Human Factors Engineering

Prof. V. K. Tiwari
Prof. P. K. Ray
Department of Agricultural and Food Engineering
Department of Industrial and Systems Engineering
Indian Institute of Technology, Kharagpur

Lecture - 57
Extraction of Bioactive and Pigments from Processing Waste

Welcome to the next lecture on the Ergonomic Performance Indicator.

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Now, in this lecture session we will be discussing EPI Assessment Tool Development.

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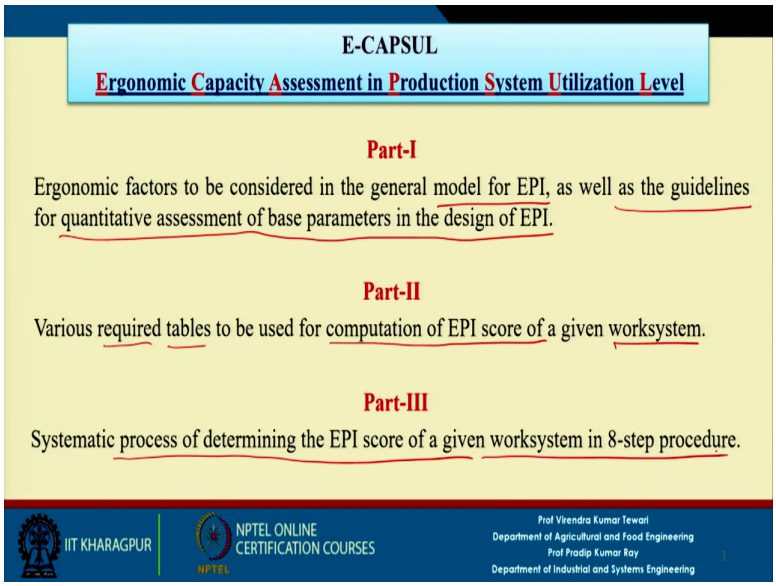

In fact, we have developed a E-CAPSUL or we call Ergonomic Capacity Assessment in Production System Utilization Level; that means, when we are talking about how best we can assess the capacity then production system utilization level, we are talking of the ergonomic capacity assessment.

So, for that we have three parts, they are as follow:

Part-I: Ergonomic factors to be considered in the general model for EPI, as well as the guidelines for quantitative assessment of base parameters in the design of EPI.

Part-II: Various required tables to be used for computation of EPI score of a given worksystem.

Part-III: Systematic process of determining the EPI score of a given worksystem in 8-step procedure.

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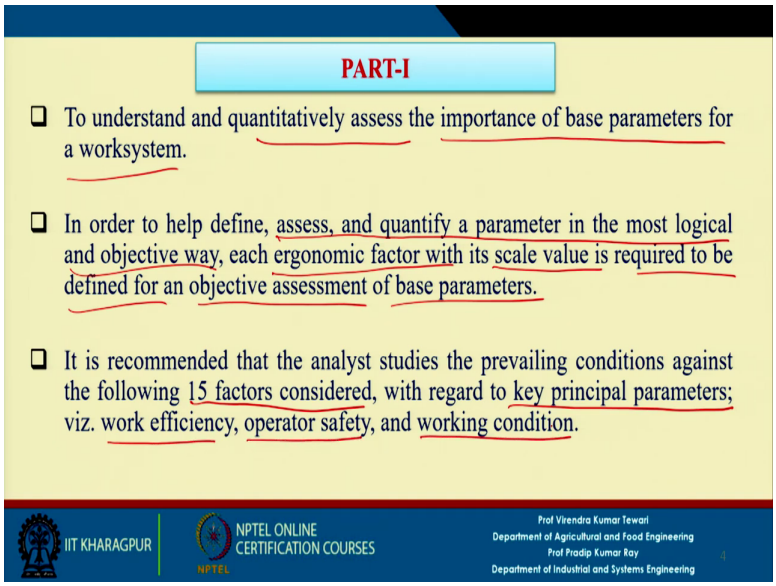

Part-1: To understand and quantitatively assess the importance of base parameters for a worksystem.

In order to help define, assess, and quantify a parameter in the most logical and objective way, each ergonomic factor with its scale value is required to be defined for an objective assessment of base parameters.

It is recommended that the analyst studies the prevailing conditions against the following 15 factors considered, with regard to key principal parameters; viz. work efficiency, operator safety, and working condition.

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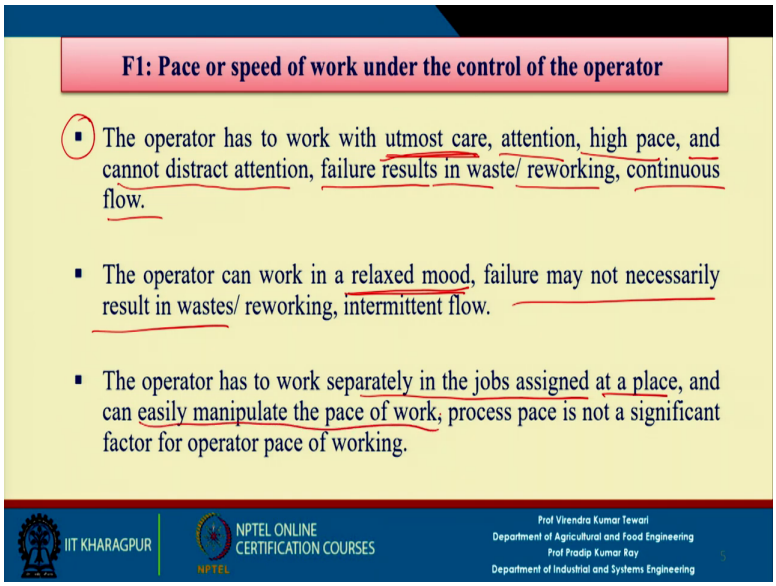

Number 1 factor is: Pace or speed of work under the control of the operator.

The operator has to work with utmost care, attention, high pace, and cannot distract attention, failure results in waste/ reworking, continuous flow.The operator can work in a relaxed mood, failure may not necessarily result in wastes/ reworking, intermittent flow. The operator has to work separately in the jobs assigned at a place, and can easily manipulate the pace of work, process pace is not a significant factor for operator pace of working.

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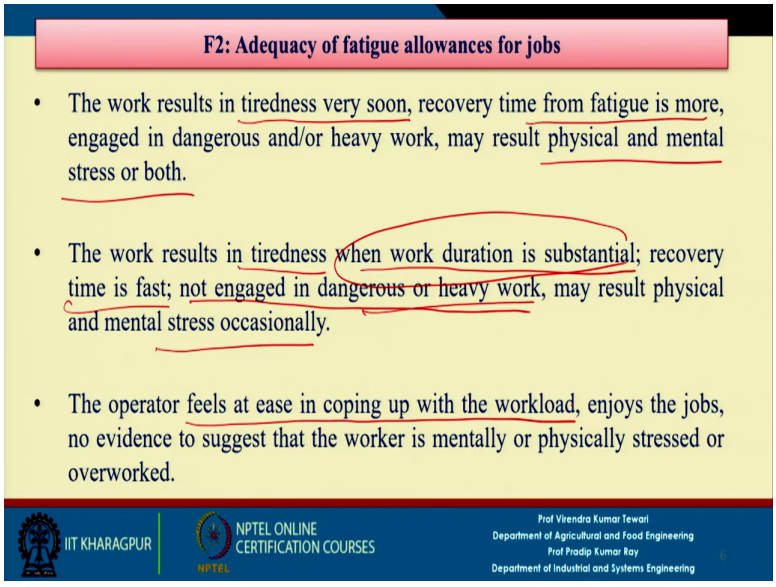

Factor 2: Now, adequacy of fatigue allowance for jobs. It may also happen because when

The work results in tiredness very soon, recovery time from fatigue is more, engaged in dangerous and/or heavy work, may result physical and mental stress or both.

The work results in tiredness when work duration is substantial; recovery time is fast; not engaged in dangerous or heavy work, may result physical and mental stress occasionally.

The operator feels at ease in coping up with the workload, enjoys the jobs, no evidence to suggest that the worker is mentally or physically stressed or overworked.

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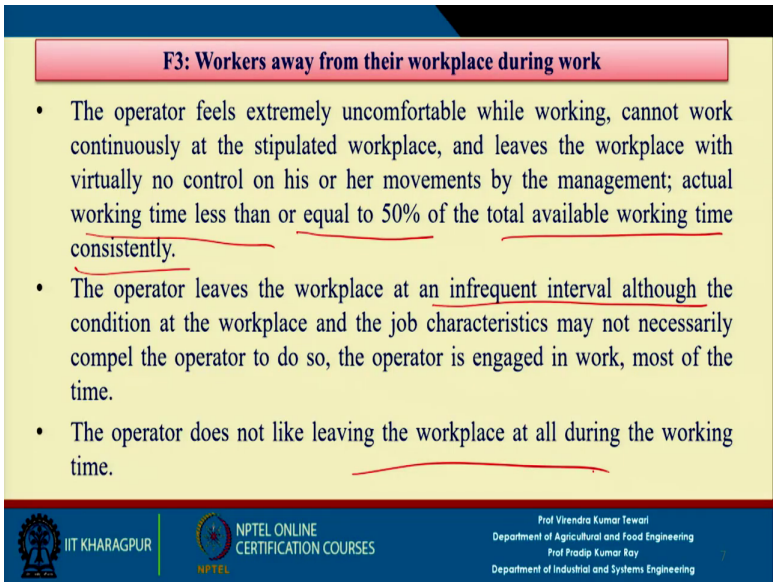

Factor 3: Workers away from their workplace during work; it may also happen, we have seen some of the very strenuous tasks where the person is alone for a long duration, we have seen in the cold rolling mill that when the person goes to the cabin and looks at the various jobs being performed from that top height in order to maintain the purging drum to be placed properly into the actual location, you will find that this task was very tough and very strenuous.

The operator feels extremely uncomfortable while working, cannot work continuously at the stipulated workplace, and leaves the workplace with virtually no control on his or her movements by the management; actual working time less than or equal to 50% of the total available working time consistently.

The operator leaves the workplace at an infrequent interval although the condition at the workplace and the job characteristics may not necessarily compel the operator to do so, the operator is engaged in work, most of the time. The operator does not like leaving the workplace at all during the working time.

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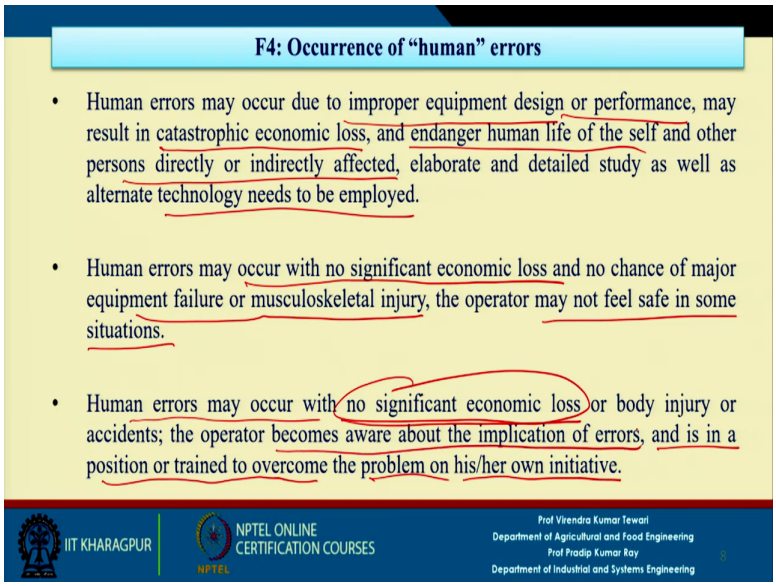

Factor 4: occurrence of "human" errors. Human errors may occur due to improper equipment design or performance, may result in catastrophic economic loss, and endanger human life of the self and other persons directly or indirectly affected, elaborate and detailed study as well as alternate technology needs to be employed.

Human errors may occur with no significant economic loss and no chance of major equipment failure or musculoskeletal injury, the operator may not feel safe in some situations.

Human errors may occur with no significant economic loss or body injury or accidents; the operator becomes aware about the implication of errors, and is in a position or trained to overcome the problem on his/her own initiative.

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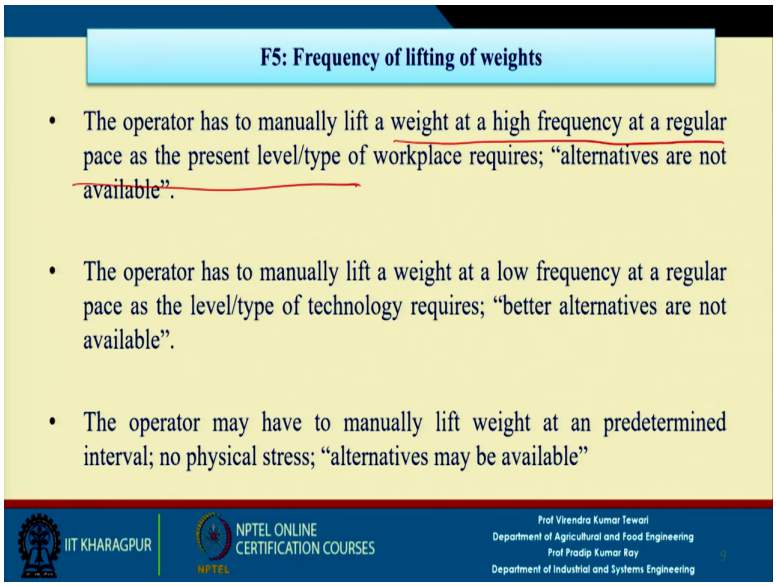

Factor 5: The operator has to manually lift a weight at a high frequency at a regular pace as the present level/type of workplace requires; "alternatives are not available".

The operator has to manually lift a weight at a low frequency at a regular pace as the level/type of technology requires; "better alternatives are not available".

The operator may have to manually lift weight at an predetermined interval; no physical stress; "alternatives may be available".

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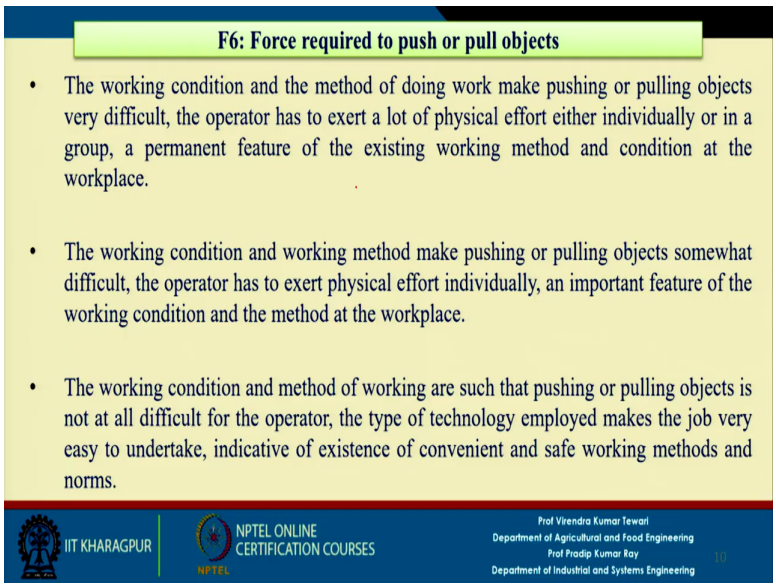

Factor 6: Force required to push or pull objects it could also happen, the factor 6 where force required to push or pull objects there could be a situation where the operator has to push or pull an object and move the task, move the load, take care of the load and assign certain jobs on that, write something on that, there could be various types of tasks which could be there.

The working condition and the method of doing work make pushing or pulling objects very difficult, the operator has to exert a lot of physical effort either individually or in a group, a permanent feature of the existing working method and condition at the workplace.

The working condition and working method make pushing or pulling objects somewhat difficult, the operator has to exert physical effort individually, an important feature of the working condition and the method at the workplace.

The working condition and method of working are such that pushing or pulling objects is not at all difficult for the operator, the type of technology employed makes the job very easy to undertake, indicative of existence of convenient and safe working methods and norms.

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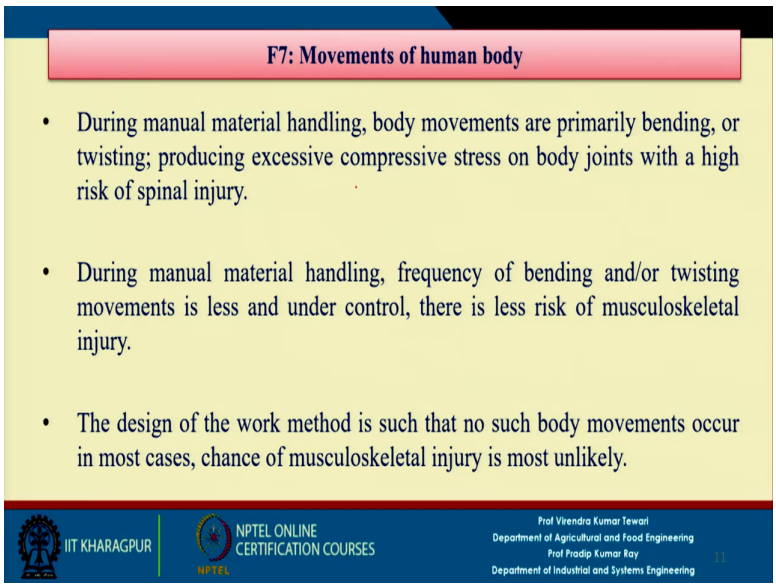

Factor 7: Movement of human body, well it could also happen that the person when he is on the job lot of body movements are required may be lifting something, getting

bending, then moving, twisting his body, stretching arm, picking certain items from the conveyor belt.

During manual material handling, body movements are primarily bending, or twisting; producing excessive compressive stress on body joints with a high risk of spinal injury. During manual material handling, frequency of bending and/or twisting movements is less and under control, there is less risk of musculoskeletal injury. The design of the work method is such that no such body movements occur in most cases, chance of musculoskeletal injury is most unlikely.

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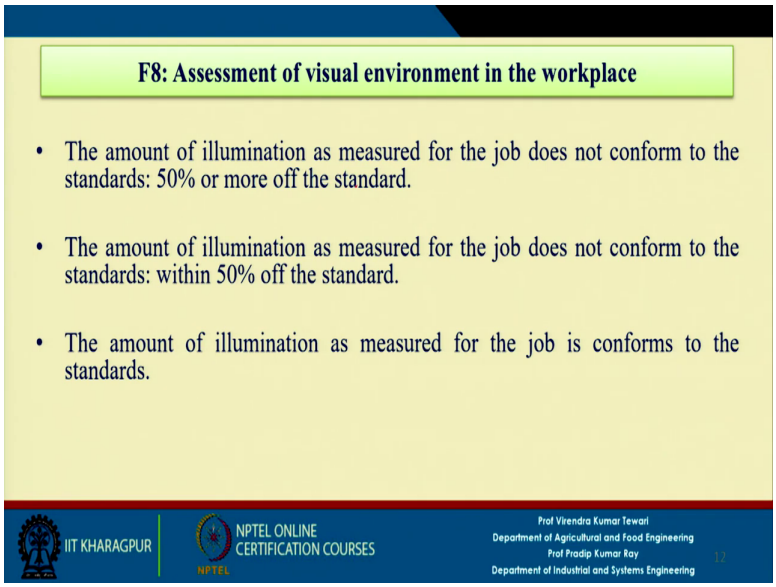

Factor 8: assessment of visual environment in the work place. The amount of illumination as measured for the job does not conform to the standards: 50% or more off the standard. The amount of illumination as measured for the job does not conform to the standards: within 50% off the standard. The amount of illumination as measured for the job is conforms to the standards.

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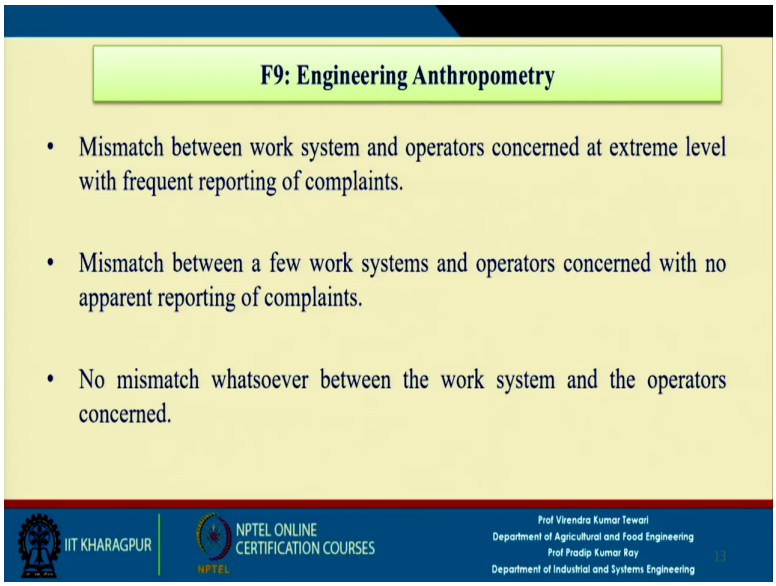

Factor 9: engineering anthropometry. It is the measurement of the body dimensions. How they are placed while we are talking of applying force or doing some tasks or steering a wheel or whatever. So, whenever we are doing this what is the level of engineering anthropometry maturity factor so, factor 9 talks about engineering and anthropometry.

Mismatch between work system and operators concerned at extreme level with frequent reporting of complaints. Mismatch between a few work systems and operators concerned with no apparent reporting of complaints. No mismatch whatsoever between the work system and the operators concerned.

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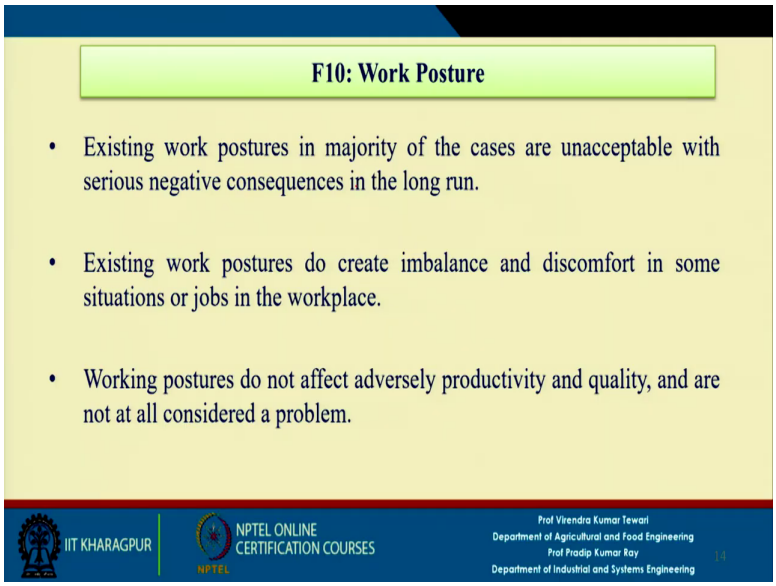

Factor 10: The work posture. Irrespective of the task that you are performing work posture is very important whether you are talking of a academic task, manufacturing task, construction work or you are looking at some environment.

Existing work postures in majority of the cases are unacceptable with serious negative consequences in the long run. Existing work postures do create imbalance and discomfort in some situations or jobs in the workplace. Working postures do not affect adversely productivity and quality, and are not at all considered a problem.

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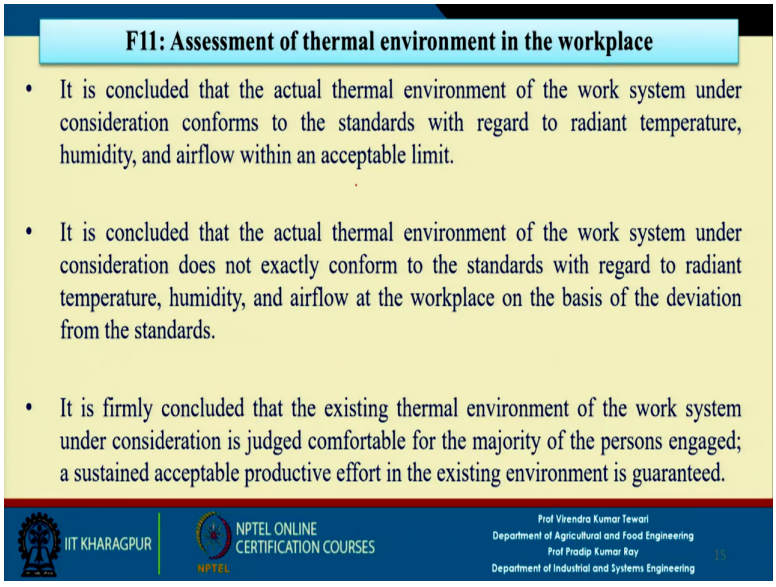

F11: Assessment of thermal environment in the workplace Of course, when you are talking of thermal environment of the workplace this has to be considered. The thermal environment if it is very high then there will be a problem. If it is very low or acceptable then it is definitely acceptable to the persons. It is concluded that the actual thermal environment of the work system under consideration conforms to the standards with regard to radiant temperature, humidity, and airflow within an acceptable limit.

It is concluded that the actual thermal environment of the work system under consideration does not exactly conform to the standards with regard to radiant temperature, humidity, and airflow at the workplace on the basis of the deviation from the standards.

It is firmly concluded that the existing thermal environment of the work system under consideration is judged comfortable for the majority of the persons engaged; a sustained acceptable productive effort in the existing environment is guaranteed.

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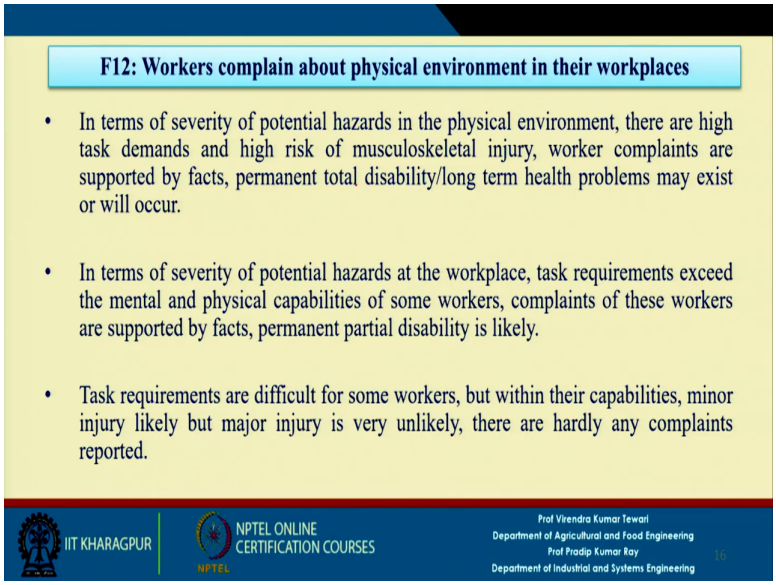

Factor 12: Then complain about physical environment in the workplace.

In terms of severity of potential hazards in the physical environment, there are high task demands and high risk of musculoskeletal injury, worker complaints are supported by facts, permanent total disability/long term health problems may exist or will occur.

In terms of severity of potential hazards at the workplace, task requirements exceed the mental and physical capabilities of some workers, complaints of these workers are supported by facts, permanent partial disability is likely.

Task requirements are difficult for some workers, but within their capabilities, minor injury likely but major injury is very unlikely, there are hardly any complaints reported.

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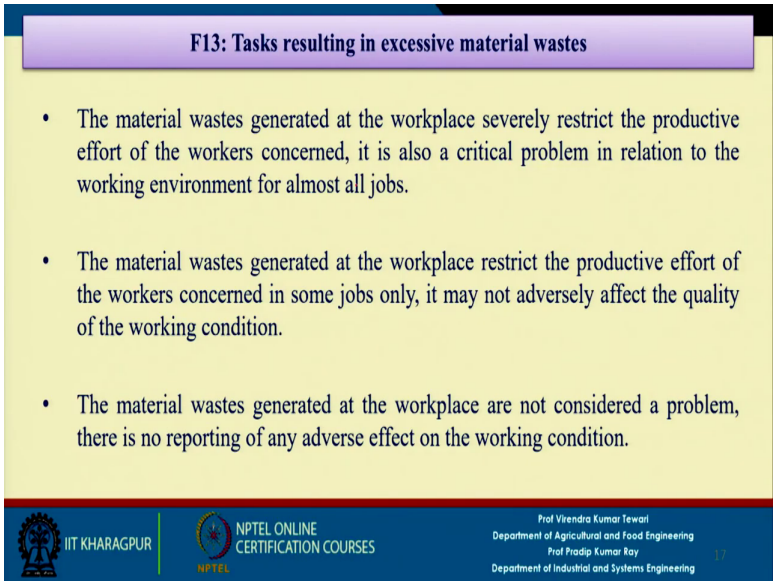

Factor 13: The task resulting in excessive material.

The material wastes generated at the workplace severely restrict the productive effort of the workers concerned, it is also a critical problem in relation to the working environment for almost all jobs.

The material wastes generated at the workplace restrict the productive effort of the workers concerned in some jobs only, it may not adversely affect the quality of the working condition.

The material wastes generated at the workplace are not considered a problem, there is no reporting of any adverse effect on the working condition.

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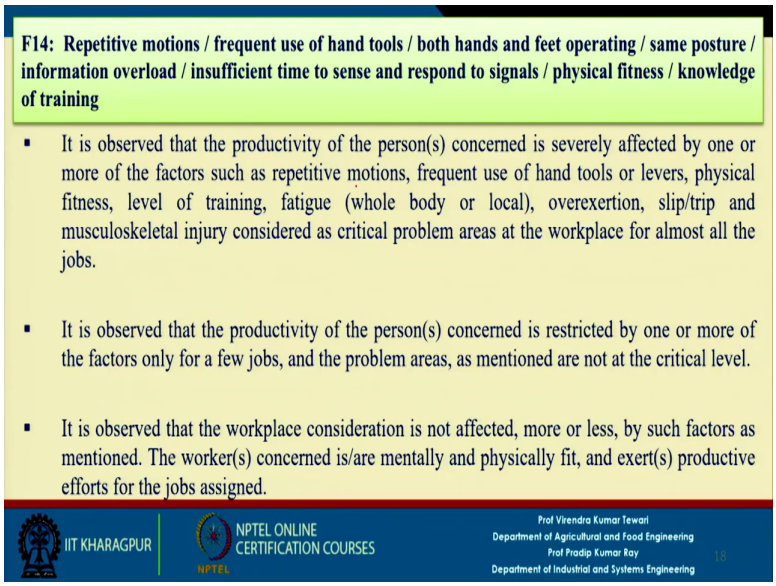

Factor 14: Then repetitive motions, frequent use of fan tools, both hands feet, same posture, information workload, insufficient time to sense and respond, physical fitness, knowledge of training and so on.

It is observed that the productivity of the person(s) concerned is severely affected by one or more of the factors such as repetitive motions, frequent use of hand tools or levers, physical fitness, level of training, fatigue (whole body or local), overexertion, slip/trip and musculoskeletal injury considered as critical problem areas at the workplace for almost all the jobs.

It is observed that the productivity of the person(s) concerned is restricted by one or more of the factors only for a few jobs, and the problem areas, as mentioned are not at the critical level.

It is observed that the workplace consideration is not affected, more or less, by such factors as mentioned. The worker(s) concerned is/are mentally and physically fit, and exert(s) productive efforts for the jobs assigned.

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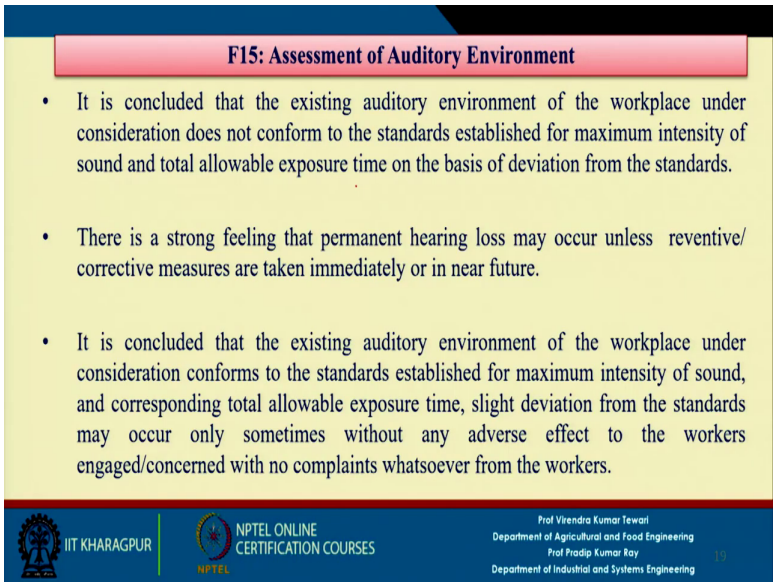

Factor 15: The last is the auditory environment, how much is the noise level. It is concluded that the existing auditory environment of the workplace under consideration does not conform to the standards established for maximum intensity of sound and total allowable exposure time on the basis of deviation from the standards.

There is a strong feeling that permanent hearing loss may occur unless preventive/ corrective measures are taken immediately or in near future.

It is concluded that the existing auditory environment of the workplace under consideration conforms to the standards established for maximum intensity of sound, and corresponding total allowable exposure time, slight deviation from the standards may occur only sometimes without any adverse effect to the workers engaged/concerned with no complaints whatsoever from the workers.