

ISA 2021 Virtual Tree Climber Summit: Gear Check Best Practices

This transcript is auto-generated. Please direct any questions to isa@isa-arbor.com.

[00:00:00] Slide with text reading: This video's purpose is to serve as a high-level discussion and reference on how to perform gear inspection and manage gear on a personal level. It is not meant to supersede manufacturer's recommendations or national, state, or local laws and regulations around equipment and gear.

[00:00:14] Slide with text reading: International Society of Arboriculture and Husqvarna present, Gear Check Best Practices. Featuring Phillip Kelley, ISA ITCC Head Technician.

Phillip Kelley: [00:00:27] Hey everybody. I'd like to say, thanks for taking the time to watch this video of best practices for gear inspection. My name is Phillip Kelly. I am the head technician for the International Tree Climbing Championships. And one of my responsibilities in that role is to kind of take the look at gear that's coming into the events, make sure that it's safe, make sure that it's being used properly and that it's moving our industry forward.

And so I feel like gear inspection is something that's ever constantly evolving, constantly changing. And it's a topic that we don't get to spend enough time on. There's not a lot of information around it. So I'd like to take them second and just say thanks to the ISA for coming up with this idea on having a gear inspection video and thanks to Husqvarna for sponsoring it, without those two things, this wouldn't happen.

And, and this topic's really critical for the success of us as an industry. And so what we're going to do today is we're going to talk at a high level about what gear inspection should look like on a daily and an interval. How we, what retirement criteria there. In this video, it's just a best practice as a reference material, but it's not to supersede a manufacturer's recommendations.

It's also not to supersede or go above and beyond state and local regulation. So we still need to make sure that you're being compliant with whatever governance you have to fall under for the country that you live in, or the state that you live in. This, this video is really about management of gear on a personal level.

But it's not an end all be all. And this is a video intended to close some of that and make sure that we are doing what we need to do every day to be safe, because I want everyone to love climbing trees as much as I do. And I want everyone to go home as safe as they [00:02:00] possibly can.

When we're talking about gear inspection one of the first things we need to realize is that we're want to be using and selecting gear that was designed for arboriculture. In the past, we pulled gear from other industries, other work at height industries, from caving and rock climbing and things like that.

And what we find is that a lot of those tools while applicable, they don't necessarily they aren't resilient enough to withstand the abuse that we put them through. Arborists are hard on gear for sure. We go out there and we put it to work every day and we, we stretch it to its absolute limits. So we wanna make sure that the tools that we're using were designed for this industry and that they,

and the other thing we want to look for is, is we want to make sure that the, the gear is some sort of governance or certifying body around it.

We want to make sure that someone has tested the gear and put it through the process to, to say that it is safe and will withstand the forces that we're gonna apply to it. And so whether that's EN or CE , ANSI, ASTM, when we're looking at gear, we want to make sure that there's some sort of rating.

And then we want to make sure that what, that, whatever that rating is, is true to the application, we're putting it into. So when I'm looking at gear for ISA ITCC events, what I'm looking for is to first thing I want to know is does it meet any sort of standard at all? And then what is that standard? And I'm going to look it up.

So if it's EN 1891A, I'm going to look up that standard and figure out am I using this tool the way it was tested to be used. Am I following along with what the manufacturer intended me to do with this? And then I want to make sure that there's traceability. I want to make sure that I can go back and find, you know, where it came from, what batch it was into, what batch it was involved in.

And that way, if there is a recall or there's something wrong with the product, I can quickly get notification from the manufacturer and take it out of service. So there's gotta be traceability within the product, and then there's gotta be manufacturer's guidelines on how to use it. So there should be some sort of similar to this, some sort of manufacturer's guide that tells [00:04:00] me how I, how they intended me to use the tool.

And that way I can, I can make sure that I'm using it properly. So when we're talking about gear inspection that's the first starting point. So I'm looking at, doesn't meet a standard. Second thing that I look for is the, is configuration. I want to make sure that when I put it together and I can figure it, all of the parts and pieces line up and there, and when configured, they don't do anything that I hadn't intended, they can't rotate, they can't turn, they can't twist.

And so that when I build it, so each individual part or piece has met some standard or some application process. But when I put them together, have I changed anything that takes it out of service? So I'm looking at configuration. Then the last thing I look at is compatibility. If I take a carabiner or, and I put it in this sling do those two work well together?

Is that a happy marriage? Or are they going to get divorced some and it's going to be messy, like everything else in life. Right? So we want to make sure that they're compatible they're configured well, and they meet some sort of standard.

When we're talking about gear inspection there's really three kind of, I look at it. Three levels of gear inspection. We look at the first is a daily gear inspection. Every time I get my bag, my gear out of my bag. I'm going to give it a quick once-over I'm going to test the carabiner quickly. I'm going to give it an eyeball through the ropes.

I'm going to run through it. Just at a very quick high level. Daily inspection five, six minutes in the morning just to make sure everything is exactly the way it was when I put it away the night before. Then the next gear inspection is more of an interval gear inspection. And when I do that, I'm going to set aside a regular time and interval of time, say every 30 days or every two weeks.

And I'm going to sit down with a piece of paper and I'm going to run through all my gear, a very intensive inspection. And I want to make sure that I'm documenting this inspection. So I have a record that's being kept. So I can go back and say, this is when I put it into service. This is when I checked it last.

These are things that I'm noticing. Is it becoming more frayed more worn? Is there damage significant damage from the last time I used it? Is it discoloration? [00:06:00] What is kind of going on with the gear? And I can, I can go back on a timeline to verify if I'm close to retirement. So that's, that's an interval inspection that needs to be pre-planned.

Some gear manufacturers will tell you what that interval is. If you look in the manufacturer's recommendation. But sometimes it's just, you need to set aside that time to do it. Always refer back to whatever your company policy is or whatever your governing body regulates to stick with that standard.

And if there isn't one, then just less, more frequency is better. I would not go out three months or six months, you know, once a month is kind of the minimum for that. And then the other type of inspection is what we call a post-incident inspection. So if you have something that goes terribly wrong, if you take, if a piece of gear is shock loaded, or it falls out of a tree and hits the ground, what we want to do is we want to take and look at that gear to make sure that whatever happened, whatever force was applied to the gear, that it didn't change or damage the gear to the point that we have to retire it.

So post-incident inspection is really, really critical and it's one of those things that I don't feel like we do very well. We just, we kind of look at it real quick and like, yeah, it's survived and nothing got broken. It doesn't seem bent or damaged and we're just going to keep rocking it when really we need to take five or 10 minutes to really sit down with that piece of gear and go through all of the processes to make sure it's functional.

So that's, that's the three levels of gear inspection we're going for. And again, documentation is key.

We're going to move into how that looks and how we start that. I start my gear inspection at a pretty basic level. I always start with PPE because fundamentally that's the first thing that goes on when I get out of the truck. So when looking at PPE you know, I'm going to look at my glasses, make sure that the glass is pretty simple for here in the U S we want to make sure that they're Z87. I also want to make sure that they're not too scratched up, that I can't see out of them. And I want to make sure that they stay on my face and make me look cool. As long as that, those couple things are happening, I'm going to win. Because if you don't look [00:08:00] cool, you won't wear them.

Right. And it's key, critical components to success is keeping the eyeballs in the head. Right. Then, so that's really, it. Safety glasses are simple. Then we're going to move to helmets. I've got three helmets up here. Each manufacturer kind of dictates how long a life, a service life of a helmet is. So make sure that you read the manufacturer's guidelines to see when you should be retiring it. And these are just plastic. They are very, very affected by sunlight. UV is very hard on these helmets. So, you know, most manufacturers are going to be anywhere between five, seven to 10 years, a service life on a helmet. And that's if you take care of it.

So when we're looking at helmets real quick, daily inspection for me, what I'm gonna do is pick it up. I'm going to look for a label inside the label is going to tell me when. Either when it was born or

when it needs to be retired. It's also going to give me some baseline information about service, life of the helmet.

All of the helmets have a label somewhere in them and just understand what you're looking at. Each manufacturer has a different way to label or mark their helmets. So make sure you're familiar with how that process looks so you can verify what it means. When we're looking at helmets, I want to visually look at it.

I'm looking for discoloration. I'm looking for deep scratches. I'm looking for cracks or fractures that are visible to me. Then after I look at the color, make sure that it's not too faded, then I want to give it just a quick squeeze. So I'm going to grab the helmet between my hands and I'm going to press compress it Edwards and then release it.

When I do that, the helmet should return back to its original state very quickly. If it, if I push in and it's really slow to come back out, that means that the plastic is starting to be affected by UV. And it's getting soft per se and it's time to retire it. So I'm going to push on it, make sure it returns back to its form.

The other thing I'm looking for when I'm pushing on it is I'm looking to see if there's any cracks that can't, aren't visible to the, to the eye without, without compression. So I'm going to compress it and as I'm compressing it, I'm going to turn it. To see if there's anything that I don't notice any cracks or wear [00:10:00] marks that I can't see just visibly on the helmet.

And then when I look inside, I want to check the suspension. I want to make sure that all the attachment points, there's a couple of different types of suspensions, right? We've got a foam insert in this cast. We've got a foam insert in this one. And then we got a, what we call more of a five-point suspension in this one. I want to make sure that the foam in these foam helmets make sure that the foam doesn't move it. Doesn't wiggle, it's in place tight. I want to make sure that all the points in the suspension are attached properly. They're not loose or broken. And I want to make sure that the tense chin strap is functional, right?

I want to make sure that it buckles and I want to make sure that none of the plastic pieces are broken on the chin strap, because this is part of the actual service of the helmet, the chin strap is integral to the impact protection of the helmet. So the chin strap has to be functional. Same with this Petzl.

Again, five point harness. I want to make sure that the stitching is good. I want to make sure that all the webbing is not, there's no phrase next or cuts inside the webbing. I want to make again, make sure that the chin strap is fully functional, that the clip works. So that way, if I do fall or have an impact, it'll stay on my head. Kind of critical.

It doesn't do any good when it falls off. And then I want to make sure, again, that all the suspension points are properly attached. There's no cracks or breaks, and then adjustment part works on it. And that's just a really, high-level overview of the different types of helmets that we're using. You want to be checking these quite often, and then you want to make sure that if there is an incident that you look at what the manufacturer recommends on retirement criteria, some manufacturers will tell you that if it falls out of a tree from 35 feet up, that needs to be retired immediately.

The first time it falls up from that height and we need to abide by those recommendations. So helmets take care of your head. So you need to take care of them. So moving down our PPE list or following the PPE dance, we've got our eyes, we did the helmet. Now we're going to talk about hearing protection.

We know that when you're running a tool that has at a volume of over 80 decibels, that you need to have some sort of [00:12:00] protection. So we don't have hearing loss. It's very common to me, older arborists that can't hear anything. I would be one of them. And so hearing protections quite often, overlooked are not valued, but it is super critical.

If you want to be able to listen to really great music later on in life. It's, there's a couple of different kinds. I tend to wear ear muffs. I find the ear must for me worked really well because I don't lose them. And they're generally kept clean. There's also inner ear hearing protection. You can put your plugs in. For me earplugs don't work as well because I tend not to put them in all the way.

And also because they're kind of nasty and dirty and nobody wants to stick that back in their ear after a hot day in the sun. So I, I prefer the muffs. All you need to do is make sure that you have appropriate protection for the level, the volume of whatever it is, tool you're operating. So if you're operating a chainsaw or a chipper, just make sure that you're getting enough noise or NRR noise reduction rating.

That brings that volume back down to around 80 decibels or lower if possible.

All right. Now the final conversation we want to have about PPE. We did head, eyes, ears, now we're going to talk about leg protection when we're operating a chainsaw. It's, it's required all over the world that you have to have some sort of chance of protection. I prefer chainsaw pants rather than chaps.

But we need to make sure that they're not cut damaged, dirty. There, they definitely lose a lot of efficacy when they get covered in oil and dirt. So you want to keep them clean. I it's one of the most common things that I find going out in the field, working with crews is that the chaps are always in the bottom of the bend with the chain sitting on top of them, completely covered in oil and dirt and never ever have they been washed.

And so right away, their ability to stop a chainsaw decreases significantly. So you want to make sure that they are not torn. They're not dirty. You want to make sure that they go from the top of your leg all the way down to the top of your foot. You don't want those capri chaps that are up here. No one looks sexy and capri chaps.

So you want to make sure that the chaps have full coverage and you want to make sure that they are. They meet the standard for whatever country you're in. There [00:14:00] are different types of different levels of protection, and there are different requirements across the world. So just make sure that you're wearing whatever chaps you're wearing, meet CE or EN or the ASTMs standard, whatever standard that you fall under, make sure that the label, the tag and the testing requirements criteria is, are met for your governing body, wherever you're at.

And then the last thing to talk about with chaps or pants make sure that you have them on all the time. Don't get lazy about it. And the other thing I wanted to say is just bringing back this conversation about battery saws. You know, one of the great evolutions in tree climbing for

arboriculture for me has been the invention of the battery saw. Battery technology has come a long way, whether you're using whether you're using a rear handle or top handle saw, they are, it's a great way to cut down a fatigue.

And it's a great way to cut down on noise level and improve communication on the job site. But one of the top two questions I get asked about battery saws. First question is how long does a battery last? It lasts just as long as it needs to. That's the answer to that question. And then the other question that I get is will a battery saw cut through a pair of chaps?

And the answer to that question is no, it will not. Battery saws are designed that they have a threshold. And when the chain, when there's a resistance, that's higher than the threshold, the chain will stop and you can't cut your leg off. So the idea that battery size will cut right through a pair of chaps is a complete myth.

There is technology built into these chaps work, just fine against, or pants work just fine, as long as they're clean and well-maintained with no frays or no tears. So battery saws, chaps, great combination.

So moving to the next piece, PPE that we have, we're going to start talking about harnesses and we're going to go through the inspection process of harnesses, and we're also going to spend just a minute or two talking about what I find to be some of the most common flaws or faults and harnesses that why I would take a harness out of service when I'm looking at [00:16:00] competitions.

All of our arborist harnesses are, are becoming more similar in their design and functionality. The arborist harness evolution has been so massively. Fast forwarded that it it's hard to believe that for 20, 30, 40 years, we were all climbing on the same kind of old school, 40 webbing harness that did uncomfortable things to your body for the entire day.

And we're moving into these more ergonomic harnesses that offer options on how we work and function and work position, and really have opened up the doors and, and to functionality for us as climbers. Now, they becoming they've moved from. Classic four-inch wide webbing with a steel hardware to climbing on things like rope bridges, or having different sliding functionality.

So we have work positioning. So while we've moved them forward, they've also become more common to have wear parts. So they tend to have wear parts and we are having to replace parts more frequently than we did in with a classic harness. Classic harness I had could last 15, 20 years without anything going wrong.

And now I'm looking at replacing harnesses every three to five years. So first thing we want to do on inspection process, we're looking at the kind of the body of the harness. What we're looking at is what's keeping us up in the air. I have two harnesses here the tree motion, and then the Petzl. These are kind of the more common ones.

Most of the other harnesses are going to look very similar in their design and functionality. First thing I'm going to check when I'm looking at a harness. The first thing I want to look for is I want to make sure that all my buckles function. So as I'm looking over the harness, I'm going to grab each buckle.

I'm going to depress it, make sure the clips are working on either side, put the buckle back in, give it a wiggle and make sure that it's nice and tight. On this Petzl harness, similar idea. The buckles are a little bit different in their design and functionality, but still the same concept. What I want to do is I want to put the buckle in and make sure that it locks into place and I can't wiggle it out.

So I'm going to check if there are how however many buckles are. I want to check all the buckles. Next thing I want to do is I want to make sure that I have, I'm going [00:18:00] to check the webbing. So the webbing is what's really keeping us up in the air. So I want to make sure that my webbing is all intact.

There's not a bunch of damage. There's not a lot of frays there's not deformities or compression points on it. So I'm looking at the webbing. I start with my leg straps and I'm just going through all of the webbing points to make sure that I don't see any significant damage. My rule of thumb is if I'm looking at this type of webbing, if there's more than 10% of the surface area is damaged. Then I'm going to look at replacing that piece of webbing or replacing the whole harness. So if this is three inches wide and I have 10% of that three inches, that's damaged, I'm going to retire or replace that webbing. So I'm going to check the lower part of the webbing, and then I'm going to look at the body of the harness the tree motion's kind of nice from an inspection standpoint, because I can simply pull off this padding.

And that's going to allow me to see the webbing inside very easily. It also, this is the point where I find the label. So as I'm looking through my webbing and I'm going to make sure that I have a label, all harnesses have one. Here's the label on the Petzl. Here's a label on the tree motion. Now the label again is going to tell me it's going to traceability.

It's going to tell me what testing or what the standard is that it conforms to. So if you look at the back of this one, or if you look at this one, they both say that they're conforming to CE, they're conforming to EN, they're conforming to UL. They have ASTMs certification, ANSI certification. So this, this harness has been tested.

To meet criteria and pretty much all over the whole world. When I'm done with looking at I'm looking at my webbing, I've checked my to make sure that I have a label or have a tag is very specific, especially here in the United States. You have to have this tag, if it doesn't have the tag and it doesn't say ASTM on it, the harnesses has to be taken out of service.

So that's one of the inspection criteria for us in the US is it has to have a specific standard that says it means ASTM. And if the label isn't on the harness, then it's kind of like the mattress police that always says, don't tear this tag off. I don't know what happens, but it's bad. So then you got to take the whole harness out of service.

When we're looking at [00:20:00] harnesses, we've gone from buckles. We looked at the webbing. Now we're going to look at stitching. All harnesses have stitching what we call life support stitching. You're going to see it's either bar starts stitching, which is like this, or it could be a cross pattern stitch, but all harnesses are going to have stitch points.

The stitch points generally are going to be found near the upper D-rings or the work positioning D-rings. So I have this stitching here and I have stitching here. I also have stitching on my buckle and then when I I'm going to move down and I'm going to have stitching on my leg straps on the tree motion, the stitching is going to be hidden underneath the leg straps.

So you just pull the leg strap out and right there as the stitching, I want to make sure that all my stitching is intact. It's not frayed. It's not discolored or worn out. So I'm going to look, I'm going to double-check all the stitching. Common things that I find when I'm looking at harnesses, common defects or common areas of wear are going to be in the lower leg straps,

We tend to put a lot pressure against the lower legs and they tend to get twisted and bound and they start to wear out. So what we're looking, we're looking at these, these are common wear parts on a harness. You can see that this is my, this is actually my harness. And you can see there is some definite compression damage on this webbing, and there's definitely starting to be a little bit wear damage just from rubbing it back and forth from the climbing.

So, you know, every once in a four or five months, I have to replace the webbing just just what it is. That's the new design it's actually, you know, it's kind of a safety feature that's built in. Now we have wear parts, it's kind of like brakes on a car. Eventually you just have to change them. And that's what it is.

On this particular harness and this particular harness, we have rope bridges. You need to follow your manufacturer's recommendations on the replacement or retirement criteria for rope bridge. Some, some manufacturers say six months, some say one year, some say with you can go longer than that, depending on inspection, but you need to know for sure what your criteria for replacement is based on manufacturer.

From my side of the fence, my recommendation is if I'm climbing for six months, hard every single day in a production setting. I believe that after six months it's okay to replace a rope. Rope is [00:22:00] fairly cheap. These are like 20 bucks. So I generally don't like to go more than six months a year is kind of my personal max, but again, follow whatever manufacturer recommendation is, but please, please, please make sure that you're replacing this, this isn't designed to last forever.

The other thing about replacement of rope bridges is I want you to make sure that whatever rope bridge the harness came with, that's the rope bridge that you replace it with. So don't go, you know, just go cutting a climbing line and put it on your rope bridge. Don't think that because you, the Petzl makes this rope bridge that you should put it on your tree motion or tree motion Teufelberger makes this rope bridge, you should put it on your Petzl. Put the Petzl rope bridge on the Petzl harness, but the tree most rope bridge on the tree motion. And then make sure that you're, when you're looking at harness inspection, make sure that everything's lined up. There's not a lot of compression damage, double check your barrel knots make sure that they're inside there's enough tail sticking out the red marking on the tree motion is what indicates that and make sure that the, the lower D-rings the S the screws are tight.

On the Petzl it's the same idea. These lower D-rings actually have a small screw. Petzl will send you the Allen wrench for make sure that you're, you're checking these frequently. I would say once a month or so, just make sure that they're not working themselves loose and nothing's funky going on because that's really all it's holding you up.

And then when you replaced the bridge, make sure you're replacing it with Petzl specific design. So that's what I'm looking for on harnesses. And last but not least, I'm going to check the hardware on the harness. So the D-rings themselves, I'm going to just take and make sure that there's no. serious knicks.

There's no serious damage in the D-rings nothing that would damage my rope as I'm climbing nothing. That's going to cause a bad interface between any of my textiles or hardware. So I'm just gonna make sure that I don't see any visual damage. Make sure I rub my hand on it. Make sure there's no knicks or, or anything that would damage rope.

It's a pretty quick process for doing that. And then once that's done. We make [00:24:00] sure that everything goes back to the way it was looking, the way it was intended to look. And last but not least, then we want to make sure that the harness that we're using actually fits us and we have it adjusted properly.

So that way when we're climbing and we, if something does go wrong, it's going to hold us in place and support us in the proper way. So we don't actually get physically hurt.

Now we get to talk about one of my other favorite topics, which is rope or cordage. We use this a lot in the arborist industry. First things first, just make sure that the cordage you're using was designed to be used in arboriculture. There's lots of different rope cordage out there. I find people trying to pull ropes from the rock climbing world, or pull rope from the local hardware store.

And, you know, that's not designed for the forces or the applications that we're using them in. So we've come a long way in arboriculture with our options for ropes. So the couple of things that we need to know. You know, a rope is cordage that doesn't have purpose. It doesn't become a line until it has a job.

And so when we choose, when we make something into a line of rigging line of climbing line, we want to make sure that that cordage, a piece of cordage, fits that definition of line. And it's used for that application. Now, when we're looking at what we're going to decide to use for a climbing line or rigging line or whatever we want to, first thing we're going to talk about is kind of construction.

Construction lends itself to the inspection process. There's lots of different constructions of rope. There's six, 12 strand, 16 strand, double braid, curn mantle, you know, and all kinds of different jackets, structures and weaves. And so I'm trying to really think about what, you know, how do we simplify rope inspection?

And, and again, first things first, always go back to the manufacturer. I know Samson has a really nice app that you can get on your phone. If you're a millennial again, the app thing is perfect. There's an app for everything. You can look that up and it'll tell you there's really great criteria. You can go to the Teufelberger's website, any of those companies, they have the information on their website if you're not sure. But kind of my go-to process for looking at how I inspect rope is to [00:26:00] say that here's what it is.

There's two rules that we have to understand about rope. And once we understand these two rules about rope as arborists, we're going to succeed. Rule number one about rope is that rope is pretty cheap, right? It's not that expensive when you're talking about your life being held up in the air by this piece of cordage, then all in all it's cheap.

So rule number one, rope is cheap. Rule. Number two, when it comes to rope inspection for me is if I have to look at it for longer than four seconds, I need to buy a new rope, refer back to rule. Number one, if rope is cheap, go buy a new rope. Overall, a couple easy rules to think of about when we're talking rope inspection.

And we've got to realize how rope works, right? So rope works in a straight line. When we pull on a rope, this is how a rope wants to perform its job. And it's designed to do really two things, either to hold something in place or to pull something. It doesn't generate or work on its own. You can't push up a rope and it won't generate for us unless we do something to manipulate it.

So when a rope is being worked, it's worked this way, 360 degrees of the full circumference of the rope, every strand working together. So even by removing just one or two strands, we significantly weakened that section of line. Now, overall, the rest of the rope could be fine, but that becomes our weakest point.

So what we're looking for is we want to make sure that these fibers are intact and they're all working together to perform the task that's in front of them. So if I know the construction on my rope, whether it's a double braid or a 16 strand or a curn mantle, then that tells me which part of the rope is doing the work.

Right. And whether that's the core or the cover or the core and the cover working symbiotically together, I need to know what part of the rope is doing the work, because that's going to be critical to my inspection process. Once I get past the inspection process, I'm going to look at all the strands within a rope.

So I'm going to look at what I'm looking for. Is, are they cut? Are they damaged? Are they dirty? Did they have gasoline on them? I'm going to run my hand down the rope during my inspection process to make sure that there's no there's no bulges or lumps or flat spots within the core of the rope. I'm also going to feel for any glazing.

Rope is essentially [00:28:00] plastic. So when it gets hot, it melts when you add friction to it and heat, it starts to turn and starts to change its form. And I want to make sure that the strands are able to work separately and individually. So if a bunch of strands get hot and are melted together, the strands can't perform their task.

And a rule of thumb that I use is 10%. So if I have a 32 strand jacket, then I'm going to look for, if I have 10% of the strands damaged in a one inch area. I'm going to take the rope out of service. If it's a double braid 24 strand jacket, same thing. I'm looking at 10% of the number of overall strands counts.

And that's, what's the damage within a one inch section. I'm going to retire the rope. If it's just like my foot Ascender slipped and the rope is all puffed out. There's not a strand completely severed, but there's a large section of rope where it's over 10% of the entire circumference of one inch of rope.

Then again, take the rope out of service. Because there's so many options and so many choices for us as when it comes to arborist, climbing and working. When I just go back to the fact that if I have to pull it out and look at it for a couple of seconds, then I should probably retire it. If I have to ask somebody else, then I already know the answer.

If I have to pull the rope out and say, Hey, what do you think about this? Then I already know the answer is I should probably retire it. That's my brain telling me to do the right thing. Just go ahead and buy new rope. When we're looking at a couple of other things about rope from an inspection standpoint, I'm going to hold it.

I'm going to run my hand down it, I'm looking to make sure all the individual fibers are working together and I'm checking for splice the splices as well. What I'm looking for is the label on the splice. I'm also looking to make sure that it has some sort of stitching. I want to make sure that each splice has either a whipped black stitch or a pass through stitch to back it up.

And then I'm also looking to see if it's a stitch sewn on termination such as this. I want to make sure that if it has a plastic jacket over it or intended to have a plastic jacket over it, that that's not too damaged and the threads aren't exposed, or if it, it doesn't have the jacket, but it has that hard wax.

I want to make sure again, that the, the [00:30:00] stitching threads are not damaged or exposed. I want to make sure the eye is in decent shape and there's no core popping out. And then if I'm looking at a traditional hand splice, I want to make sure that my, the splice has again, has some sort of stitching. And then I want to run my hand down that splice to make sure that there's not an abrupt diameter.

Feel that splice all the way through the taper to make sure that the pass through was good. And that if the rope has a dramatic change in diameter, that's where the rope is going to fail. So I want to make sure I feel that to make sure there's no bunching in the splice and there's no there's no drastic change in diameter all the way through, and I can feel the tape or the tape.

There has to be a good distance of line down. So if it's less than six or seven inches, then that's not a very good splice. So I definitely want to look for that. The other soft goods that we use commonly in the industry is going to be some of our textiles, such as these such as one of these slings here, or where is it. There it is, or these slings as well from an inspection criteria when it comes to slings, I'm looking at just a couple of things.

What I want to see is I want, first of all, I want to make sure that it has a tag and the tag is legible. And I want to make sure that it's rated for whatever I intend to use it for. So I'm looking for the tag first and foremost, then what I'm going to look for is make sure that the stitching, if it is a stitch sling, like these two, that the stitching is in good condition.

I'm also going to look for severe discoloration. Here's a great example of discoloration from sun and UV damage. So this is starting to get to the point where I would consider retirement just based off the fact that it's lost a lot of colors, obviously been, had a lot of exposure to the elements. So it's probably significantly weaker than when it started. Life cycles, cycles to failure, span of life on this, you know, textiles can last a long time, but they don't last forever.

So if you've had the same sling for four years and you've been abusing it every single day, it's okay to buy a sling. Because once again, they're not that expensive. [00:32:00] So when I'm looking at, I'm looking at the stitching to make sure the stitching is solid, making sure there's a tag, and then I'm going to just run my hand on it, make sure there's no lumps or bulges.

And I'm looking for any kind of rips or tears. When you're looking at nylon webbing, such as this. If there's damage to it, there it's really strong in a straight pull but as soon as you start to do any significant damage across the grain, it weakened significantly and it'll fail very quickly. So if I have any damage going across the grain of the sling I'm going to pretty much immediately consider it for retirement because they're not that expensive.

So what happened? One of two things either they'll get cut and they'll start to fail this way. Or if you overload them, you'll start to see damage to the fibers on the inside. And what, again, there's really no reason not to retire them. The service life three or four years for me. And then what I'm looking for is any kind of significant damage and realizing that there are soft goods or just that.

And we want to make sure that they don't fail us when we need them. Another point and rope inspection, recording, and inspection. Going back to the term, the idea that, you know, rope is a line when it has a purpose, it becomes a line. Not all ropes are created equal or created for the tasks that we necessarily use them for. A great example of making sure we're using the right rope for the job is in when we're talking or discussing our rope bridges on our harnesses.

So for me, inspection criteria, any damage to a rope harness bridge needs is automatic taken out of service until it's repaired. There's been way too many stories of climbers falling to their demise based on the idea that either A they had damaged this and just couldn't find time to replace it, or B replace the rope bridge with some other rope product that wasn't fit for the purpose it was being asked to do. So when we're looking at rope bridge from an inspection standpoint, any damage is automatic retirement criteria. You can't just kind of have a little nick or a little bit fray just go ahead and replace it. It's 20 bucks. The other [00:34:00] thing is making sure that you're using the right cordage th that, that it's suitable for rope bridge application.

And that it's, it's tied and inspected correctly. Make sure that you have no lumps or indications. A lot of times, if we're running certain hardware on these rope bridges, you'll start to see where the rope starts to get memory or starts to get really deformed or defeated. That's when we want to know that we have to replace it.

So when you take your rope bridge and you rub your hands across the rope bridge, you want it to feel soft. You want the cover to move. You want it to be able to bunch up if it's really stiff and it feels hard. And basically the rope isn't relaxing back to its original state. It needs to be immediately considered for retirement.

That means that we've reached the end of our cycles to failure. A climbing line lasts longer than a rope bridge because a climbing line I'm using all the distance of the climbing line. I have 50, 60, 70, 80 feet of rope in the system at all times. So there's different parts of rope seeing load at different times.

I'm not loading the same 16 inches of rope like am with this rope bridge and when the rope bridge, because this is the only part of the rope in the system at any time, the cycles to failure on this add up very, very quickly. So we want to make sure that we're really monitoring this and sticking this on a hardcore schedule of six months or one year or following manufacturer's recommendations, but there's should be zero hesitation when you're inspecting this.

Any damage is too much damage. Last thing I want to talk about with ropes is how do you store or manage rope? Because this is my life. Literally. I wanna make sure that I don't coil it up and throw it in the bed of the truck and hang it next to the handsaws and have chainsaws passing past it and hard materials and sharp things going nearby.

It, I want to make sure that my rope is well taken care of. I want to keep it out of the direct sunlight. I want to keep it free from oil, away, from chemicals, away from anything that could affect it. So for

me, the best places I put it in a bag. I want to make sure that when I put the rope away, I put it away and it's not soaking wet.

If I applied in the rain all day, I want to make sure [00:36:00] that I hang it up and let it dry. I want to keep it out again, keep it in a cool dry place. Keep it in a bag, keep it contained, keep it away from chemicals and gasoline and chainsaws and all of those wicked cool, fun toys that we have as arborists. And you'll get a good long life out of your rope.

Now we're going to take a minute and talk about hardware and connecting links. As arborists we use a lot of different tools and, and again, our industry's growing and changing. So there's been a lot of new things incorporated in. Again, baseline, always go back to manufacturer's recommendations, but there's a few things that we have to have, and we have to know.

First thing, when we're talking about the connecting links, generally, what we're going to use and our industry is going to be either a snap or a carabiner. When we're looking at snaps from an inspection standpoint, you know, we want to make sure that it's rated for a minimum. Any, any life support PPE needs to be rated for 5,000 pounds.

So when we're talking about connecting links and hardware, your two D-rings have to be rated 5,000 pounds. This needs to be rated up to 5,000 pounds. Your carabiners, your snaps, everything that you're using to support yourself needs to be at a minimum per ANSI standard rated up to 5,000 pounds or 23 kilonewtons.

So when we're looking at this, we want to make sure that it's got some sort of rating on it. So we know that it's rated and, and intended for this purpose. And then we want to make sure that there's no deformities. There's no gouges. There's nothing that, we don't see any cracks or bent anything out of alignment. All the pins look good.

And we want to make sure that it's functional. So all of the tools that we're using as life support links and in our industry have to be what we call positive auto locking. And it has to take two distinct motions at a minimum to open or activate them. This snap. Again, if you push on the.

It won't open. If you push on just the back itself, it won't open. But if you squeeze both at the same time, it opens up and allows you to function it. That's a snap. More common in our industry is going to be carabiners right. When we're looking at carabiners, all kinds of different shapes, [00:38:00] sizes, colors of carabiners from different manufacturers.

So when you're looking at all the different types of carabiners, where you need to know is one again, they need to be positive auto locking. So it needs to take two distinct motions at least to get them to open. So I need an, and here's an example. I need to be able to lift it, turn it, and then open it all the way. When you're testing a carabiner or looking at inspection criteria for a carabiner.

What we don't do is we don't want to open the carabiner and let it slam shut. Cause slamming it shut, operates through centrifical force, which isn't a true measure of whether or not the pin mechanism is working. So what we want to do to look at our carabiners is quite simply, we're going to lift it up the gate, rotate it, turn it, open it, and then let it close slowly and activate itself.

Then we're going to do it halfway. And then we're just going to operate the gate on its own and let it swing back. So we don't slam it. We do one. Then half. And then just open the gate by itself. And

every time it should positively or lock itself closed again so that it can't come open. Then we want to make sure that it has some sort of stamp, some sort of rating on it, to make sure that it's compliant.

Not all carabiners are created equal, that's for sure. So make sure you're buying carabiners that are rated for the intended purpose of life support, because that's what we're using them for. A couple of other interesting connecting links that we have,. You know, we obviously we use a lot of pulleys and the industry right now, pulleys and blocks.

They come in different shapes, sizes, configurations, what we need, what we need to make sure is one that there's no damage to the inside of the shift. We want to make sure that the wheel itself doesn't have anything that's going to damage our rope or damage the surface that it's going against. We want to make sure that the cheek plates aren't bent, make sure that they're positive orientation.

Make sure it opens and closes. There's not too much play in it. We don't want a lot of play in there. Or force against the shift pin. And this particular PPE, this particular pulley is used very commonly for PPE. So we want to inspect all the connecting points to make sure that they're not damaged or cracked.

If there is an [00:40:00] event where this falls to the ground or is dropped out of a tree, we definitely want to take it extra, extra time to go over it and look at it, inspect it, to make sure that there wasn't any permanent damage from that event, because this is, would be considered PPE. Some of the other hardware that we're using a lot of, a lot of rope bridges are going to come with a ring.

The rings are common. One of the common tools use the connect or link into our climbing systems. So again, when you're looking at a ring, you want to make sure that the ring has some sort of stamp or rating on it. Make sure that there's no, no gouges, damage, nicks or anything that would tear up anything soft or rope that would rub against it.

When you're looking at some of the other tools that we have on our bridge. We have some swivels like this one. I want to make sure again, checking out to make sure that it's positively locked. Make sure once in a while you get your wrench out and tighten on this. Again, I'm going to look to make sure there's no fatigue or wear in the metal and make sure there's no cracks or anything.

Same thing with this swivel. We can see once you start to wear off, anodizing really doesn't matter. But once you start to fatigue or wear away the metal, once the metal starts to wear away, we're looking at five or 6%. If there's five or 6% of the overall circumference is worn away or damaged, we need to retire it.

And that's a pretty good rule for all of our hardware, but again, go back to manufacturers. So there's lots of different connecting links or tools in the system or systems that we can use to climb. We're moving as an industry, we're starting to see a lot more mechanical tools or mechanical climbing devices going on.

And again, so if I'm looking at mechanical tools or devices, first things first, I'm going to figure out what the manufacturer tells me I should or shouldn't do. Next thing I'm going to do from an inspection criteria. Here's the example of a zigzag. So this is a product made by Petzl. When I'm looking at the zigzag, what I'm looking at, I want to make sure that nothing is bent or out of alignment in the chain itself.

I want to inspect the chain from top to bottom, particularly paying attention to the [00:42:00] links on the outside because they, if they get sideloaded or stress, they tend to crack. I want to make sure there's no damage to the aluminum or the connecting links inside here. Make sure there's no damage to the inside of the swivel and make sure that it fully rotates and feels solid and in place.

There, it's pretty awesome. Most of these tools that we're using are aluminum. They can take quite a beating and they last a long time, as long as we take care of them and clean them. So the other part about it is maintenance. When you're looking at the mechanical tools, they do need to be kept clean and free of debris.

If they're not kept clean and free of debris, they won't positively grab the rope. They won't generate the friction that we need and it could lead to something tragic happening. Another mechanical devices becoming more popular, especially in climbing competitions or for just ease of use is the Taz lov2. When we're looking at the Taz from an inspection criteria standpoint, first thing I want to open it up, make sure that this spring lock is engaged and the screw is tight.

Make sure that it positively orientates itself. Make sure that the handle is in good working order. Make sure that when I operate the handle, the cam moves in the way that it's supposed to, which is what causes it to pinch the rope or release the rope. I'm going to make sure that my attachment point for life support is in good working condition and it doesn't have any damage to it.

And then I want to make sure that any part of this device that's touching the rope is and have any sharp edges or anything that can create damage to the rope. So when it comes to hardware, again, what we're looking at is retirement criteria is based off manufacturer. Most of these aluminum tools, the last a long time, they have great resilience.

As long as you take care of them, maintain them. Don't drop them. If you do drop them. And it's from a height that's concerning again, if you have to think about it or you have to ask somebody else, if this is okay, the answer is already no, right? Because you're, you're already admitting some part of your brain saying this was a bad idea.

And go ahead and run with that. Because there's no tool that we're using that is worth more than the value of the human life that's attached to the other end of it. So when in doubt, throw it out. It's really that simple. When it comes to gear inspection for [00:44:00] me and hardware is no different. Hardware, it, if it looks good, it probably is, but make sure it has full functionality before you put your life on it.

As always, test everything low and slow. And then last but not least, one of the things we don't do very well as arborist, is keep it clean and well-maintained. So any of these tools, if they get full of dirt, if it gets full of debris, it cannot function. It won't grab the rope in the way that it's supposed to. It.

Won't compress on the line and we'll end up having where the cam will slip or the tool won't function the way it's supposed to. So maintaining the tool and inspecting the tool is really important when it comes to our aluminum and connecting links.

So to bring everything wrapped up and kind of put a nice little bow on it, we're going to talk about compatibility and configuration. What we find is that most of our fatalities or serious injuries come from the fact that the gear is being, being made is good. Manufacturers are doing an excellent job of

selling tools to us, or building tools that pass testing criteria and are safe when used in the application, they intended to be used in.

Then we can think outside the box, as long as we understand that there still has to be a boundary somewhere that we have to play inside of a boundary. And so compatibility and configuration is when we look at how people are getting hurt, again, that's really caused by two things.

It's either inappropriate configuration or lack of inspection. Those are the two greatest causes of fatality that we have in the industry when it comes to gear. So inappropriate configuration and, and lack of proper inspection. So I want to get into that and I think to start off what we're kind of to tie it up really nice as a lanyard is a perfect example.

So if I take my lanyard here. My lanyard is a bunch of individual parts or components that have been put together to act in a system. And the system works really well. But what I got to do is I got to make sure that now that I've taken all these parts and pieces and shoved them together, when I operate the system, is it configured [00:46:00] well? And do all the parts line up to be compatible.

And this is a great example. So if I put my land here and I go around the tree and I load my land, do my carabiners stay positively oriented under load? Does my hitch operate and grab properly against my rope? Does do the parts and pieces stay in alignment? Does the pulley function the way it should against the tool that is being pressed against, against this prosc are all of these things occurring in the way they should when under load or when I'm operating it.

And then I got to look at well, does it work in all different configurations of operation? And do the parts and pieces are they made to be together? Is this rope good with this rope, which is good with this rope? Do they all play well together? Or is this rope not really intended to be touching this rope because of the fiber construction or the way it's made?

So I need to really look at how each, how each system interacts with itself and whether or not it has resiliency, an example or a conversation to have about lanyards. Here's a great example. So this is a Xeon made by Petzl. It's a great tool. It's a mechanical lanyard adjustment. I, I like it a lot. And when we're looking at orientation of this tool, it's designed only to be a lanyard.

It's not for climbing. It's not for, it's not intended to be a climbing tool. When I operate it, as long as I'm operating in this configuration where I'm going from D-ring to D-ring, this is what Petzl has done. They've tested this tool and they're saying it's safe to operate this way. It will support the load of a static pole in this configuration, but more importantly, it'll support the load of a static configuration, but only if you're using this particular rope, this specific rope is the only rope that's been tested with this tool and passed all the testing criteria to say that it's met a certification marker.

So right now Petzl has sent me a tool that's properly configured and all parts are compatible, but let's say I damage this rope. [00:48:00] And then I put in this rope instead, I've now changed the configuration because this rope isn't necessarily compatible with this tool. And it was never tested to be compatible. So yes, it might work, but it's outside what Petzl has said they are recommending for this tool to function properly. So that's when we start getting into compatibility and function. So here's one of my favorite examples of compatibility versus a configuration. So if I take this pulley right here, Got all this cool stuff hanging on me. Right? Perfect example. So when I take this Pentel pulley, it's a good tool.

It's rated for 50. It's rated really high for rigging light rigging. I can use it as redirect. I can use it to do whatever the problem is is when I take this pulley and I marry it to this carabiner or this carabiner, each one changes the functionality of the pulley. So when you're looking at these two compatibility wise, if I hold this up, this system is very compatible that pulleys properly oriented.

It sits in the bottom, right? Fit legs of the Becket are being loaded and across their access, just the way the engineers designed it too. But when I stick it on this pulley, because of the way this pulley, this carabiner configured because the length of the carabiner or in the nose of the carabiner you can see that the poli sits a little bit off center.

And when I load it, it's actually only loading on one leg. It's not loading on both legs. So that creates a problem where I'm going to overload one side of this pulley, this side over here, and this side, over this side, over here is not seeing enough load. And so eventually what I'm going to do is fatigue this side of the pin until it fails in the Becket and the pulley falls out.

So that not that this bolt parts are intended to do their job and they can do their job well. And they're rated and they're tested and they're certified and all that stuff, but they, they do not [00:50:00] function together. So there is a compatibility issue here that I have to be aware of. And that compatibility issue is potentially going to cause, could cause enough fatigue in this device that it fails.

Manufacturers have gone out of their way to design tools that are really well put together. Well, thought out if looking at these two tools specifically, we got the Petzl zigzag, and then we got the nice ISC squirrel tether. Now Petzl has built the tool with the zigzag plus and the chicane.

They have built a system. That is properly configured and works perfectly together. And as long as I'm using this tool with this device, there's no way for anything to go wrong. There's no way for this to touch the top of the chain to cause it to fail. And because Petzl has thought themselves out. They have designed this so that it holds the care carabiner or will stay upright and oriented properly the whole time.

There's no way the carabiner here can influence the chain. That's not tall enough to, and configuration wise, everything's going to stay in alignment and they've made it so that only this carabiner can function with this device, the chicane, and it's a Petzl carabiner. And originally I thought, well, that's kind of mean of Petzl.

They just want to sell me more carabiners. I didn't realize that it's an engineered solution to the problem by putting what they've done is they put a bump or a Ridge inside of this device right here on the bottom handle. And their carabiner is the only one that has an open nose. So when I put this in that bump holds the tool perfectly in line and upright so that it can't flop side to side and the carabiner cannot rotate down.

So it keeps everything, keeps all of this proud and true. So there's no way that this can engage this tool, which would cause me to fall. So if I want to use this tool on a stationary rope, a couple of things I need to do. I need to listen to Petzl. When they say that it can only be done with this device.

I cannot take this device and put it above this tool because they were not designed to function together. Even though they both serve the same exact purpose and they look similar in their [00:52:00] operation, they actually aren't operating the same way because there are engineered

solutions in here that solve problems that we didn't even know we had. Somebody thought of it first. Right. And so that's what it is. So as long as I'm, big thing, looking at maintenance and retirement process, and then the other thing I need to make sure is that what Petzl tells me about this tool is that it needs to be from a 11.5 diameter rope up to 13 millimeter diameter rope.

And it must be an arborist grade climbing line. So as long as I stay between 11.5 and 13 millimeter diameter of my rope, and it's an arborist grade climbing line, the rope will work well and function well with this tool at height. The other thing about compatibility and configuration, I want to make sure again, that my tools all stay in perfect alignment.

So when we're looking at like this tool, the zigzag the way that it attaches at the bottom, you should, we need to have a capture. Now, compatibility wise, the carabiner fits. The carabiner has rated, the swivels rated, everything works. But what happens is from a configuration standpoint, because this is such a large opening and it allows the Caribbean or to fully rotate.

If I'm not paying attention and I stand up and generate a little slack in my line, the carabiner could rotate into an orientation like this carabiners aren't designed to be loaded this way. Right. This right here, this configuration could cause a failure in my system because I've significantly decreased the ability for the carabiner to function and its intended form.

And therefore I could fall and die. So from a configuration standpoint, these two are compatible the whole system's compatible, but I miss one important step because during my configuration, this is an inappropriate operational function. So I need to, in order to have proper configuration capture this so that it cannot rotate inside of there.

And then when we're looking at how we build it, you know, we want to be really careful to make sure that we don't have anything that's outside a manufacturer's recommendation from a compatibility [00:54:00] standpoint. So here's one, if I take this beautiful tool, right, just the standard climbing system. What they've said is if I tie in, if I'm tying in this way and I'll just use a quick raft hitch here from a configuration standpoint, if I want to attach the end of my climbing line to the system, which is what it's designed to do to function. If I want to tie my climbing line, what the manufacturer has said is that it needs to have, if I want to set it up and misconfiguration, right where this is attached here, this now becomes life support.

What the manufacturer has said is that in order for me to operate it this way, I must have an eye splice on my line. I cannot tie a knot in the end of this rope because it is an incompatible situation and it's a misconfiguration of the tool. And here's why if I were to, if I didn't have an eye splice and I were to tie let's just say I were at a time, my favorite bunt line. Cause I liked that one. And it's quick. So what the manufacturer is saying is from a compatibility issue. Yes. My rope is okay. Yes. The knot is approved for life support, but when this knot sits too close to this, knot it can cause a failure in the system, which would cause me to crash and burn.

Right. So again, going back to configuration is almost as important as inspection and maintenance. So we've gotta be super certain that when we start putting pieces together, every piece we put in the chain is a potential weak spot. And so that's really what configuration is about is making sure we're, we're doing appropriate things with the tools and using them as systems and their built systems.

All the different components will interact the way we hoped they would. Another configuration issue is modifying your harness in any way. As soon as you change [00:56:00] anything on the harness, you've, you've stepped outside all of the testing that the manufacturer did to say it was safe for you, and you've modified it to a point that they cannot guarantee that it won't be bad anymore.

So trying to reconfigure your harness, a great example is a lot of people try to figure out a way to make their rope bridge adjustable, right? And they'll put a camming device. They'll put anything against your problem with that as the device that they're putting against was not used or intended to be used as a rope grab in that function.

And so there's a potential for failures. So when we're putting tools together, we want to make sure that if the tool has testing criteria or is certified to some sort of standard, we understand what that standard was. So that way we're using it and it's proper application.

It took me a while to realize that the most powerful tool I have to teach me about inspection, configuration and compatibility of my tool is the one thing that I threw in the garbage, as soon as I bought something new. And that's this the user's guide or user's instructions, right? And what's the first thing all arborists do.

And when we get one of these, either we leave it in the box and throw the box away, or we just throw this away all by itself. But this is the legal binding contract that the manufacturers put together that tells you what is the testing criteria, what, when to retire it, how to maintain it, how to keep it clean and how to inspect it.

And it also tells you what it was tested to. So this, everything you need to know about the tool is right here in front of you. And we, that's the first thing we throw away. So if you're like me and you have thrown it over your shoulder, what I want you to do is find yourself a millennial, get an iPhone, or one of those Android things have them go on the Google.

That's a real thing have having go on the Google and they can pull it up in PDF format. And then you can read the material and understand your tool.

I'd like, once again, say thank you for your time, taking the time to watch this video. I had a blast today. We covered a lot of ground. I just want to remind [00:58:00] everyone that this is definitely not an end all be. All this process is constantly changing. The tools and techniques are constantly evolving. So keep going out there and doing the research, making sure you're on top of all the tools and techniques that you're using.

I want to take the opportunity to say thanks to the ISA for allowing us to do this. This is, I feel like there's a huge gap in knowledge and information, particularly surrounding gear inspection. So I feel like this is something that was definitely needed for our industry. And once again, I'd like to thank Husqvarna for providing the funding for us to be able to do this, for us to be safe and go home safely.

We need to be doing this, the process and we need to stay on top of our gear inspection. So that way we can continue having fun climbing trees. Cause it's my favorite thing to do. Good luck, everyone stay safe out there. And I look forward to seeing you at the next competition.

Narrator : [00:59:03] Thank you for viewing the session. If you need the CEU code, please email conferencereg@isa-arbor.com. Please note that to receive credit for this session, you must have viewed the session in its entirety and submitted the CEU form located within the Whova platform. When submitting the CEU code, please make sure to submit the code in the format as presented on this screen.

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