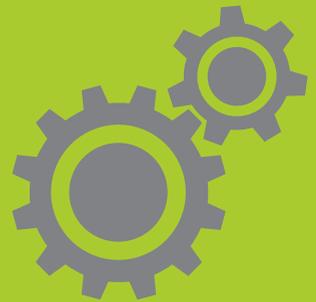


Guide for Risk Assessment in Small and Medium Enterprises

6

Manual Handling of Loads Lifting, Holding, Carrying, Pulling, Pushing

Identification and Evaluation of Hazards; Taking Measures



issa

INTERNATIONAL SOCIAL SECURITY ASSOCIATION

Section for Electricity

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Section for Machine and System Safety

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Imprint

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Introductory Note

This brochure is intended to conform to the requirement for a risk assessment during operations with manual load handling.

This brochure is structured as follows:

1. Basic Information – Principles

2. Risk Assessment and Specification of Measures

Annex 1: Assessment Sheet – Lifting, Holding, Carrying

Annex 2: Assessment Sheet – Pulling, Pushing

Note:

The objective of the brochure is to implement the Framework Directive on the introduction of measures to encourage improvements in the safety and health of workers at work (89/391/EEC) and the individual Directives issued thereto.

If relevant regulations implemented into national law exist, they shall imperatively be observed.

In addition to this brochure, other guides are planned/available for the following topics:

- Hazards arising from machinery and other work equipment
- Hazards arising from electricity
- Hazardous substances
- Hazards arising from whole-body and hand-arm vibrations
- Hazards arising from explosions
- Slipping and falling from a height
- Noise
- Mental workload

1. Basic Information – Principles

1.1 | Legal and normative bases

The bases are the legal regulations of the respective countries.

On an international level, the Standard ISO 11 228-1, Ergonomics-Manual handling-Lifting and carrying applies.

For the EU, the Directive 90/269/EEC is the legal basis for the minimum requirements for the protection of workers

against hazards arising from manual handling of loads.

According to Article 4 of the Directive, the employer is obligated to consider in particular the characteristics of the load, the working environment and the requirements of the task when identifying and evaluating hazards likely to occur at the workplace.

1.2 | Manufacturer's regulations

The relevant national regulations for the limitation of load weights, packing sizes, ergonomic design etc. shall be taken into account.

For Europe, especially the Machinery Directive 2006/42/EC and the Standard EN 1005, Safety of machinery – Human physical performance apply.

2. Risk assessment and Specification of Measures

In practice, it has proven of value to carry out the risk assessment in three steps: hazard identification (clause 2.1), risk estimation and risk evaluation (clause 2.2) and specification of measures (clause 2.3)

2.1 | Hazard identification

The first step of a risk assessment is the identification of risk features.

With the table given on page 6, the most important **features of manual load handling** shall be checked. The check does not require specialized knowledge.

When a risk feature was identified, a risk estimation and evaluation shall be carried out.



Figure 1: Load transport with cart

Checklist for risk identification (manual load transport)

If one or more questions are answered with „**PARTIALLY**“ or „**YES**“, a **risk estimation and risk evaluation** should be carried out.

Questions	Yes	Partially	No
1. Are loads > 5 kg regularly moved?			
<p>Manual load transport may be lifting, holding, carrying, pulling or pushing.</p> <p>Examples: Setting of building stones, loading of machines, unloading of packages, holding a portable grinding machine, furniture hauling, putting up scaffoldings, transfer of patients</p>			
2. Is lifting and carrying performed in unfavourable postures?			
<p>All postures which strongly deviate from a normal and comfortable posture are considered as unfavourable.</p> <p>Examples: bending far forward, twisting or lateral inclining of the upper part of the body, load far from body or above shoulder height, hollow-back, kneeling, crouching</p>			
3. Is handling made more difficult by the nature of the load?			
<p>Examples: bulky, unshaped, instable, hardly seizable, hot, cold, sharp-edged, smooth surface, unfavourable balance point</p>			
4. Is handling made more difficult by unfavourable working conditions?			
<p>Examples: confined area of movement, small room height, uneven or soft or slippery floor, long ways, cold or very warm rooms, poor lighting</p>			
5. Are there complaints from the workforce?			
<p>Examples: too heavy load weights, back and joint pain, high working speed, time pressure, increasing exhaustion</p>			

Note:

Specific regulations apply when operations with manual load handling are carried out by young persons, older workforce or pregnant women.

2.2 | Risk estimation and risk evaluation

Key indicator methods may be used for risk estimation and risk evaluation. Hence, orientating evaluations are possible. They take into account the most important features of manual working operations. Due to different types of physical stress and working features, risk estimation and risk evaluation with key indicators are carried out separately for

Lifting – holding – carrying and Pulling – pushing

The result points to deficiencies in design and shows whether physical overload is possible or probable for the activity concerned. From this, direct measures for technical, organizational and person related design can be derived.

For evaluating the features, it is absolutely necessary to have a good knowledge of the activity to be evaluated. If this is not the case, an evaluation must not be made.

Rough estimates or presumptions will yield wrong results. More detailed estimates require special ergonomic analyses.

2.2.1 | Key indicator method for lifting, holding and carrying

The key indicator method describes the type and characteristic of relevant working features. These are features having an important influence on the physical strain:

- time duration, frequency
- load weight
- posture
- working conditions

The description of the activity is supplemented by a risk evaluation, which pictures the probability of physical overload.



Figure 2: Manual lifting and carrying at a bakery

Operating procedures for the key indicator method lifting, holding, carrying

Evaluation is principally made for partial activities and is to be based on one working day. If during a partial activity load weight and/or postures change, the values shall be averaged.

If within a total activity **several partial activities** with clearly differing load handling operations occur, they shall be **estimated** and documented **separately**.

The assessment sheet for lifting, holding and carrying can be found in Annex 1.

3 steps are necessary for the evaluation:

Step 1: Determination of the time rating points

Step 2: Determination of the key indicator rating points

Step 3: Evaluation

When determining the rating points, the establishment of intermediate steps (interpolation) is in principle allowed. A frequency of 40 results, for example, in a time rating point of 3

The sole exception is an effective load of ≥ 40 kg for a man and ≥ 25 kg for a woman. These loads give uncompromisingly a load rating point of 25.

Step 1:

Determination of the time rating point

Determination of the time rating point is made on the basis of the table separately for three possible types of load handling:

- For partial activities characterised by **regular repeating of short lifting, lowering or moving operations**, the number of operations is decisive for the time rating.
- For partial activities characterised by **holding** a load, the total time of holding is taken as basis.

$$\text{Total time} = \text{number of holding operations} \times \text{time for an individual holding operation}$$

- For partial activities characterised by **carrying** a load, the total way covered with the load is taken as basis. A mean walking speed of 4 km/h \approx 1 m/s is assumed.

Step 2:

Determination of rating points of load, posture and working conditions

► Load weight

- Determination of the load weight is made on the basis of the table, separately for **men and women**.
- If different loads are handled during the activity under evaluation, a **mean value** may be calculated, as long as the individual load does not exceed 40 kg for men and 25 kg for women.

For comparison, also peak values may be used. Then it is the reduced frequency of these peak values which shall be taken as basis and by no means the total frequency.

- For **lifting/holding/carrying/lowering activities** the effective load shall be taken as basis. Effective load means the real action force which is necessary for the workforce for moving the load.

This action force does not correspond to the load mass in each case. When tilting a carton, only 50 % of the load mass will have an effect.

► Posture

Determination of the rating points of posture is made on the basis of the pictograms contained in the table. The **postures during load handling** which are **characteristic** for the partial activity shall be used.

If due to the sequence of the working progress different postures are taken, a mean value may be calculated from the rating points of posture for the partial activity being evaluated.

► Working conditions

For determining the rating points of working conditions, the working conditions prevailing in time shall be taken. Occasional discomfort without any safety relevance shall not be considered.

Safety-related features shall be documented in the description field „*Check of the workplace necessary for other reasons*“.

Step 3:

Evaluation

The evaluation of each partial activity is made by means of a **point value related to the partial activity** (calculation by addition of the rating points of key indicators and by multiplication with the time rating points).

- **Evaluation basis** are bio-mechanic effect mechanisms in connection with dose models.

It is taken into account that the internal strain of the lumbar spine crucially depends on the bending forward of the upper part of the body and on the load weight and that it rises with increasing strain duration and/or frequency, lateral inclination and/or twisting.

- **Summarising evaluations** for several partial activities are **problematic**, because they are beyond the informational value of this orientating analysis.

In general, they require more detailed work related analytical procedures for risk assessment.

● **Derivable design necessities**

From this risk estimation design necessities and approaches can immediately be seen. In principle, the causes of high rating points shall be abolished. In detail, this means organisational regulations in case

of high time rating points, reduction of the load weight or the use of lifting means in case of high load rating points and the improvement of the workplace design in case of high posture rating points.

Evaluation example

At a packing place of a company packages with a load weight of 14 kg are moved from the packing table to a pallet on the floor. This activity is carried out by a female workforce

The following marginal conditions occur:

- 180 moving operations per shift
- 14 kg load weight
- low bending or far bending forward during lowering
- bad gripping conditions



Figure 3: Work at packing place

Using Assessment sheet (Lifting, Holding, Carrying), see Annex 1, one finds:

Assessment Sheet – Lifting, Holding, Carrying
Where there are a number of individual activities with considerable physical strains, they must be estimated separately.

Workplace/Activity: *Palletizing packages*

1st step

Determination of time rating points

Lifting or displacement operations (< 5 s)	
Number on working day	Time rating points
< 10	1
10 to < 40	2
40 to < 200	4
200 to < 500	6
500 to < 1000	8
≥ 1000	10

Effective load ¹⁾ for women	Load rating point
< 5 kg	1
5 to < 10 kg	2
10 to < 15 kg	4
15 to < 25 kg	7
≥ 25 kg	25

2nd step

Determination of rating points of load, posture and working conditions

	<ul style="list-style-type: none"> ● Low bending or far bending forward ● Slightly bending forward with simultaneous twisting of trunk ● Load far from the body or above shoulder height 	<div style="border: 1px solid black; border-radius: 50%; width: 40px; height: 40px; display: flex; align-items: center; justify-content: center; margin: 0 auto;">4</div>
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<p>Space for movement restricted and unfavourable ergonomic conditions: → e.g. 1.: space for movement restricted by too low high or working area less than 1,5 m² or or 2.: posture stability impaired by uneven floor or soft ground</p>	<div style="border: 1px solid black; border-radius: 50%; width: 40px; height: 40px; display: flex; align-items: center; justify-content: center; margin: 0 auto;">1</div>
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3rd step

Evaluation

3rd step: Evaluation

The rating points relevant to this activity are to be entered and calculated in the diagram.

	Load rating points	4			
+	Posture rating points	4			
+	Working conditions rating points	1			
=	Total	9	x	Time rating points 4	= Risk score 36

The evaluation result shows an increased stress. The essential design deficiency is the unfavourable posture

2.2.2 | Key indicator method for pulling and pushing

Manual load handling also covers transport on trolleys, roller belts or with handling aids.

Instead of being carried, loads are pushed or pulled.

Thus, transport of high load weights becomes possible and transport of load weights between 10 and 50 kg is effectively facilitated.

However, important basic rules shall be observed in order to prevent possible hazards.

Operational procedures for the key indicator method pulling, pushing

The assessment sheet for pulling and pushing is given in Annex 2.

Step 1:

Determination of time rating points

Operating sequence, time duration, frequency and distances covered are ascertained.

Step 2:

Determination of rating points of mass, positioning accuracy, speed, posture and working conditions

► Transport means

There are different ways of moving loads by pulling or pushing:

- without auxiliary means, the load is rolled or pulled with sliding
- barrows (wheelbarrow, one-axle barrow)
- Roll containers, rollers without drawbar and trolleys with drawbar, hand pallet trucks
- Manipulators, suspension and guide rails

It is important that the auxiliary means are suited for the working task. Type, size, and weight of the goods to be conveyed, distance covered and quality of the road, tilting stability and frequency of use shall be taken into account.



Figure 4: Stair climbing barrow



Figure 5: Transport trolley

Regard shall also be paid to the ergonomic design of the handles with protection against hand injuries and, if necessary, brake mechanisms.

► Load weight

Weights of the transported load and the transport means moved simultaneously are ascertained. Rough reference values are sufficient. In case the weight was not given, it can be estimated.

In most cases, the weight of barrows and trolleys is given on the type plate.

If the load weight cannot be estimated or if weight specifications are missing (e.g. for manipulators), an extended analysis should be performed.



Figure 6: Use of roll containers

► Speed of motion

It is determined how quick and how exact pulling and pushing is performed.

Quick movements and high accuracy of motion is not only very exhausting but also increases the risk of accidents.

► Posture

During pulling and pushing the posture should be upright with low inclination and without twisting of the trunk.

This is possible by an ergonomic installation of the handles. Drawbars, spars at barrows which are too short, missing handles or loads blocking the view can lead to unfavourable postures. Twisting, bending and inclining of the trunk reduce possible physical forces and put severe strain on the muscular-skeletal system.

► Working conditions

The most important influencing variables, i. e. the distance covered (travelling distance) and the technical state of the transport means are determined. Soft floors, rough pavement, potholes, gutters, steps as well as up-slopes and down-slopes may strongly aggravate transport and make it impossible to a certain extent.

The same impeding effects are given by sliding or tight rolls, deformed handles and defective brakes. Attention shall also be paid to obstacles on the driveway, unsecured differences in altitude and lateral inclinations which may cause tilting over.

Step 3:

Evaluation

For evaluation, the results of step 1 and step 2 shall be summarized and three complex questions shall be answered:

- Is the ratio between the required action forces and the available physical forces adequate?

Is application of the forces always safe and does no excessive exhaustion arise?

- Are favourable postures possible?

Do unfavourable postures only occur occasionally and are twisting and bending during pulling and pushing avoided?

- Are the conditions safe?

Is there no accident hazard due to slipping or tilting over of the load, falls or crushing of the hands?

Evaluation example

A truck is charged with commissioned goods in roll containers. The weight of the roll containers is between 40 and 190 kg.

Design deficiencies are:

- Roll containers are not adapted to the conditions of use. Rolls are too small and often get stuck in driveway irregularities.
- Roll containers have no tilting stability during driving as the balance point is too high.
- The required physical forces are already too high at slight up-slopes and down-slopes.
- Ergonomic handles with protection against hand injuries are not available. Crushing at other roll contain-

ers or in narrow passages occur frequently.

- Passages are often not wide enough, in parts poorly lightened and not free from obstacles.



Figure 7: Transport with roll container

Using Assessment sheet (Pulling, Pushing), see Annex 2, one finds:

Assessment Sheet – Pulling, Pushing

The overall activity must be broken down into individual activities. Each individual activity involving major physical strain must be assessed separately.

Workplace/Activity: *Roll container loaded*

1st step

Determination of time rating points

Time rating points
1
2
4
6
8
10

0,5
1
2
3
4
5

Speed of motion	
slow (< 0,8 m/s)	fast (0,8 to 1,3 m/s)
1	2
2	4

2nd step

Determination of rating points of mass, positioning accuracy, speed, posture and working conditions

		Trunk slightly bending forward or slightly twisted (one-sided pulling)	2
--	--	------------------------------------------------------------------------	---

Difficult: → unpaved or roughly paved roadway, potholes, severe soiling, → inclines of 2 to 5°, → industrial trucks have to be torn loose when starting up → rollers or wheels soiled, bearings run sluggishly	4
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3rd step

Evaluation

3rd step: Evaluation

Die für diese Tätigkeit zutreffenden Wichtungen sind in das Schema einzutragen und auszurechnen.

Mass/industrial truck	2
+ Positioning accuracy/speed of motion	2
+ Posture rating points	2
+ Working conditions rating points	4
= Total	10

x Total ratings points 4 x $\frac{1}{3}$ = Risk score 40

for women employees

The evaluation result shows an increased strain. The essential design deficiency is the unfavourable driveway with ramps, narrow points and irregularities.

Further analysis

The risk assessment made with key indicator methods does not always lead to final evaluations.

For example, in case of complicated operating cycles, when preparing investment plans or during work of persons under difficult conditions (e.g. firefighters) further analyses are necessary.

These analyses require more time and workforce and specialised ergonomic knowledge.

Contact partners are national authorities and special health and safety at work institutions.

2.3 | Specification of Measures

Based on the risks determined in clause 2.2, concrete measures can be derived.

That means planning of load transport operations, provision of auxiliary means for manual load transport and measures for health-oriented behaviour and for training and supervision.

The following clauses are based on the Suva Check List "Moving heavy loads by hand" (www.suva.ch/waswo/67089).

2.3.1 | Planning of transport operations

Transport operations shall be taken as seriously as production flows.

Good planning saves unnecessary, risky, awkward or improvised transports with inadequate transport means.

Important for superiors:

- to make sure during planning and work preparation that appropriate and sufficient transport equipment is available
- to make sure that regularly repeated transport is automated, if possible

- to take account of the time needed for transports during planning of work and production flows
- to take care during ordering of operating resources and materials that the packs can be transported without problems
- to give the instruction that operating resources and materials that need to be transported manually are only purchased in units of 25 kg at maximum

2.3.2 | Aids for manual load transport

When purchasing aids, it is imperative to let the persons who are to work with them later on have a say. They are the specialists and may contribute to the procurement of the correct equipment.

Important for superiors:

- to appoint competent person or body responsible for the procurement of transport equipment
- to check auxiliary transport means for suitability prior to procurement
- to let the workforce have a say in the procurement of transport equipment
- to train the workforce in the use of new transport equipment
- to give the necessary period of familiarization during the introduction of new transport equipment

- to check and maintain transport equipment regularly



Figure 8: Moving of loads with a vacuum lifting device

2.3.3 | *Lifting and carrying*

During lifting and carrying of loads, the risk of physical overload frequently occurs. To avoid this, it is of special importance that the loads lifted are not too heavy and that the workforce uses correct lifting and carrying techniques.

Important for superiors:

- to consider age, gender and constitution of the persons involved during workforce planning
- to limit load weights
- to calculate and arrange for recreation breaks for activities requiring frequent load transport
- to always mark loads, which are heavier than 10 kg with their actual weight

- to train the workforce in correct lifting and carrying
- to inform the workforce on possible consequences of incorrect lifting



Figure 9: Good body posture during lifting of loads

2.3.4 | *Training and supervision*

Generally, a single training on the correct handling of loads is not sufficient. Superiors shall supervise observance of the instructions

Important for superiors:

- to carry out training courses on load transport consistently with all the workforce concerned
- to address and correct the workforce, when they behave incorrectly during load transport
- to ensure that existing transport equipment are being used consistently
- to encourage the workforce to notify deficiencies and to suggest improvement measures



Figure 10: Prevention of lifting and carrying activities through vertically adjustable work tables and roller conveyors

Lift, push, load or carry in a way well-thought-out – you'll be okay.

Assessment Sheet – Lifting, Holding, Carrying

Where there are a number of individual activities with considerable physical strains, they must be estimated separately.

Workplace/Activity: _____

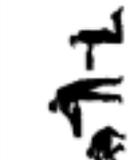
1st step: Determination of time rating points (Select only one column!)

Lifting or displacement operations (< 5 s)		Holding (> 5 s)		Carrying (> 5 m)	
Number on working day	Time rating points	Total duration on working day	Time rating point	Overall length on working day	Time rating points
< 10	1	< 5 min	1	< 300 m	1
10 to < 40	2	5 to < 15 min	2	300 m to < 1 km	2
40 to < 200	4	15 min to < 1 hr	4	1 km to < 4 km	4
200 to < 500	6	1 hr to < 2 hrs	6	4 km to < 8 km	6
500 to < 1000	8	2 hrs to < 4 hrs	8	8 km to < 16 km	8
≥ 1000	10	≥ 4 Stunden	10	≥ 16 km	10
Examples: laying bricks, placing workpieces into a machine, taking boxes out of a container and putting them onto a conveyor belt		Examples: holding and guiding a cast iron slug while working on a wheel stand, operating a hand grinding machine, operating a weed-eater		Examples: furniture removal, delivering scaffolding parts to a building site	

2nd step: Determination of rating points of load, posture and working conditions

Effective load ¹⁾ for men	Load rating point	Effective load ¹⁾ for women	Load rating point
< 10 kg	1	< 5 kg	1
10 to < 20 kg	2	5 to < 10 kg	2
20 to < 30 kg	4	10 to < 15 kg	4
30 to < 40 kg	7	15 to < 25 kg	7
≥ 40 kg	25	≥ 25 kg	25

¹⁾ „Effective load“ means in this context the real action force which is necessary for moving load. This action force does not correspond to the load mass in each case. When tilting a carton, only 50 % of the load mass will have an effect on worker and when using a cart only 10 %.

Typical posture, position of load ²⁾	Posture, position of load	Posture rating point
	<ul style="list-style-type: none"> ● Upper body upright, not twisted ● When lifting, holding, carrying und lowering the load is close to body 	1
	<ul style="list-style-type: none"> ● Slightly bending forward or twisting the trunk ● When lifting, holding, carrying und lowering load is near to medium to body 	2
	<ul style="list-style-type: none"> ● Low bending or far bending forward ● Slightly bending forward with simultaneous twisting of trunk ● Load far from the body or above shoulder height 	4
	<ul style="list-style-type: none"> ● Bending far forward with simultaneous twisting of trunk ● Load far from body ● Restricted stability of posture when standing ● Crouching or kneeling 	8

²⁾ To determine the posture rating points the typical posture during manual handling must be used. For example when there are different postures with load a mean value must be used – not occasional extreme values.

Annex 1

Working conditions	Working conditions rating point
Good ergonomic conditions: → e.g. sufficient space, no physical obstacles within the workspace, even level and solid flooring, sufficient lighting, good gripping conditions	0
Space for movement restricted and unfavourable ergonomic conditions: → e.g. 1.: space for movement restricted by too low high or working area less than 1,5 m ² or 2.: posture stability impaired by uneven floor or soft ground	1
Strongly restricted space of movement and/or instability of centre of gravity of load: → e.g. transfer of patients	2

In the table not mentioned characteristics are complementary in spirit.

3rd step: Evaluation

The rating points relevant to this activity are to be entered and calculated in the diagram.

+	Load rating points		
+	Posture rating points		
+	Working conditions rating points		
=	Total		

x Time rating points = Risk score

On the basis of the rating calculated and the table below it is possible to make a rough evaluation³⁾. Regardless of this provisions of the Maternity Leave Act apply.

Risk range	Risk score	Description
1	< 10	Low load situation , physical overload unlikely to appear.
2	10 to < 25	Increased load situation , physical overload is possible for less resilient persons ⁴⁾ . For that group redesign of workplace is helpful.
3	25 to < 50	Highly increased load situation , physical overload also possible for normal persons. Redesign of the workplace is recommended ⁵⁾ .
4	≥ 50	High load situation , physical overload is likely to appear. Workplace redesign is necessary ⁵⁾ .

³⁾ Basically it must be assumed that as the number of point rating rises, so the risk of overloading the muscular-skeletal system increases. The boundaries between the risk ranges are fluid because of the individual working techniques and performance conditions. The classification may therefore only be regarded as an orientation aid. More exact analyses require specialist ergonomic knowledge.

⁴⁾ Less resilient persons in this context are persons older than 40 or younger than 21 years, newcomers in the job or people suffering from illness.

⁵⁾ Design requirements can be determined with reference to the number of point in the table. By reducing the weight, improving the execution conditions or shortening the strain time, elevated stress can be avoided.

Assessment Sheet – Pulling, Pushing

The overall activity must be broken down into individual activities. Each individual activity involving major physical strain must be assessed separately.

Workplace/Activity: _____

1st step: *Determination of time rating points (Select only one column!)*

Pulling and pushing over short distances or frequent stopping (single distance up to 5 metres)	Pulling and pushing over longer distances (single distance more than 5 metres)
Number on working day	Total distance on working day
< 10	< 300 m
10 to < 40	300 m to < 1 km
40 to < 200	1 km to < 4 km
200 to < 500	4 to < 8 km
500 to < 1000	8 to < 16 km
≥ 1000	≥ 16 km
Examples: operation of manipulators, setting up machines, distribution of meals in a hospital	Examples: garbage collection, furniture transport in buildings on rollers, unloading and transloading of containers

2nd step: *Determination of rating points of mass, positioning accuracy, speed, posture and working conditions*

Mass to be moved (load weight)	Industrial truck, aid			
	Without, load is rolled 	Barrow 	Carriage, roller, trolleys without fixed rollers (only steerable rollers) 	Gleiswagen, Hand/Rail cars, hand carts, roller tables, carriages with fixed rollers 
rolling				

< 50 kg	0,5	0,5	0,5	0,5	0,5
50 to < 100 kg	1	1	1	1	1
100 to < 200 kg	1,5	2	2	1,5	2
200 to < 300 kg	2	4	3	2	4
300 to < 400 kg	3		4	3	
400 to < 600 kg	4		5	4	
600 to < 1000 kg	5			5	
≥ 1000 kg					

sliding		Grey areas: Critical because a check of the movement of industrial truck/load depends very much on skill and physical strength.
< 10 kg	1	
10 to < 25 kg	2	
25 to < 50 kg	4	
> 50 kg		White areas without number: Basically to be avoided because the necessary action forces can easily exceed the maximum physical forces.

Positioning accuracy	Speed of motion	
	slow (< 0,8 m/s)	fast (0,8 to 1,3 m/s)
Low – no specification of travelling distance – load can roll to a stop or runs against a stop	1	2
High – load must be accurately positioned and stopped – travelling distance must be adhered to exactly – frequent changes in direction	2	4

Note: the average walking speed is approx. 1 m/s

Annex 2

Posture ¹⁾		
	Trunk upright, not twisted	1
	Trunk slightly bending forward or slightly twisted (one-sided pulling)	2
	Body inclined low in direction of motion Squatting, kneeling, bending	4
	Combination of bending and twisting	8

¹⁾ The typical posture must be used. The greater trunk inclination possible when starting up, braking or shunting can be ignored if it only occurs occasionally..

Working conditions	Working conditions rating point
Good: → floor or other surfaces level, firm, smooth, dry, → no incline, → no obstacles in workspace, → rollers or wheels run easily, no evident wear in the wheel bearings	0
Restricted: → floor soiled, a little uneven, soft, → slight incline up to 2° → obstacles in workspace which have to be bypassed, → rollers or wheels soiled, no longer run easily, bearings worn	2
Difficult: → unpaved or roughly paved roadway, potholes, severe soiling, → inclines of 2 to 5°, → industrial trucks have to be torn loose when starting up → rollers or wheels soiled, bearings run sluggishly	4
Complicated: → steps, stairs, → inclines > 5°, → combinations of indicators from "restricted" to "difficult"	8

In the table, not mentioned characteristics are complementary in spirit.

3rd step: Evaluation

Die für diese Tätigkeit zutreffenden Wichtungen sind in das Schema einzutragen und auszurechnen.

	Mass/industrial truck		
+	Positioning accuracy/speed of motion		
+	Posture rating points		
+	Working conditions rating points		
=	Total	x	Risk score

Total ratings points **x** 1,3 = Risk score

for women employees \rightarrow

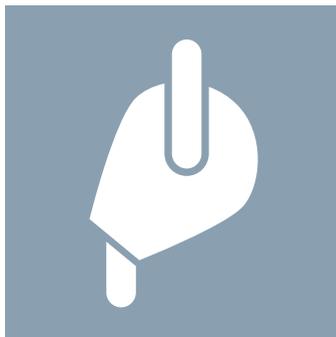
On the basis of the rating points calculated and the table below it is possible to make a rough evaluation.

Risk range ²⁾	Risk score	Description
1	< 10	Low load situation , physical overload unlikely to appear.
2	10 to < 25	Increased load situation , physical overload is possible for less resilient persons ³⁾ . For that group redesign of workplace is helpful.
3	25 to < 50	Highly increased load situation , physical overload also possible for normally resilient persons. Redesign of workplace is recommended.
4	≥ 50	High load situation , physical overload is likely to appear. Workplace redesign is necessary.

²⁾ The boundaries between the risk ranges are fluid because of the individual working techniques and performance conditions. The classification may therefore only be regarded as an orientation aid. Basically it must be assumed that as the number of risk scores rises, so the risk of overloading the muscular-skeletal system increases.

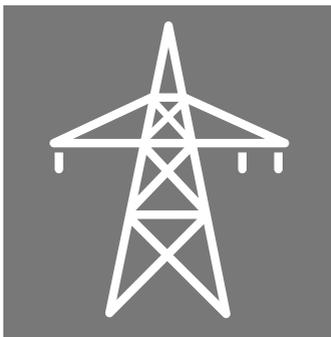
³⁾ Less resilient persons in this context are persons older than 40 or younger than 21 years, newcomers in the job or people suffering from illness.

The following ISSA International Sections on Prevention elaborated the brochure. They are also available for further information:



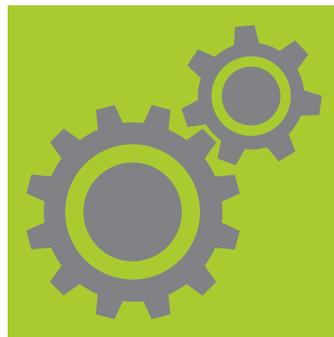
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