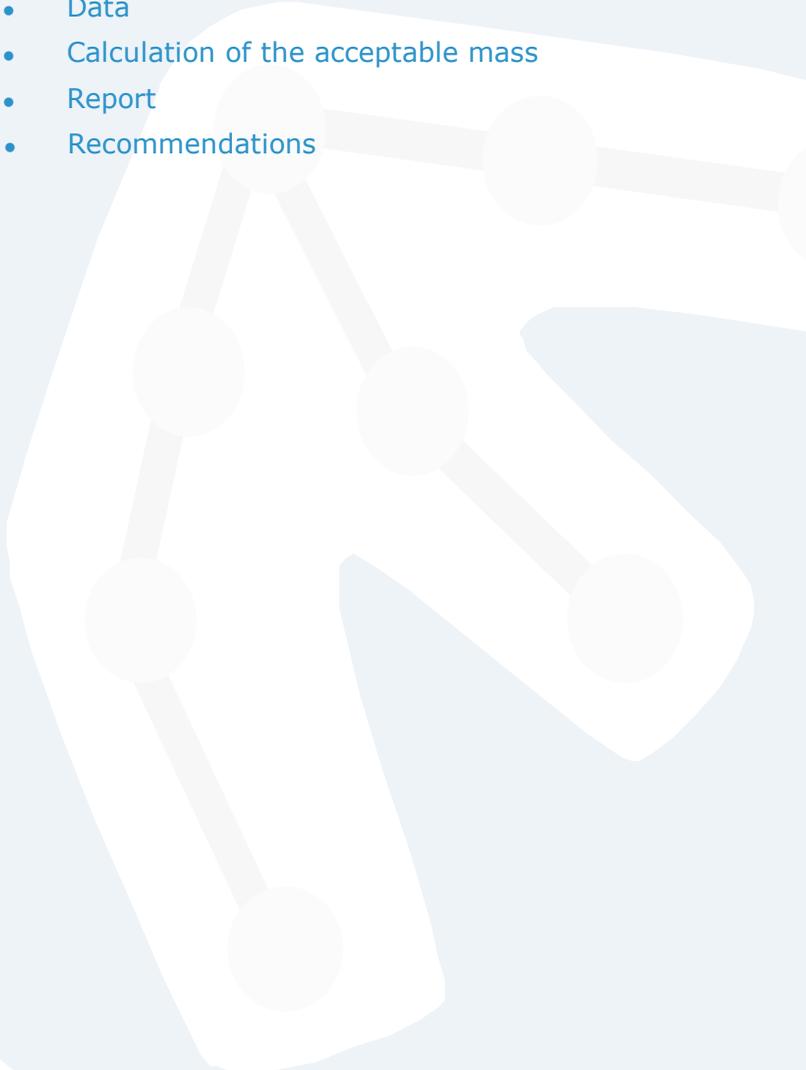

16. MODULE ErgoMater

- Introduction
 - Data
 - Calculation of the acceptable mass
 - Report
 - Recommendations
- 

INTRODUCTION

Scope of application. The *ErgoMater* module is aimed at the ergonomic protection of maternity, making it possible to evaluate and detect ergonomic risk factors for the pregnant worker.

It is important to note that this applies solely to healthy women who have pregnancies without medical or obstetrical complications. Some female conditions (pathologies, pregnancy complications, etc.) may require a more detailed assessment of the situation and the application of additional changes or restrictions in the occupational activity. Such conditions have to be determined in a customized manner by the medical professional.

It is recommended to avoid the risk factors contemplated in this module from the beginning of pregnancy, although their control is particularly important from the 20th gestational week.

Content. The evaluation questionnaire contains items related to the physical demands of the tasks, the environmental and organizational working conditions that could imply risks for the mother and/or the fetus.

Also, the module offers recommendations to aid in controlling the risks detected in the analysis.

Source. *ErgoMater* is the result of a research project developed by IBV in collaboration with two mutual insurance companies [IBV, Unión de Mutuas, Muvale, 2004].

DATA

The analysis is commenced by selecting *ErgoMater* in the *New task* window (Figure 1).

This gives access to the main window for this module (Figure 2) in which the data are to be entered.

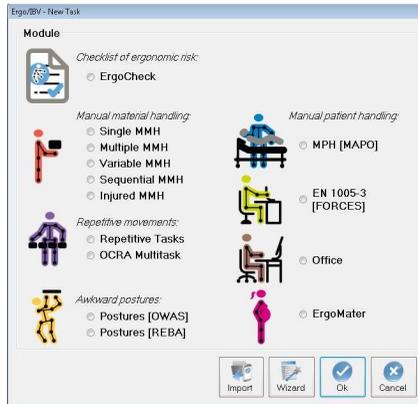


Figure 1: ErgoMater module entry

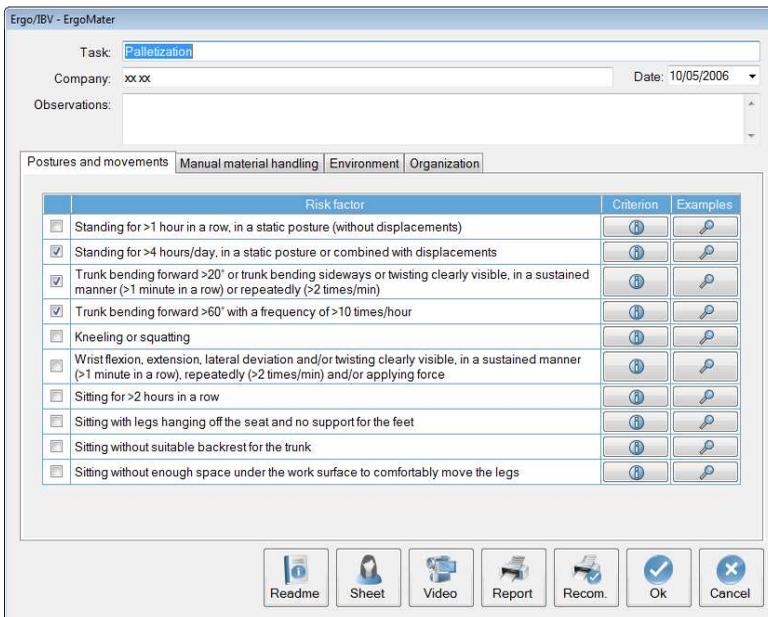


Figure 2: ErgoMater – Main window

Identification. The task name, the company, the date of the analysis and the observations are recorded in the main window's header.

Data of the worker. By clicking the *Sheet* button (in the lower part of the main window) one accesses a window for collecting the appropriate information for identifying the worker. Besides, her *opinion* on the physical effort for the work as a whole (heavy, normal, light) and her perception of changes in her capacity to work as from the beginning of pregnancy are registered.

Risk factors. The evaluation itself consists of a questionnaire or checklist with 19 items distributed into four sheets, which are accessed by clicking the corresponding sign:

- *Postures and movements*
- *Manual materials handling*
- *Environment*
- *Organization*

When evaluating these risk factors one has to consider the most usual and/or most unfavourable situation during the work, and the box that precedes the item is ticked when this factor appears in the analysed task.

The evaluation of the first item in the *manual materials handling* section requires the calculation of an additional variable (ACCEPTABLE MASS) through a specific procedure that is detailed below.

Criterion and examples Each item of the checklist has two buttons located to its right:

- The *Criterion* button displays a brief commentary setting out the adverse consequences that the presence of this risk factor in the workplace could imply for the mother and/or fetus (Figure 3).
- The *Examples* button offers images of some jobs that could present the risk factor in question (Figure 4).

Instructions. Clicking the *Read me* button (lower part of the main window) displays the instructions for using the *ErgoMater* module that have already been commented on in the preceding text.

Ergo/IBV - ErgoMater - Criterion

Standing for >1 hour in a row, in a static posture (without displacements)

During pregnancy tolerance to standing is reduced because of back pain, fatigue and dizziness. Furthermore, swelling of the feet and ankles (edema) and varicose veins in the legs are common effects of pregnancy that can become worse if woman stands for an extended period of time in a static posture.



Figure 3: ErgoMater – Criterion associated to a risk factor

Ergo/IBV - ErgoMater - Examples

Standing for >1 hour in a row, in a static posture (without displacements)

Examples (jobs or tasks that could involve this risk factor)

	Fruit warehouses (sorting, packing, etc.)
	Textile industry (checking or visual inspection of pieces)
	Preparation of food products (packaging, quartering, etc.)



Figure 4: ErgoMater – Examples associated to a risk factor

Detailed below are the risk factors included in each sheet.

Postures and movements

- Standing for >1 hour in a row, in a static posture (without displacements)
- Standing for >4 hours/day, in a static posture or combined with displacements
- Trunk bending forward >20° or trunk bending sideways or twisting clearly visible, in a sustained manner (>1 minute in a row) or repeatedly (>2 times/min)
- Trunk bending forward >60° with a frequency of >10 times/hour
- Kneeling or squatting
- Wrist flexion, extension, lateral deviation and/or twisting clearly visible, in a sustained manner (>1 minute in a row), repeatedly (>2 times/min) and/or applying force
- Sitting for >2 hours in a row
- Sitting with legs hanging off the seat and no support for the feet
- Sitting without suitable backrest for the trunk
- Sitting without enough space under the work surface to comfortably move the legs

Manual materials handling

- Handling loads over the acceptable mass.
- Pushing or pulling forces over 10 kg
- Handling loads >3 kg or applying considerable force while sitting

Environment

- Working on elevated surfaces (step ladders, platforms, step stools, etc.)
- Moving on unstable, irregular or slippery surfaces (floors with obstacles or holes, slippery areas, etc.)
- Risk of blows or compression to the abdomen (confined spaces, moving objects, constrictive belts or safety harnesses, sudden starts and stops in vehicles, etc.)

Organization

- Working >40 hours/week
- Night work, either fixed or in rotating shifts
- Paced work without self-selected breaks

CALCULATION OF THE ACCEPTABLE MASS

In the *manual materials handling* sheet (Figure 5), the evaluation of the first item requires a prior calculation of what should be the **acceptable mass** of the load under current handling conditions.

The procedure used for this is based on the proposal for lifting loads in the standing position according to a Technical Guide from the *Instituto Nacional de Seguridad e Higiene en el Trabajo* of Spain [INSHT, 1998]. One such procedure has been suitable adapted for incorporating the ergonomic requirements applicable to the pregnant worker.

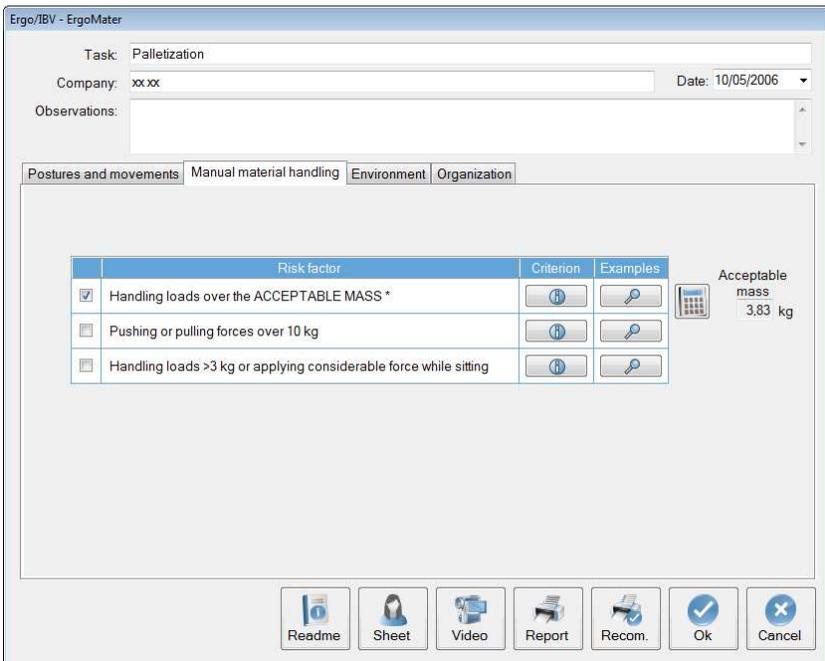


Figure 5: ErgoMater – Manual materials handling

Clicking the *Calculate acceptable mass* button (alongside the first item) gives access to the *Acceptable mass* window (Figure 6) in which the *handling conditions* used for calculating this variable are to be entered.

The program calculates the **acceptable mass** by multiplying the *recommended theoretical mass*, depending on the *handling zone*, by a series of correction factors associated with the *vertical displacement* of the load, *trunk twisting*, *coupling*, *duration* and *frequency* of the handling. Once these data have been entered, the program automatically displays the value of the **acceptable mass** in the corresponding box. Thus, when the actual mass handled in the task is higher than the calculated **acceptable mass** the box preceding the item should be ticked so as to indicate that the risk factor in question exists.

The recording of the **handling conditions** is performed as follows:

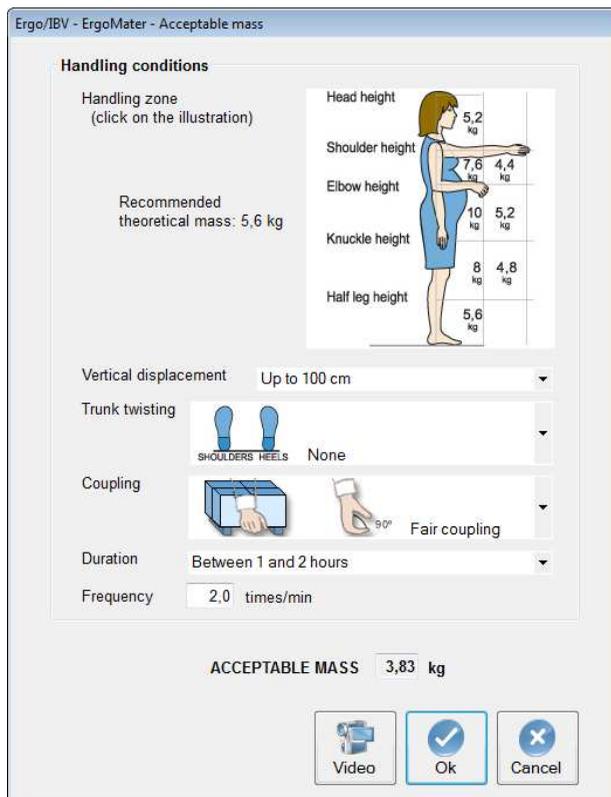


Figure 6: ErgoMater – Acceptable mass window

- Handling zone.** Click on the illustration the zone in which the load is handled (height and depth position of the load with respect to the body). When loads are handled in more than one zone, the most unfavourable one has to be considered for higher safety.

The illustration shows the values of the **recommended theoretical mass** depending on the handling zone, with 10 kg being the maximum value corresponding to the ideal position for the load (held against the body at a height between the elbow and the knuckles). The further the load is held away from the body the higher the risk of injury and the lower the weight that should be handled.

Note: Outside of the zones indicated in the illustration it is not permitted to handle loads (>3 kg); consequently, if this were the case, it is not necessary to pursue the calculation of the *acceptable mass* and the box preceding this item of the checklist should be ticked directly.

- Vertical displacement.** Select from the pull-down menu the vertical distance travelled by the load from the start of lifting until handling is complete.

The vertical displacement of a load is considered ideal up to 25 cm, with displacements between the *shoulder height* and the *half leg height* being acceptable. Displacements outside of these ranges should be avoided.

- Trunk twisting.** Select the trunk twisting from the pull-down menu, estimating the angle formed between the line linking the heels and the line linking the shoulders (Figure 7).

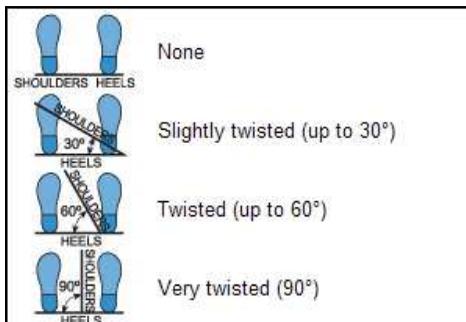


Figure 7: Trunk twisting

- **Coupling.** Select the load coupling from the pull-down menu, taking the following into consideration (Figure 8):
 - *Good coupling.* When the load has handles or other type of coupling with a shape and size that permits comfortable coupling with the whole hand, with the wrist remaining in a neutral position, without deviations or unfavourable postures.
 - *Fair coupling.* When the load has handles or slits not so optimum, that do not allow such comfortable coupling. It also includes loads without handles that can be held by flexing the hand 90° around the object.
 - *Poor coupling.* When the above requirements are not met.

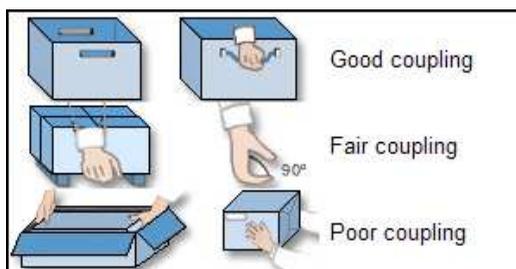


Figure 8: Coupling categories

- **Duration.** Select the duration of the loads handling from the pull-down menu (1 hour or less, 1-2, or 2-8 hours). High duration can produce fatigue and increase the risk of injury.
- **Frequency.** Enter the frequency with which the load is handled (times/min).

REPORT

Once the evaluation has been performed, clicking the *Report* button in the main window accesses the *task report* (Figure 9) which contains the following:

- **Identification.** This includes the general data (file, date, task, company and observations), the data of the worker and an image of the task, if a video source has been configured.
- **Risk factors.** This shows the items that have been detected in each section of the checklist. If the *acceptable mass* has been calculated, the associated handling conditions also appear.

RISK FACTORS

Postures and movements

- Standing for >4 hours/day, in a static posture or combined with displacements
- Trunk bending forward >20° or trunk bending sideways or twisting clearly visible, in a sustained manner (>1 minute in a row) or repeatedly (>2 times/min)
- Trunk bending forward >60° with a frequency of >10 times/hour

Manual materials handling

- Handling loads over the ACCEPTABLE MASS *

ACCEPTABLE MASS * kg for current handling conditions:

Handling zone	nearby, between half leg height and the floor
Vertical displacement	up to 100 cm
Trunk twisting	none
Coupling	fair
Duration	1-2 hours
Frequency	2 times/min

Environment

- Risk factors have not been detected

Figure 9: ErgoMater – Task report

RECOMMENDATIONS

Clicking the *Recom.* button in the main window allows one to obtain a *recommendations report* (Figure 10). In addition to the **identification** data, this report shows **recommendations** aimed at preventing or minimising the risk factors detected in the case, including also general measures that can be useful for any pregnant worker. Some of these recommendations are accompanied by an **image** as an aid to clarify some concepts.

Although an attempt has been made to offer solutions with a relatively broad scope of application, it is obvious that the needs for a specific case might not be reflected in this recommendations report; in fact, it is the evaluator who should check whether these recommendations can be applied to the case being analysed and can propose any other type of solution necessary for resolving the problems detected.

RECOMMENDATIONS (check if they are applicable to the current case)

- Avoid standing for >4 hours/day, in a static posture or combined with displacements. This measure can prevent adverse effects to the mother or the fetus due to the increase in physical effort. In order to do so alternate tasks carried out in a standing posture or walking with tasks in a sitting (or semi-sitting) posture and suitable rest breaks.
- Avoid unnecessary walking displacements during work. For example, locate all the activities assigned to the worker on the same floor and in areas that are relatively close together.
- Allow alternating between sitting and standing positions while doing the task. In order to create a workstation that combines standing and sitting, a considerable amount of space under the working surface is required for the legs, and special attention should be paid to the working height. The options include:
 - [a] use a work bench positioned at a fixed height that is suitable for working in a standing position and provide a high stool for sitting, with a suitable footrest in order to assure an adequate blood return to the heart from the legs;
 - [b] use a working surface that is height-adjustable and provide a conventional seat for the sitting position.

In any case, alternating between standing and sitting positions should not be too frequent because pregnancy makes rising from the chair more difficult. Before applying this measure, it is worth considering that the specifications of the task to be carried out determine the most suitable working posture; for example, a standing posture is recommended when high mobility, effort or reaching are required and in workstations where there is not much legroom.
- Provide anti-fatigue mats for tasks that are carried out in a standing posture. This type of flooring reduces discomfort, leg pain and back pain during prolonged standing periods. The function of this mat is to stimulate small muscle movements and to favour blood return to the heart from the legs.
- Provide a support system to place one foot occasionally while carrying out tasks in a standing position. This alternative support for the feet means that a small change in the working posture can be made regularly, thereby making the standing posture dynamic rather than static. The aim is to minimise fatigue and to relieve discomfort in the legs and back while standing.
- Use support tights. These are elastic tights that apply a gradual pressure to the lower extremities, minimising stagnation of peripheral blood flow and reducing discomfort in the legs while working in a standing position.






Figure 10: ErgoMater – Recommendations report