

## INTRODUCTION

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Technological development in the last few years and the growing role the third world is taking in the working world have influenced decisively the workload development, increasing more and more the mental burden in the workplace. Nowadays, working requires less and less direct contact with materials, and more involvement with the processing of these materials, relegating this task to machinery and robots. It is the worker's responsibility to supervise the correct running of the machinery. This means having to pay attention to a series of warnings, knowing what they imply and knowing how to activate the right controls to get the desired result.

The job is based on the following process:

- Perception of data. A series of very different signs which could be very varied (orders, documents, gauges, etc.) are dealt with in every job. These signs are usually perceived through our senses.
- Synthesis of data. The data is sent to the brain where it is processed. That process makes us react in a specific way.
- Decision making. To be able to carry out the required action, the individual will choose the most appropriate way to obtain the desired results. When action is carried out, the sequence ends and starts again.

According to this process, Mental Burden could be defined as the amount of deliberate mental effort carried out to get a specific result. This process demands attention (being alert) and concentration (being able to follow up one or more tasks for a period of time).

In the Mental Burden field we must consider the following aspects:

- Quantity and complexity of the information to be dealt with, which is mainly determined by the type of task to be carried out. The type of task is conditioned by the quantity of signs to deal with, the inferences we make based on the data we possess, the precision of our response and the possible margin for error.  
New technologies like computerization, automation, etc., will have to be considered also because they generally imply an increase in the volume of data and the signs the worker will have to interpret.
- Time. This is of vital importance in the Mental Burden process because time affects it in two ways: the amount of time available to create a response and the amount of time to be alert.

In the first case, the concept of time has to do with the working tempo: if the work has to be done fast (keeping in time with a machine, maximizing

production, etc.) the effort made to give the correct response is bigger than if the response is thought of with no hurry.

In the second case, time is related to the possibility of having breaks or alternating different type of tasks to recover from mental fatigue, when the job demands keeping high concentration standards.

- Individual aspects. Different people's response times vary depending on a series of individual characteristics like age, personality, attitude towards the job, level of training and level of tiredness. Special attention must be paid to individual factors such as experience, training and level of tiredness in the study of Mental Burden. These aspects are very relevant because they influence the time required for the interpretation and decision making and because these are factors that can be organized.

## BASIC PREVENTIVE CRITERIA

To prevent mental fatigue, it is recommended to provide each stage of the data management and decision making:

- Perception: detection and differentiation of the different signs (it could occur that an important sign is not perceived correctly) must be provided through adequate design and correct location.

Aspects such as the size of the symbols, the contrast with the background, the adjustment of the stimuli to the environment using a combination of more than one type of sensory channel if necessary (visual signs when there is noise), the duration of the sign, mobility of the object or subject etc., must be considered.

- Interpretation: received messages are often inappropriate or too complex, and sometimes symbols whose interpretation has not been foreseen are used. To avoid this happening the information received must be foreseen adequately (in quantity and complexity): clear, simple and concrete messages. Who is the receiver (vocabulary, type of symbols, etc.) must be considered, as well as the frequency of the messages. Too much memorization should be avoided. Making the data browsing an easy process when necessary is advisable.
- Response: after the required action analysis, an ergonomic design of the controls and the working station must be made, taking into consideration the amount and direction of the strength required, length of movements, position, range distance, adequate adjustment of the controls to the

required action, use frequency, reciprocity with other controls or gauges, etc.

Apart from these measures, mental fatigue must be considered as well. It is recommended to plan short and frequent breaks in jobs which are mentally demanding (for tedious computing tasks, a 10 minute break every 40 minutes is recommended for example), or the possibility to switch to a different task that requires a lower level of concentration.

Moreover, it is very important to lower the workload on nightshifts, especially between 3 a.m. and 6 a.m., since between these times it is harder to retain the correct level of concentration.

It is important to consider the worker's experience and training, since these aspects have an influence on the mental burden. The learning and retraining timings will have to be planned accordingly whenever there are technological, operational or organizational changes in place.

Finally, it is important to stress that when we talk about mental burden, mental work overload is as dangerous as having tasks which demand no concentration at all: a task which requires no mental effort is not positive since mental functions should be exercised.

Therefore, positions which require no mental effort and have no content should be avoided.

## BASIC REGULATION

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Royal Decree 485/1997 regarding minimal Health and Safety and Signals dispositions at work.

Royal Decree 488/1997 regarding minimal Health and Safety dispositions at work including display screens equipment.

ISO 10075. Ergonomic principles related to mental work-load.

## MENTAL BURDEN/FATIGUE

### 20. MENTAL BURDEN/FATIGUE

People affected

Working area

Date:

Next revision date

By:

1. The next level of concentration required to complete the task is high	<b>YES</b>	<b>NO</b>	Jump to question 4
2. The task requires concentration less than half of the time or only occasionally	<b>YES</b>	<b>NO</b>	Switch to other less demanding tasks
3. Apart from the statutory breaks, the task allows other breaks	<b>YES</b>	<b>NO</b>	Plan shorter and more regular breaks to avoid fatigue
4. It is possible to make a mistake with no critical consequences on the facilities or personnel	<b>YES</b>	<b>NO</b>	Provide a Decision Making Process (enough information, adequate symbols, response time, etc)
5. The working pace is determined by external factors (chains, customers, etc)	<b>YES</b>	<b>NO</b>	Jump to question 7
6. The working pace is acceptable for an experience worker	<b>YES</b>	<b>NO</b>	Switch to other tasks. Establish short breaks
7. The task is based on data or information managements (automated processes, IT, etc)	<b>YES</b>	<b>NO</b>	Jump to a different questionnaire
8. The information is perceived correctly	<b>YES</b>	<b>NO</b>	Check the symbols and gauges design (size, shape, contrast, etc.) and their disposition
9. It is easily understandable	<b>YES</b>	<b>NO</b>	Use clear and univocal symbols
10. The amount of information received is reasonable	<b>YES</b>	<b>NO</b>	Avoid an overload of information. Break up the information
11. The information is simple. Excessive memorization of data is avoided.	<b>YES</b>	<b>NO</b>	Provide data search by written means
12. Control design and panels are adequate for the required action	<b>YES</b>	<b>NO</b>	Check the adequacy of the controls (functions, position, controls/symbols correlation)
13. The worker is experienced and he is familiar with the process and equipment	<b>YES</b>	<b>NO</b>	Train and inform
14. The task is usually carried out without interruptions	<b>YES</b>	<b>NO</b>	Avoid interruptions as much as possible

15. The physical environment makes the development of the task easier

**YES**

**NO**

Be aware of the physical environment, specially the noise.

**ASSESSMENT CRITERIA**

VERY POOR	POOR	NEEDING IMPROVEMENT
Three or more poor	2, 3, 8, 9, 10, 11	4, 6, 12, 13, 14, 15

	VERY POOR	POOR	NEEDING IMPROVEMENT	CORRECT
Objective	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Subjective	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**MEASURES TO BE TAKEN IN ORDER TO CORRECT DETECTED DEFICIENCIES**