A team's device may move freely within the playing field during the demonstration.

Updated October 1, 2020

Question 18: Can capacitors be used to store energy and charge the battery?

Answer 18: Yes. See Question 1.

Question 17: Does all of the energy from the charging have to go through the battery to be used?

Answer 17: No. See Question 6.

Question 16: Can the solar panels on the robot extend past the 50 cm limit once out of the box?

Answer 16: Yes. See Question 11.

Question 15: Are we allowed to use magnets and electromagnets on the robot?

Answer 15: Yes. Magnets are allowed and electromagnets may be used as long as they are powered by the AAA battery and no energy is stored using the magnets at the beginning of each demonstration.

Question 14: Will we be allowed to have parts of the robot detach, specifically can we have a charging unit to leave in the charging zone while the robot goes around the course or a detachable cart to hold the weights?

Answer 14: No. See Questions 3 and 11.

Question 13: Rule 9 mentions that there may be variability in weight dimensions, but exactly how much should be expected?

Answer 13: Because this competition will not be taking place at a face-to-face event, teams will be responsible for providing their own uniform half-kilogram weights to be used for the competition. Details will be provided in the future for the procedures that each team will be required to follow in order to ensure their course adheres to the official rules.

Question 12: Can the mass of the weights, when these are being loaded by a team member, be used to store energy for later use (compressing a spring, for example), as long as these springs are not precompressed to start the round?

Answer 12: No. Team members may not add energy to the device at any time during a demonstration. All energy must come from the AAA battery and energy collected from the wind and solar energy provided in the Charging Zone.

Question 11: Can the robot extend out of its 50 x 50 x 50 cm³ volume after the round has begun?

Answer 11: A team may design their device to expand under its own power beyond the 50cm x 50cm x 50cm volume however the device must fit completely within the 1m x 1m Weight Loading Area before a team may load weights and it must fit completely within the 1m x 1m Weight Unloading Area before the weights may be unloaded.

Question 10: Do we need to remove the weights from our robot if our battery dies mid-transit to the unloading area or can we keep our weights after the time penalty is over?

Answer 10: If a team's device becomes stranded and must be manually returned to the Charging Zone, any weights on the device must be unloaded and returned to the Weight Loading Area. In order for a team to earn points, their device must complete an uninterrupted trip from the Weight Loading Area to the Weight Unloading Area.

Question 9: In the Day 2 tie breaker, do the batteries start charged or uncharged?

Answer 9: For every round, each team will start with their AAA battery charged.

Question 8: Is there any penalty for hitting your robot into the other robot or for roughness in the head to head rounds?

Answer 8: The decision has been made that no face-to-face competitions will be held for the 2021 ASME Student Design Competition. Teams will be asked to submit a video recording of their individual devices running a course at their home schools which will only involve a single device.

Question 7: Can both the light and fan be used to generate electricity for the AAA battery or just one?

Answer 7: Teams may choose to design their device to harvest wind energy, solar energy, or both to recharge the device's AAA battery.

Question 6: Can the fan be used to store mechanical energy without going through the AAA battery as long as the light is able to recharge the AAA battery?

Answer 6: Yes. Mechanical energy can be stored and used by a device during the demonstration as long as no mechanical energy is stored within the device at the start of each round.

Question 5: At what speed will the 3 speed Lasko fan be set?

Answer 5: Students teams may set the fan speed to any of the three speed settings of the unaltered fan.

Question 4: I understand that the loading of the weights is done by a student, but is the unloading of the weights done by the same student or must it be done by a mechanism of the device?

Answer 4: After the weights have been loaded into a team's device and it has traversed the Playing Field, a team member may manually unload the weights from the device after it has completely entered the Weight Unloading Area.

Question 3: Must we build an all-in-one device that moves the desired weights to the unloading area and also deploys a mechanism to start recharging with wind and solar or can we create a device focused on moving weights and a separate collection station to deploy within the charging zone?

Answer 3: Each student team is required to design, build, test, and demonstrate a single mobile device which is able to both harvest energy and transport weights. All elements of the device must move from the Weight Loading Area to the Weight Unloading Area in order to earn points.

Question 2: Can we use a gasoline engine, chemical energy, or a Stirling Engine to power our robot?

Answer 2: No, per Rules #5 & #6, gasoline engines and chemical energy are not permitted. A Stirling Engine could be used to produce mechanical energy as long as the AAA battery is used to power the heating element.

Question 1: Are we allowed to use capacitors as part of our circuit design on our robot?

Answer 1: Yes.