Assessment of pulling and pushing based on key indicators *Version Sept. 2002*

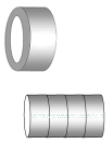
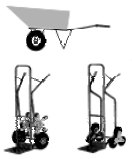
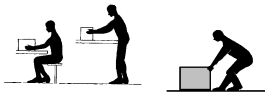
The overall activity must be broken down into individual activities. Each individual activity involving major physical strain must be assessed separately.

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	**Time rating points**	*Total distance on working day*	**Time rating points**
< 10	1	< 300 m	1
10 to < 40	2	300 m to < 1km	2
40 to < 200	4	1 km to < 4 km	4
200 to < 500	6	4 to < 8 km	6
500 to < 1000	8	8 to < 16 km	8
≥ 1000	10	≥ 16 km	10
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) 	Rail cars, hand carts, roller tables, carriages **with** fixed rollers 	Manipulators, rope balancers 
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					
< 10 kg	1				
10 to < 25 kg	2				
25 to < 50 kg	4				
> 50 kg					

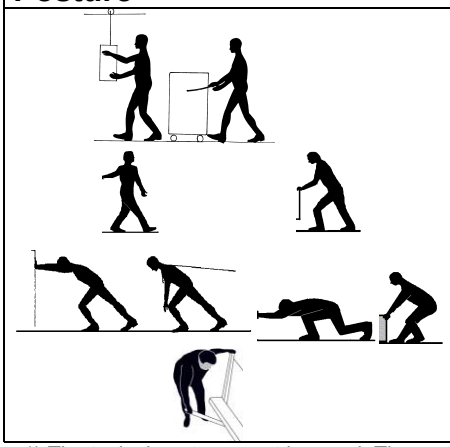
Grey areas:
Critical because a check of the movement of industrial truck/load depends very much on skill and physical strength.

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 bis 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

In general the whole muscular-skeletal system is subject to strain when pulling and pushing, but in particular the hand-arm-shoulder area. Depending on the specific force applications and postures, however, it is also possible that the lumbar spine and the hip and knee joints will be under severe strain. Because the physical forces are substantially lower and more varied than when lifting and carrying, it is difficult to verify chronic damage from overload. It is typical for pulling and pushing that there is a risk to the muscular-skeletal system from sudden overloads as a result of impact, slipping or unexpected and great forces with change of direction or when stopping.

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	
Good: → floor or other surfaces level, firm, smooth, dry → no incline → no obstacles in work-space → 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 work-space 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

Indicators not mentioned in the table must be added as appropriate.

3rd step: Evaluation

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

	Mass/industrial truck							
+	Positioning accuracy/ speed of motion							
+	Posture rating points							
+	Working conditions rating points							
=	Total	x	Time rating points	x	for women employees: **1.3**	=	Risk score	

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.

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