Ergonomics Research Techniques

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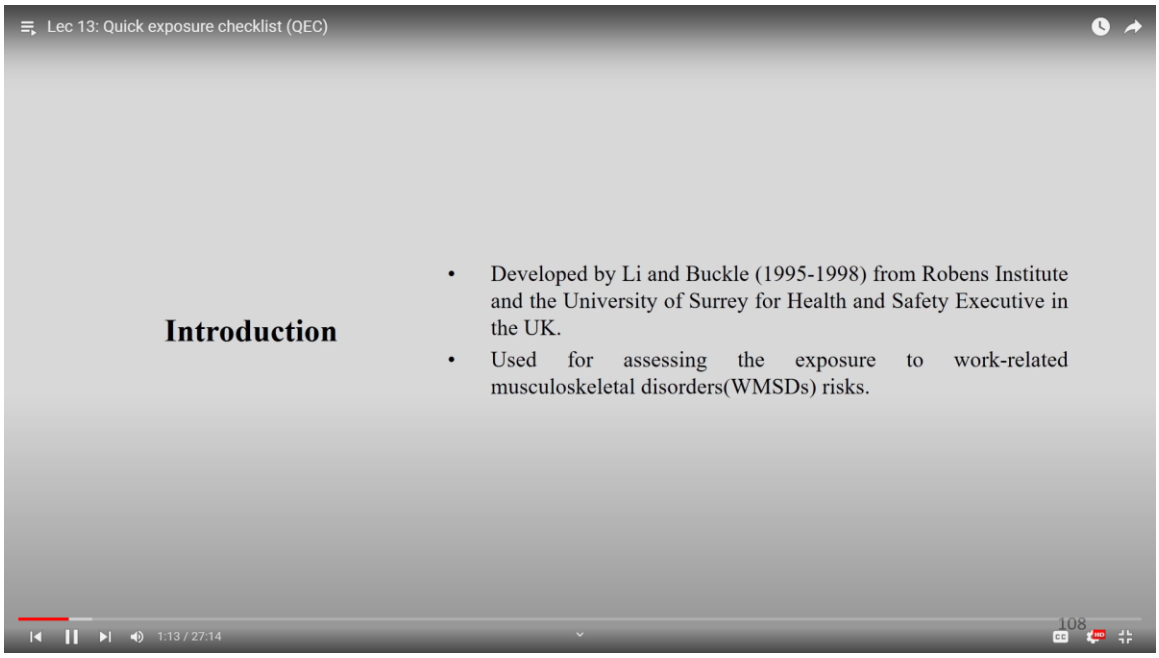
Week – 03

Lecture - 13

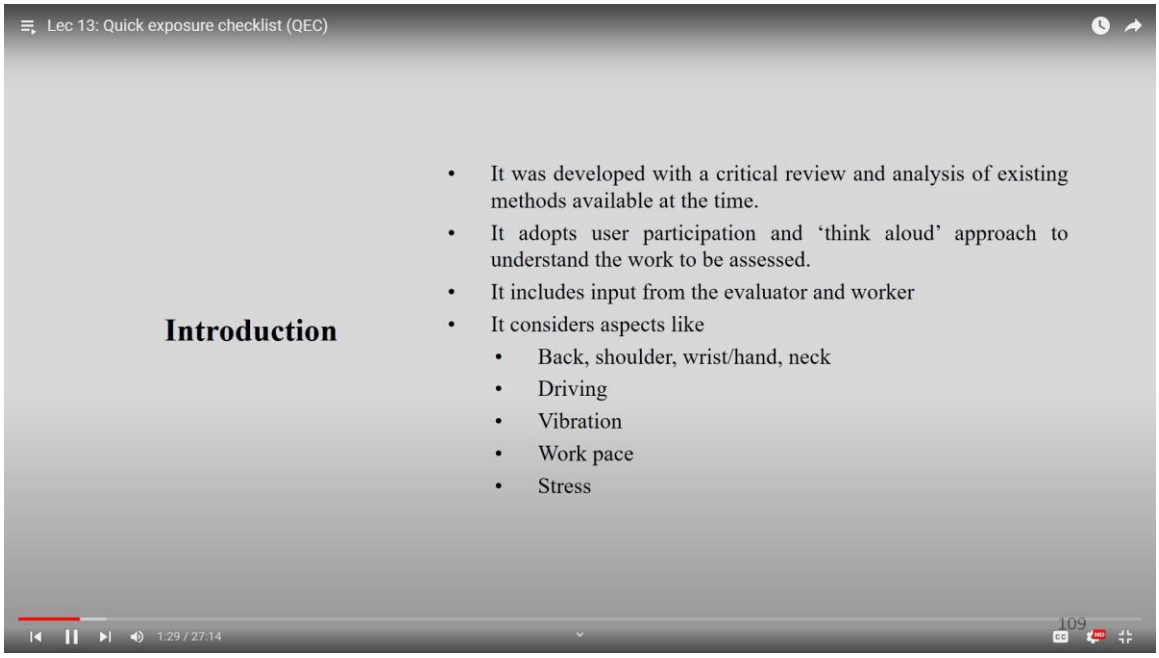
Lec 13: Quick exposure checklist (QEC)

So, we will take you for one more tool today again that is the quick exposure checklist and I am going to start it now. So clear about this particular tool. Now moving to next method or next technique which is again going back to your posture assessment related to your posture assessment. So this the name of this tool is Quick Exposure Checklist, we call it QEC. So let us understand a little background of it.



So it is developed in 1995 and 1998 that particular period.

It is given by Li and Buckle and used for assessing the exposure to work-related musculoskeletal disorder risk which is connected to posture. So it is this particular tool was developed with a critical review and analysis of existing methods available at that time. So you can see the time span in 1995 to 1998.



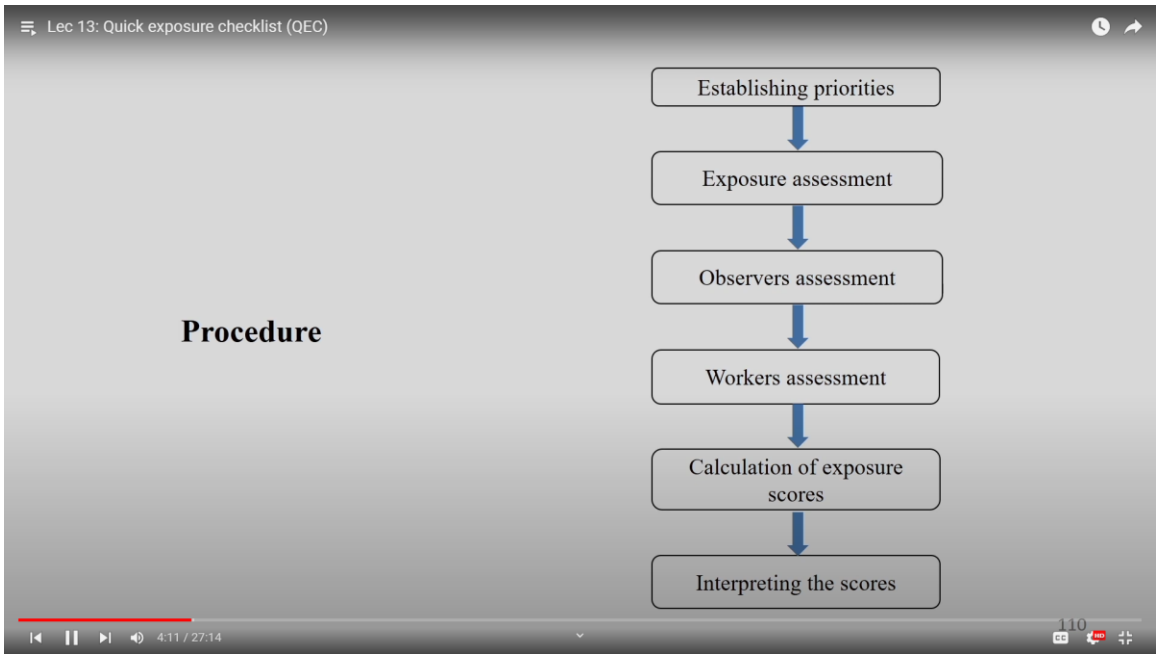
So those days RULA was present, OWAS was present.

So whatever other method posture evaluation methods were present from reviewing that this particular tool was developed. So it adopts users participation. Here it is very important in RULA or any other posture evaluation tool, you do not expect that participant to participate. The subject will participate. You are only the observer, you are only the collecting the data.

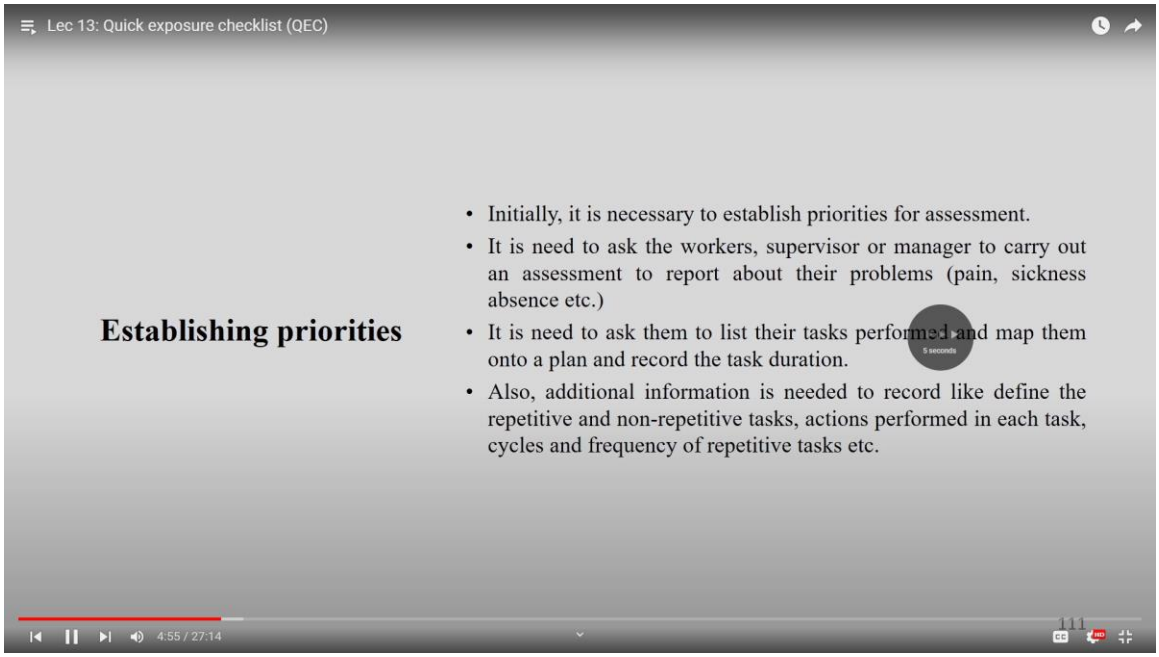
But for this case, you have some scope where you are involving the participant. And think-aloud approach to understand the work to be assessed. It includes input from the evaluator as well as the operator and it considers back, shoulder, wrist or hand, neck, then driving, vibration, workspace, and stress. So so many factors, it is not about the posture. It talks about your vibration, it talks about the surrounding like work environment.

Also, it takes care of, try to take care of your stress level. So some kind of psychosocial factors right. So it is quite useful in that case. However use of this particular tool is little restricted as per my understanding and as per my experience because it is little complicated and in some cases, the posture evaluation is little exaggerated. The values are little exaggerated as compared to other tools.

So some researchers prefer to use it, and some researchers do not prefer to use it. Now it absolutely depend what scenario it is and where it is being tested. So if you want to use it, first you get the validation that this particular tool is useful for your case or not. If it is useful, you check the data, do a pilot study, and do the validation. Once it is, you find it is yes, it is validated for your situation, then you can use this particular tool.



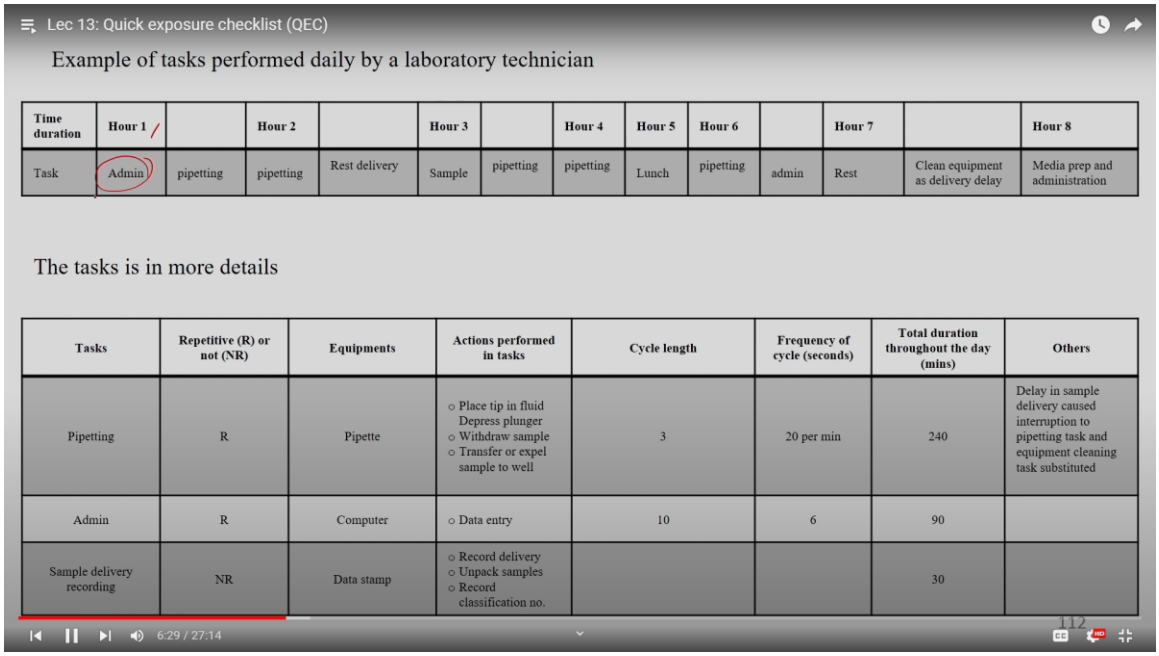
So this is the procedure. So establishing the priorities, so from the whole set of task you have to establish that which task you are going to analyze. So you have to give a grading, exposure assessment, then here two thing, one is for the observer's assessment, another is from the operator's assessment. Then calculation of the exposure score and then you are going to interpret that particular score.



Very similar to whatever we studied earlier.

So how do you establish the priorities? Initially, it is necessary to establish priorities for assessment. It is need to ask the workers, supervisors and manager to carry out an assessment to report about their problem. So maybe you can use here NMQ or DMQ or somebody discomfort mapping so that you have an idea yes, there is some kind of body discomfort or sickness or data from the absentee like your roaster cycle that you can use it. So it is need to ask them to list their task performed and map them onto a plan and record the task duration. So first you will do this.

Also in additional information what is needed to record like define the repetitive and non-repetitive task, actions performed in each task of one task in that what are the small actions, cycle, cycle time, frequency of repetitive task, and so on. These are the information you need to collect before you set the priorities. From these only you are going to set the priorities.



Now let us take some kind of example. So here you can see in a particular laboratory technician suppose it is a particular job in that case what is happening what so first one hour the person is doing some kind of administrative job then pipetting.

In the second hour again he is continuing with the pipetting and rest the delivery. Maybe on the third hour, he is doing the sample collection then pipetting then pipetting then he is giving a pause for his lunch one-hour lunch break. First, four hours he is working, and then fifth hour he is taking a break for lunch. On the sixth hour again he is doing pipetting then some small admin work and then taking some kind of rest, cleaning the equipment and maybe there is some kind of delay so he is waiting, and then media preparation and the administration he is doing at the last hour. Now once you see there are so many job one major activity is admin and pipetting, some cases sample collection also.

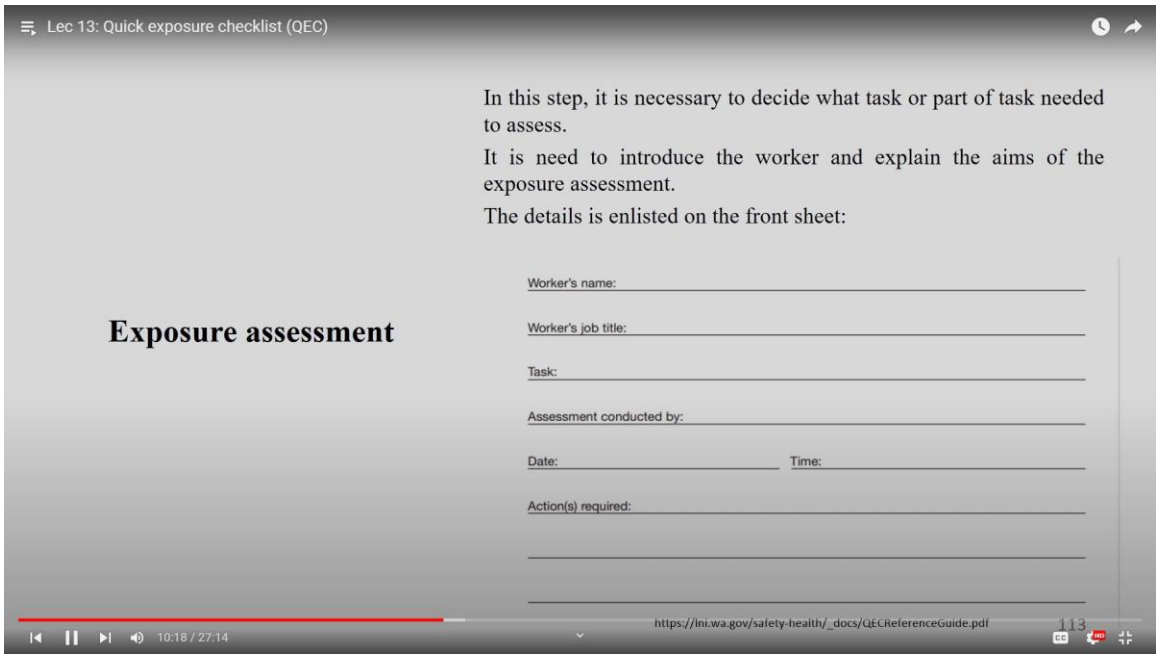
So this pipetting is the major job that you find while doing the whole day analysis. Now let us say the next step. So the task is in more detail that you have to find. Now for pipetting what you are doing? Is it repetitive or non-repetitive? Yes, it is repetitive. What kind of equipment they are using? They are using you know what pipette.

Now action what is required to do? Place the tip in the fluid you know depressed in the plugger, withdraw the sample and transfer or expel the sample to a particular place or particular well. So this they are doing. What is the cycle length? Maybe you can use this as the three-minute and frequency of cycle in second that is 20 times per minute he or she is doing the job. So total duration of this pipetting job in a whole day is 240 minutes.

Maybe some cases there is a delay in sample delivery, cost to interruption to the pipetting task, and equipment cleaning task may be substituted.

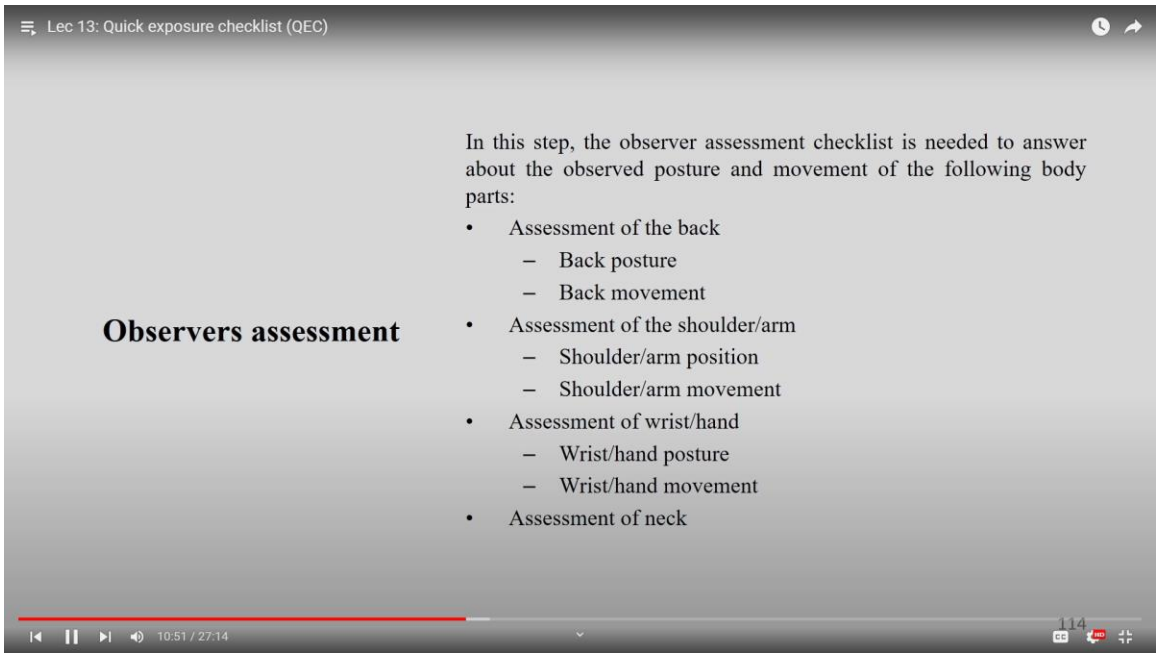
So you are doing the detailing of the whole pipetting job. Now similarly you can do for admin, you can do for sample delivery, and all those things. Now for this particular laboratory technician task or job, you can see pipetting is a major task which is causing, is taking a lot of time in the whole day shift. So let us analyze it. So it is very clear how you are going to select.

You are not going to select the admin job. You are not going to select the sample collection job. You are going to select only the pipetting job because that is going to take a lot of time and it is having repetition, it is having small small tasks involved in it. So you have selected one particular task.



Now this is the method like this is the standard form that you are going to use.

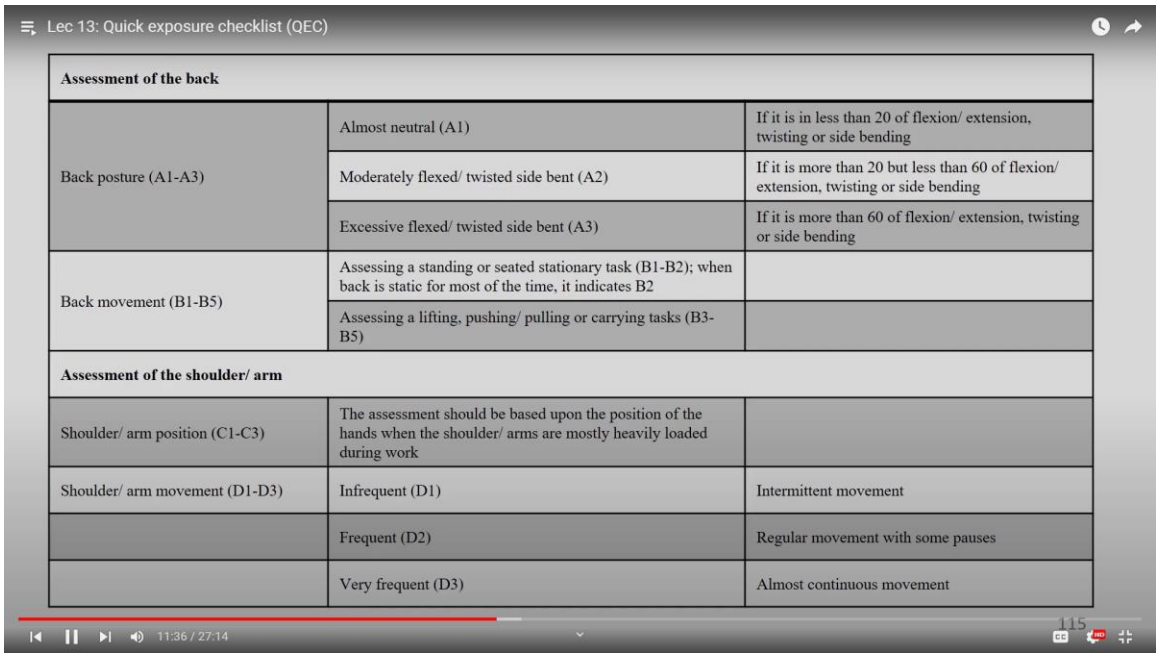
So worker's name, job, task, assessment, who is conducting this assessment, date, and time, this is the standard procedures. So in this particular step, it is necessary to decide what task or part of the task needed to assess. It is need to introduce the worker and explain the aim of the exposure assessment and you can use this particular form to note it down.



Now next step is the observer's assessment. In this particular step the observer assessment checklist is needed to answer about the observed posture and movement of the following body parts.

So assessment of the back. Here in assessment of the back, you have two variety. One is back posture, another is back movement. If you recall any other posture assessment tool like RULA, REBA, or OWAS we only talked about the posture, we never talked about the movement. So in QVC, we are talking about back posture as well as back movement.

For shoulder also shoulder arm position and their movement. Wrist also wrist posture or position and the movement similarly for neck.



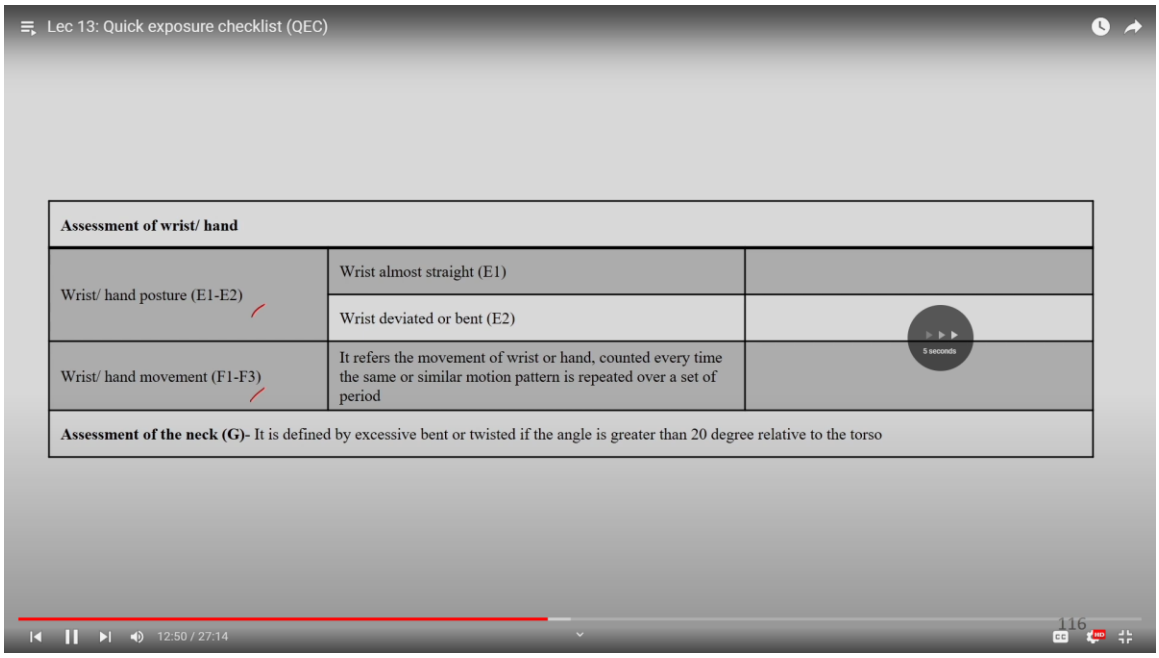
Assessment of the back		
Back posture (A1-A3)	Almost neutral (A1)	If it is in less than 20 of flexion/ extension, twisting or side bending
	Moderately flexed/ twisted side bent (A2)	If it is more than 20 but less than 60 of flexion/ extension, twisting or side bending
	Excessive flexed/ twisted side bent (A3)	If it is more than 60 of flexion/ extension, twisting or side bending
Back movement (B1-B5)	Assessing a standing or seated stationary task (B1-B2); when back is static for most of the time, it indicates B2	
	Assessing a lifting, pushing/ pulling or carrying tasks (B3-B5)	
Assessment of the shoulder/ arm		
Shoulder/ arm position (C1-C3)	The assessment should be based upon the position of the hands when the shoulder/ arms are mostly heavily loaded during work	
Shoulder/ arm movement (D1-D3)	Infrequent (D1)	Intermittent movement
	Frequent (D2)	Regular movement with some pauses
	Very frequent (D3)	Almost continuous movement

So this is the detail of your assessment. So there is some kind of numbering. So back posture you will get the answer from A1, A2, and A3.

So this is the description of A1, A2, A3. For back movement B1 to B5. So here you get the description of it. For shoulder so back posture is A1 like A denoting by A, back movement is B. Shoulder and arm position is C to C3.

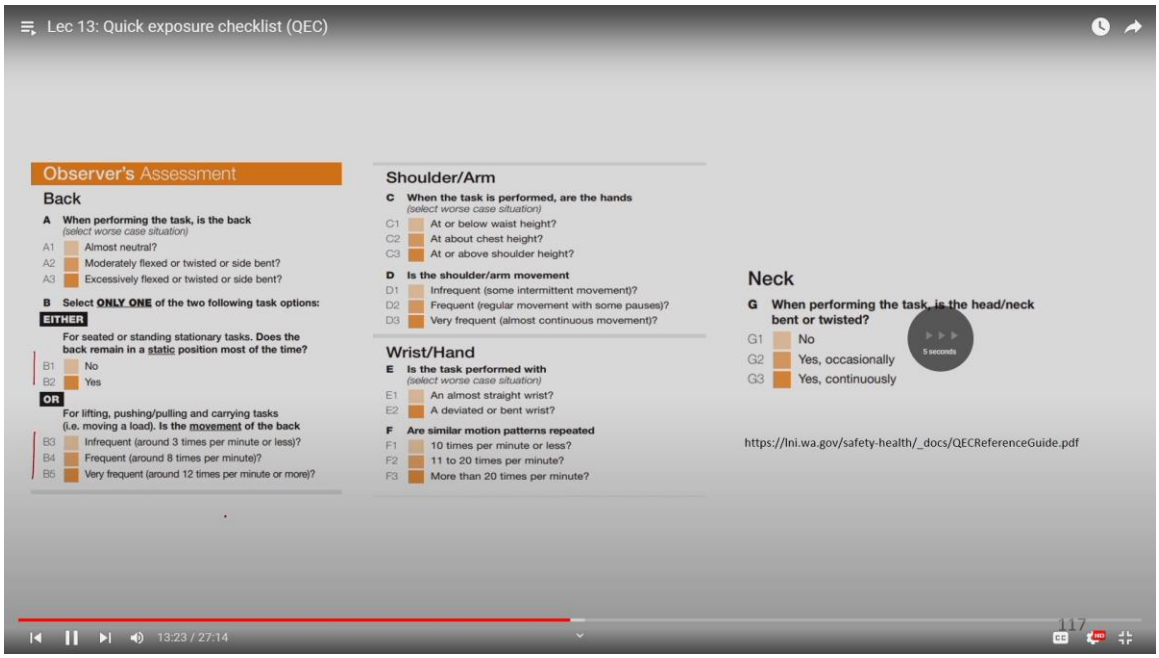
Shoulder arm movement that is D1, D2, D3. So here is the description. Everywhere you know you have the description in this particular form, in this particular chart. So you can read it out and take the decision.

So description also is there. Differentiation and the description. Assessment of the wrist and hand.



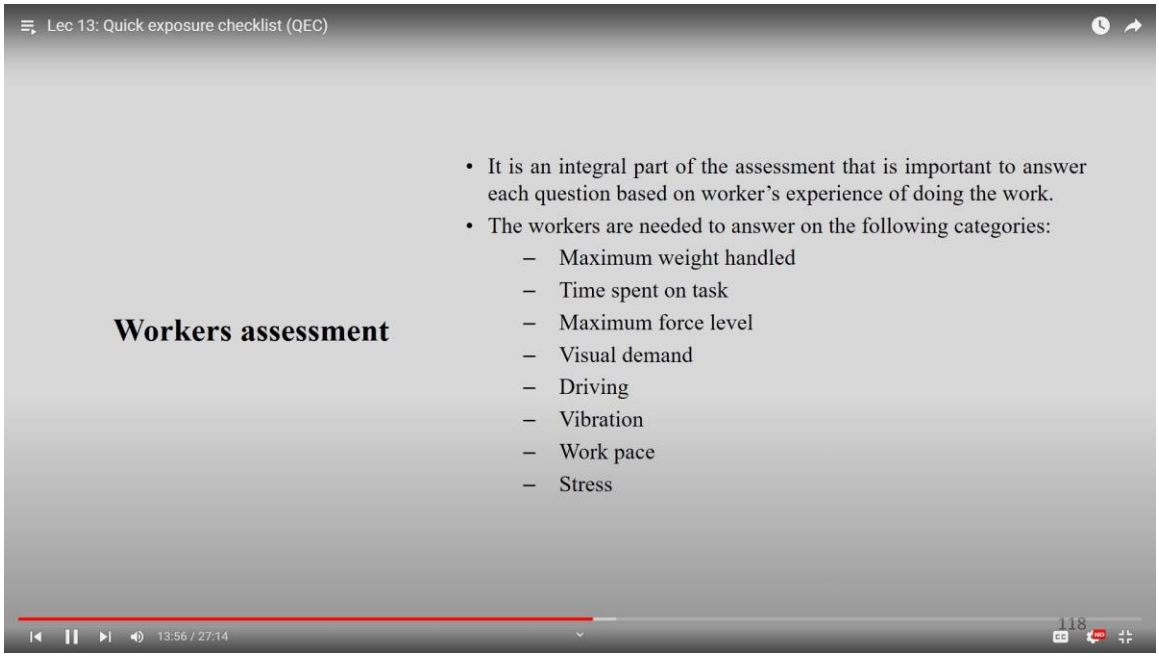
So E1, E2, and movement you are talking about F1, F3. Now here assessment of the neck is G. It is defined by the excessive bend or twist if the angle is greater than 20 degrees relative to the torso.

So you know you stand straight and you are trying to see if it is more than 20 degree or not. So this is the first part.



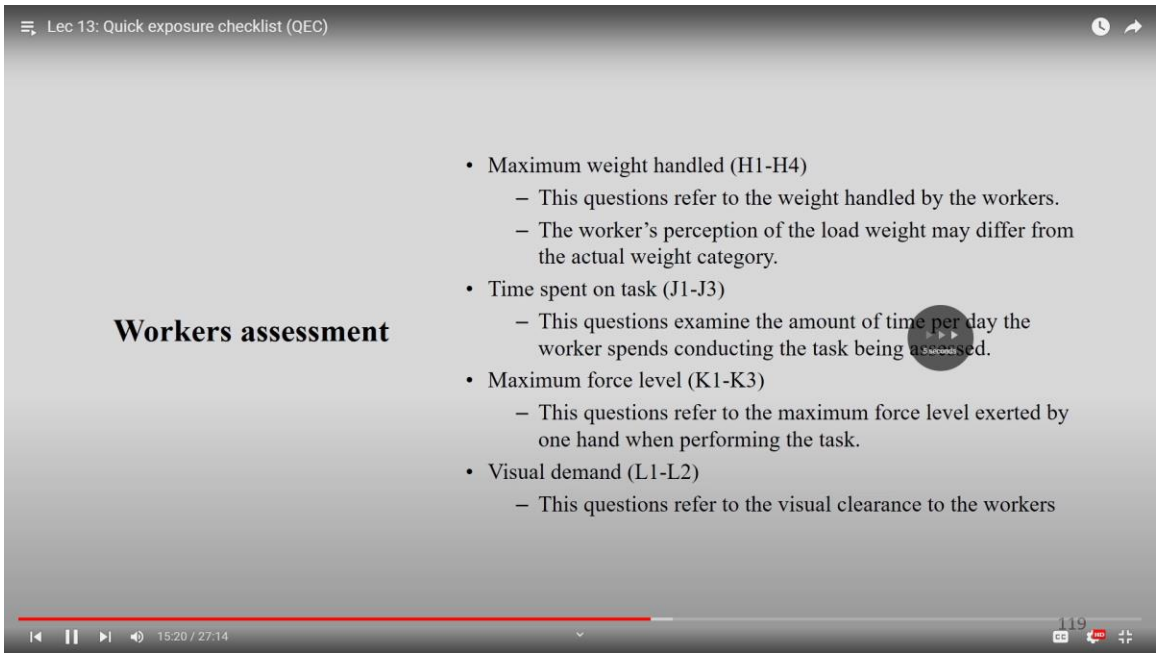
So this is the observer's assessment. You have to tick here. So here you can see that select only one.

Either B1, B2 or B3, B5. If you read you can understand why. Because if it is B3, B4, B5 only lifting, pushing, pulling, lifting, pulling, pushing, and carrying. Whereas this is for static or repetative. So either you say yes or no or if you are doing lifting, pulling, pushing then this is the definition and accordingly you have to tick one. So for observer's assessment, you get some value.



Now move to the next part that is the worker's assessment. Operator is going to. So in a single tool, you have observer's assessment, you have operator's worker's assessment. So it is an integral part of the assessment that is important to answer each questions based on the worker's experience of doing the work. So lot of information is coming from the experience, their involvement in that particular job.

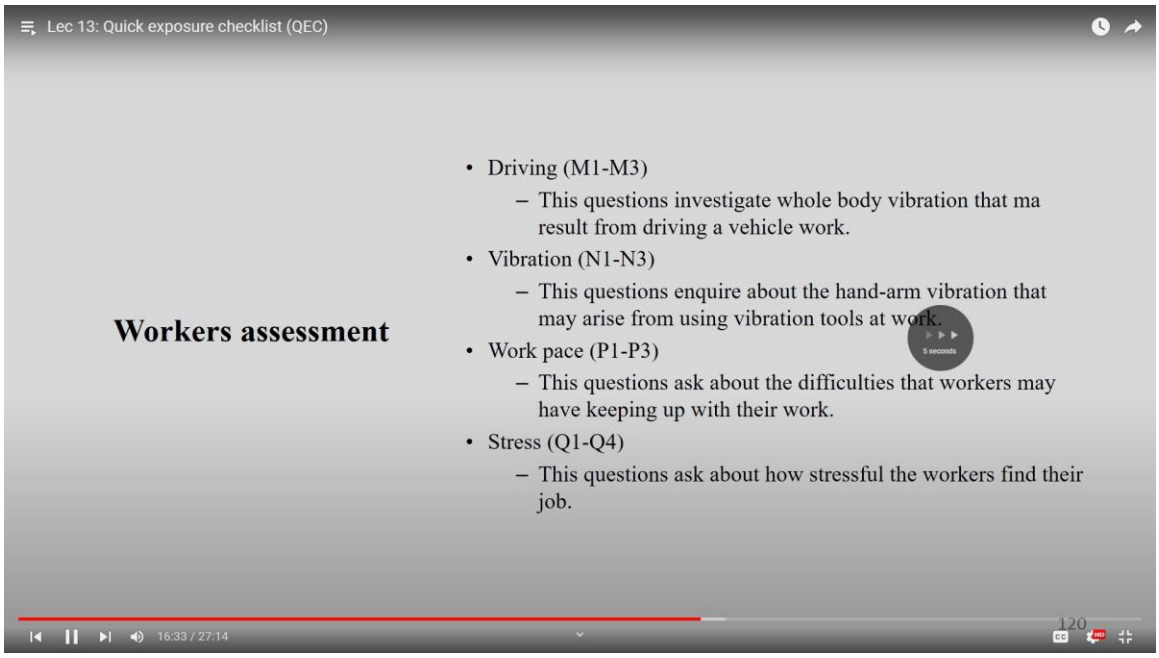
So maximum weight handled, time spent on the particular task, maximum force level, visual demand, is there any driving activity or not, is there any vibration or not, what about the work pace and what kind of stress is there while doing that particular. So very, very important factors. You know individual, as well as organizational and psychosocial factors, are involved in this particular part of your QVC.



So let us understand.

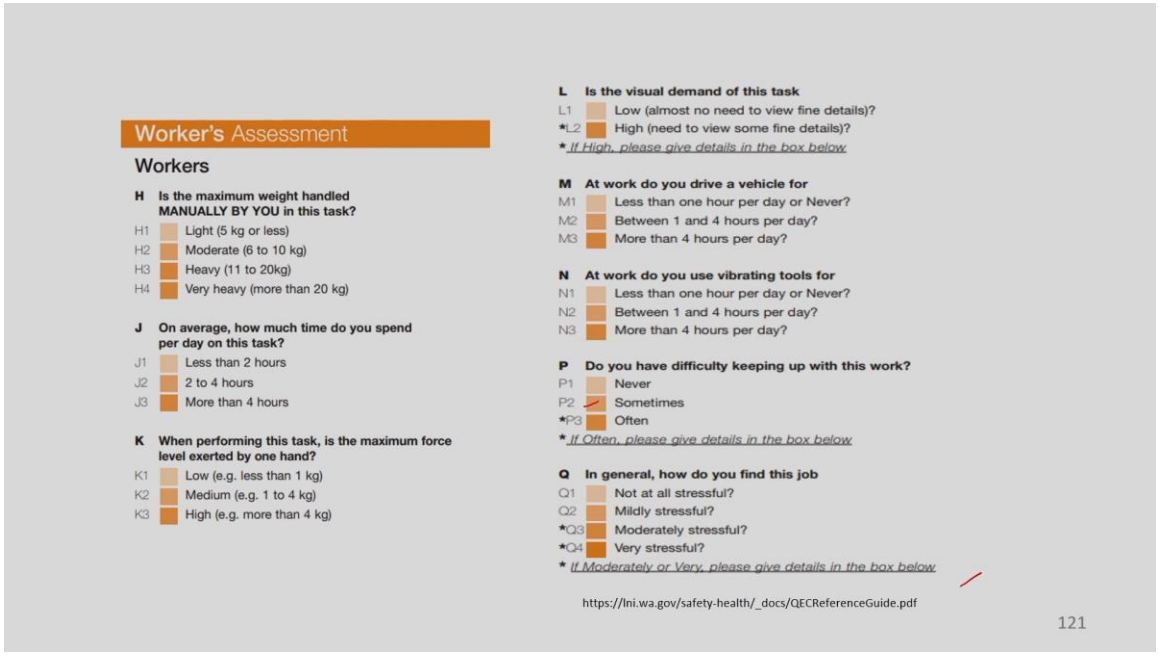
So we did some kind of analysis till G. Now here maximum weight handled you will get the denotion by the H1, H2, H3, H4, time spent by J, maximum force level that is for K, and visual demand for L. So you have all the definitions over here. So for visual demand, you are trying to answer that this question refers to the visual clearance of the work. So if you are working how clear it is. Force level, this question refers to the maximum force level exerted by one hand when performing the task.

So very important. So you can do for left hand and right hand separately, so with one hand. This question, this time spent, examine the amount of time per day the workers spend conducting that particular task when they are going, which is going to be assessed. So this is how you are going to get answers for the worker's assessment.



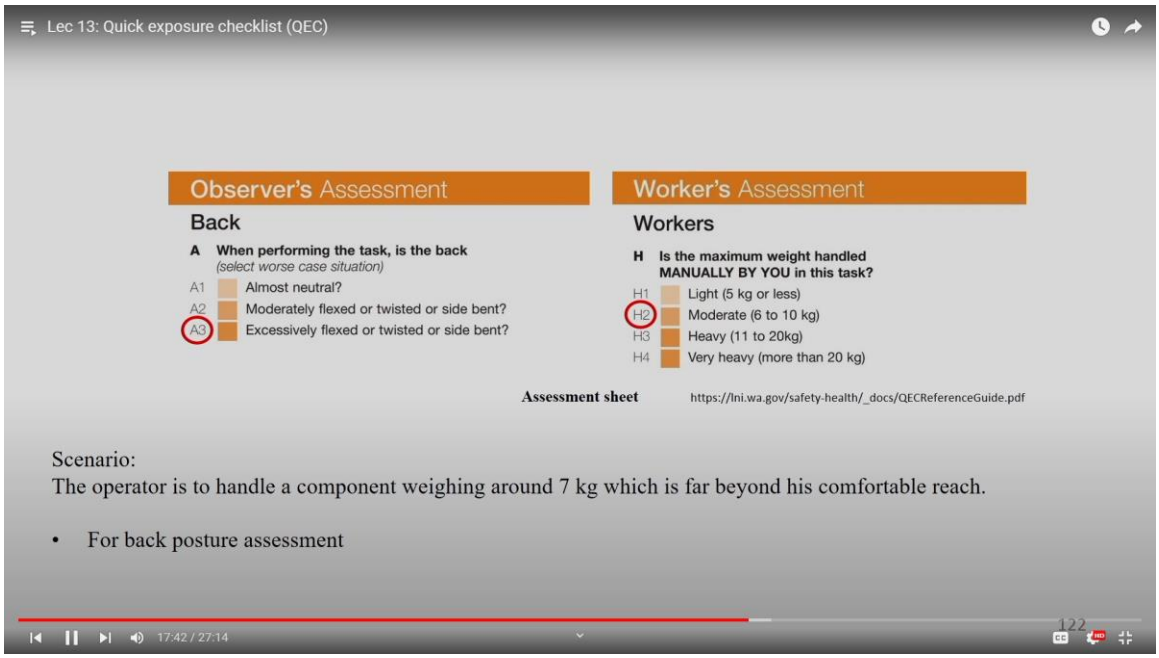
Also for driving M, vibration N, work pace that is the, what is the kind of pace available while doing this job that is for P, and stress is going to denote by Q. So this particular Q is very, very important because it is not only we are doing the job.

You know sometimes there are a lot of stress factor, maybe due to time, due to total amount of job, due to independency of our job, maybe relation with the peer, there are many things. So this is very important aspect of this particular tool.

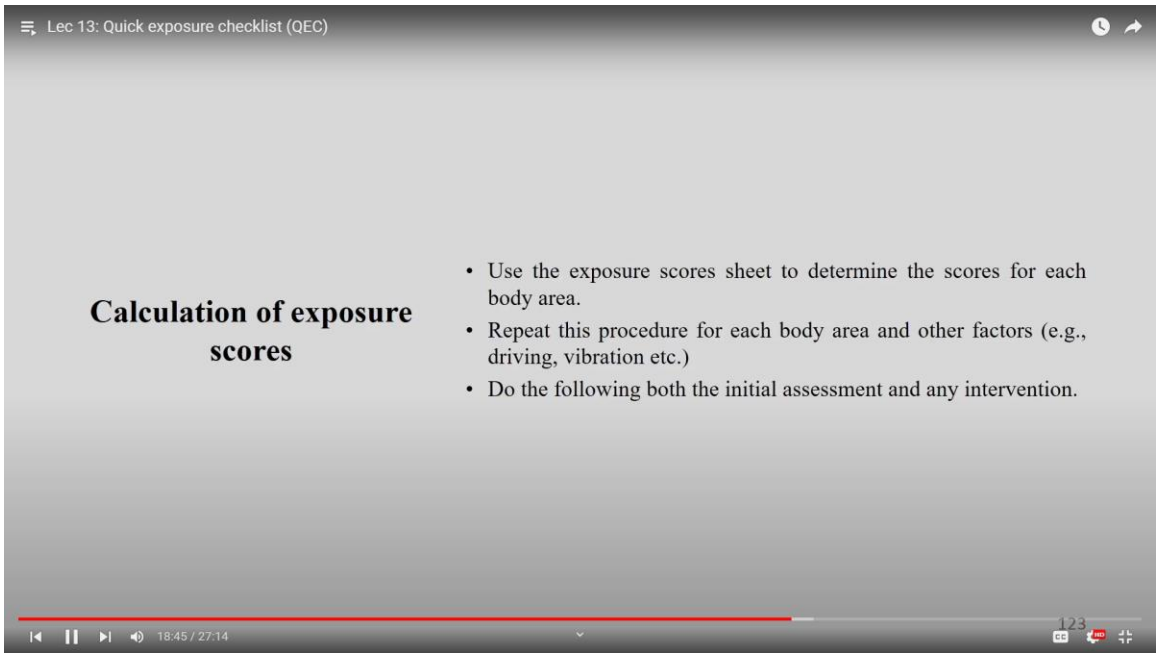


Also workers assessment, again this is the description, you can get any one of these thing ticked. So suppose do you have any difficulty keeping up with this work, never, sometimes, or other. So maybe you can tick here depending on the situation.

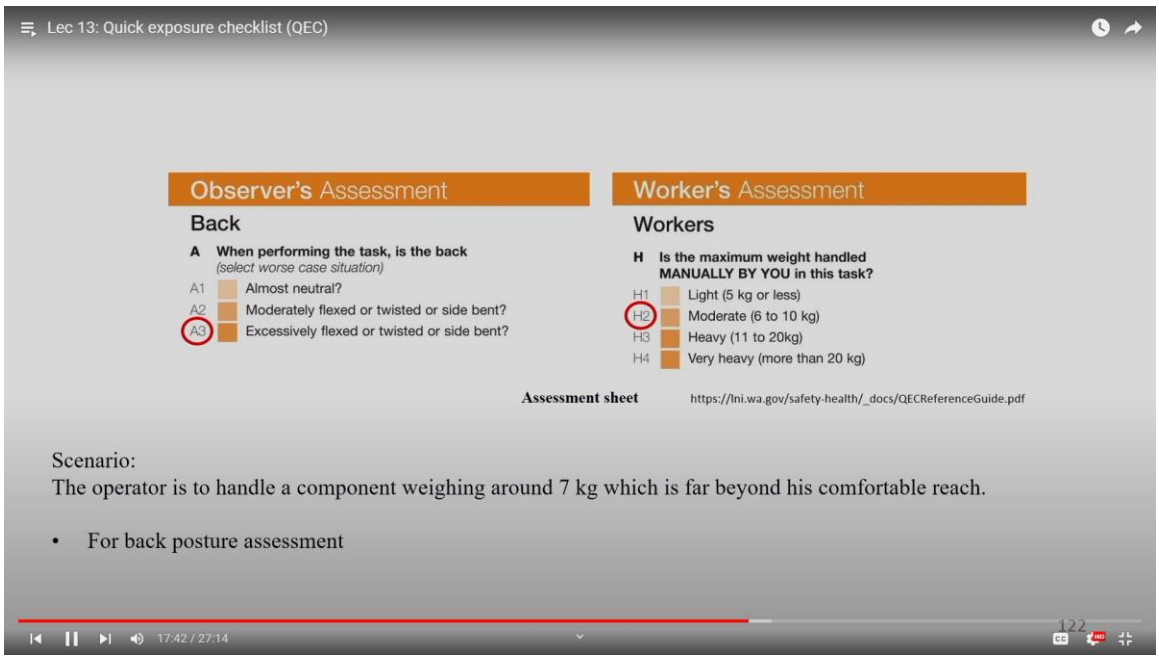
So accordingly we will get the value. So the values we are going to get from the pre-computed table as we did for other assessment like RULA, REBA, and all. Let us see that as well.



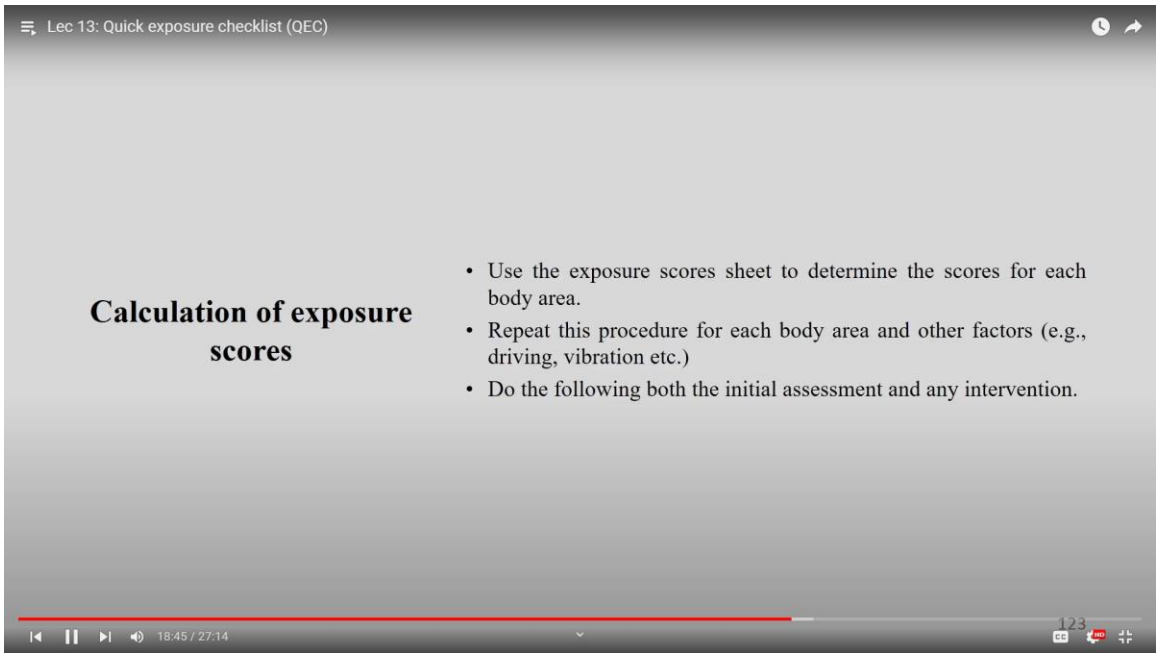
So this is for example in a particular scenario, the operator is to handle a component weighing 7 kg which is far beyond his comfortable reach. So for back posture, maybe here they have given 3 A3 H2, you know slowly we are taking it right.



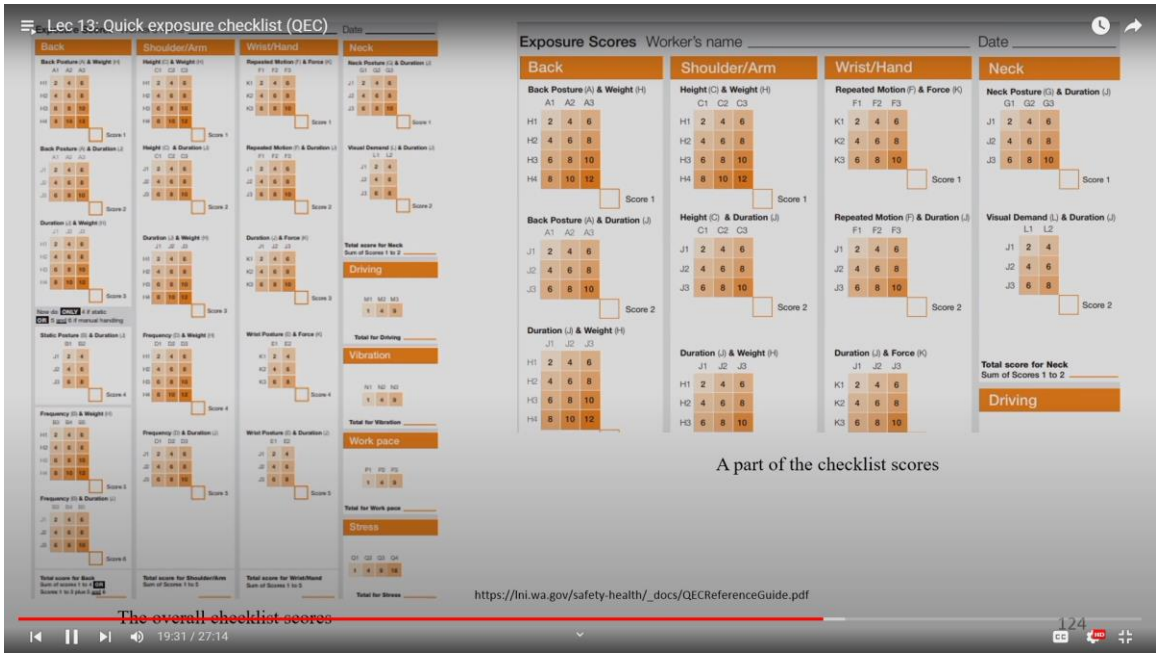
Something like that you will be doing and maybe you can take it for final result. I will give you the final observation result or observation sheet. So calculation of the exposure.



So here is the example. So what it says, excessively flexed or twisted or side bended whereas worker is saying about the is the manual, is the maximum weight handle manually by you in that particular case, they are saying moderate. So maybe 6 to 10 kg, that way we are going to collect the data for everything from A to Q, from A to Q.

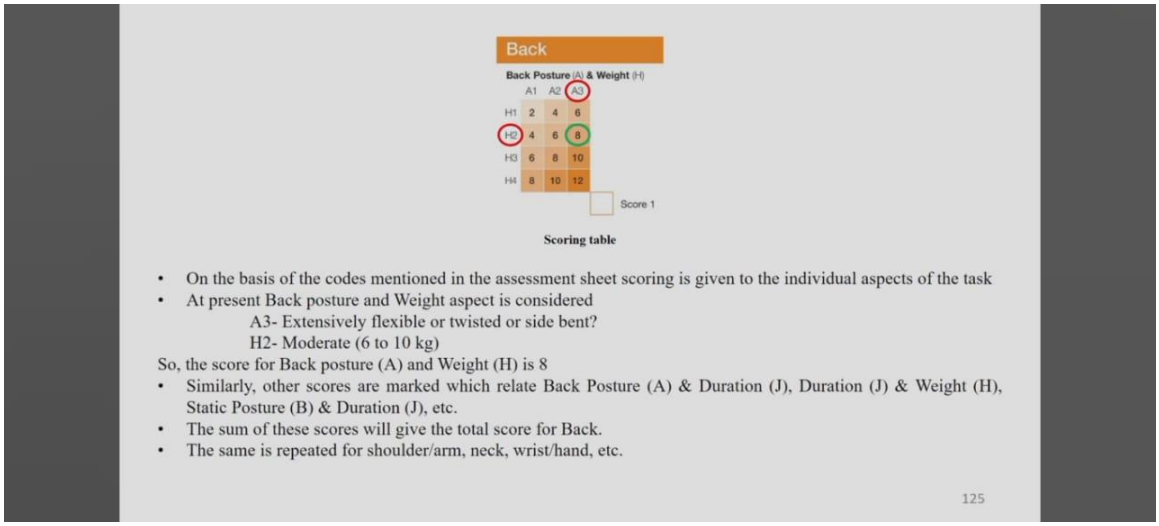


Now how you are going to calculate the exposure score? So use the exposure scores sheet to determine the scores for each body area, repeat this procedure for each body area and other factors, do the following both the initial assessment and if you did any kind of intervention. So you have a before score and you have an after score and then you can do the comparison and comparison can come from like you know for different activity from different operators. So you have lot of data points.

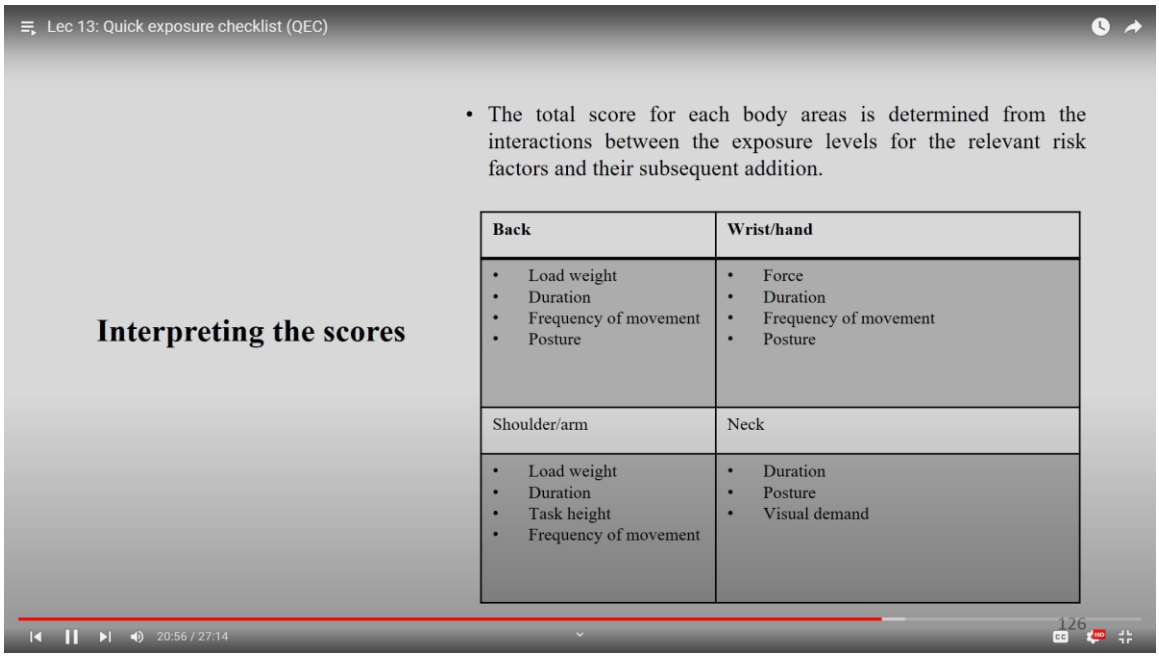


Now this is how the final score worksheet look like. So from your observation you must have ticked Q1, Q2, so you can check this, these matrix and you can select any one of the value.

So if I am saying this that means A2 along with H2. So like that, you can see. So here maybe you know I am selecting this value, why? Because it is A3 in combination of H3. So that way you are going to get this value and now let us once everything is done then you have to add those scores. So here you can see the exposure score and the worker's name and you can get that particular value. So you have a total exposure score beforehand and after intervention and then definitely you can compare them.

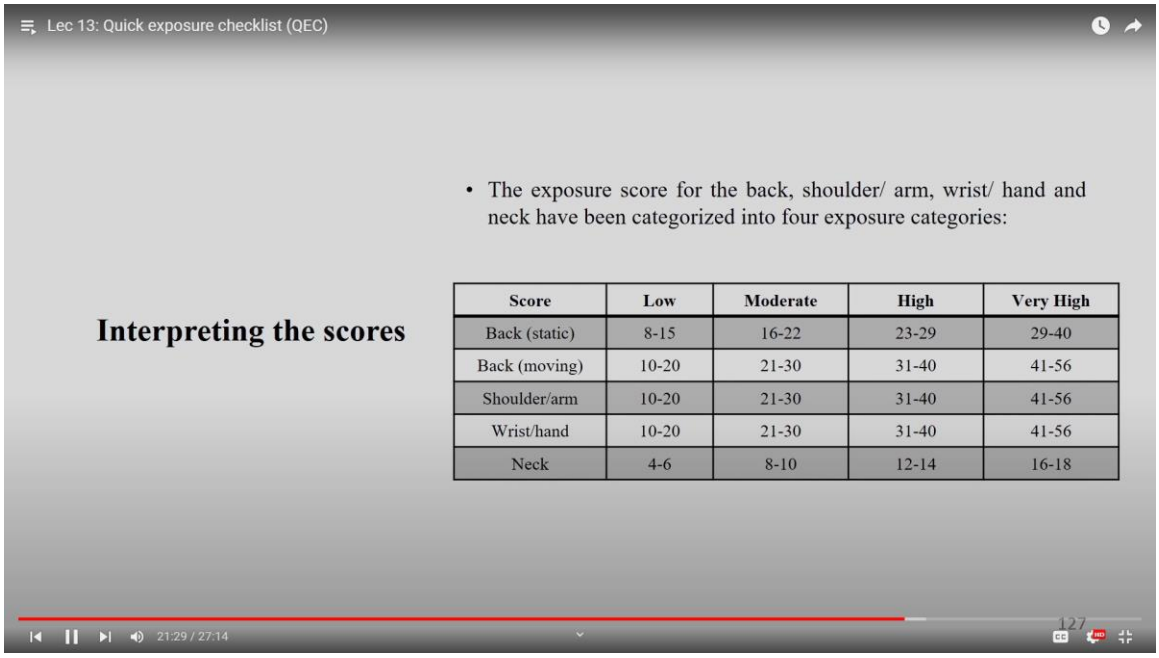


So like this way for example I did right I showed you. So if it is A3 and it is H2 then value is 8. So you will be writing 8 over here.



This is an example. So once you have all these thing then how you are going to interpret them. So the total score for each body areas is determined from the interaction between the exposure level for the relevant risk factors and their subsequent addition.

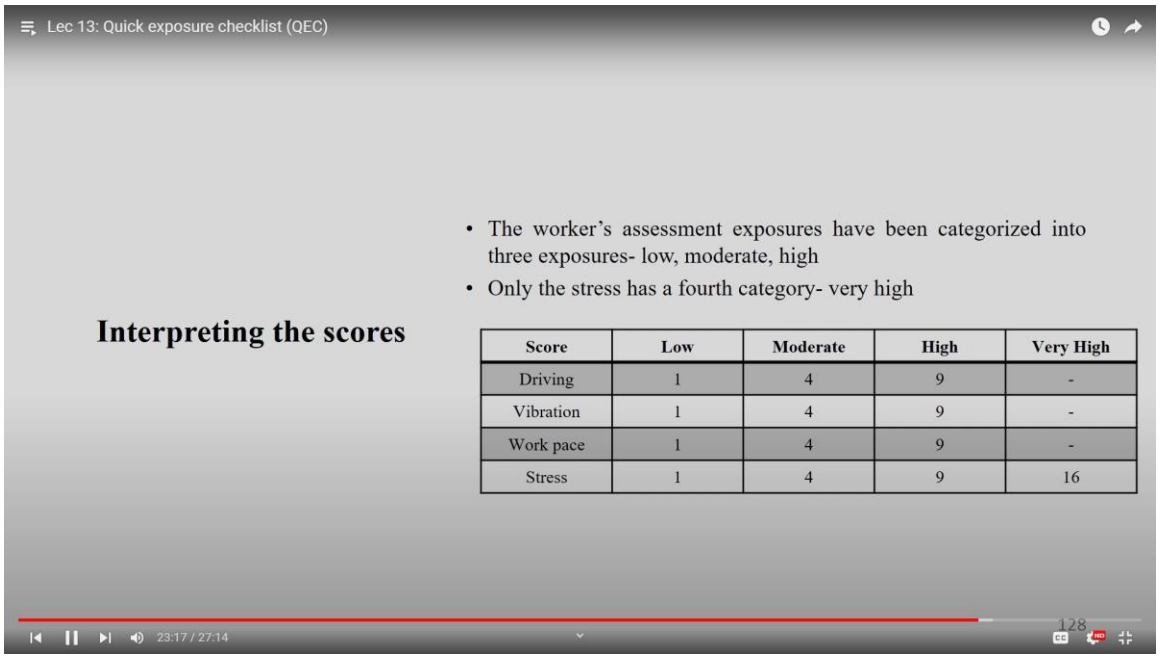
So for back, you have low duration frequency of movement and posture. For wrist or hand you have force, duration, frequency of movement, and posture like that you have for shoulder, you have for neck. So these are the ways where you can do your intervention or design changes.



So this exposure, the exposure score for the back, shoulder, arm, wrist, and neck have been categorized into four exposure categories low, moderate, high, and various. So you have all these scores and from there if you see the score is coming between 8 to 15 so that means back is static and the risk is low.

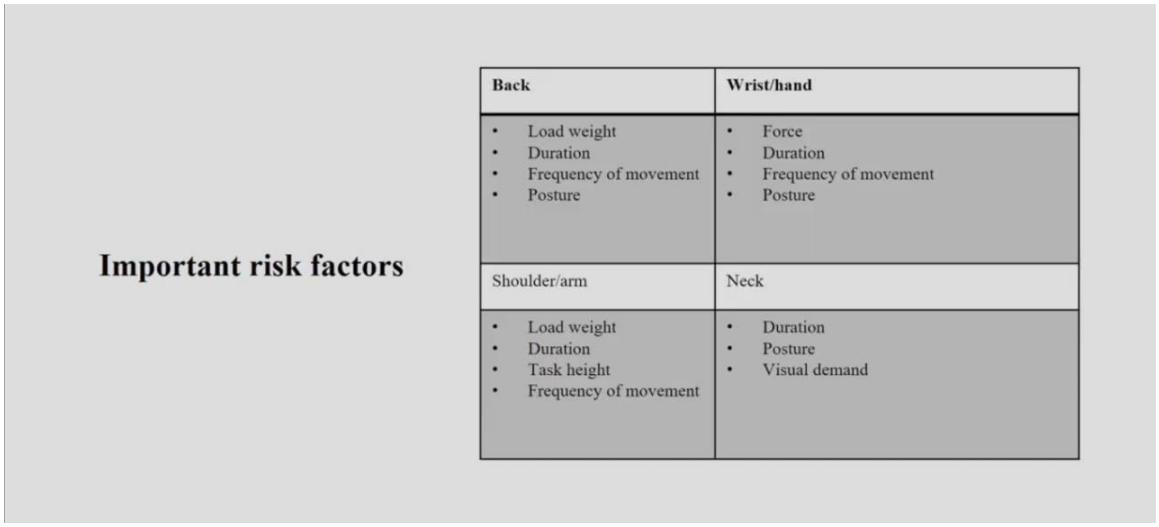
Whereas back is moving then also if the score is like this then also the risk is low. Whereas if you are talking about shoulder and thus value is here then maybe risk is moderate. So depending on the body region the scores are different and from this particular reference value, you can see what is the level of exposure for back, back movement, shoulder, wrist, and neck. So you can get an idea where they are standing. So typically for a particular case your back, back movement, shoulder, wrist all are in low.

Only for neck, this is coming somewhere here. So your intervention should look at that how your neck position can be improved. So this is how you are going to use this particular score for interpretation and going ahead for the design intervention.

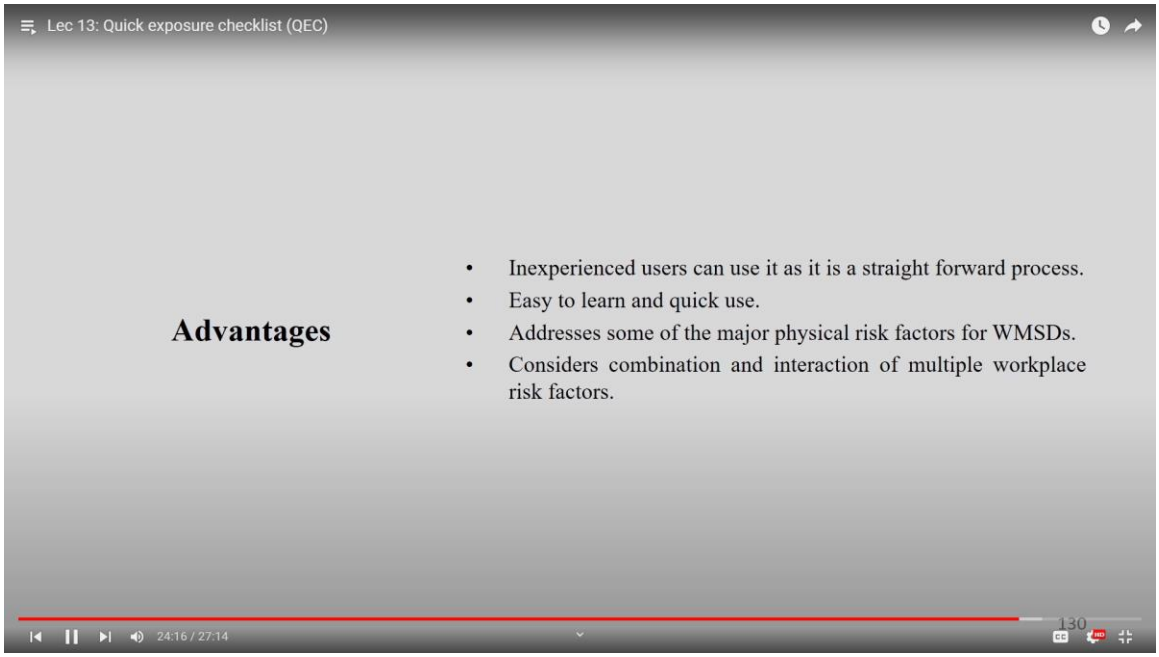


The workers assessment exposure have been categorized into three exposure level again like low, moderate, high, sorry not three. So this is very high only is present in case of stress but for other cases, it is only three.

So mainly it is three. So for driving vibration and workspace, you can have the value and you can get the categorization done.



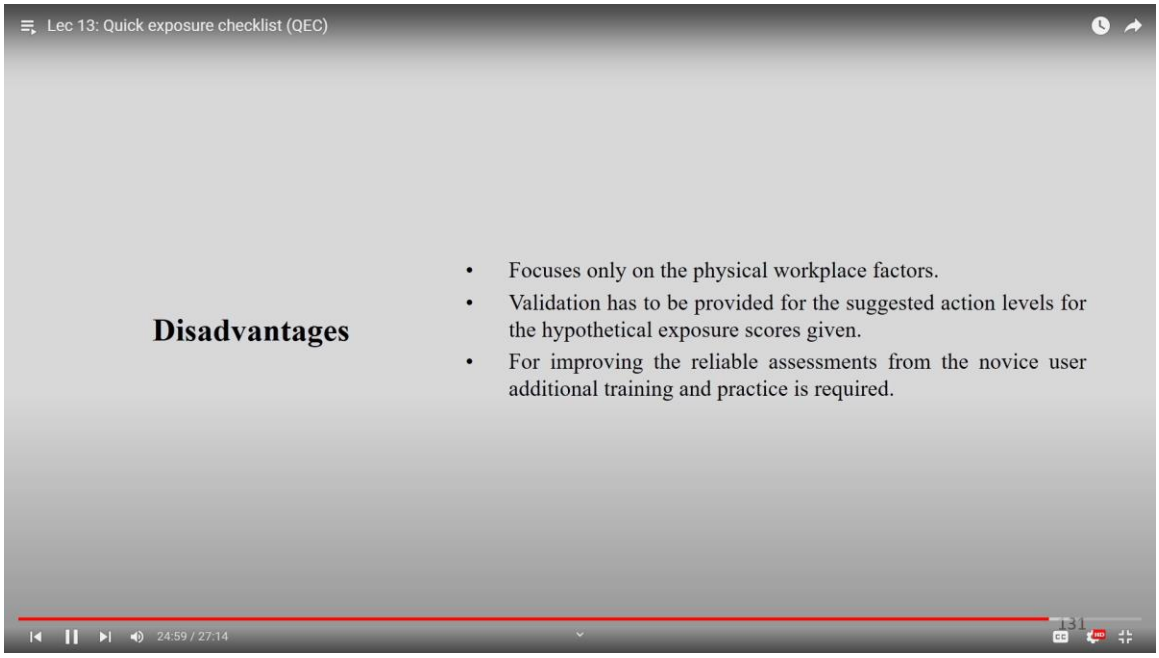
So important risk factor that you are going to get from here are all these. So we discussed it earlier as well.



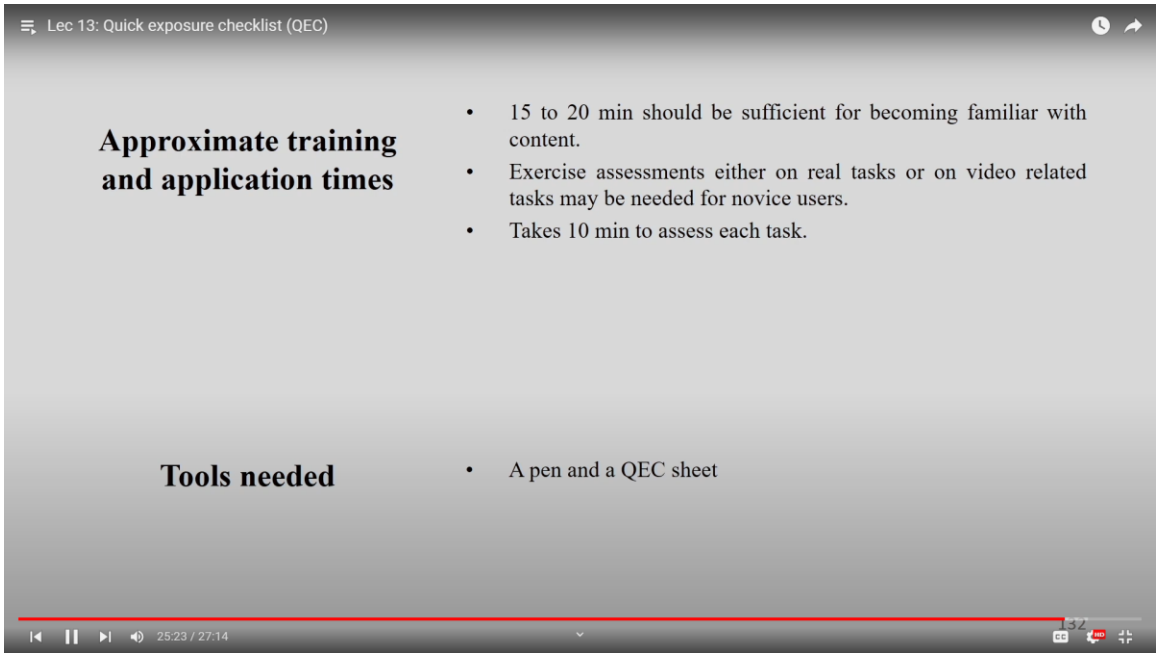
Now let us discuss what, so it is clear right how you are going to use these scores and how you are going to use like interpret them and how you are going to take it for further for your design intervention. So let us understand the advantages and disadvantages of this particular tool.

So any inexperienced user can use it as it is a straightforward process, easy to learn and quickly you can use it, addresses some of the major physical risk factors which is connected to work-related musculoskeletal disorder and it considers the combination and interaction of multiple workplace risk factor. This is very, very important. Multiple

workplace risk factors which is not really available for many other tool. For this tool, it is there. So QVC it is very important in such cases.



However, there are some disadvantages. It focuses only on the physical workplace factor. So action has to be provided for the, so that is why I said before you take this as a method or tool for your case you validate it. Suggested action levels for the hypothetical exposure score what is given and for improving the reliable assessment from novice user as additional training and practice may be required.



So approximate time to apply this it is like 15 to 20-minute exercise assessments either on real task or on a video-related task maybe you may do it for the novice user.

So you do the recording, you come back to the lab, and do the data processing. So because it may happen at one go, say while in the field, on the field maybe they will not be able to collect the data properly. So from the videotape, you can do it and which may take around 10 minutes to assess the whole scenario and you need only pen and paper and the QVC worksheet that I described earlier. So that worksheet you should have printed.

From there only you can give the marking. So these are the things related or required for QVC assessment quick exposure checklist. So it is just a checklist, it gives some indication but it is very important or it is very different from other posture assessment tool as it takes care of some other workplace factor including stress. So observer's assessment. So that is why it is little different. That is all for QVC and that is all for today. Thank you.