

## Lunabotics 2024 Frequently Asked Questions (FAQ) 2.0

The responses are based on the Lunabotics 2024 Guidebook Draft Ver 2.0, 09.12.2023

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### GUIDEBOOK CHANGES - 01.25.2024

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#### 1. Sample berm calculator

Berm Calcs	
Angle of Respose	45 deg
h	0.35 m
L	1.3 m
LT	2 m
r	0.35
Total Volume	0.20 m <sup>3</sup>

  

13.8 in
51.2 in
78.7 in

  

Material Mass Movement	
BP-1 min density	1.1 g/cm <sup>3</sup>
BP-1 mx density	1.3 g/cm <sup>3</sup>
BP-1 avg density	1.2 g/cm <sup>3</sup>
Berm Mass	244.978314 kg

  

Run Time	28.5808033 Mins
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Target Berm Size KSC

- ~8.5kg/min production rate
- 15 min total run time. ~ 2mins mins allows for travel to begin construction

#### 3. Section 8.2 – SCORING

4. Item 2. *Berm Construction*, Example Construction Points, is changed to read as follows; “150.00”.

Construction Points Calculator – Artemis Arena				
Construction Category Elements	Units	Specific Points	Example Actuals	Example Construction Points
1. <i>Pass All Inspections (Comm/Vehicle).</i>	1,000=Pass / 0=Fail	0 or 1,000	1,000.00	1000.00
2. <i>Berm Construction – A volumetric scan before and after the run will be performed. Only the berm volume within the target berm location will be counted. The team will earn 2500 construction points for each cubic meter of berm constructed above grade.</i>	cubic meters m <sup>3</sup>	2500	0.06	<b><u>150.00</u></b>

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(FAQ's) 2.0 - 01.25.2024 (FAQ 24 – 32)

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Q32: We were also wondering if a student team member could serve as the staff member required to accompany the rest of the team. This is due to our advisor having a conference they must attend at the same time.

**A32: No. Teams shall: be composed of enrolled undergraduate and graduate students and shall include at least two undergraduate students, have its own working robot(s), be accompanied by the faculty advisor or an adult employed by the institution and shall accompany the team to KSC. The number of students on the team is at the discretion of the school. Students who have graduated in the same semester/quarter as this challenge are eligible to be on the team. (NDSU)**

Q31: Are touch sensors referred to in 6.1.6 banned all together or just for collision avoidance purposes? For example, if we wanted to put a load cell or other touch sensor on the end of a shovel on the robot for

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the purpose of knowing when the shovel has hit the ground, would this be banned (6.1.6: The robot can run either by telerobotic (remote control) or in autonomous operations and cannot have any touch sensors to sense and avoid obstacles).

**A31: Touch sensors are permitted but may not be used for collision avoidance purposes.**  
(NYU)

Q30: What are the communication distance requirements for the wireless access point?

**A30: The Wireless Access Point (WAP) must be able to communicate with their construction robot throughout the Artemis Arena (see Section 7.2.2 The arena area measures ~6.8 m long and ~5 m wide).**  
(UM)

Q29 : Would it be possible to add a custom-made button addition to a COTS kill switch to satisfy the 40mm requirements, as the one we have currently does not fit the 40mm requirement?

**A29: No, No and No. See Section 10.1.6.**  
(UM)

Q28: Are the berm structures expected to be an oval, creating a wall with the berm leaving the middle empty, or one large berm structure in the construction zone?

**A28: That is for the team to decide. (see GUIDEBOOK CHANGES - 01.25.2024, ABOVE).**  
(UM)

Q27. Are there any height or width requirements for the berm structure?

**A27: That is for the team to decide. (see GUIDEBOOK CHANGES - 01.25.2024, ABOVE).**  
(UM)

Q26: What are the eligibility requirements for an exchange student that will be leaving after the end of this semester?

**A26: See Section 3.**  
(UM)

Q25 - Is dozing (i.e. pushing a pile of dirt/rocks) with a bladed dozier-type of rover considered an acceptable excavation technique for the competition? In this case, the robot would push material into the berm area to create the berm.

**A25: Bulldozing (i.e. pushing a pile of dirt/rocks) with a bladed dozier-type of rover is considered an acceptable excavation and regolith simulant transfer technique for the Lunabotics challenge. In this case, the robot would push material into the berm area to create the berm. All regolith simulant material must be pushed in a pile from the excavation zone into and through the construction zone to the berm. Regolith simulant may be skimmed from the construction zone but only if it is part of the operation of pushing it from the excavation zone into the berm. The bulldozing pushing operation shall not start inside the construction zone – each bulldozing attempt shall start in the excavation zone.**  
(Var)

Q24 - IN THE RMC FAQ, A3 STATES "YES, THE CENTRAL HOIST POINT AND THE FOUR LIFTING POINTS CAN BE DETACHABLE OR MOVABLE". WITH THIS IN MIND, IS THE CENTRAL HOIST POINT ABLE TO BE DETACHED BY HUMANS PRIOR TO THE RUN, OR IS THE ROBOT REQUIRED TO DETACH FROM THE HOIST POINT BY ITSELF DURING THE COMPETITION RUN.

**A24 – Detached by any sentient being is allowed.**  
(Tem)

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END OF FAQ'S 2.0 - 01.25.2024 (FAQ 24 – 32)

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(FAQ's) 1.0 - 09.08.2023 (FAQ 1 – 23 )

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Q23 - What is the policy on international students attending the in-person Lunabotics competition at KSC?  
**A23 – Non-U.S. Citizens are WELCOME to Lunabotics at the Kennedy Space Center Visitor Complex and the Astronauts Memorial Foundation’s Center for Space Education in Bldg. M6-306. Should your team be selected, the student will have to apply through NASA STEM Gateway, like everyone else. Security will make further determinations at that point and advise on the next step in the process.**

(Var)

Q22 - ELIGIBILITY, DELIVERABLES, APPLICATION, Eligibility 3.1.3 - Does this intend to state that both 2 undergraduate students AND ALSO 2 graduate students are needed on a team or is it a typo and is intended to say "...a minimum of (2) undergraduate students OR graduate students...".

**A22 - 3. ELIGIBILITY, DELIVERABLES, APPLICATION, Eligibility 1.3 " The team shall be composed of enrolled undergraduate and graduate students ..." is changed to read "Teams shall: be composed of enrolled undergraduate and graduate students and shall include at least two undergraduate students ..."**

(Var)

Q21 - The current listed date will affect these teams' ability to compete as well as the ability to travel to Central Florida. Our finals week is May 11th-17th. Would it be possible to push back the in-person competition at least one week to accommodate?

**A21 - See the Lunabotics 2024 Guidebook – Draft Ver 1.0, dated Sep 01, 2023. Per Section 1.9 of our FAQ, we do not honor requests to change dates., "1.9 - Frequently Asked Questions / Ask For Help. There will be no response to requests for information already contained in the Guidebook, to change a date(s), to change/waive a deadline, a rule or a rubric." We understand that the Competition week conflicts with your school’s finals, however we can’t change the dates for this year’s competition for many logistical reasons. Many institutions have policies which allow students to take their finals early or late if they have to travel for an event related to a school club/team, such as a robotics team participating in a NASA challenge or presenting a paper at an international conference. We encourage you to reach out to your academic institution to see if such policies are available for your team.**

(Var)

Q20 - Lastly, in the rules it states that the orientation of the 3 dimensions of the bots can be decided by the teams as long as it is stated to the judges. It also states in the rules that a height of 1.5m after the bot starts becomes the new maximum height. I wanted to know if this is specific to height only, or if it only pertains to whichever dimension, we dedicate to being our 1.1m length side.

**A20 – I can see the confusion, but this is specific to height only. See Lunabotics 2024 Guidebook – Draft Ver 1.0, dtd 09.01.2023 Section 10.4.1.**

(Tem)

Q19 - The rules seemingly do not explicitly state that dumping cannot be done from the mining zone. We wanted clarification on whether or not we would be able to do this or not. Additionally, if dumping is not permitted in the mining zone, does the bot have to be fully in the construction zone, or does being partially in it count.

**A19 - There is no mining zone. There is an excavation zone and a construction zone. The regolith simulant must be excavated in the construction zone and then moved to the construction zone where it can be used to construct a berm. The Lunabot must have its front wheels in the construction zone before it can build the berm.**

(Tem)

Q18 - The rules state that there will be BP-1 used at KSC and LHS-1 used at UCF. We just wanted to clarify that this is accurate before we begin designing our bot to the needs of driving on two separate materials.

**A18 – It is accurate, please see Lunabotics 2024 Guidebook – Draft Ver 1.0, dtd 09.01.2023 Glossary of Terms, definitions 6 and 10. No issues, this is a good example of applying sound engineering practices and principles.**

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(Tem)

Q17 - What are the categories for autonomy

**A17 - See Lunabotics 2024 Guidebook – Draft Ver 1.0, dtd 09.01.2023 Section 9. Autonomy.  
(UA)**

Q16 - Is the minimum berm the .013 m<sup>3</sup> in 4.6.1 or the .023 m<sup>3</sup> in 3.2

**A16 - During each competition attempt, the team will earn construction points for each cubic meter of berm constructed above grade. There is no minimum threshold of 0.026 cubic meters.  
(UA)**

Q15 - How loose with the material in the excavation zone be (will front loader designs be viable).

**A15 - See the Lunabotics 2024 Guidebook – Draft Ver 1.0, dated Sep 01, 2023, Appendix B. Glossary of Terms Item 9. Black Point-1.  
(UA)**

Q14 - It lists that we must have a hoist point for a crane above the center of gravity on the robot what are the requirements of this?

**A14 - See Lunabotics 2024 Guidebook – Draft Ver 1.0, dtd 09.01.2023 Section 6.1.2. Let's think on this. The lifting point is the point at which lifting gear connects with the load it is hoisting. Ensuring that these are securely attached is a critical step in preventing injuries and property damage when using these devices. Please design accordingly, you may have to explain it on your systems engineering paper.  
(UA)**

Q13 – Reserved.

Q12 - What is the correct timeline the one on the website or the one on the rules?

**A12 - This has been updated. See Lunabotics 2024 Guidebook – Draft Ver 1.0, dtd 09.01.2023  
(Var)**

Q11 - What is the correct volume the 1x.75x.75 outlined in section 4.1.1 or the 1.75x.75x.75 outlined in 8.1.4.2.?

**A11 – This has been corrected. See Lunabotics 2024 Guidebook – Draft Ver 1.0, dtd 09.01.2023 Section 6.1 and Section 10.1.4.1.  
(Pur, UA)**

Q10 - Section 6.4.4 - Will the berm volume be displayed as opposed to mass this year?

**A10 – Yes, the berm volume will be displayed after it has been calculated.  
(Pur)**

Q9 - Section 8.2 & 8.3.2 - The score calculator in section 6.2 says the points per cubic meter of berm volume will be 25,000, while section 6.3.2 states the points per cubic meter of berm volume will be 1,000 past 0.026 cubic meters. Which scoring method is accurate? Will there be any points gained for simply hitting the 0.026 cubic meter volume, if that method is used?

**A9 – During each competition attempt, the team will earn construction points for each cubic meter of berm constructed above grade. There is no minimum threshold of 0.026 cubic meters.  
(Pur)**

Q8 - Section 6 - Are obstacles allowed to be part of the berm volume? Are prefabricated berm structures allowed to be part of the berm volume?

**A8 – See Lunabotics 2024 Guidebook – Draft Ver 1.0, dtd 09.01.2023 Section 8. The obstacles may only be pushed to the side of the arena in the Excavation Zone. There are no obstacles in the Construction Zone. This is an error in the guidebook and will be corrected. Obstacles may be part of the berm volume, but only from the Excavation Zone. Prefabricated berm structures are not allowed to be part of the berm – regolith simulant from the arena must be used.**

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**(Pur)**

Q7 - Section 5.9 & 6.3 - The figure in section 6.3 provides craters of diameter 0.5 m, but the arena specifications in section 5.9 state that craters will be no wider than 40 cm. What are the dimensions we should expect for craters?

**A7 - See Lunabotics 2024 Guidebook – Draft Ver 1.0, dtd 09.01.2023 Section 7.6, Section 7.7 and Section 8.3. Crater width = 40-50 cm.**

**(Pur)**

Q6 - Section 4.2.6 - Does the beacon/target weight limit not apply in any situation since it refers to the attachment to a sieve, which does not exist in the current competition format?

**A6 – See Lunabotics 2024 Guidebook – Draft Ver 1.0, dtd 09.01.2023 Section 6.2.6.**

**Section 6.2.8: “The mass of the navigational aid system is included in the maximum mining robot mass limit of and must be self-powered”**

**(Pur)**

Q5 - Section 4.2.5 - What constitutes a far-reaching mechanism? Is there a maximum reach for any component?

**A5 - See Lunabotics 2024 Guidebook – Draft Ver 1.0, dtd 09.01.2023 Section 6.2.5. There are too many permutations, tell us your proposal and why you think it may be in conflict with Section 6.2.5. We can move forward from there. The intent of the rule is to prevent a Lunabot from parking and deploying long arms while never moving. The Lunabot must move and be self-supporting.**

**(Var)**

Q4 - Section 4.1.10 - The team may decide to use battery cell monitoring leads to read voltage for an under-voltage protection circuit. This, theoretically, would not have its power cut with the emergency stop button. Would this be allowed under the current rules?

**A4 - See Lunabotics 2024 Guidebook – Draft Ver 1.0, dtd 09.01.2023 Section 10.1.6 “Only onboard laptop computers and data-logger(s) may stay powered on if powered by its own, independent, internal computer battery. For example: it is acceptable to have a small battery onboard that only powers a Raspberry Pi control computer, and whose power does not flow through the main robot kill switch.” Yes, this would be allowed, as long as it is not connected to the main power battery.**

**(Pur)**

Q3 - Section 4.1.2 - Can the central hoist point and the four lifting points be detachable or movable? If they can be detachable, do they count toward the mass limit?

**A3 – Yes, the central hoist point and the four lifting points can be detachable or movable. They do not count towards the mass limit. They are considered Ground Support Equipment (GSE).**

**(Pur)**

Q2 - Section 4.1.1 & 6.3 - The figure in section 6.3 provides dimensions of 1.5 m x 0.75 m x 0.75 m, while the requirements in section 4.1.1 state that the dimensions should be 1 m x 0.75 m x 0.75 m. What is the correct dimensional constraint?

**A2 – See Lunabotics 2024 Guidebook – Draft Ver 1.0, dtd 09.01.2023 Section 6.1 and Section 10.1.4.1. The correct dimension is (1.5 m x 0.75 m x 0.75 m).**

**(Pur)**

Q1 - Section 4.1.1 - The envelope height limit given is 0.75 m, and the rules say the robot cannot extend 1.5 m beyond it, totaling 2.25 m, but it also says that would be 2.5 m above the regolith. How do we interpret this height limit? Does the extension apply to the envelope height or does it apply to the actual robot height (e.g. Robot height of 0.65 m = deployable height of 2.15 m)?

**A1 - Robot(s) shall be contained within a payload envelope measuring 1.50 m length x 0.75 m width x 0.75 m height with a maximum mass of 80kg. It may deploy or expand beyond the envelop after the start of each attempt but may not exceed 1.75 m in additional height which is 2.5 m above the surface of the regolith (dimensions correspond to the typical payload volume available on today’s Lunar landers that are commercially available).**

Lunabotics 2024 Frequently Asked Questions (FAQ) 2.0

**(Pur)**

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END OF END OF FAQ'S 1.0  
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