

# Q&A

## VEXU 2021-2022: Tipping Point

Tagged: VUR4

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 VEX U 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](#) (including the VEX U Appendix C) itself.

**Please review the [Q&A Usage Guidelines](#) before posting.** This system is only intended for specific VEX U Tipping Point rules questions.

- For event, registration, or other competition support questions, please contact your [REC Foundation Manager](#).
  - For VEX technical support, contact [support@vex.com](mailto:support@vex.com) or [sales@vex.com](mailto:sales@vex.com).
- For game questions, suggestions, or concerns outside of specific and official rules questions, contact [GDC@vex.com](mailto:GDC@vex.com).

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## 1471: VUR6, VUR4, Belts

21-Feb-2023

VUR4 VUR6

Under VUR6, it's stated that a spring is "any device used for storing and releasing elastic potential energy". Under the definition, would COTS rubber and polyurethane timing belts fall under the category of springs, since their primary function is power transmission via the use of elastic tension? Additionally, would COTS rubber and polyurethane belt extrusion be legal under VUR4? Other legal materials - such as surgical tubing and aluminum extrusion - go about the same manufacturing process, so it would make sense that extruded rubber and polyurethane belt would fall under that rule as well. Thanks!

### Answered by committee

Yes, rubber and polyurethane timing belts are legal.

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## 1459: Bearing Balls

16-Feb-2023

VUR3 VUR4

<VUR3> Fabricated Parts may be made using the following processes: a. Adding material, such as 3D printing. b. Removing material, such as cutting, drilling, or machining. c. Bending material, such as sheet metal breaking or thermoforming. d. Casting or molding material, such as injection molding or sand casting. e. Attaching materials to one another, such as welding or chemically bonding (e.g., epoxy).

<VUR4> Fabricated Parts must be made from raw materials. For the purpose of this rule, a "raw material" is any material that would not be considered a "pre-fabricated" part (i.e., has not undergone any of the fabrication techniques listed in <VUR3>).

According to your ruling on [Q&A 1235](#), billets and sheet plastic are considered stock materials although they are cast and rolled. In your ruling on [Q&A 1269](#), a cast gear is considered fabricated and is therefore not a stock material because a billet "is designed to be fabricated into something else," while the gear is "fabricated for the sole purpose of being used as a gear." Additionally, you stated that if "an item is generally intended to be used in the exact state in which it is sold & purchased, it is unlikely to qualify as a raw material under the VEX U competition rules."

From those rulings and the rules in the game manual, is a [ball bearing ball](#) considered a stock material or a prefabricated (therefore illegal). The [manufacturing process of a ball bearing ball](#) is as follows:

1. Wire rod is cut to length. (Although "cutting" is illegal in VUR3a, this should be legal in the same way that it is legal for a long bar of metal billet is cut to individual length. The cutting is not adding complexity, it is shortening the material or detaching it from the spool.)
2. The cut slug is forged to produce a cold-headed ball. (Some metal billets are forged.)
3. Flashing removes the "equator" and "poles" giving the ball a rough finish. (Flashing should be legal since it is not a fabrication technique that is listed in VUR3.)
4. The ball is heat treated (Heat treating is legal according to VUR4.)
5. The ball is ground to approximate size. (Grinding could be classified as "removing material," but it is not expressly illegal in VUR3, and metal billet is ground to remove surface defects, so grinding should be legal.)
6. The ball is polished through a lapping process. (Polishing and lapping should be legal since they are not deemed a fabrication technique in VUR3.)

Additionally, a ball bearing ball is "designed to be fabricated into something else" such as a linear slide, turntable, or gyroscope. It is not usable by itself in the same way a gear is.

With these rules and rulings in mind, is a ball bearing ball legal for use in VEXU?

## Answered by committee

Yes, ball bearing balls are legal. This was also clarified in this previous Q&A post: <https://www.robotevents.com/VEXU/2022-2023/QA/1208>

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### 1383: Q&A 1341 Follow up

13-Jan-2023

VUR4 VUR6 VUR7 VUR10 R7

Previously, in [Q&A 1341](#) the GDC has ruled:

Per rule &R7e&gt;, all rope/string (or string-like material) on a Spin Up Robot must measure at least 3mm in diameter at its narrowest point, regardless of how it is used on the Robot. This is an intentional change from the rules regarding string in previous competition seasons, and applies to both VRC & VEX U Robots.

R7e:

An unlimited amount of non-elastic rope / string, with a thickness / diameter between 1/8" (imperial standard) / 3mm (metric standard) and 1/4" (6.35mm). String must measure at least 1/8" / 3mm in diameter at its narrowest point while on the Robot under no load.

VUR4:

Fabricated Parts must be made from raw materials. For the purpose of this rule, a "raw material" is any material that would not be considered a "pre-fabricated" part (i.e., has not undergone any of the fabrication techniques listed in VUR3). Standard raw material finishing processes, such as extrusion, heat treating, or anodizing, are not considered pre-fabrication.

VUR6:

Teams may use commercially-available springs on their Robots. For the purposes of this rule, a "spring" is any device used for storing and releasing elastic potential energy. Examples include, but are not limited to:

- Compression, tension, torsion, constant force, or conical springs made from spring steel.
- Springs made from elastic thread or rubber, such as surgical tubing, bungee cords, or stretchable braided rope.
- Closed-loop (pneumatic) gas shocks

VUR7:

Teams may use any commercially available fastener on their Robot. Examples include (but are not limited to) screws, nuts, washers, rivets, hinges, pins, rod ends, threaded rods, hose clamps, bushings, spacers, or standoffs. To be considered a legal "fastener" in the context of this rule, the primary function of the part must be to join or fasten together two otherwise legal parts.

VUR10:

There is no restriction on sensors and other Additional Electronics that Robots may use for sensing and processing, except as follows:

1. Does the maximum sizing restriction of 1/4" also apply for string-like materials in VEXU?
2. Does R7e take precedence over VUR4? If so, does this mean that any Fabricated Part which could be considered "string-like" must abide by the sizing restrictions in R7e?
3. Does R7e take precedence over VUR6? If so, does this mean that any spring which could be considered "string-like", such as elastic thread, rubber, surgical tubing, bungee cords, or stretchable braided rope, must abide by the sizing restrictions in R7e? If so, should measurements be taken when the spring is stretched or unstretched?

4. Does R7e take precedence over VUR7? If so, does this mean that any Fastener which could be considered "string-like" must abide by the sizing restrictions in R7e?
5. Does R7e take precedence over VUR10? If so, does this mean that any Additional Electronics which could be considered "string-like", such as thin and flexible wires, must abide by the sizing restrictions in R7e?
6. If the answer to #5 is Yes, would thicker (but still thinner than 1/8") wires, solid or stranded, be restricted in size under R7e? Previously in [Tipping Point Q&A 1027](#) the GDC has said that single strand wire of 1/8" in size should be considered rope/string.

Overall, I believe the GDC's intention in answering Q&A 1341 in the manner they did was to prevent teams from using small diameter rope and string-like material as part of end game mechanisms. I agree with this intention. However, the ruling itself goes far beyond this and potentially restricts VEXU teams' exercise of many VEXU rules. To prevent this, I ask that the GDC modify its ruling for Q&A 1341 to only restrict other VEXU rules when legal materials under those rules are then used as part of an end game mechanism.

### Answered by committee

1. Does the maximum sizing restriction of 1/4" also apply for string-like materials in VEXU?

Yes.

2. Does R7e take precedence over VUR4? If so, does this mean that any Fabricated Part which could be considered "string-like" must abide by the sizing restrictions in R7e?

R7e takes precedence. All string-like materials must comply with R7e.

3. Does R7e take precedence over VUR6? If so, does this mean that any spring which could be considered "string-like", such as elastic thread, rubber, surgical tubing, bungee cords, or stretchable braided rope, must abide by the sizing restrictions in R7e? If so, should measurements be taken when the spring is stretched or unstretched?

R7e takes precedence. It would be measured unstretched.

4. Does R7e take precedence over VUR7? If so, does this mean that any Fastener which could be considered "string-like" must abide by the sizing restrictions in R7e?

R7e takes precedence. All string-like materials must comply with R7e.

5. Does R7e take precedence over VUR10? If so, does this mean that any Additional Electronics which could be considered "string-like", such as thin and flexible wires, must abide by the sizing restrictions in R7e?

Wiring to additional electronics does not fall under R7e.

6. If the answer to #5 is Yes, would thicker (but still thinner than 1/8") wires, solid or stranded, be restricted in size under R7e? Previously in [Tipping Point Q&A 1027](#) the GDC has said that single strand wire of 1/8" in size should be considered rope/string.

Q&As from prior seasons do not apply to this season. Wire that is used for any purpose other than wiring to the additional electronics specified in VUR10 should be considered string, and must comply with R7e.

## 1341: String in VEXU

11-Dec-2022

VUR4 VUR7 R7

R7e:

An unlimited amount of non-elastic rope / string, with a thickness / diameter between 1/8" (imperial standard) / 3mm (metric standard) and 1/4" (6.35mm). String must measure at least 1/8" / 3mm in diameter at its narrowest point while on the Robot under no load.

VUR4:

Fabricated Parts must be made from raw materials. For the purpose of this rule, a "raw material" is any material that would not be considered a "pre-fabricated" part (i.e., has not undergone any of the fabrication techniques listed in VUR3). Standard raw material finishing processes, such as extrusion, heat treating, or anodizing, are not considered pre-fabrication.

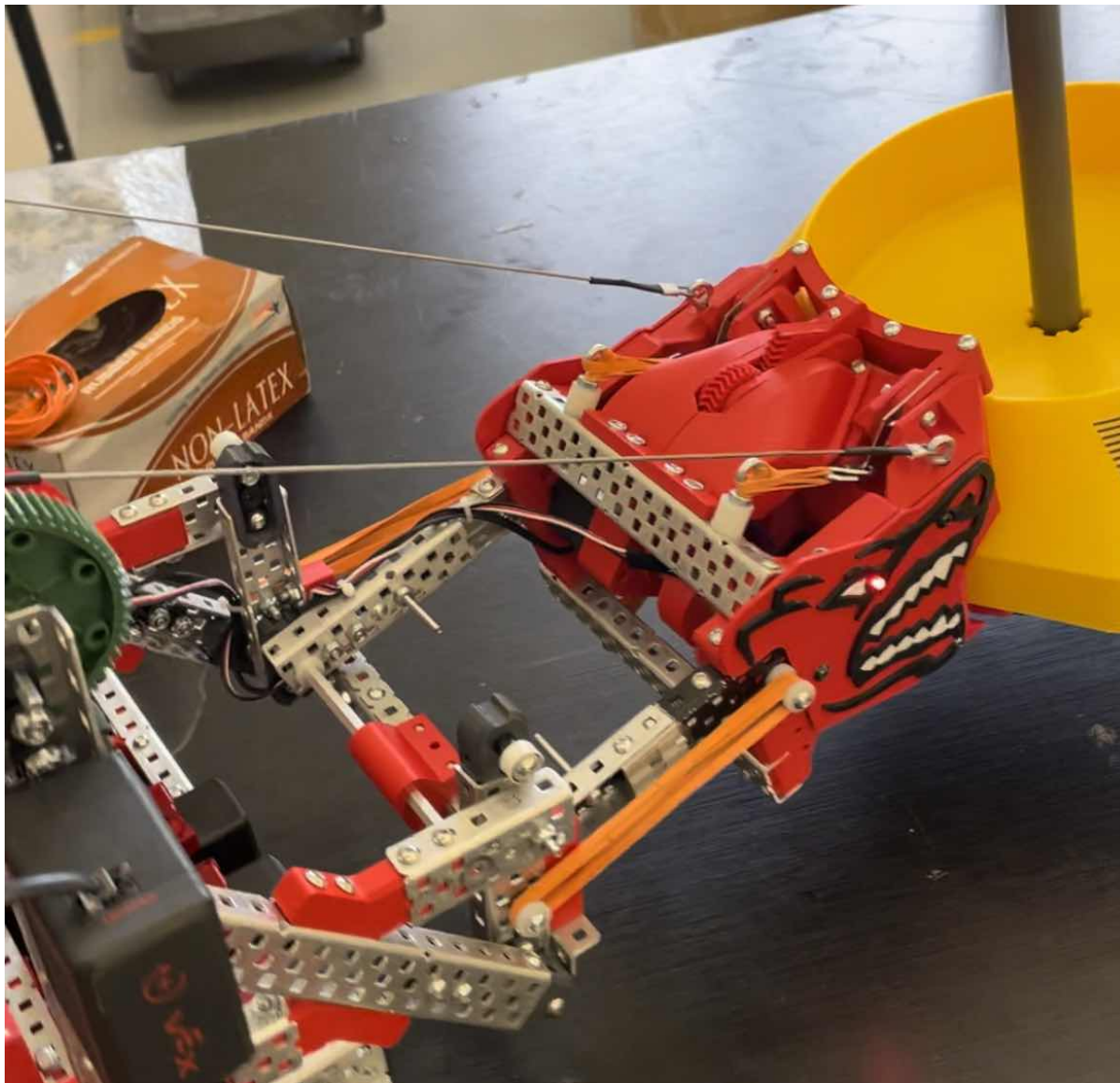
VUR7:

Teams may use any commercially available fastener on their Robot. Examples include (but are not limited to) screws, nuts, washers, rivets, hinges, pins, rod ends, threaded rods, hose clamps, bushings, spacers, or standoffs. To be considered a legal "fastener" in the context of this rule, the primary function of the part must be to join or fasten together two otherwise legal parts.

Recently, the game manual was updated to require all string be at least 3 millimeters in diameter. This raises a couple questions in regard to VEXU:

1. Does string, regardless of diameter or material, qualify as a fastener by VUR7 if being used to connect two objects together?

For an example, steel cable with a diameter less than 3 millimeters was used in this fashion on one of our VEXU Tipping Point robots, as shown in the attached image.



Regardless of the answer to the above question, there are other extruded raw materials that would be legal under VUR4. For example: fishing line, TPU 3D printing filament, or metal wire, can all act like string and fulfill the same purpose. These materials are often less than 3 millimeters in diameter. Additionally, if the unstated intent of rule R7e is to make endgame mechanisms easier to score, then string size restrictions could vary based on its application on the robot. Therefore, the follow-up question is:

2. Can string or string-like materials with a diameter smaller than 3 millimeters be used for endgame mechanisms on VEXU robots?

#### Answered by committee

Thank you for your questions. Per rule <R7e>, all rope/string (or string-like material) on a Spin Up Robot must measure at least 3mm in diameter at its narrowest point, regardless of how it is used on the Robot.

This is an intentional change from the rules regarding string in previous competition seasons, and applies to both VRC & VEX U Robots.

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## 1301: VUR3 and VUR4 Differing Standards

16-Nov-2022  
VUR3 VUR4

Thank you for your clarification in Q&A 1269! We have another follow up question about VUR3 and VUR4. Again, here are the rules:

VUR3:

Fabricated Parts may be made using the following processes: a. Adding material, such as 3D printing. b. Removing material, such as cutting, drilling, or machining. c. Bending material, such as sheet metal breaking or thermoforming. d. Casting or molding material, such as injection molding or sand casting. e. Attaching materials to one another, such as welding or chemically bonding (e.g., epoxy).

VUR4:

Fabricated Parts must be made from raw materials. For the purpose of this rule, a "raw material" is any material that would not be considered a "pre-fabricated" part (i.e., has not undergone any of the fabrication techniques listed in VUR3). a. Standard raw material finishing processes, such as extrusion, heat treating, or anodizing, are not considered pre-fabrication.

To summarize these two rules, fabricated parts are additively or subtractively manufactured, formed, cast, or attached together. Raw materials are materials that have not undergone these processes.

The problem is, by a literal reading of the rules, basically nothing is a raw material. Materials such as 3D printer filament, plastic sheets, and metal billets, despite meeting the common sense definition of a raw material, have all undergone some of the manufacturing processes listed in VUR3 and should therefore not be considered raw materials by the written rule.

To solve this problem, the GDC has introduced 3 new standards to determine whether a part is considered a raw material. Sometimes the standard is the [part's primary fabrication process](#), sometimes the standard is the [part's finishing process](#), and sometimes the standard is the [intention of the vendor who sold the part](#).

Each standard is fine on its own, but they are often in conflict with each other. When this happens, it's not clear when to apply which standard. We hope the GDC considers rewriting this rule in the future to make it less confusing. However, until then, we hope to gain some clarification by asking about a few specific parts. We have intentionally selected edge cases because we want to understand when to apply each standard.

1.) Are rubber bands that are not size 32 or 64 raw materials? Rubber bands are usually extruded and cut to length, which should make them raw materials by Q&A 1144, but they are also "intended to be used in the exact state in which it is (they are) sold & purchased," which should make them prefabricated by Q&A 1269.

If they are raw materials, how does that square with Q&A 1269, and if not, how does that square with Q&A 1144?

2.) Is gear stock a raw material? Many suppliers cast and heat treat their gear stock, and intend for it to be cut (subtractively manufactured) by the user, which should make it a raw material by Q&A 1235 and 1269. However, it seems like common sense that gear stock and normal gears are equally prefabricated / raw since the manufacturing processes and final geometry are very similar.

If gear stock is not a raw material, how does that square with Q&A 1235 and 1269?

3.) Is colored tape legal? In tape manufacturing, the backing and the glue of tape are attached together, which should make it a prefabricated part by VUR3 note e. Then the tape is dyed, which is a standard material finishing process and should make the tape a raw material by Q&A 1235. And, like an aluminum billet, tape is intended to be cut (subtractively manufactured) before use, so it should be a raw material (or at least shouldn't be disqualified from being a raw material) by Q&A 1269.

If colored tape is a raw material, how does that square with VUR3 note e? If not, how does that square with Q&A 1235?

Thank you for your time, and for your patience :) We know that these edge-cases are difficult to formalize rules around, and we appreciate your clarification and professionalism.

**Answered by committee**

Thank you for your questions.

1.) Are rubber bands that are not size 32 or 64 raw materials?



Acceptable usage of rubber bands is covered by rule <R7h>, unless you wish to fabricate your own rubber bands as permitted under rule <VUR3>.

2.) Is gear stock a raw material?

Commercial off-the-shelf gears are not allowed for use on VEX U Robots, which we believe is the question you're actually asking here and the one we're able to provide a definitive answer for.

Team-fabricated gears, machined from raw steel / aluminum round stock, would be legal.

3.) Is colored tape legal?

Acceptable usage of tape is covered by rules <R7f>and <R10>, unless you wish to fabricate your own tape as permitted under rule <VUR3>.

Generally speaking, we try to refrain from extending the logic of one rule into another. However, we believe that the red box note for rule <R11> is also pertinent to your string of questions regarding rules <VUR3> and <VUR4>, so we'll extend it here: If a key component of your Robot's design relies upon convincing an inspector that a specific material or part is "technically not prefabricated" or "technically a raw material," it is probably outside of the spirit and intent of these rules.

Thank you for your patience. Edge cases are, as you've stated, difficult to formalize rules around.

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## 1148: Carbon Fiber

6-Jul-2022

VUR3 VUR4

VUR3 states:

Fabricated Parts may be made using the following processes:

- a. Adding material, such as 3D printing.
- b. Removing material, such as cutting, drilling, or machining.
- c. Bending material, such as sheet metal breaking or thermoforming.
- d. Casting or molding material, such as injection molding or sand casting.
- e. Attaching materials to one another, such as welding or chemically bonding (e.g., epoxy).

VUR4 states:

Fabricated Parts must be made from raw materials. For the purpose of this rule, a "raw material" is any material that would not be considered a "pre-fabricated" part (i.e., has not undergone any of the fabrication techniques listed in VUR3).

- a. Standard raw material finishing processes, such as extrusion, heat treating, or anodizing, are not considered pre-fabrication.
- b. Fabricated Parts may not be made from raw materials which pose a safety or damage risk to the event, other Teams, Field Elements, or Discs. Examples of prohibited materials include, but are not limited to:
  - i. Any material intended to produce flames or pyrotechnic effects.
  - ii. Any material that is liquid at the time of the Match (e.g., hydraulic fluids, oils, liquid mercury, tire sealant, etc.).
    1. Fabrication processes that include the use of liquids, such as milling coolant or resin which has been cast into a solid part, are not considered a Violation of this rule.

Is carbon fiber stock a legal raw material under VUR4? Here are a couple examples of commonly available carbon fiber stock:

<https://www.mcmaster.com/5287T78/>

<https://www.mcmaster.com/8194K111/>

Given that the team performs one or more of the manufacturing processes in VUR3 in order to turn the raw carbon fiber into a Fabricated Part, would it be legal for use?

### Answered by committee

VUR4 does not include a specific list of permitted or prohibited materials, other than point "b" (i.e. the materials do not pose any safety or damage risks to the event).

So, in general, the use of carbon fiber is not prohibited as a blanket rule, but we would *strongly* advise researching any applicable safety precautions and protocols involved, and including these as part of a Team's VUR5 documentation (as should be done when working with any exotic materials).

Ultimately, the decision whether a given material poses a safety risk is at the discretion of the Head Referee and the Event Partner, taking into account the context of the material's usage and application. For example, we would not recommend using carbon fiber for a Fabricated Part that has a high likelihood of snapping during a match, or require additional drilling / cutting in the pit areas (i.e. around other Teams who may not be familiar with proper safety precautions involved).

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## 1144: Follow-up to VUR-4 questions from last season regarding the legality of T-slotted aluminum extrusion.

30-Jun-2022

VUR4

At the end of last season, the GDC answer asked for a specific example of "extruded aluminum," such as this one: [8020.net/1010.html](http://8020.net/1010.html)

T-slotted aluminum is available for many suppliers (80/20 is probably the most well known), and comes in a variety of sizes. Will these be legal in accordance with VUR4 section a, "Standard raw material finishing processes, such as extrusion. heat treating...?"



Answered by committee

Yes, this is legal.

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### 1063: <VUR4>T-Slot Aluminum

16-Feb-2022

VUR4

<VUR4> Fabricated Parts must be made from raw materials. For the purpose of this rule, a “raw material” is any material that would not be considered a “pre-fabricated” part, i.e. has not undergone any of the fabrication techniques listed in <VUR3>. a. Standard raw material finishing processes, such as **extrusion**, heat treating, or anodizing, are not considered pre-fabrication

<https://www.robotevents.com/VEXU/2020-2021/QA/613> In previous year's Q&A, slotted aluminum would not fall under raw material

Milling slots into a piece of aluminum bar stock would be legal, but **buying pre-slotted aluminum** would not. The goal of VUR3 is to encourage Teams to explore fabrication techniques of their own. Similarly, pre-drilled or **extruded metal**, such as angle aluminum, is not permitted

Since this year's rule specifically allows extruded material as raw materials, does this mean slotted aluminum, angle aluminum etc would be legal?

**Answered by committee**

Yes. As you have noted, in previous years, "extruded metal" was explicitly referred to as not permitted. In the current Game Manual, "extruded metal" is explicitly referred to as permitted.

If you have a specific product that you would like a ruling on, please feel free to submit a link to a product website. In general, if something is referred to by a manufacturer as "aluminum extrusion", then it is most likely legal.

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**1062: <VUR4> Polycord, rubber strip raw materials**

16-Feb-2022

VUR4

<VUR4> Fabricated Parts must be made from raw materials. For the purpose of this rule, a "raw material" is any material that would not be considered a "pre-fabricated" part, i.e. has not undergone any of the fabrication techniques listed in <VUR3>. a. Standard raw material finishing processes, such as extrusion, heat treating, or anodizing, are not considered pre-fabrication

Would polycord and rubber strip fall under the definition of raw materials and thus legal to use in VEX U? In previous year's VUR3

b. An unlimited amount of silicone, polyurethane, or other rubber.

polyurethane and rubber were both listed as raw materials. Since this year's VUR4 is an expansion on previous year's VUR3, we believe they should be legal.

**Answered by committee**

Yes, polyurethane and rubber are considered "raw materials" and may be used to make Fabricated Parts.