Q&A

VRC 2022-2023: Spin Up

Tagged: VEX U

Welcome to the official VEX Robotics Competition Question & Answer system, where all registered teams have the opportunity to ask for official rules interpretations and clarifications. This Q&A system is the only source for official VRC Spin Up rules clarifications, and the clarifications made here from the Game Design Committee (GDC) are considered as official and binding as the written Game Manual itself.

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- For game questions, suggestions, or concerns outside of specific and official rules questions, contact GDC@vex.com.

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98: <VUR3> Casting Silicone, Polyurethane or Rubber

4-Oct-2018
VEX U VUR3

Our team is interested casting uncured resins of silicone, polyurethane, or rubber into parts for our robot. While these are not legal materials listed in <VUR3>, we believe this is in the spirit of the rule because we developing our own fabrication process for these materials and not using prefabricated commercial parts. Would fabricating parts out of these materials in this fashion be legal and in the spirit of the rule?

> **Answered by committee**
>
> As you noted, these are not materials or fabrication processes that are currently included in VUR3. Thus, they would not be legal. However, we will take this into consideration for future seasons.

93: <VUR10> Powering non-vex solenoids

2-Oct-2018
VEX U

<VUR10> allows 3rd party solenoids, but there does not appear to be a legal way of powering solenoids other than the vex solenoid driver cable.

> <VUR10> Teams may utilize commercially available pneumatic components from the following list: Cylinders, actuators, valves, gauges, storage tanks, regulators, manifolds, and solenoids.

The VEX solenoid driver cable is only compatible with a small number of 5V SMC solenoids, but most solenoids follow a standard 12V or 24V. Is it legal to power other solenoids with other electronics?

> **Answered by committee**
>
> Yes, this is legal.

92: <VUR10> c Use of vacuum pressure in VEX U pneumatics systems

2-Oct-2018
VEX U

> <VUR10> Teams may utilize commercially available pneumatic components from the following list:
>
> Cylinders, actuators, valves, gauges, storage tanks, regulators, manifolds, and solenoids. c. Pneumatic devices may only be charged to a maximum of 100 psi.

There is a maximum pressure, but no minimum pressure. Assuming the components used are allowed by <VUR10> and rated for vacuum pressure by the manufacturer, would the limit of 100psi also apply to vacuum pressure? If so, would vacuum heads be considered legal pneumatic actuators by VUR10?

> **Answered by committee**

> Yes, vacuum heads would be considered legal pneumatic devices within the scope of <VUR10>. If using a Venturi pump, which uses positive pressure to create negative pressure, the operating pressure would be bound by the 100psi limit.

8: VEX-U hardware allowances.

15-May-2018
R7 VEX U

Hardware for VRC is given under <R7> c. Any commercially available #4, #6, #8, M2, M2.5, M3 or M4 screw up to 2" long (nominal), and any commercially available nut and/or washer to fit these screws.

<VUR2> a. i. expands this to "Small hardware, such as screws and nuts found in VRC field kits, are permitted."

Is the intent of VUR2 to allow any hardware up to size 1/4" (M6) for VEX-U? VEX-Pro does not specifically sell hardware, but some hardware is included in various components, such as VERSADROP has 1/4" and #10 hardware included. Also, Versaframe specifies #8 screws or 5/32" aluminum rivets for assembly, but VEXPRO does not sell either in the catalog. Would aluminum rivets (and any size steel screw or nut for that matter) fall under the "unlimited aluminum and steel" since both types of fasteners could be machined from aluminum or steel bar stock as allowed by <VUR-3>c?

> **Answered by committee**
>
> The intent of VUR2a-i was specifically in reference to field kits, which are not permitted (per VUR2a). It would not be feasible to differentiate between a screw that came from a field kit and a "normal" screw. VUR2a-i was not meant to stand alone as a blanket allowance for small hardware beyond R7c.
>
> That being said, rivets and hardware found inside of VEXpro kits are considered legal fasteners for VEX U. We will be sure to clarify this in the June 15th update.

70: <VUR2> and 'This product is not legal for use in the VEX Robotics Competition.'

9-Sep-2018
VEX U

As of September 9, 2018 < VUR2 > states:

> Teams may use any official VEX Robotics product, other than the exceptions noted below, to construct their Robot. This includes those from the VEXpro, VEX EDR, and VEX IQ product lines. To figure out if a product is “official” or not, refer to the www.vexrobotics.com website. ...

But several items (such as the *BEST Belt & Pulley Kit*, item 270-1683) state:

> Note: This product is not legal for use in the VEX Robotics Competition.

So I would like to ask: For items that state they are not legal for VRC use but could potentially be allowed under < VUR2 >, does VUR2 take precedence (making these items legal) or does the item page take precedence (making these items illegal)?

> **Answered by committee**
>
> For BEST products that explicitly state "This product is not legal for use in the VEX Robotics Competition", like the Belt & Pulley Kit you reference, the website will take precedence. These items are not legal for use in the VEX Robotics Competition or VEX U.

7: Clarification of VUR3 materials allowed

15-May-2018
Other VEX U

<VUR3> Teams are allowed to fabricate their own unique components from the following additional items, for each of their robots: a. An unlimited amount of non-shattering plastic, such as PVC, Delrin, and ABS. b. An unlimited number of plastic 3D printed parts. c. An unlimited amount of steel and aluminum.

Clarification on point "a": are Fiber Reinforced Plastics (i.e. carbon fiber reinforced epoxy tube, rod, sheet, etc) acceptable as non-shattering plastics? Clarification on point "c": does the "unlimited steel and aluminum" include commercial fabricated components, such as steel springs, extruded aluminum shapes, and commercially available aluminum products (such as Andy Mark aluminum wheels https://www.andymark.com/Performance-s/101.htm)?

> **Answered by committee**
>
> Yes, composites and fiber-reinforced plastics are legal.
>
> No, commercially-purchased items that are not captured by VUR2, VUR4, or VUR6 are not permitted.
>
> As quoted, VUR3 lists the raw materials from which "Teams are allowed to fabricate their own unique components". It does not state that all products made from these materials are legal, only that teams are allowed to use these raw materials to create their own parts.

6: VEX-U Expansion allowances

15-May-2018
SG2 VEX U

VUG6 there are differences between manuals in the VRC hub and the Game Manual. On the VRC Hub app, rule VUG6 says: “Once the Match begins, Robots may expand beyond the starting size defined in <VUR1>, but no horizontal dimension can exceed 48” (1219.2mm). The robot may not exceed this limit for the duration of the match. There is no height limit on Robot Expansion” But on the Vex U appendix on the Vex website: “Both robots follow the expansion rules laid out in <SG2>

Which one of these rules (If either) is the correct VUG6 rule? If the VRC Hub App version is the correct ruling, does the 48” expansion apply to the 15” robot as well, and is there no vertical height limit restrictions for VEX U as implied by the wording in the VRC Hub version of VUG6?

> **Answered by committee**
>
> Thank you for bringing this to our attention. This wan error in VRC Hub and has now been corrected. The PDF Game Manual version of VUG6 was correct - both VEX U Robots follow the same expansion rules set forth by SG2.

58: VUR4 Question

23-Aug-2018
VEX U

VUR4 states "Each Robot must utilize one (1) V5 Robot Brain microcontroller and one (1) V5 Robot Radio. No other types of VEX microcontrollers or wireless communication protocols are permitted."

With the delay in the shipping of the V5 Robot Brains and peripherals, can VEXU teams use the old microcontroller cortex for qualification events?

> **Answered by committee**
>
> We are monitoring the V5 rollout, and at this time there are no plans to change the VEX U robot rules in this way.
>
> If this stance changes and such an update is made, it will be communicated via a manual update, VEXforum.com post, and email blast to VEX U teams.

5: Pneumatics for VEX-U robots

15-May-2018
Other VEX U

From the VEX-U appendix,

<VUR5> There is no restriction on the number of V5 Smart Motors that Robots may use. No other motors, servos, or actuators are permitted, including those sold by VEX (e.g. the 2-Wire 393 Motor).

Is the term "actuator" referring also to pneumatic cylinders (often called actuators in industry), meaning that VEX-U is not permitted to use a pneumatic system this season? Or is VEX-U permitted to use pneumatics as in past years: 2 air tanks at 100 psi and unlimited number of air cylinders?

> **Answered by committee**
>
> Yes, VEX U teams are still permitted to use pneumatic systems. This will be clarified in the June 15th Game Manual update.

44: VUR3c Legal Plastic

7-Aug-2018
VEX U

VUR3 states: “Teams are allowed to fabricate their own unique components from the following additional raw materials for each of their robots:” VUR3c continues: “An unlimited number of plastic 3D printed parts.”

Specific types of plastic are not defined in VUR3c.

Are the plastics in these Q&As from last season still legal for this season?

https://www.vexforum.com/index.php/27581-answered-vexu-allowed-3d-printing-materials/0

https://www.vexforum.com/index.php/32739-answered-3d-printing-materials/0

In addition, is NinjaFlex filament considered legal this season? The product description states the material is a variation of thermoplastic polyurethane (TPU). https://ninjatek.com/products/filaments/ninjaflex/

> **Answered by committee**
>
> Yes, these would be legal.

43: VUR9 And VRC License Plate Identification Letters

7-Aug-2018
VEX U

VUR9 states: “Teams must display their team identification letters (e.g. “IFI”, “ABCD”) in two visible locations on opposing sides of the Robot. The team identification letters in total must be legible to head referees or other participants, at least 2” high and 3” wide. The identification must also clearly display which alliance color the Robots belong to in that Match (i.e. red or blue).”

The rule specifically states “**The team identification letters** in total must be legible to head referees or other participants, **at least 2” high and 3” wide**.” However, on a standard VRC License Plate Kit, the identification letters are not 2” high. The identification letters are also less than 3” wide unless the name is 5 characters long.

Image showing size of identification letters.

https://drive.google.com/file/d/1UKJ_ZVhDN66cmmonAM1FcEdjQNC7ruuV/view?usp=sharing

Under this rule, are the VRC license plate identification letters illegal in VEX U?

> **Answered by committee**
>
> This was addressed in the August 17th Game Manual Update:
>
> > <VUR9> Teams must display their team identification letters (e.g. “IFI”, “ABCD”) in two visible locations on opposing sides of the Robot, per <R20>. [b]Teams must use the official VEX Robotics License Plate Kit (276-3938) for this identification.[/b] The identification must clearly display which alliance color the Robots belong to in that Match (i.e. red or blue).

41: Hardware specified by VEXpro, but not available from VEXpro.

24-Jul-2018
R7 VEX U

Sorry to be so nitpicky, but there are a couple points on hardware that was not clarified on the June 15th update:

"Answered by Game Design Committee That being said, ***rivets and hardware*** found inside of VEXpro kits are considered legal fasteners for VEX U. We will be sure to clarify this in the June 15th update." (emphasis mine).

There are six references to a McMaster Carr part withen the vexpro product specifications, two for master links, three for screws, and one for a washer.

On the page for roller chain: https://www.vexrobotics.com/roller-chain.html "Note: VEXpro does not offer a #35 master link for purchase separately. We recommend McMaster-Carr part number 6261K191 as a suitable replacement. The #25 Roller Chain requires a standard master link. VEXpro does not offer a standard #25 master link. We recommend McMaster-Carr part number 6261K108 as a suitable replacement."

And on the page for the linear gussets:

https://content.vexrobotics.com/vexpro/pdf/217-4399-20180116.PDF "(Note: Some McMaster parts required)" and the BOM lists the following: McMaster P/N 91251A555 1/4-20 x 3.250" Screw
McMaster P/N 91251A553 1/4-20 x 2.750" Screw
McMaster P/N 91251A550 1/4-20 x 2.000" Screw
McMaster P/N 92141A029 9/32" ID x 5/8" OD Washer

Additionally, the versaframe page notes using 5/32 rivets for assembly (https://www.vexrobotics.com/versaframestock.html), but these are not sold by VEXpro, only 1/8 rivets are avaialble.

Do the references to McMaster-Carr parts, and to a 5/32 rivet, make these McMaster-Carr parts legal for VEX-U?

If so, then would the legality of a 1/4-20 x 3.250" screw (McMaster 91251A555) make any shorter screw lengths of 1/4-20 screw legal also (since long screws can obviously be cut shorter). In the same way, VEXpro sells a #10-32 x 2.5 long screw and 10-32 locknut (in kit 217-4824), so would this make #10 screws up to 2.5 long also be legal?

Thank you for your time and consideration.

> **Answered by committee**
>
> > Sorry to be so nitpicky, but there are a couple points on hardware that was not clarified on the June 15th update.
>
> No apology needed, these types of questions are beneficial to all teams as we work through the nuanced implications of this year's VEX U rules.
>
> > Do the references to McMaster-Carr parts, and to a 5/32 rivet, make these McMaster-Carr parts legal for VEX-U?
>
> For the most part, yes.
>
> The #25 master link (6261K108) is legal for this purpose (alongside VEXpro #25 chain).
>
> The following items will be clarified in the August 17th manual update:
>
> - All rivets up to 1/4" will be legal
> - 1/4-20 screws, washers, and nuts will be legal
> - #10 screws, washers, and nuts will be legal (in addition to the #4, #6, and #8 screws as specified in R7-c)

265: VexU- VUG6 Loophole

15-Mar-2019
SG2 VEX U

Hello, Upon a close inspection of the game manual, I noticed a discrepancy between the intent of VUG6 and the actual wording of the rule. VUG6 reads:

"The Robot which starts 24” tall must return to 24” once it is no longer contacting the Expansion Zone. The Robot which starts 15” tall must return to 15” once it is no longer contacting the Expansion Zone."

The loophole lies with in phrase "starts 24" tall" and "starts 15" tall. Very few robots actually start at 24" tall and 15" tall. In practice they are smaller then these values, for example a robot sarting at a height of 23" tall and another robot starting at a height of 14.5" tall. The way the rule is written, a robot starting at 23" tall and another starting at 14.5" tall would not fall under VUG6 as it is not starting at 24" tall nor 15" tall. Furthermore since VUG6 no longer applies to these robots, SG2a would apply. SG2a reads:

"Once the Match begins, a Robot which is contacting the Expansion Zone may expand vertically with no height limit. However, once fully outside of the Expansion Zone (i.e. no longer contacting it), the Robot must return to a height limit of 18” (457.2 mm) tall."

So from the actual wording of the game manual, all vexU robots that do not start at exactly 24" tall or 15" tall then must return to be within 18" outside of the expansion zone. So that means that nearly every vexU team has violated the game manual rules as they are written.

The intent of the rule clearly is to base the expansion rules off the robots that start within 24" tall and within 15" tall, which is how vexU has been playing Turning Point sofar. However, even this wording is inadequate as the scenerio that both robots start within 15" tall would cause confusion on which robot would be allowed to expand vertically. For example, a 23x23x14" tall robot and a 14x14x14 robot. Now is the 14"x14x14 robot allowed to expand to 24" tall, declaring that is your robot that started within 24" tall, and the 23x23x14" robot limited to 15" expansion declaring that is your robot that started within 15" tall?

I would like to propose the wording of VUG6 to revised to reflect the actual robot definitions established in VUR1. VUR1 reads:

"Teams must build two (2) Robots, subject to the following size restrictions at the start of the match: c. Robot A must be smaller than 24” x 24” x 24”. d. Robot B must be smaller than 15” x 15” x 15”. "

Therefore using the definitions of robot A and robot B already set by VUR1, I would like to propose VUG6 be revised to: "Robot A must return to 24” once it is no longer contacting the Expansion Zone. Robot B must return to 15” once it is no longer contacting the Expansion Zone."

> **Answered by committee**
>
> Thank you for pointing this out. Yes, the intent of the rule is for Robot A to return to no higher than 24", and for Robot B to return to no higher than 15".
>
> We will be sure to clarify this in the April 5th Game Manual update, but until then, <G2> and this Q&A should be used to confirm the intent of <VUG6>.

184: <VUR5> <VUR6> Legality of CPU Cooling Fans

15-Dec-2018
VEX U VUR5 VUR6

<VUR5>"There is no restriction on the number of V5 Smart Motors that Robots may use. No other motors, servos, or actuators are permitted, including those sold by VEX." <VUR6>"There is no restriction on sensors and other additional electronics that are used for sensing and processing, except as follows: a. Sensors and electronics MUST be connected to the V5 Robot Brain via any of the externally accessible ports. b. Sensors and electronics CANNOT directly electrically interface with the VEX motors or solenoids. c. The additional sensors and electronics may only receive power from any of the following: i. Directly from the V5 Robot Brain via any externally accessible port. ii. From an additional VEX 7.2V Robot Battery or from a VEX 9.6V Transmitter Battery."

With these rules in mind, would a CPU cooling fan be legal in VEX U? The fan motor, which is not used for any physical robot mechanism actuation, would be attached to and powered off of a single board computer. The computer would be connected to and receive power from the V5 Robot Brain via an externally accessible port.

> **Answered by committee**
>
> No, this would not be legal.

143: VEXU - <VUR4> obligatory use of V5 in light of VEX suspension of new orders of V5 systems

13-Nov-2018
VEX U

I have been asked if there will be an adjustment to the requirement of VEXU teams to use V5 in light of VEX indefinitely suspending all new V5 system order?

VEXU is the only format that requires V5. VRC middle and high school have the option to run with Legacy Cortex systems.

> **Answered by committee**

At this point, there are no plans to modify <VUR4> and allow VEX U teams to use Cortex microcontrollers in official VEX U tournaments.

The REC Foundation, VEX Robotics, and the GDC have been working closely together to ensure that VEX U teams are supported as best as possible this season. Orders for VEX U teams are being expedited when possible, to ensure that currently registered teams have time to get their V5 equipment before official qualifying tournaments. Based on this data and monitoring, the VEX sales team and the REC Foundation Regional Support network are confident that the majority of currently registered VEX U teams have either received equipment, or have orders placed that will be fulfilled soon.

To modify this rule would be to change one of the most significant design constraints that all VEX U teams have worked within thus far. We acknowledge that the V5 rollout delays translated into build season delays for many VEX U teams, but these were delays and constraints that impacted all VEX U teams; to lift the restriction would be to cast aside the efforts of the teams that worked within this constraint to learn a new coding language, prototype without microcontrollers that were traded in, or in some cases delay starting their season as a whole.

VEX U teams who have not yet placed an order are an exception to the V5 ordering freeze, and can place an order by contacting sales@vex.com. VEX U teams who have placed an order but not yet received it should notify their REC Foundation Regional Support Manager or sales@vex.com to ensure that their order is prioritized accordingly.

14: <VUR3>c further clarification

22-May-2018
VEX U

<VUR3>c is the rule allowing steel and aluminum as raw materials for making parts. What limits are placed on the form of raw material. Based on our previous Q&A, it's clear that simple round or square bar, plate, and sheet (industrial standard stock) would be fall under this rule, but what about the following examples, considered by many to be raw materials, that are not so clear:

1. threaded steel rod
2. steel pipe or tubing
3. rolled steel shapes (angle iron, C-channel, etc)
4. threaded aluminum rod
5. extruded aluminum shapes (angle, C-channel, small bars)
6. extruded aluminum shapes, specifically 80/20-style T-slot extrusions
7. Aluminum castings (produced by the team in their college's own foundry)

If #6 is allowed, would the commercial fasteners available for the T-slot (1/4-20 or M6 t-nuts) be legal, or would the team need to machine their own t-nuts from legal steel bars?

Answered by committee

Point 7 (aluminum castings made in a college foundry) would be legal.

Points 1 and 4 (threaded rod) would be legal, if it is the same diameter/pitch as the screws already permitted by <R7c>.

The rest (pipe, tubing, angle, 80/20) would not be legal, other than VEX Robotics products per <VUR2>. These are not raw materials, as they have already undergone some amount of "post-processing" to add functionality.

The intent of <VUR2> is to provide access to a set of commercially available products that teams may utilize to build their robots. This is similar to <R5> for Middle/High School teams, just with a broader library for VEX U. The intent of <VUR3> is to encourage teams to explore fabrication techniques such as milling, 3D printing, injection molding, sheet metal punching, etc, to develop their own new robotic components in addition to those permitted by <VUR2>. Its intent is not for all commercial products made out of these materials to be legal.

130: <R19>,<VUR10>, and tank-less pneumatic systems

30-Oct-2018
R19 VEX U

If the ports of multiple cylinders are connected to each other and the pressure in both sides of the cylinders are kept relatively similar, a cylinder can be actuated and retraced by manipulating one of the cylinders (ideally using a motor) (Image for clarification).

R19 States

> <R19> Pneumatic devices may only be charged to a maximum of 100 psi. Teams may only use a maximum of two (2) legal VEX pneumatic air reservoirs on a Robot. The intent of this rule is to limit teams to the air pressure stored in two reservoir tanks, ***as well as the normal working air pressure contained in their pneumatic cylinders and tubing on the robot.*** Teams may not use other elements (e.g. surgical tubing) for the purposes of storing or generating air pressure. Teams who use cylinders and additional pneumatic tubing for no purpose other than additional storage are in violation of the spirit of this rule and will fail inspection.

And VUR10 states:

> Teams may utilize commercially available pneumatic components from the following list: Cylinders, actuators, valves, gauges, storage tanks, regulators, manifolds, and solenoids. c. Pneumatic devices may only be charged to a maximum of 100 psi. ***i. Compressors or any other forms of "on-Robot" charging are not permitted.*** d. All commercial components must be rated for 100 psi or higher. Teams should be prepared to provide documentation that verifies these ratings to inspectors if requested. e. Components must not be modified from their original state as purchased from a commercial vendor, other than the following exceptions: i. Cutting pneumatic tubing or wiring to length, assembling components using preexisting threads, brackets, or fittings, or minor cosmetic labels.

I would assume that the setup (same as the image) would be illegal, as air is technically compressed if the cylinders experience resistance, but would like an official ruling.

If the max pressure (under load) is kept under 100Psi, is the setup in the image legal for VRC?

If not legal for VRC, is such a setup legal for VEXU?

> **Answered by committee**
>
> The intent of <R19> and <VUR10>, in this context, is to safely limit the amount of stored pneumatic energy available at the beginning of a Match. As pictured, and assuming no other rules were violated in the process, this hypothetical example would satisfy that intent and would be legal in both VRC and VEX U.
>
> Of course, if this concept was used to create a rudimentary "compressor" or otherwise generate additional pneumatic pressure during a Match for other devices to use, this ruling would not apply, and it would be illegal.

13: VEX U Expansion Outside Expansion Zone

22-May-2018
SG2 VEX U

VUG6 States: "Both Robots follow the expansion rules laid out in <SG2>."

VUR1 States: "Teams must build two (2) Robots, subject to the following size restrictions at the start of the match:

a. Robot A must be smaller than 24" x 24" x 24". b. Robot B must be smaller than 15" x 15" x 15"."

SG2 States: "a. Once the Match begins, a Robot which is contacting the Expansion Zone may expand vertically with no height limit. However, once fully outside of the Expansion Zone (i.e. no longer contacting it), the Robot must return to a height limit of 18" (45.72 mm) tall."

Does this mean Robot A may not be taller than 18” when not in contact with the expansion zone?

Is Robot B able to expand 3” vertically from its starting height while not in contact with the expansion zone?

> **Answered by committee**
>
> VUG6 will be revised and clarified in the June 15th game manual update to answer this question.

1252: As per <VUR11> what frequencies are considered radio frequencies?

21-Oct-2022
VEX U

<VUR11> No radio communication is allowed between Robots. However, other non-radio forms of communication are permitted (e.g., IR, ultrasonic, etc.).

In relation to the title, is there a specific band of frequencies which constitute as radio (30Hz to 300GHz) and at what point is the line drawn between other types of frequencies?

> **Answered by committee**
>
> This system is only intended for specific **VRC** Spin Up rules questions. Because your question only pertains to VEX U and has no effect on VRC robots or rules, you will need to resubmit it in the Official VEXU 2022-2023: Spin Up Q&A for us to consider it. Thank you.