21. MODULE ErgoMater

- Introduction
- Data
- Report and 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, except in those items whose assessment indicates a possible risk before the 20th week of gestation.

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. This module is based on:

- The help guide for the assessment of occupational risk during pregnancy (3rd edition) published by the Instituto Nacional de la Seguridad Social (National Social Security Institute) in 2020. Madrid. NIPO: 122-20-049-0
- The results obtained in a research project developed by the IBV with the support and collaboration of two workmen's compensation insurance companies [IBV, Unión de Mutuas and 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.

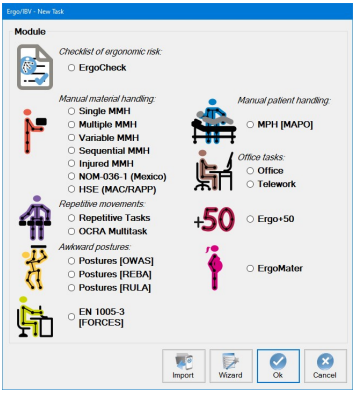


Figure 1: ErgoMater module entry

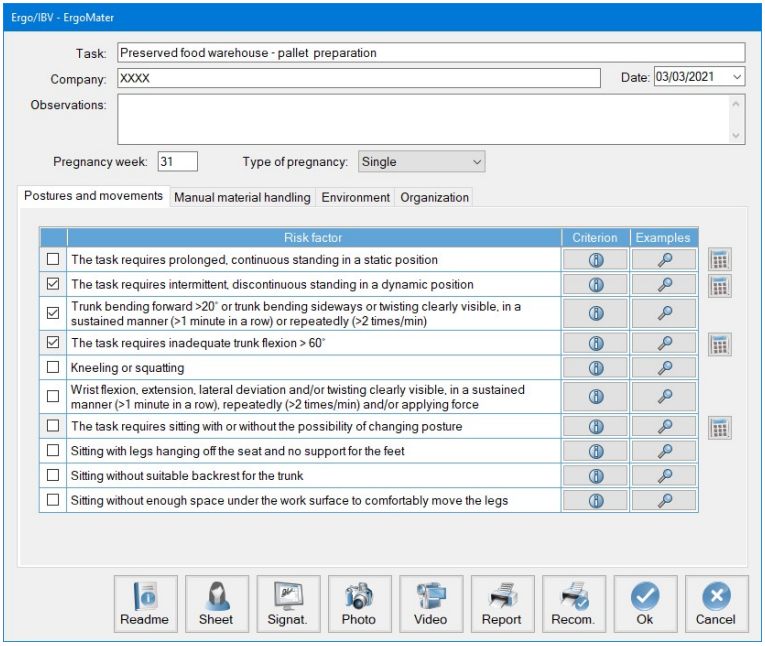


Figure 2: ErgoMater – Main window

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

Additionally, the **gestational week** in which the assessment of the worker is performed, as well as the **type of pregnancy** (single/multiple) must be specified.

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 20 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 assessment of some items (flagged with the symbol ) requires more information to determine the presence of risk in the workstation being assessed. These items are automatically filled in after completing the additional information; if a risk situation in determined, the item will be automatically filled in. The analysis procedure and the data necessary to determine each of them are 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.

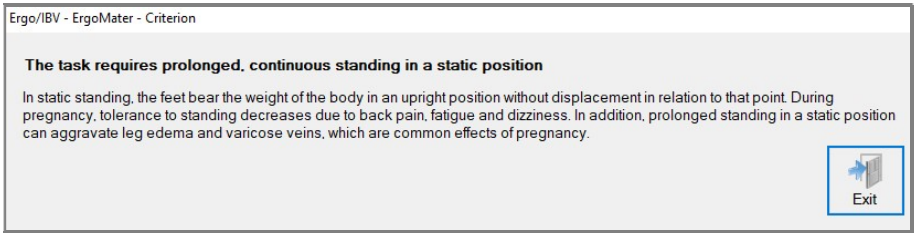


Figure 3: ErgoMater – Criterion associated to a risk factor

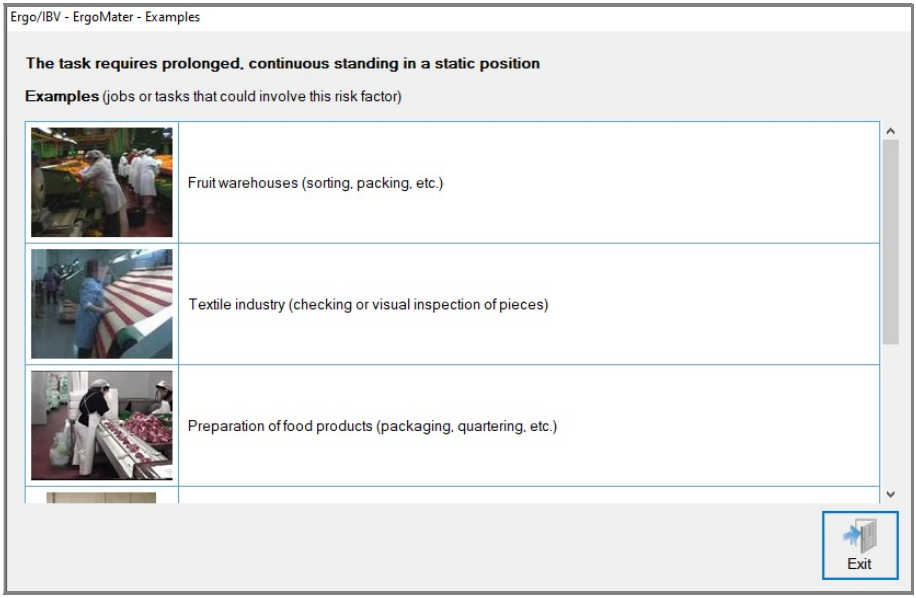


Figure 4: ErgoMater – Examples associated to a risk factor

Detailed below are the risk factors included in each sheet.

Postures and movements

- ☐ Prolonged, continuous standing in a static position.
- ☐ Intermittent, discontinuous standing in a dynamic position.
- ☐ Trunk bending forward >20º or trunk bending sideways or twisting clearly visible, in a sustained manner (>1 minute in a row) or repeatedly (>2 times/min)
- ☐ Inadequate trunk flexion> 60º
- ☐ 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 with or without the possibility of changing posture.
- ☐ 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 weights greater than the acceptable weight.
- ☐ Pushing or pulling forces over 10 kg
- ☐ Handling loads >3 kg or applying considerable force while sitting

Environment

- ☐ The task requires working on raised surfaces (platforms, ladders or vertical posters).
- ☐ The task requires using ladders.
- ☐ 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 ITEMS THAT REQUIRE ADDITIONAL INFORMATION

The items that require additional information to determine the presence of risk in the workstation are listed below for each tab. When these items, flagged with the symbol , are selected, a pop-up window opens with the data that must be filled in to determine the presence or absence of risk in the workstation.

If the gestational week when the worker is assessed is lower than the week when the risk begins, **there is** currently **no risk**, and therefore the corresponding item will not be filled in automatically in the main window. If, on the contrary, the gestational week is equal to or greater than the week when the risk begins, **there is risk**, and the item will appear checked on the main screen of the corresponding tab.

In any case, the software shows the week when the risk begins and a color code indicating the presence or absence of risk (Figure 5).

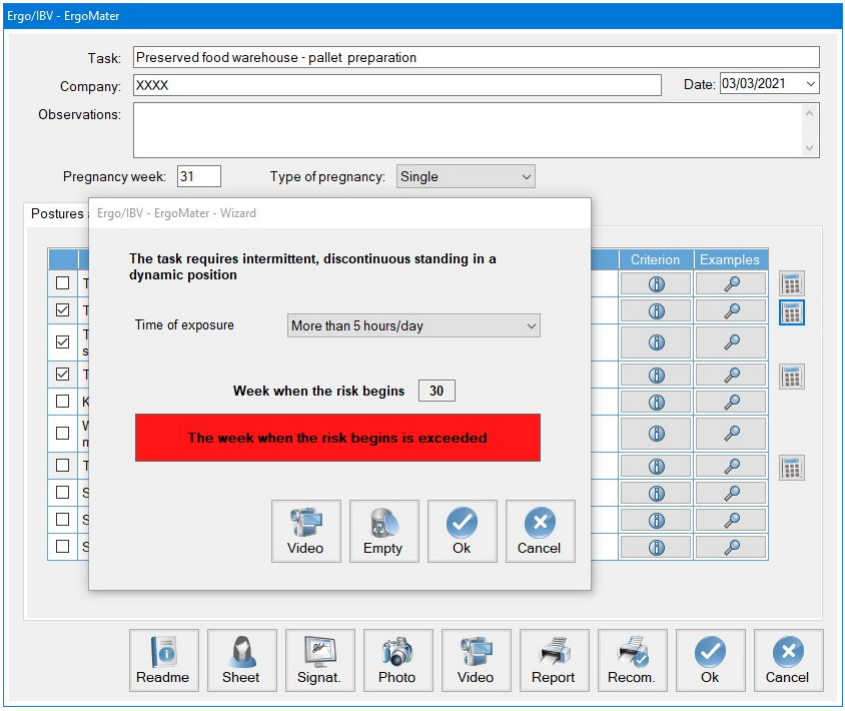


Figure 5. ErgoMater – Calculation of the items risk

Postures and movements

☐ The task requires prolonged, continuous standing in a static position.

- Time of exposure
  - Less than 2 hours/day
  - Between 2 and 3 hours/day
  - Between 3 and 5 hours/day
  - More than 5 hours/day

☐ The task requires intermittent, discontinuous standing in a dynamic position.

- Time of exposure
  - Less than 2 hours/day
  - Between 2 and 3 hours/day
  - Between 3 and 5 hours/day
  - More than 5 hours/day

☐ The task requires inadequate trunk flexion> 60º

- Frequency
  - Intermittently (less than 2 times/hour)
  - Intermittently (between 2 and 10 times/hour)
  - Repeatedly (more than 10 times/hour)
- Time of exposure
  - Less than 2 hours/day
  - Between 2 and 3 hours/day
  - Between 3 and 5 hours/day
  - More than 5 hours/day

☐ The task requires sitting with or without the possibility of changing posture.

- Sitting
  - Without the possibility of changing posture
  - With the possibility of changing posture
- Time of exposure
  - Less than 2 hours/day
  - Between 2 and 3 hours/day
  - Between 3 and 5 hours/day
  - More than 5 hours/day

Environment

☐ The task requires working on raised surfaces (platforms, ladders or vertical posters).

- Distance from the floor:

  ☐ More than 1 meter ☐ Less than 1 meter

- Frequency (number of times /8-hour day):

  ☐ less than 4 ☐ 4-8 times ☐ more than 8 times

☐ The task requires using ladders.

- Distance from the floor:

  ☐ More than 1 meter ☐ Less than 1 meter

- Frequency (number of times/8-hour day):

  ☐ less than 4 ☐ 4-8 times ☐ more than 8 times

Manual material handling

☐ The task requires handling weights greater than the acceptable weight.

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]. Such procedure has been suitably adapted to incorporate the ergonomic requirements that are applicable to pregnant workers according to the help guide for the assessment of occupational risk during pregnancy (3rd edition) published by the Instituto Nacional de la Seguridad Social (National Social Security Institute) in 2020.

By clicking the button  , the user accesses a window where the *handling conditions* are entered in order to calculate such variable.

The software calculates the **acceptable weight** by multiplying the *recommended theoretical weight* according to the *handling area* and the *gestational week* of the worker (Figure 6) by a series of factors.

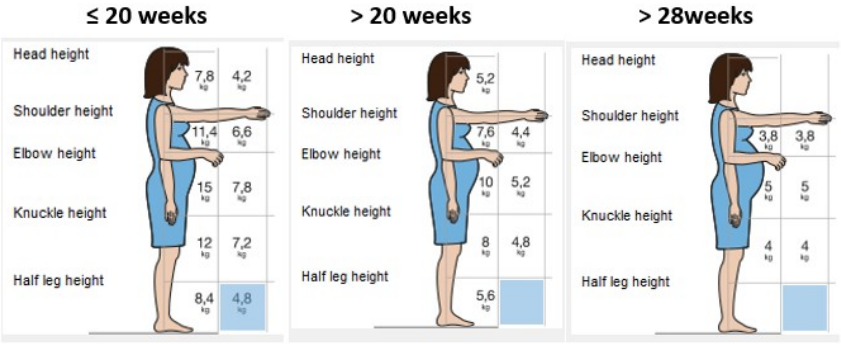


Figure 6. ErgoMater – Recommended theoretical weight according to the handling area and the gestational week of the worker

The calculation of the acceptable weight considers several correction factors: *vertical displacement* of the load, *trunk twisting*, *coupling*, *duration*, and *frequency* of the handling. Once these data have been entered, the software automatically displays the value of the acceptable weight, compares it with the weight that the worker actually handles, and automatically shows the week when the risk begins (if the assessment conditions are maintained), as well as whether the weight handled is greater than the **acceptable weight**, in which case, it would indicate the presence of the risk factor and automatically check this item.

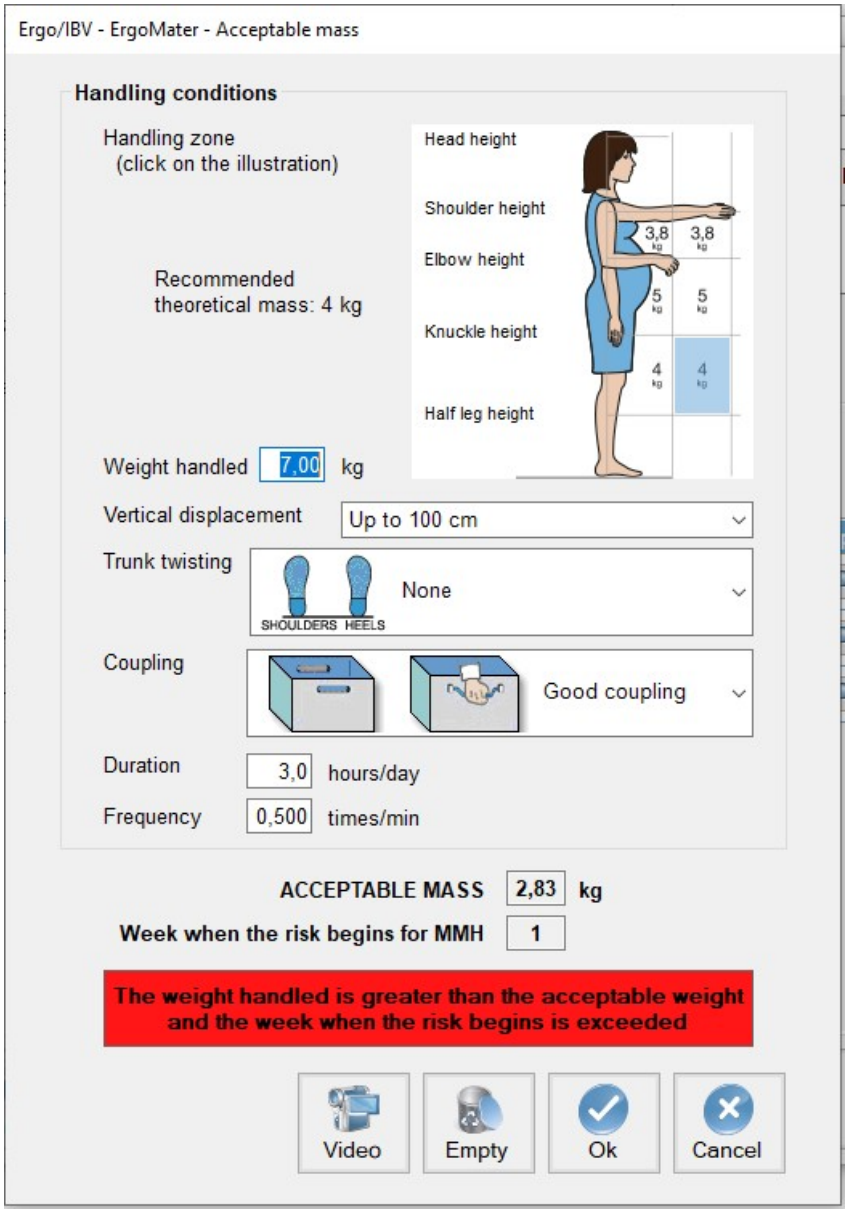


Figure 7: ErgoMater – Acceptable mass window

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

- **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.

- **Weight handled.** Indicate the weight that the worker actually handles in her workstation. This weight will later be compared with the acceptable weight to determine if the handling poses a risk to the worker.

- **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 8).

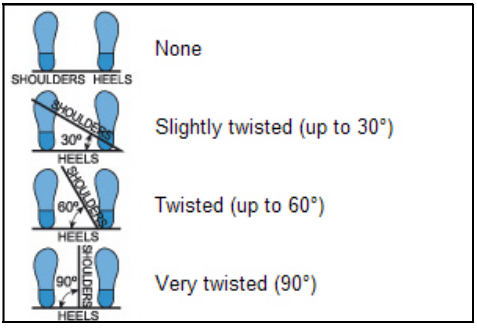


Figure 8: Trunk twisting

- **Coupling**. Select the load coupling from the pull-down menu, taking the following into consideration (Figure 9):
    - *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 90º around the object.
    - *Poor coupling.* When the above requirements are not met.

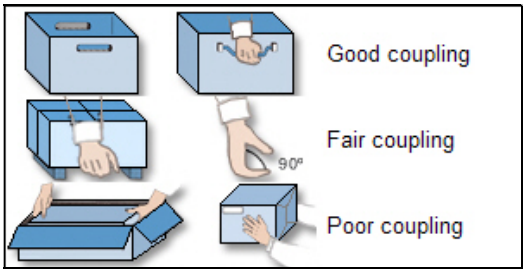


Figure 9: Coupling categories

- **Duration**. Enter the duration (hours), in which the load is handled. High duration can produce fatigue and increase the risk of injury.

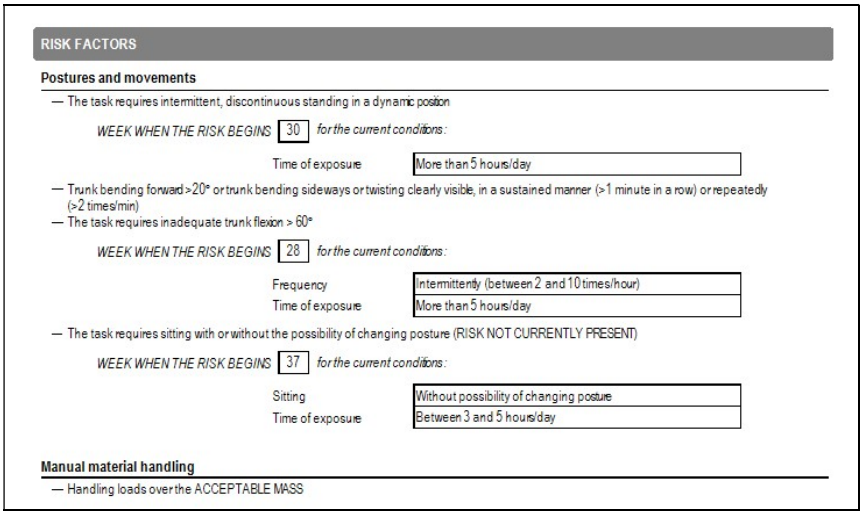
- **Frequency**. Enter the frequency with which the load is handled (times/min).

REPORT

Once the evaluation has been performed, clicking the *Report* button in the main window accesses the *task report* (Figure 10) which contains the following:

- **Identification**. This includes the general data (date, task, company and observations), the data of the worker, the gestational week in which the assessment is performed, the type of pregnancy, and an image of the task, if a photograph was added.

- **Risk factors**. This shows the items that have been detected in each section of the checklist. The items that require calculations include the indicated conditions, as well as the week when the risk begins. If the evaluator performed the calculation of an item that requires additional information, and the result of this evaluation is an acceptable situation at the time of the assessment, the report will indicate that there is currently NO risk for that item, and will also show the week in which the risk will be present.



RISK FACTORS

Postures and movements

— The task requires intermittent, discontinuous standing in a dynamic position

WEEK WHEN THE RISK BEGINS 30 *for the current conditions:*

Time of exposure	More than 5 hours/day

— 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)

— The task requires inadequate trunk flexion > 60°

WEEK WHEN THE RISK BEGINS 28 *for the current conditions:*

Frequency	Intermittently (between 2 and 10 times/hour)
Time of exposure	More than 5 hours/day

— The task requires sitting with or without the possibility of changing posture (RISK NOT CURRENTLY PRESENT)

WEEK WHEN THE RISK BEGINS 37 *for the current conditions:*

Sitting	Without possibility of changing posture
Time of exposure	Between 3 and 5 hours/day

Manual material handling

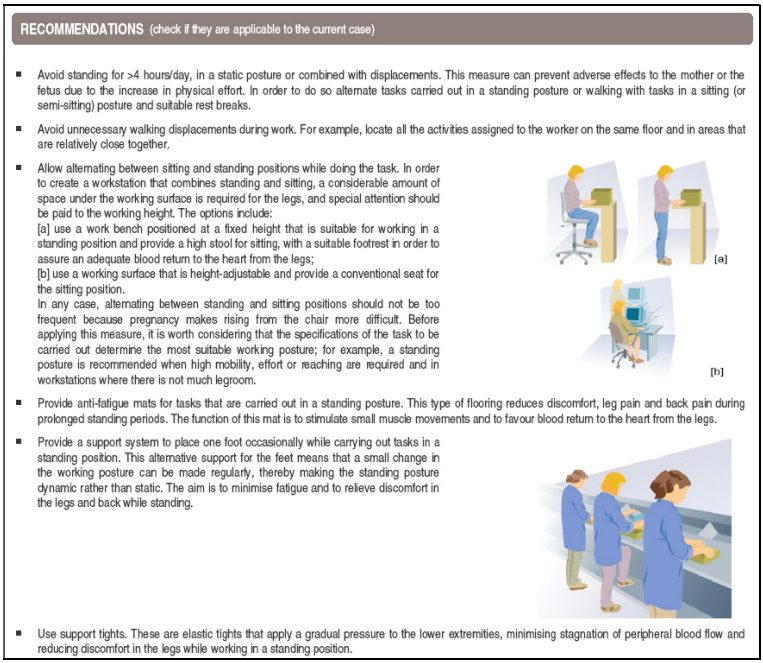
— Handling loads over the ACCEPTABLE MASS

Figure 10: ErgoMater – Task report

RECOMMENDATIONS

Clicking the *Recom.* button in the main window allows one to obtain a *recommendations report* (Figure 11). In addition to the **identification** data, **recommendations** are provided to prevent or minimize the risk factors detected in the case and future factors (items that do not currently pose a risk, but for which the week when the risk will be present was indicated), 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.

  [a] [b]
- 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 11: ErgoMater – Recommendations report