Transcript 11.09.22

Steve Reinsch, and he is located in Nebraska. Steven is also acting as -- today's presentation is to the agriculture, and this technical note is a useful document for several concussions /STRA vacation practices And with that Steven, are you ready to begin. >> JENNIFER: Back in 2017, we didn't have documents on gravel surfacing, and first it was heavy code 561, and so I started to look at that a little bit and then we grew into other practice standards and surfacing, we did our best to develop some guidance document on that As anything all of these documents would be reviewed and update periodically and during ever five years you look at it. And so it's coming up on that a little bit. So I want to go through those the best thing that I can and the surfacing on the 16 soils that we refer to us as sub grade and it applies to these four contra version practices, with any kind of surfacing that you do out there. Access roads, trials and walkways and stream crossing projects. For today it follows the document, we will give a literature review and basically this is in the sub grade strength that is bearing capacity in the details that are just for review for you. And we'll talk a little bit Aggregate and the ago great components those are the surface sub grade. And we'll talk a little bit how we do a field investigation for the type of projects what is important and some techniques to make you feel comfortable with the conditions of your sub grade sort of speak. And then we'll get into the four practice standards ten then, access roads, the heavy use area protection, and a little bit on stream, or sub grade that you can do out there. Let us review a little bit and it's based on the bearing capacity equations, and what is that. It's basically like a shallow slope failure in a sense. And so these equations and there is other techniques to do it too but this is more of the generalized that most people follow. And -- (Indicating.) And the use of your sub grade and the bearing capacity factors, and we and pin it on the angel on the friction of soil and we'll go off in the parameters a little bit here. For most cases we are doing the sub grade rapidly. And -- it has these parameters for any soils I guess. You load it quickly and then when you have loading on it like for animals and things like that, you are

putting it an ultimate stress on the sub grade, and what your share string is doing when a soil is loaded or saturated and the pore pressure build up in carries the load. As things drain out your strength of the soil brains take over a little bit after it consolidate some and it continues. And so you get a fee and C in the share value. And C is really the cohesion of your soil and that is the measure of your cohesion sort of speak. And there is several test that I'll go into. In these situations it's undrained or saturated and your loading quickly everything on your bearing capacity go to zero. Your C goes to soil. And then your ultimate bearing capacity goes to your cohesion times your bearing capacity factor. So with Q all that this is the ultimate bearing capacitor, and C is the share strength for the soil or cohesion for the saturated clays. And so you want to put it in the typical share strength be question your strength here is equaled to your cohesion plus your loading times your TAN of your fee angel When your share strength is undrained you have it, right. Your share goes to zero. And so when your pressure takes on the load. And your soil grains are /KAODed and they have it for plastic soils. And so that is the overlying and you have any kind of wheel load, and you have a bearing capacity failure, and your circles are filling out ward, right. And so if this dark line here is your fabric and that can adjust the slope failure but that is really what is going on. So let me get a better view here. Can you see my mouse here okay. Here is your sub grade here of course. What is it, that is what your building on, sometimes you have to get it level and things like that, And the first thing is do you determine what elevation, or what is the base elevation that you are going to step self on. And so then you have to get rid of a little topsoil and organic matters and vegetation and things like that, and then you remove all of that and the sub grade continues and so you want to know how deep it is and the water table is and then you want to know the shear strength parameters of the sub grade. You can look at the other layers on top of it. You can use some kind of Geomembrane depending on the situation, that can be a sub base material. And right now your base course is the me I guess, that is what your measuring on all types of things or the gravel or Aggregate and how

deep it should and what is the size of it. And most of us want to circle cochlears, and some of it is comfort for animals and the drying surface and things like that. And so those are the basic components of the Aggregate system The next slide I have it in some words for you guys. Again, the sub grade is what your setting things on and so so this is the stuff that you have to investigate what it is. And what kind of cochlears or things that we need to do. And those kind of things. And it's the stabilizing materials in your system. And again your surface course is your top layer. Now again subgrade I want to get into the investigation of it and what it is. And once you get that graded out survey it out and know what the cut and fields are and measure down how deep that you need to go and it's a bearing capacity problem it's three to four feet and get a good idea what is going on. And if you want to know what the water table is you need to know outside mechanics and streams that could produce some uplift pressures on your system and things like that you have to design for. Again we move six to 12 inches to get to the elevation. And we and handle them at the end of the presentation for the questions. We'll get into the investigation of your sub grades a little bit here that your building on. If this gives us the idea of the soils for the area that you will do this work for 40 inches and that is the first step and so you know and what materials you will be working with however you may have soils in that area that you have a start date on that is a survey, or the construction records, and the near by projects and that is the first step before you go out there. And then it depends on the project specifics, right design and construction plans and mostly projects are the stabilized projects, right. And so I can deal with the materials that you have with it out there, and these are areas that you can steal from and what access for the equipment out there location and utilities, and environmental issues constrain s and things like that. Different types of crops in your region there, and the flood type of things. Now I want to get into the sub-surface investigation, six to 12 inches will be removed. What is the standard in engineering, US CS if they are described by A short term memory DEP 2488, and in the DEP classification is 248 seven. In your hand outs I gave you the flow chart for classification

of soils and we didn't want to get into all of those details but we can a little bit and remember in the US CS system you can have three main The number 200, it's the smallest, anything passing that is the silver clay materials and between whatever remains only 200 and it goes through the number four is sand based material, right. And anything larger than four is gravel, right. Number four is sieve, opening per inches. And there is the plot up your grade there. And in US C F, you have your /PHREBGSty of your soil, the P I, liquid limit, and I'll describe those in a little bit. And this cup leer if you can see my mouse, and this is what you will use to get to your liquid limit and what you will do is to take three to four paths of soils at various contents, And you will smear it in the cup that comes together. And so once it's done and you take it out you get a water content on it. You do that three or four times and there is a range of bowls that you will have stay within. And those are details to the test but I can go over that with you any time if you would like. That is liquid limit and you take one of the drier examples there and you start to role it out and once it starts the crack you boil it up again and throw it out that is your plastic limit. And you get your plastic index and so we'll talk more about that for Aggregate surfacing it's really with the gravel roads and things like that and And so you get into 35 percent of less, and passing 200 seven, and remember that is the, and that is anything finer in the 200, and also I should mention that to get the difference between the clay size and the milk size, and so you get the percent of plays in our lab we do -- (Indicating.) Internals of the as to, these are your number ten, and forty and 200 that is Sam size particles, and the reason that those are important you do your limits anything other than the forty and then you do your analysis anything finer than the number ten. And you compare that with your Civ analysis, you can tell if it's graded and things like that on the particles. When you get over here, f the one to seven here, one to seven here that is the classifications on them. When you get from four to seven, you get more silk. We'll move on here, field test I wanted to pull up a pocket -- or a tore vein, there is two types of those, and I'll show you those here a little bit. Those are some easy equipment that you

can do a test pit or something like that, or you can do it on the side or the test pit then you have the penetrometer. The trig type, is a hand one, you can do that and get a shear, a vane shear -- (Indicating.) These are good for the Aggregate things, it's a direct share type of you can compare it, too. And so then you have heard of the standard penetration test and the cone penetrometer test but there are some hand ones that you can get, too. This reads your shared parameter directly and then I give you the sub parameters here that I'll show you later, too. And it's soft and it gives you the share strength for that, and it's soft, and some share strength that you can use or a range of them that might expect based on the soil consistency of the materials to now go over that here too a bit. On a torvane, what you do is you get how soft and firm what your in to and you can use the different size vanes, and you have the death of blades and the test of vertical pressure, and you start turning the nob, and after it fails and it will snap back and it will just read the strength right off the gage. Here is a pocket penetrometer, when I was in the field I would carry one out every time I would go out in the field and use them where I can. It's amazing once you use them that you get a feel for them. The pocket penetrometer , and it's a pocket strength that is what you get from it. If you see the little line here, and put it on a flat surface again, and you put it, and push into the soil down to the line and there is a spring in there, and the little ring once you pull it out you get undefined compression strength. It's measured in times square foot here, and it's a 2000 PS F, you divide it by 144 and it's 13 point 9 and then you have your share strength is Q compressive strength divided by two. Now you can get a little more sophisticated too, and so you have to get it on the soil sample and there is different ways to do that in the field if you don't have a lot of equipment and so forth. That will go over it. And it's the same thing and you get a slug of it and so you have to make sure it's saturated in the lab, and you put it on your boards and you saturate them in there, and once it's saturated and once it's close to saturation, based on the strength that you're applying, here you get it in this case it's 125 PSI and you divided it by two, square foot in this sample. We can get fancy here, and so you have

though stress here, and so you can have the strength and you can go over those a little bit and it's a visual that you have the three examples and you put the different pressures on them. And that measures what your pressures in the field that is going to be seeing you. You put the middle on it for load, and the one higher and lower, and then you develop the more circle failure curve, and if it's of your C value, right that we have talked about. Just a close up of oneover the machines, with a dry cylinder or something like that out there. And I just went over the test earlier, and these are the different types of shear test that you can use. And what you do here is that you don't allow it to drain and you load it and not allow it to drain that will measure the shear strength the pressure takes over the strength. And so if it's a long term analysis, you can do saturated test, and you start the test and add additional load to failure. And you can run a consolidate drain test here that is a C DEP test. That is in a bind rain soil that will take a long time because your draining it. The better way to do is to do the -- then you do the total saturated stress, it's a web condition and vector stress is more of a dry condition if it's under the water table it's pore stress, and you get both for both direction s. Direct shear, you have those to and what you are doing is taking an sample or a remodeling sample and your putting it in apparatus and you are moving it both ways until you are determining where it's failing, and then you run it where it fails. And I mentioned some of the field test earlier that you can use. It's a condition here where for undrained conditions you have a more circle here, you have your confining pressure and your vertical pressure, and you have three of these. If it's undrained test, this blue line would be straight across here. Your sub grades as a certain share strength and as you are loading it these circles get bigger and bigger to failure. We'll get back to some estimates in a little bit and I mentioned the soil consistent say, and we'll go over that a little bit too, and the saturated consistency is what you're talking about if your soil is a very soft condition, you can use your thumb and penetrates and push it in, and it also corollates here with the values, and 60 that is corrupted values that you can use based on your equipment and techniques based on

what you're using out there. Then you go out in the soft and medium with the thumb then when you get to it you can't penetrates it with the thumb and it's very stiff and it's a thumb nail and if it's hard you have to use a knife and you have correlated of the shear strength with that. There is some other ways of determining the saturated consistency with the correlated shear strength. This is one way, if you have some lab data, and you have liquid limit and the P I even a unit weight and if it's a saturated condition, then you get a saturated water limit. And again your classical limit, it's normal /-L al liquid lemon P I in your report. And get back to the P L and minus the P I, right. Plastic lemon is not, is where you role it out, and it starts to crack in the moisture content and it's the number of blow that you take on three different examples you pick it up at 25 blow and I mentioned that earlier that is liquid limit and you plot the three and they should line up pretty good hopefully and you pick up the water content What you can do here is that this is not a pour were point what you can do here is draw a little line diagram here. And you have your plastic limit and liquid limit and you measure it off So you have one, two three between there, and the segments. Then you have plastic limits, and it's right under it. And so you have your plastic limit of the right or left of the liquid limit you cut around it it's soft and then around it it's in the immediate, right What you do is established your content water on the line graph so whatever the water content is here again for saturated deposits, you can get the water content and you compare it with it. And for unsaturated deposit, you have to get a sample and do it, and develop that. And assume and have a lab, and you know where the GS is, and the whole sample is soil mineral it's a relationship to water. And so a lot of times it's between two appointment six two to 75 ish, and if you have a determined dry density and you get the saturated content by the equation here and so you have to have the dry weight of your sample one over the GS times one hundred. And you have to go over a quick sample here. You have a liquid limit of I use that because a lot of times that is what the lab will get, if you need to do it you just multiply it by 6/2 point four you will see it in the equation. And you will see it for this

or run a test either way. So you start to construct your aligned diagram here -- (Indicating.) So it's 23. So you need to develop a water content for this, right. It's unit water divided by the weight. (Indicating.) And then it's 79.9 cubic foot dash -- (Indicating.) So it's a medium consistency 41 percent right dead in the middle. So what do you use, you can go in here and you can see the blue arrows here it's between 500 and a thousand per square foot. What do you use, do you use 500 or a thousand, do you look at both, and see what it gives you a little bit in terms of your layers that you might need or the thickness of your gravel surfacing or things like that. If you think that you need to and you go over it more of your soil investigation and send something to the lab or you use it in the pore vein and your pocket , and the heavy use area in the corners in the middle and the area that you have some loading and things like that. This is pretty, you are not going to go to this extreme on these types of projects this is a dam project that they are carving out of a chest pit and the things that you can do here. You have to have some kind of a container or a box in the old days you get a copy of the metal containers, it's all plastic now, and you have the car goes into the example of the field some times. There are things that you can do measure the top and bottom, and the elevation in those types of things before you send it to a lab or do it yourself You have your sampler and you can put in this clear sleeve and a lot of people use it in the liners and use it to us. You pound it in the ground and in the example here. And if you have a microwave and you might drive your co-workers nuts one in the office. There is moisture methods by doing moisturing contents. But you can get a dry density with this. And then I mentioned shell by tubes this is pushed into the ground here. And you see the back whole here a bit. And there is some creative ways of doing it this contractor put a little sleeve in the tube in it and you can kind of screw in. And you have the test bits and most are going to be shallow, with down to three or four foot, right these are construction and inspection equipment and get an in direct measurement of the density and this picture is the sand cone apparatus and the field density test and that is the dry cylinder that is similar to the cylinder that I said

before, it's bigger and different We have a class, in the fort worth lab, we have two, the one I set up here in Lincoln, but we have a lab down there to that we run these different apparatuses through. And learn about them and things like that. We want to get a heavy use area here. How are we doing on time 12:49, okay. If you have it and the vehicles like that. So we'll go over that kind of stuff. Design of heavy use area, and the components those are the layers I was talking about and the subgrade, the sub based and the surface areas on top of that. So let's see what you need there. What you do here this is the steps I guess but on an Aggregate pad on the assigned procedure for the project. Including the animal types and the types of vehicles that you will use, and you determine your design load, before cited, and I talk about the field investigation in the four document. And you determine the strength, and again you see that document and you see it on the soil, and any way to estimate on the shear strength of the soils, what you do is you get your permissible -- permissible Indicating. Without a Geo. Textile -- your permissible stress can be higher. (Indicating.) So what I did here this is table seven, this is all in the document this is the undrained share strength table and I multiplied all of those by two point eight and with the Geo. Text tile, and what we did was get a rough idea of a cows, horse and when they stand up, on a low they might have on the ground based on horses based on your permissible stress it gives you a rough idea of your ago great base that you might need. You can see as you get up in your strengths, you may not need, you may need six inches of stuff in the Aggregate if it's six inches or less you can go to the material that is compacted with the densities that you might need that fits right. This is a CVR of 80, of volume or weight that is on this material. If you can get that with the different types of gradient then good. That is how you determine the thickness. (Indicating.) Between two and a half and three, or three quarters inch. The base course can be compacted and this can be a accomplished in the track or, and expect the type of approach. And then again you have to be well graded materials, what that means is that you have to have a variety of different size particles in there, you can have some finds,

you can have up to ten percent finds, this is the general that you want to get and make sure that your within between if it's graded nicely within that, you get a nice compaction -- and we do have a document that is in draft status -- okay. You have the two layer system, the less you need the less that your shear strength are over this. And the two point eight and the two point eight again and so you go further here -- and you don't need this and this is a strong foundation, you say 2000 and with the capacity that you try and design it, too. And you did tell them of the pad the surface area, if you have two and a half to three points base cochlear and you have the existing subgrade and the surface cochlear and generally what I see the three inches the to number 200 with the ten percent finds that is anything finer than the 200, right And so you have the saturated soils in the foundation, right. And so you have the water run over them. And so this is kind of an approach for this and you go through and whatever lading that you can see out there or the animal that is used out there. And then determine the subgrade, and share field test, and lab test, generally like that once you have it, you have it from nine to 18 inches. You get it in the corners and the memo of that, and you compare that Okay. On these I only use. I think that you needed some of this, and needed for that. And geotextiles are really nice -- (Indicating.) So with the geotextile once you are out in the banks with the saturation maybe you can get away with the geotextile in those areas of the crossing, just something to think about And so with that can be used it may be a similar type of loading. If you have bigger loading s, you can have it when you get to the access roads you can use the type of tables to determine that. So then you have it out of the stream bank, you have your slope of your channel. And you have your pool bank and if you something and it's the stream crossings are in the bank and if you have it higher and there is some other information in the stream banks ability documentation, okay. Do we have any questions, if you have any questions, we'll get into unpaved roads. We didn't think that we would go through the whole two hours, but we have 47 minutes we'll have sometime for some questions and have you here. For unpaved and access roads, I have been involved

and we'll get into. So this is an easy, there is three different methods in there and I was picking one method or the service method to use here, you simplify it to fit, or you don't have the access roads are heavily traveled You select the appropriate value for the capacity value. And that is geotextile or not. Or you look at both to see what is most efficient and cost effective There is different tables and things like that, and steward from 1977 that is used from there it's an older document a little bit. And this is based on your load, and then your permissible stress and you come up and get your thicknesses, and then the permissible stress is the ten, and then you have a ten thousand pound access loading and then you're talking about somewhere in the 25 inches category and the material. So you're talking very soft materials here, aren't you? You get some typical pressures and things like that. And you upload the pressures things like that. Choose the best alternative on the Aggregate -- (Indicating.) Then the frequency of the factors is comparing -- Design. That is your hard Rock well graded material that you have, it's a C B R on a 55, 55 divided by line by 80 and than you divide the depth by the factor the term is adjusted and you increase it based on that material there is the alternative in the use of the materials you request the hard rock we'll go over this in the end. And you measure it there, and everything is then you divide you are using, I don't know the complete sand or the sample and so that is what the charge is used for. And then you have undoubtly have to increase, and then you have to use it quite a bit, and you have to increase, if it's 22 thousand passes or more, and then you increase it by eight percent or 19 that was five thousand and then thousand, and that is you increase it by two percent. The term Aggregate starts out as bedrock -- (Indicating.) And now Aggregate includes combinations, of crushed stone, gravel, crushed or sand or other materials, okay. Now I agree, it's kind of a combination of a lot of this stuff and usually crushing and processing are the approaches to go and the crushes breaks the stone and the gravel into smaller pieces and then you process it through the different Civs that you need. And there might be some standard ones out there and you may want to get the different ones

they developed out there to make it more cost effective. And grid rolling means that your crushing it in place and the rock sources include native materials or aggravated hauled from pits You can use that but you may need an equivalent say factor if that is what it is and if it's a sub based or a surface course and things like that. And again, ever thing should be well graded or desirable and you can get more density if you have a lot of the same size particles that is poorly graded and you will have a lot of empty space volume you will have a lot of mix and get a nice type of density. And then there is different and you can add different improvements to it and binders and it's the clay materials are added I didn't go into real detail in the document but there is some more information on that. What I didn't go over and that is in the document that is maybe if you want to a proof it in the sub base material, and you can maybe take the material there and you mix it with lime or cement and lower the P I in the material, and so it's desirable and become packed so it's 95 % of standard proctor or something like that And you use that as your sub base You may want to put a Geo. Membrane or Geo. Textile in that case. And there are things like that is in the document Now I want to go over we are having trouble with this, and this is just an explanation of this and this is a grade /TKAEUGS here, (Indicating.) So what did I say 12 % finds, let me get my little guy here. 12 % passing and so that is fives, right. Okay. What that 12 percent means if you can clean the standard gravels, right, you get up from five to 15 percent and you do a classification, right. And so if it's a gravel based it's like a G W. Well graded, and a G L and so that type of thing. And so you have 12 % in there, and so you have a 12 % of gravel here, and let's go with the sand first. So the number 200 and so you subtract 12 from that and that is an error there and that is 46 minus 12, and that is 34 percent but you have more gravel right. Because you have 54 percent gravel, right. Because it's 46 minus one hundred, right. One hundred minus 46 that is 55 percent so it's a gravel base soil. You needs these factors here to determine it. Right. And so what we'll do here is that first it has to be a C U that is the DEP 60 and that is 12 point seven roughly. Divided by the DEP ten and that is the DEP

ten is about point 032, right? Right. So it's greater than four. And so it's a greater equation and you can't see on this good, right. And so it's a DEP 30 squared and -- (Indicating.) And it's both C U requirements and you see abroad mom materials cross the spectrum of it and porely graded and it can be straight up and down here or a straight angel, of course, and so you want whatever that you can pick. Okay. Does that make sense. Because there is 12 % that is where you get the GM material Okay. I'm ready Eric , or Jennifer for answers or questions. And thank you we do have several questions in the chat, we are going to try and group them for broadly speaking. Do we have a question, does the Geo. Text tile in higher velocity streams make it so that it can take out the Aggregate more easily So you have to use some details and use some standard drawings on that and see if I can dig it up. Okay. And then similarly we have a question here or I guess a comment we have location where ago great kept pushing into the stream bed with Geo. Text tile fabric later to determine a Geo. Grid would have been a much better support solution. And so I guess that leads that Geo. Geo. Grids to the debris as well, do you have any rules of thumb or recommendation about when or how those should be used. >>SPEAKER : Geo. Grid would be a more approaching force instead of a geotextile and I don't have a rule of thumb where they would go and they would be based on the share strength and things like that and what size and how extent Civ your geogrids need to be. Do you have any recommendation for stability for -- Reading. And it's a chicken and egg approach you kind of go up. And first you start with there foundation a little bit and then you see what you need and need larger material for the, and so you don't have the rock strength and so you size that and probably what you do is whatever controls I guess that rock would control and then you would grade it down based on the D 50 is a lot bigger and whatever is controlling does that make sense. So we have a couple of questions specific to the /SHRAEUDZ in the presentation. Slide number 65, I believe that is on the access road sample is the number of passes on slide 65 per day and that was the slide that you were recommending in the price of the Aggregate. >>

PRESENTER: I believe it is per day The in channel slope, if it's out in the floodplain then it's still the channel. Okay. And in the unpaved road sample at the end of the presentation you used the Achilles denominator C B R a couple of times, can you explain what that is again. And how it relates. >> PRESENTER: We don't use it very much the terminology in a lot of the road. C B R is in the heavy type DOT throughout the country. It's a penetration test. You have your material and you have a little cylinder that looks like an action mold, that you mold it in different densities and it's five layers of 55 and you get it into the density and you compare it to the hard rocks correlation of 80 and that is where that percentage comes from. If that makes sense? >> PRESENTER: Eric , for stream crossing is better. >> PRESENTER: The top layer is something fairly large, that is the stone that you will warship. Okay. Thank you. >> PRESENTER: The waste storage facility standard 313 there is a table about presumptive allow amicable foundation lateral foundation, and the question is how does that compare to Q ultimate. >> PRESENTER: Training too on some topics we have a slope stability training and documentation, and you can And Jennifer, back to you >> PRESENTER: Jennifer. >> PRESENTER: On behalf of the US DA, a thank you to Steven agriculture and technical resources conservation service, I wanted to say thank you for Steven and Eric on agriculture technical notes third and thank you again to everyone in today's webinar, participants thank you again, and don't forget and please reply to the open browser, and your conservation and this is the conservation presentation. This concludes our webinar