



In depth analysis for assessment of physical risks for manual handling

RAMP - Risk Assessment and Management tool for manual handling Proactively

Introduction

This assessment tool (RAMP II) is intended for an in depth analysis and assessment of physical ergonomics risk factors when working with manual handling which may increase the risk of developing musculoskeletal disorders (MSDs). Manual handling involves for example manual lifting, holding, pushing or pulling of loads. At high or sustained exposure to the risk factors the risk of developing or worsening MSDs increases.

Use this tool to assess a work, work task, or a work station during an average work day. In some cases also rarely occurring extreme cases may warrant assessment. Assess the work of an employee who is representative for the group of employees who carry out this kind of work, or, alternatively two people so that the variation among employees is somewhat taken into account. This employee/these employees should be experienced in how the work should be carried out in an appropriate way. Those performing the assessment should be familiar with how the work is carried out. Otherwise, the assessment should be carried out in co-operation with someone with such knowledge. The person who carries out the assessment should have participated in a basic physical ergonomics course, an introduction in the RAMP-method and should have read the RAMP manual.

During the assessment, choose the alternative which best matches the situation. Fill in the score in the white answering box corresponding to each question.

The result of the RAMP II assessment is presented at three risk and priority levels:

	High risk. The loading situation has such a magnitude and characteristics that many employees are at an increased risk of developing musculoskeletal disorders. Improvement measures should be given high priority.
	Risk. The loading situation has such a magnitude and characteristics that certain employees are at an increased risk of developing musculoskeletal disorders. Improvement measures should be taken.
	Low risk. The loading situation has such a magnitude and characteristics that most employees are at a low risk of developing musculoskeletal disorders. However, individuals with reduced physical capacity may be at risk. Individually tailored improvement measures may be needed.

The result is also presented with a sum of scores, mainly intended for comparison between different jobs risks within a risk level (for example the red level). The result is intended to form a part of the decision making basis when prioritizing and choosing actions in order to reduce the risk for MSDs.

Date: _____ Assessment of: Work/ work task Employee load

Work/work task: _____

Assessment ordered by: _____ Position _____

Assessment completed by: _____ Position _____

Company representative: _____ Position _____

Safety/work environment officer/employee: _____ Position _____

Other: _____ Position _____

Department: _____

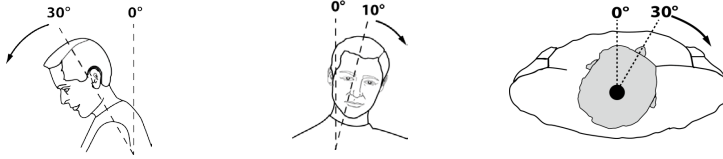
Other information: _____

1. Postures

Fill in the corresponding score in the white box **Score:** **Comment:**

1.1 Posture of the head - forwards and to the side

Does a clear bending of the head forwards or to the side, or twisting to the side occur, as shown in the figures, or more?



4 hours or more	7
3 to < 4 hours	5
2 to < 3 hours	3
1 to < 2 hours	2
30 minutes to < 1 hour	1
5 to < 30 minutes	0,5
< 5 minutes	0

1.2 Posture of the head - backwards

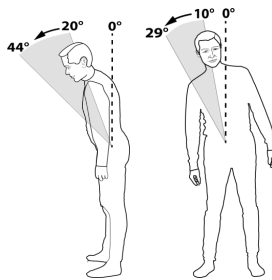
Does bending of the head backwards occur, as shown in the figure, or more?



2 hours or more	10
1 to < 2 hours	6
30 minutes to < 1 hour	3
5 to < 30 minutes	1,5
< 5 minutes	0

1.3 Back posture - moderate bending

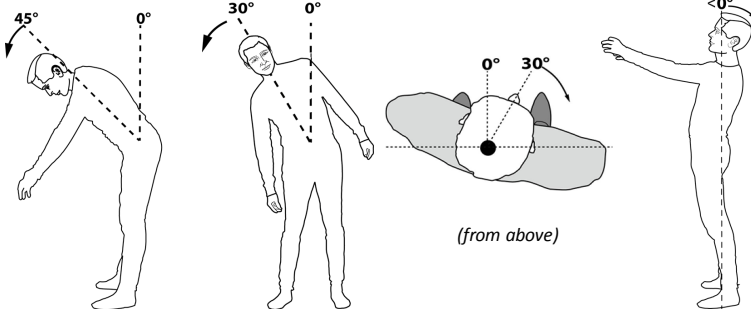
Does moderate bending of the upper body forwards or to the side occur, as shown in the figures, or more?



4 hours or more	7
3 to < 4 hours	5
2 to < 3 hours	3
1 to < 2 hours	2
30 minutes to < 1 hour	1
5 to < 30 minutes	0
< 5 minutes	0

1.4 Back posture - considerable bending and twisting

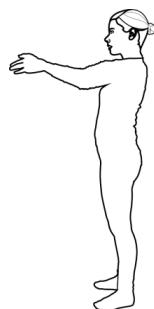
Does considerable bending of the upper body forwards or to the side, twisting or bending backwards occur, as shown in the figures, or more?



4 hours or more	10
3 to < 4 hours	7
2 to < 3 hours	5
1 to < 2 hours	3
30 minutes to < 1 hour	2
5 to < 30 minutes	1
< 5 minutes	0

1.5 Upper arm posture - hand in or above shoulder height

Is work performed with the hand at or above shoulder height? (about 130 - 150 cm)

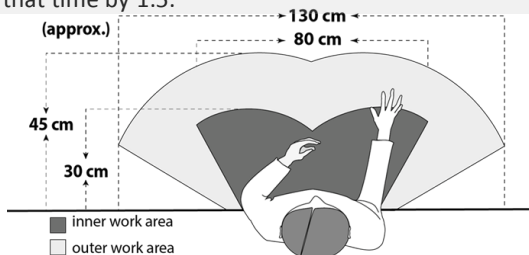


	Left	Right
4 hours or more	10	10
3 to < 4 hours	7	7
2 to < 3 hours	5	5
1 to < 2 hours	3	3
30 minutes to < 1 hour	2	2
5 to < 30 minutes	1	1
< 5 minutes	0	0

1.6 Upper arm posture - hand in or outside the outer work area

Is work performed with the hand in the outer work area?

If the hand is outside the outer work area (white area), multiply the time-points for that time by 1.5.

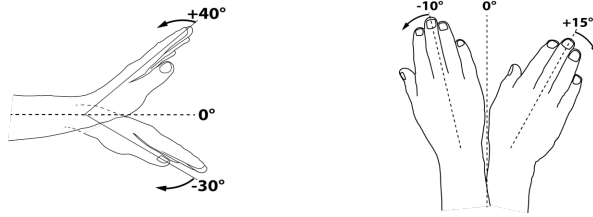


	Left	Right
4 hours or more	10	10
3 to < 4 hours	7	7
2 to < 3 hours	5	5
1 to < 2 hours	3	3
30 minutes to < 1 hour	2	2
5 to < 30 minutes	1	1
< 5 minutes	0	0

Fill in the corresponding score in the white box Score: Comment:

1.7 Wrist posture

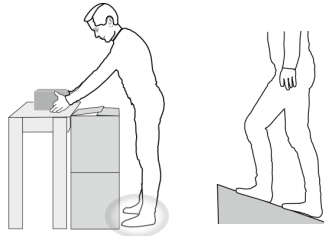
Is work performed with clearly bent wrist, as shown in the figures, or more?



	Left	Right
4 hours or more	7	7
3 to < 4 hours	5	5
2 to < 3 hours	3	3
1 to < 2 hours	2	2
30 minutes to < 1 hour	1	1
5 to < 30 minutes	0	0
< 5 minutes	0	0

1.8 Leg and foot space and surface

Is there a lack of space for the legs or for the feet, or is the surface unstable or sloping?



4 hours or more	3
3 to < 4 hours	2
2 to < 3 hours	1,5
1 to < 2 hours	1
30 minutes to < 1 hour	0,5
5 to < 30 minutes	0
< 5 minutes	0

2. Work movements and repetitive work

2.1 Movements of the arm (upper and lower arm)

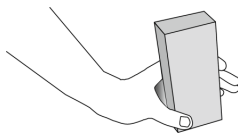
How are the movements of the arm generally?



	Left	Right
Constant movements mainly without pause	5	5
Frequent movements with some pauses	2	2
Varied movements, movement now and then (up to 2/min)	0	0

2.2 Movements of the wrist

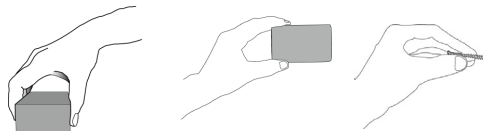
Do similar movements of the wrist occur?



	Left	Right
More than 20 times per minute	5	5
11 - 20 times per minute	3	3
6 - 10 times per minute	1	1
Up to 5 times per minute	0	0

2.3 Type of grip - frequency

Is overhand grip (palm facing downward), wide finger grip or pinch grip used while lifting or holding objects weighing 0.5 kg or more?



	Left	Right
More than 200 times per day	4	4
101 - 200 times per day	2	2
50 - 100 times per day	1	1
Less than 50 times per day	0	0

2.4 Shorter recovery/variation during work (mainly regarding the neck, the arms and the back)

Assessment of whether or not the work enables sufficient variation or breaks so that muscle groups under strain are given time to recover. The variation or break has to be at least 5 seconds at a time to be eligible.

Approximately, how much of the working time consists of such variation or breaks generally?

30 seconds or less per 10 minutes work	10
Between 30 and 90 seconds per 10 minutes work	4
90 seconds or more per 10 minutes work	0

2.5 Longer recovery/variation during work (not breaks, e.g. task rotation that gives sufficient recovery)

Assessment of whether or not the work enables sufficient variation or breaks so that muscle groups under strain are given time to recover. The variation or break has to be at least 5 minutes when totalled together to be eligible.

Approximately, how often does such variation or breaks occur during the work generally?

Every 4 hours or less frequently	10
Every 3 hours	6
Every second hour	3
Every hour	0

3. Lifting work

Fill in the corresponding score in the white box **Score:**

If no lifts occur: Write 0 in the box on the right and go to 4.

No lifting work

0

Make an assessment for an average case. Frequent handling of light loads (< 1 kg) is covered in other parts of RAMP II.

- Estimate the weight of the load and how often it is lifted to determine the Frequency-and-weight factor (Table 1).
- Estimate in what work area the lifting is carried out (Table 2) using the posture of the hands (height and distance) at the start and at the end of the lift. Use the largest of these values.
- Calculate the Risk score in Table 3 by:
 - inserting the values from Table 1 and Table 2 into Table 3.
 - assessing the other factors on the list in Table 3 and use these when calculating the Risk score in Table 3.
 - multiplying the factors in the column on the right in Table 3 with each other.
- Insert this Risk score as "Risk score 1" in the box on the right at the bottom.
- If single lifts which are perceived as particularly strenuous occur, these should be assessed separately. If so, do the same for that case, i.e. perform step 1-3.
- If a worst case is analysed, insert its Risk score in the box "Risk score 2" on the right at the bottom. If no worst case is analysed, insert the Risk score for the average case (i.e. "Risk score 1") also in the "Risk score 2" box. Beside it information about if the Risk score corresponds to green, yellow or red risk level is displayed.

Table 1: Frequency-and-weight factor.

Number of lifts per day	≤ 12	13 - 24	25 - 60	61 - 96	97 - 240	241 - 480	481 - 960	961-1920	1921-2880	2881-3840	3841-4800
Equals number of lifts per hour	≤ 1.5	1.6 - 3	3.1 - 7.5	7.6 - 12	13 - 30	31 - 60	61 - 120	121 - 240	241 - 360	361 - 480	481 - 600
Weight	over 25 kg - 30 kg	6.5	6.5	7.0	7.6	8.0	8.6	9.9	14.3	23.9	49.7
	over 20 kg - 25 kg	5.4	5.4	5.8	6.3	6.6	7.1	8.3	12.0	19.9	41.4
	over 15 kg - 20 kg	4.3	4.4	4.7	5.1	5.3	5.7	6.6	9.6	15.9	33.1
	over 10 kg - 15 kg	3.2	3.3	3.5	3.8	4.0	4.3	5.0	7.2	12.0	24.8
	over 7 kg - 10 kg	2.2	2.2	2.3	2.5	2.7	2.9	3.3	4.8	8.0	16.6
	over 5 kg - 7 kg	1.5	1.5	1.6	1.8	1.9	2.0	2.3	3.3	5.6	11.6
	over 3 kg - 5 kg	1.1	1.1	1.2	1.3	1.3	1.4	1.7	2.4	4.0	8.3
	1 kg - 3 kg	0.6	0.6	0.7	0.8	0.8	0.9	1.0	1.4	2.4	3.6

Table 2: Lifting area factor. If the lift is performed outside the shaded area in the figure, add 1 point to the value of the closest cell.

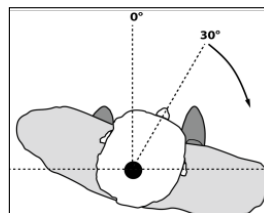
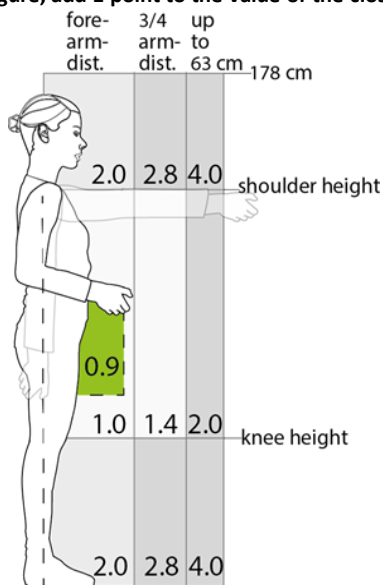


Figure: Torso twisted 30°.

Table 3: Calculation of Risk score.

	Factor	Possible worst case Factor
Frequency-and-weight factor from Table 1.		
Lifting area factor from Table 2.		
Do the following factors occur in the majority of lifts? If no, insert the value 1.0 to the right, else the stated value:		
<input type="checkbox"/> Lift with one hand. If yes, insert the factor 1.7.		
<input type="checkbox"/> Torso twisted more than 30° (see the figure to the right above). If yes, insert the factor 1.3.		
<input type="checkbox"/> Poor grip. If yes, insert the factor 1.1.		
<input type="checkbox"/> Hot environment 27-32°. If yes, insert the factor 1.1.		
<input type="checkbox"/> Two people lift the load. If yes, insert the factor 0.6.		
Risk score (multiply the factors in each column)		

Comment:

Score	Colour
≥ 5	
3- 4,9	
< 3	

Risk score 1:

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Risk score 2:

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4. Pushing and pulling work

Fill in the corresponding score in the white box Score: 0

If no pushing and pulling work occurs: Write 0 in the box on the right and go to 5.

No pushing and pulling work 0

Make an assessment for an average case. Frequent handling of light loads (exerted forces < 50 N) is covered in other parts of RAMP II.

If the load is pushed or pulled for less than 5 seconds, only assess the initial force (the force to set an object in motion, sometimes called starting force) using Table 4. If it is pushed or pulled for 5 seconds or longer, assess both the initial and the continuous force (i.e. also Table 5).

1. Measure the exerted force.
2. Enter Table 4/Table 5 at the relevant frequency and force level to find the corresponding Frequency-and-force factor.
3. Calculate the Risk score in Table 6 by:
 - a. inserting the values from Table 4 and when applicable from Table 5 into Table 6.
 - b. assessing the other factors on the list in Table 6 and use these when calculating the Risk score in Table 6.
 - c. multiplying the factors in the column for initial force with each other. Do the same for continuous force if also such an analysis is carried out.
4. Insert the Risk score for the initial force, or if also continuous force is assessed, the highest Risk score of these two as "Risk score 1".
5. If single pushing and pulling tasks which are perceived as particularly strenuous occur, these should be assessed separately. If so, do the same for that case of those cases, i.e. perform step 1-3.
6. If one or two worst cases (initial and continuous force) are analysed insert the highest of these two Risk scores in the box "Risk score 2". Else, insert the Risk score from "Risk score 1" also in the box for "Risk score 2". Beside it information about if the Risk score corresponds to green, yellow or red risk level is displayed.

Table 4: Frequency and force factor for initial force (starting force).

Times per day	≤ 1	2 - 16	17 - 96	97 - 240	241-480	481-1920
Times per hour	≤ 2	2.1 - 12	13 - 30	31 - 60	61 - 240	
501 - 600 N	8.5	10	10.5	14	14.5	24
451 - 500 N	7.5	9	9.5	12.5	13	22
401 - 450 N	6.5	8	8.5	11	11.5	20
351 - 400 N	6	7	7.5	9.5	10	18
301 - 350 N	5	6	6.5	8	8.5	16
251 - 300 N	4	5	5	5	7	14
201 - 250 N	3	4	4	4	5	12
151 - 200 N	2.5	2.5	3	3	4	5
101 - 150 N	2	2	2.5	2.5	3	4
51 - 100 N	1.5	1.5	2	2	2.5	2.5

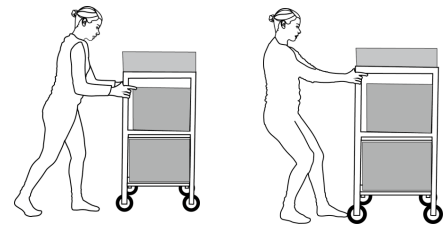


Figure: Pushing and pulling work.

Table 5: Frequency and force factor for continuous force.

Up to 8 meters: Use the force values in the table.
 9-30 meters: Add 50 N to the measured force to calculate the force value.
 31-60 meters: Add 100 N to the measured force to calculate the force value.

Times per day	≤ 1	2 - 16	17 - 96	97 - 240	241-480	481-1920
Times per hour	hour	≤ 2	2.1 - 12	13 - 30	31 - 60	61 - 240
501 - 600 N	10.5	12	12.5	17	19	30
451 - 500 N	9.5	11	11.5	15.5	17.5	28
401 - 450 N	8.5	10	10.5	14	16	26
351 - 400 N	7.5	9	9.5	12.5	14.5	24
301 - 350 N	6.5	8	8.5	11	13	22
251 - 300 N	6	7	7.5	9.5	11.5	20
201 - 250 N	5	6	6.5	8	10	18
151 - 200 N	4	5	5	5	8.5	16
101 - 150 N	3	4	4	4	5	14
51 - 100 N	2.5	2.5	2.5	3	4	12

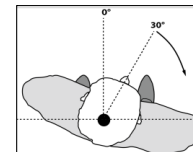


Figure: Torso twisted 30°.

Table 6: Calculation of Risk score.

Frequency and force factor from Table 4, and, if applicable, from Table 5.	Factor Initial force	Factor Continuous force	If any, worst case Factor Initial force	If any, worst case Factor Continuous force
Do the following factors occur in the majority of the pushes and pulls? If no, insert the value 1 to the right, else the stated value:				
<input type="checkbox"/> Pushing/pulling with one hand. If yes, insert the factor 1.7.				
<input type="checkbox"/> Pushing/pulling sideways. If yes, insert the factor 1.7.				
<input type="checkbox"/> Gripping height: If the gripping height is below knee height or above shoulder height, insert the factor 2; if the gripping height deviates considerably from elbow height, insert the factor 1.2.				
<input type="checkbox"/> Torso twisted more than 30° (see the figure to the right above). If yes, insert the factor 1.3.				
<input type="checkbox"/> Poor grip. If yes, insert the factor 1.1.				
<input type="checkbox"/> Hot environment 27-32°. If yes, insert the factor 1.1.				
<input type="checkbox"/> Pushing/pulling work on slippery surface. If yes, insert the factor 1.7.				
<input type="checkbox"/> Two people perform the pushing/pulling. If yes, insert the factor 0.6.				
Risk score (multiply the factors in each column)				

Comment:

Score	Colour
≥ 5	
3- 4,9	
< 3	

Risk score 1:
 Risk score 2:

5. Influencing factors

Fill in the corresponding score in the white box Score: Comment:

5.1 Influencing physical factors hand/arm - do the following occur? The times refer to "per work day".

	Yes	No	
a. The employee is exposed to hand-arm vibrations more than 20 minutes (10 for strongly vib).	2	0	
b. The employee is exposed to hand-arm vibrations more than 90 minutes (60 for strongly vib).†	4	x	
c. Warm or cold objects are handled manually.	2	0	
d. The hand is used as an impact tool often or a long time*.	2	0	
e. Holding hand tools weighing more than 2.3 kg for more than 30 minutes .	2	0	
f. Holding precision tools weighing more than 0.4 kg for more than 30 minutes.	2	0	

5.2 Other physical factors - do the following occur? The times refer to "per work day"

a. The employee is exposed to whole-body vibrations more than 1 hour.	2	0	
b. The employee is exposed to whole-body vibrations more than 6 hours.†	4	x	
c. The visual conditions are insufficient for the task.	2	0	
d. The work is carried out in hot or cold temperatures or in draughty environments.	2	0	
e. Standing or walking on a hard surface more than half of the work day.	2	0	
f. Prolonged sedentary work without possibility to change to do the work standing up.	2	0	
g. Prolonged standing work without possibility to change to do the work sitting down.	2	0	
h. Kneeling/squatting more than 30 times or more than 30 minutes.	2	0	

5.3 Work organisational and psychosocial factors - do the following occur?

a. There is no possibility to influence at what pace the work is performed.	2	0	
b. There is no possibility to influence the work setting or how the work shall be carried out.	2	0	
c. It is often difficult to keep up with the work tasks	2	0	
d. The employees often work rapidly in order to be able to take a longer break.	2	0	

† If you want to answer "No" on 5.1b or 5.2b, enter an "x" in the white answering box to the right.

* Here "often" means about 100 times per working day or more and "a long time" about 30 minutes per work day or more.

6. Reports on physically strenuous work

6.1 Documented reporting on physically strenuous work

Do documented reports exist of physically strenuous tasks (e.g. incident reports) when carrying out the work task?

	Yes	No	
Documented reporting	2	0	

6.2 Type of work that has led to reporting

If "Yes" on 6.1, mark (with an x) in the table below what type of work that has led to this. Else, go to 7.

lifting	
holding/carrying	
pushing/pulling	
pushing with hand or fingers	
other (please note)	

7. Perceived physical discomfort

Preferably ask five people who perform this work task.

7.1 Perceived physical discomfort

Are there parts of the work which lead to physical discomfort (e.g. in muscles or joints) during the work day?

Answer "Yes" if any employee experiences such discomfort.

	Yes	No	
Discomfort in muscles or joints	2	0	




7.2 If "Yes" on 7.1, which is the worst task?

Preferably state answers from five employees in the table below.

Person 1:	
Person 2:	
Person 3:	
Person 4:	
Person 5:	

Comment:

APPENDIX: RESULTS TABLE

RAMP II (version 1.02)® Results table (pdf-version)			
Ordered by:	Date:		
Assessed by:	Risk/action level and score		
Assessment of:	Red=R Yellow=Y Green=G	Score	Comment
1. Postures			
1.1 Posture of the head - forwards and to the side			
1.2 Posture of the head - backwards			
1.3 Back posture - moderate bending			
1.4 Back posture - considerable bending and twisting			
1.5 Upper arm posture - hand in/above shoulder height*			
1.6 Upper arm posture - hand in/outside outer work area*			
1.7 Wrist posture*			
1.8 Leg and foot space and surface			
2. Work movements and repetitive work			
2.1 Movements of the arm*			
2.2 Movements of the wrist*			
2.3 Type of grip*			
2.4 Shorter recovery/variation			
2.5 Longer recovery/variation			
3. Lifting			
3.1 Lifting (average case)			
3.1 Lifting (worst case)			
4. Pushing and pulling			
4.1 Pushing and pulling (average case)			
4.2 Pushing and pulling (worst case)			
5. Influencing factors			
5.1 Influencing physical factors hand/arm			
a+b. Hand-arm vibrations			
c. Manually handling of warm or cold object			
d. Hand used as impact tool			
e. Holding hand-tools weighing > 2.3 kg, > 30 min.			
f. Holding precision tools weighing > 0.4 kg > 30 min.			
5.2 Other physical factors			
a+b. Whole body vibrations			
c. Insufficient visual conditions			
d. Hot, cold or draughty environment			
e. Prolonged standing or walking on hard surfaces			
f. Prolonged sitting			
g. Prolonged standing			
h. Kneeling/squatting			
5.3 Work organizational and psychosocial factors			
a. No possibility to influence the work pace			
b. No possibility to influence the work setting			
c. Difficulties in keep up with the work tasks			
d. Employees work rapidly in order to take longer breaks			
6. Reports on physically strenuous work			
6.1 Documented reporting on physically strenuous work			
6.2 Type of work that has led to reporting:			
7. Perceived physical discomfort			
7.1 Perceived physical discomfort			
7.2 The worst task:			
<i>*Insert the highest score from left or right side (hand/arm)</i>			
Summary of the assessment			
Number of red assessments - High risk/action level			
Number of yellow assessments - Risk/action level			
Number of green assessments - Low risk/action level			
Total score			