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# HISTORICAL RESEARCH REPORT

Research Report TM/90/08  
1990

**Development of an aid to identifying task elements, which may predispose individuals to work related upper limb disorders. Final report on HSE Research Contract No.1/LMD/126/305/89**

Graveling RA, Symes AM, Love RG, Graves RJ



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DEVELOPMENT OF AN  
AID TO IDENTIFYING  
TASK ELEMENTS, WHICH  
MAY PREDISPOSE  
INDIVIDUALS TO WORK  
RELATED UPPER LIMB  
DISORDERS

RA Graveling  
AM Symes  
RG Love  
RJ Graves

September 1990

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INSTITUTE OF OCCUPATIONAL MEDICINE LIMITED

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FINAL REPORT ON HSE RESEARCH CONTRACT NO. 1/LMD/126/305/89

Institute of Occupational Medicine Limited  
8 Roxburgh Place  
EDINBURGH  
EH8 9SU

Tel: 031 667 5131  
Telex: 9312100237=TD G  
Fax: 031 667 0136

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**INSTITUTE OF OCCUPATIONAL MEDICINE LIMITED**

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**SUMMARY**

The Posture Assessment Aid has been developed by the IOM for the preliminary assessment of upper limb postures associated with potentially hazardous industrial work tasks. It is intended to provide a more detailed assessment of a job than is provided for by the Risk Factor Checklist incorporated into the HSE guide to the prevention of work-related upper limb disorders. It consists of two parts: 'Task Description' and 'Action Analysis and Assessment'. The Task Description provides a systematic breakdown of the movements and actions associated with the job in question. This breakdown is then used in the Action Analysis and Assessment, progressing through the job in stages by analysing each element. The assessment is made against current scientific knowledge and is formulated into a series of assessment grids, categorising each action as involving a low, medium or high risk of upper limb disorders.

Preliminary trials of the aid have been carried out involving occupational hygienists, doctors and managerial staff. Further work is required to examine its utility and effectiveness.



## 1. INTRODUCTION

Some soft tissue disorders of the upper limb are suspected of being caused in part by repetitive physical activity, excessive joint angles or inappropriate force requirements for a particular joint position. Such disorders have been reported in a variety of occupational groups. The Institute of Occupational Medicine has studied the risk of these injuries across a wide range of occupations through an epidemiological study of a population attending orthopaedic clinics (English *et al*, 1989).

The research identified some of the components of movements and activities at work which are associated with an increased risk of injury. Other components remain to be identified from studies of occupations not encompassed by this study and from more direct elucidation of complex movement patterns than was possible using the questionnaire approach employed in the Institute's previous study.

Although much systematic scientific research is still required, it was apparent that some form of aid was needed to assist non-ergonomically trained staff in industry, such as supervisors and safety officers, to identify those work task activities which may predispose individuals to upper limb disorders. It is relatively easy to define an 'ideal' neutral posture by stating, for example, that the wrist should be in a straight line with the forearm with no wrist rotation, radial or ulnar deviation, etc. It is also reasonably straightforward to identify extreme postures where joints are operating at or close to their anatomical limit. It is less straightforward to identify the potential risk within the 'grey' area between these two. If, for example, it is accepted that, in many industrial tasks, some ulnar or radial deviation is inevitable, at which point does 'some' become 'too much'? The present work is intended to begin to fill this gap, although we recognise that deficiencies in the available evidence regarding the causes of these disorders will prevent definitive answers in many cases.

The principal purpose of the study was to incorporate a description of upper limb movements and postures into an aid for the assessment of potentially hazardous industrial work task activities. However, to avoid encouraging the view that upper limb disorders were exclusively related to postures, it was considered necessary for the aid to be placed into the wider context of other risk factors. The final practical document was therefore considered to require two sections: a general checklist of potential problem areas and a specific aid for recording and assessing selected postural factors in more detail.



## 2. RISK FACTOR CHECKLIST (RFC)

Over the last few years, general statements of the main risk factors believed to be associated with upper limb disorders, such as the list described by Armstrong *et al* (1986), have been refined into checklists. One such list is that originally proposed by Lifshitz and Armstrong (1986) and, more recently, incorporated into a manual prepared by NIOSH staff (Putz-Anderson, 1988). A checklist based on this but incorporating additional risk elements, such as the thumb movements identified by English *et al* (1989), was taken as the first stage in the workplace assessment guide. The checklist is given in Appendix 1.

### 2.1 Interpretation and use of the checklist

Some workers, for example Putz-Anderson (1988) have suggested that such a checklist could be used to derive a quantitative score, expressing the percentage of 'yes' votes as the score for that job with 100% indicating minimal risk. However, there is no evidence to indicate the comparative severity of the risk associated with each of the factors listed, or any gradation within a category. For example, wrist deviation (radial or ulnar) is regarded as an 'all-or-none' problem with any degree of deviation warranting a 'yes' response. It is quite feasible therefore for a single factor to constitute a greater risk than three or four other factors where their deviation from acceptability is relatively minor. It is therefore recommended that the questionnaire scores should not be summed in this way.

The checklist is only intended as an initial screening device. It covers most of the major issues and presents a useful start-point for further, more detailed, assessment. It is by no means exhaustive, although, if a complete set of 'yes' scores is obtained for a particular task, it is unlikely that the task is contributing significantly to any upper limb strain disorders.

If a series of 'No' scores is obtained, particularly if it is already suspected that the work task is contributing to upper limb problems, the outcome of the checklist application may be regarded as sufficient evidence to justify seeking advice or remedial action. Alternatively, it may be taken to indicate a need for further, more detailed, assessment before taking such steps. Where postural factors are implicated by the initial checklist (and possibly also where they are not) one option for more extensive assessment is to apply the Posture Assessment Aid.





### 3. THE POSTURE ASSESSMENT AID

As explained in the Introduction, the Posture Assessment Aid is envisaged as one of a series of aids to be used to provide a more detailed assessment of a work task than is possible with the RFC. The concept adopted was that if the Checklist indicated a possible problem in a particular area then a supplementary aid could be used for a more detailed and comprehensive assessment. The Posture Assessment Aid itself was conceived as being divided into two parts: 'Task Description' and 'Action Analysis and Assessment'.

#### 3.1 Task Description

##### 3.1.1 Development

The purpose of the Task Description was to provide a systematic description of what the task in question actually entailed to ensure that the subsequent analysis covered all aspects. By focusing attention on the individual elements of the task it was also hoped that this would serve to indicate where in the work cycle the strain was occurring. In this way it would serve as a guide to where ameliorative action would be most effective, if not actually indicating what action was required. The Task Description was intended therefore to provide a breakdown of task activities. One approach which has been advocated by a number of authors (e.g. Armstrong *et al*, 1986; Putz-Anderson, 1988; Joseph, 1989) has been to use elements of work known as 'Therbligs' initially proposed for Work Study by Gilbreth and Gilbreth (1924) employing words such as 'reach' and 'grasp' to describe the work process. It seemed appropriate to follow their lead. However, it was considered desirable to modify these slightly to suit the specific purposes of guiding the subsequent activity analysis. Initially, this consisted of expanding two terms, 'Grasp' and 'Move'. Grasp, originally defined as touching or gripping, was divided to allow the record to distinguish between these two actions in aspects of the work.

The form of interface between the hand and any object can play an important role in upper limb disorders and it was considered essential to distinguish at an early stage between touching something and actively gripping it. Similarly, because of its importance in considering the forces exerted by the hand, 'Move' was divided, so that the description would indicate whether the movement entailed lifting or simply pushing or pulling.

Similar reasoning resulted in several elements being combined, in order to maintain the overall number of descriptive elements at a manageable level. Thus it was not considered necessary to distinguish between those elements relating to various forms of inactivity. 'Unavoidable delay', 'avoidable delay' and 'plan' were all therefore combined into the descriptor 'wait'. 'Rest' was, however, considered to have different implications for possible postures as someone 'waiting' may hold themselves in readiness and the term was therefore retained.

Initial trials with video-recorded activities indicated that several further terms were desirable to facilitate a comprehensive task description. Two of these related to the method of application of force. Thus, 'squeeze' was introduced to indicate a more forceful and purposive grip and 'press' supplemented 'push', having fewer connotations of movement.

Two other terms relating to forms of movement were also added: 'twist' and 'turn'. The semantic difference between these two is perhaps a little difficult to convey. Whilst acknowledging that rotational movement actually occurs around the elbow, 'twist' was conceived as portraying a rotation where the movement apparent to a 'lay' observer would be round the wrist. Thus, applying a hand-held screwdriver or operating a control knob would be classified as 'twist' (even though some people talk of turning a knob). In contrast, 'turn' was selected as involving more arm movement such as in turning the pages of a book, turning a partly assembled unit over or turning the flaps of a box in. It was also considered useful to distinguish between 'reach' and 'stretch' where stretch implied a degree of body movement or 'overreaching' beyond the normal reach distance. Finally, 'release' was added to indicate a positive end to a gripping action or tool use. Figure 1 lists the work elements finally selected and their definitions.

### 3.1.2 Task Description – recording procedure

Initially, recording charts were developed with columns for each of the work elements, the sequence of task elements being indicated either by progressing down the rows, or by numbering each entry (or a combination of both approaches). The purpose of this was to remove the need to remember the elements. It was found in practice that this was an unnecessarily cumbersome process and that most users sought to supplement the elements record with notes describing the objects involved. It was therefore decided to move to a free-form (text) record of the activity. Record charts were prepared which incorporated the list of elements and descriptors, albeit in a reduced size print, as an aide-memoire (see Appendix 1 for a copy of these). The intention was that those using the aid would write a prose description of the work task observed, using the work elements as the descriptive verbs. It was suggested that this description could either take the form of a list of action notes with one verb per note, or could be written as a short paragraph. Trials with non-ergonomically trained staff revealed that some preferred simply to write a list of the action verbs as they were observed. Such an approach is adequate for the process of completing the action analysis as an isolated exercise. However, it is expected that a fuller description will be desirable for subsequent evaluation and reporting.

Figure 1 Work elements and their definitions

## 1) Passive actions: no movement or force involved

Search	Looking for something with the eyes
Wait	Inactivity, whether due to delay, pause to plan, or any other reason
Rest	Taking weight of limb on surface

## 2) Contact actions: form of contact with object

Touch	Flat contact with an object by hand or fingers
Grip	Grasping an object with the hand or fingers

## 3) 'Static' force actions: application of force subsequent to a contact (squeeze, press) or dynamic (hold) action

Squeeze	Applying a compressive force
Press	Pushing an object with little or no movement
Hold	Exerting force to hold an object at a fixed location

## 4) Dynamic actions: normally involving movement

Reach	Moving the hand to some object or location within arms length
Stretch	Moving the hand to some object or location, bending or leaning to reach
Move	Movement of some object from one location to another
Lift	Raising (or lowering) an object
Push/Pull	Moving an object without taking its weight
Position	Placing an object reasonably precisely into a particular location
Twist	Rotating a control or object, mainly movement around the wrist
Turn	Moving or rotating part or all an object, mainly with elbow movement

## 5) Composite actions: normally movement and postures involved will have been described separately

Select	Locating one object possibly mixed with others
Inspect	Examining an object by sight, sound, touch etc.
Assemble	Joining together two or more objects
Disassemble	Separating two or more objects
Use	Manipulating a tool or device with the hand
Release	Letting go of a tool or object

## 3.2 Action Analysis and Assessment

### 3.2.1 Action Analysis – Development

Any action to be analysed was conceived as consisting of three parts. These can be described as:

- i) approaching the target
- ii) forming an interface
- iii) interacting

'Approaching the target' covers the essentially static element which can be regarded as the posture adopted in approaching the target, and the dynamic movement involved in the approach. Forming an interface considers the type of interface which is adopted between the hand of the operator and the target. This may be a touch or a grip. Within each of these broad categories, however, a number of more or less distinct forms can be identified. Because of the suspected relationship between type of contact and possible strain – for example, some grips are better suited to applying a high force than others – it was necessary to try to categorise these different forms. Finally, the form of interaction, whether it was lifting something, inspecting it, assembly, etc. was considered to be important.

As with the manufacturing description the action analysis went through a number of phases of development. Initial efforts again included a recording grid, combining the form of contact and the interactive or manipulative verbs from the manufacturing description. It also included the concept of a reach zone, classified as red, amber or green, depicting the associated risk. These zones were conceived as a series of asymmetric curves forming a 'reach map' delineating working positions of varying risk. Finally, provision was made for recording joint angles on a series of sketch diagrams depicting each plane of movement of the wrist, elbow and shoulder.

Trials with this method indicated that it was unsuitable for a number of reasons. Firstly, as with the manufacturing description, the recording grid was found to be a somewhat unsatisfactory approach. Once again, the advantages of having the terms all tabulated on the grid were outweighed by the restrictions this imposed. Secondly, the use of the appropriate interactive verbs from the manufacturing description introduced a high degree of repetition. Thirdly, the joint angle recording system was intended to allow an observer to record an angle for each joint plane of movement. A previous Institute study (Graveling *et al*, 1980) had shown that observers could generally, reliably estimate angles to an accuracy of  $\pm 10\%$ . However, in developing the assessment criteria (see below) it became apparent that even this was a greater degree of resolution than could realistically be interpreted given the available scientific knowledge. The final shortcoming of the initial action recording system was that it became apparent in devising the system for interpretation of the recorded data that it was not constructed in a manner which was conducive to interpretation by a non-ergonomist.

As a result of these conclusions, the action recording system was extensively revised to what, after a few minor alterations, was the final form. One short-coming of the first approach was that it had not seemed to develop logically from the initial manufacturing description. As a result, the individual action verbs of this description were adopted as the basic recording unit. The initial three-part concept of approach, interface and interaction was modified slightly. 'Interaction' was reduced to its basic components of movement and force. Joint angle recording was simplified to a series of zones. These were derived from a somewhat pragmatic compromise between criterion values which could be derived from the scientific literature and angles which could reasonably be expected to be estimated fairly accurately. 'Interface' - touch or grip type - formed the final element. The action recording system derived from these elements is shown in Figure 2.

### 3.2.2 Action Assessment Development

Having devised a system for recording the essential elements of any action, the final feature of the aid was some means to evaluate the significance of these actions vis-a-vis the risk of upper limb strain injury. Many of the papers on upper limb disorders fall into two categories. Some indicate that any degree of deviation from a neutral limb angle is harmful. Others apply the concept of 'excessive' angles or movement without necessarily defining what is meant by excessive. Neither approach provides much practical benefit. Few jobs can be considered to be totally free of non-neutral limb positions and therefore, according to this definition, most jobs constitute a risk. The concept of 'excessive', while arguably of some use to the trained ergonomist with a 'practised' eye, is too vague for the non-ergonomist.

The scientific literature was therefore scanned to identify those papers which indicated some form of more specific criterion. Some, such as that by Tichauer (1966) on the effect of elbow angle on a rotational task, provided clear data from which a criterion could be derived. Others, such as Keyserling *et al* (1987) or Kilbom and Persson (1987) reported the use of fairly arbitrary divisions of joint movements into angular segments (e.g. 0-30°, 30-60°, 60-90°). A novel approach, in the absence of any more definitive criteria was suggested by Pethick *et al* (1987). This involved deriving a limit for tolerable movement of 75% of the 5th percentile movement range for a particular limb movement. For example, using data reported by Chaffin and Andersson (1984), this approach would yield a limit for elbow flexion of 94.5°.

Figure 2 Action recording system

**ACTION ASSESSMENT SHEET**

(circle appropriate descriptors)

Record the Action Verb for this entry : .....

Arm being assessed : Left Right

Interface category (Touch or Grip)

	:	T1	T2	T3	T4		G1	G2	G3	G4	G5
None											

Force	:	light	moderate	heavy	actual force.....kg
					(if known)

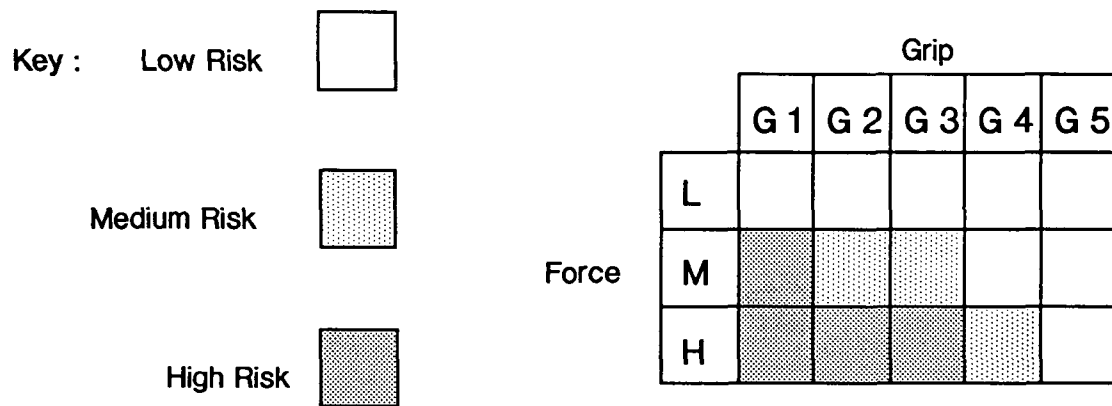
Posture	:	Wrist Angle	WA1	WA2	WA3			
	:	Wrist Position	WP1	WP2	WP3			
	:	Elbow Angle	EA1	EA2	EA3	EA4		
	:	Elbow Rotation movement		ER1	ER2			
	:	Shoulder (Arm) Position						
	:	Backwards/forwards	SP6	SP5	SP1	SP2	SP3	SP4
	:	Across/outwards	SP11	SP10	SP1	SP7	SP8	SP9
	:	Shoulder Elevation		SE1	SE2			
	:	Shoulder Rotation		SR1	SR2			

Assessment rating (from grids)

Using the published data from a number of sources, obtained through extensive searches of computerised data bases, a series of angular criteria was assembled (see References and Selected Bibliography). In some cases, apparent conflicts had to be resolved. These occasionally occurred within one text. For example, Grandjean (1987) reported shoulder discomfort amongst accounting machine operators, increasing when the elbow angle was increased from less than  $65^{\circ}$  to more than  $75^{\circ}$  (p114). In contrast, an elbow angle greater than  $90^{\circ}$  was advocated for office VDT workstations (p145). As this latter was in closer accord with the data reported by Tichauer (op cit), a criterion of  $100^{\circ}$  was selected. In many instances, interpretation of particular movements or positions are interdependent. For example, the assessment of supination/pronation (rotation of the forearm) is related to elbow angle with supination best achieved at an elbow angle of approximately  $90^{\circ}$ . These interrelationships were used to derive a series of 'assessment grids'. Figure 3 shows the grid relating type of grip used to force applied.

Figure 3

Grid relating type of grip used to force applied



Inevitably, in order to achieve an assessment system, which is suitable for interpretation by a non-expert, some reduction of information is necessary. For example, the effect of a particular combination of grip type and force could be exacerbated by wrist flexion. However, it was decided that such complexities were best left to expert assessment, avoiding the need for three-dimensional assessment grids.

The grids produced, presented in their entirety in Appendix 1, represent a compromise between current scientific knowledge and what is reasonably practicable for the non-expert assessor. As such, they should not be regarded as sacrosanct. It is anticipated that, as research yields more detail about the causation of upper limb disorders, these grids will be refined and modified to accommodate the new information.





#### 4. EVALUATION OF THE POSTURE ASSESSMENT AID

Trials were carried out to provide a preliminary indication of the perceived usability of the Posture Assessment Aid (PAA). A total of fourteen individuals applied the aid to a series of video-recordings of jobs involving extensive upper-limb activity. (These recordings had been made during consultancy work and all involved an element of risk of injury). The participants included occupational hygienists, production managers and physicians. After applying the PAA, the participants were invited to complete a short questionnaire regarding the ease with which they could complete the various elements. The responses to this are summarised below.

##### 4.1 Results and Discussion

This section presents and discusses the results from each of the questions asked.

##### Task Description

'Did you find that all the verbs you required to provide the task description were included in the list of action verbs? If not which verbs should be added to the list?'

Thirteen of the fourteen considered the list to be adequate. The one exception suggested the addition of another verb such as 'return' to indicate 'the return of unburdened limbs to the start position'. Consideration was given to adding this to the list but, as it could be accommodated by describing the movement, and no other user had found it necessary, it was decided not to include it.

One or two suggested clarifying the action verb list by, for example, subdividing the list into categories of verbs. This suggestion was adopted for the final version. Occasionally, some found a little extra explanation of the distinction between verbs to be useful. It was decided that this would best be accommodated as part of additional training material to be produced (see Conclusions and Recommendations).

'Did you find it easier to sub-divide your task description into one verb per note or did you write a short paragraph? Why?'

One subject did not complete this section. Of the remaining thirteen, ten used single verb descriptions. The most commonly offered explanation was that, as the subsequent postural assessment was based on a verb-by-verb analysis, it was easier if the initial task analysis was done in this way. Some of the others suggested that they may consider single verb records to be easier with experience.

##### Posture Analysis and Assessment

Subsequent questions related to the Posture Analysis and Assessment asking, for each entry in turn, whether the subject had any problems in assessing them. Many of the comments related to the use of video-recorded material – which was not recorded specifically for this analysis – or the video equipment itself. As the aid is intended for 'real-time' application, these

comments will not be dwelt on here.

#### **Interface category**

One subject expressed difficulty in understanding what was meant by the two terms touch and grip. No others had any problems with completing this element.

#### **Force**

As anticipated, this element caused the most problems, with almost 50% expressing reservations. However, most of these would be alleviated in the factory environment where it would be easier to get an appreciation of the force involved – possibly at first hand.

#### **Posture**

A number suggested that diagrams would be beneficial in understanding the various angles and movements involved. In addition, inevitably the camera angle was not always the most appropriate – although it was always possible to obtain an assessment. Wrist angle gave people most problems, followed by wrist rotation. The other problem category was shoulder elevation. All of those who expressed difficulties suggested that either an explanatory diagram or a better viewing angle would have removed the problem.

### **4.2 General Discussion**

Despite technical difficulties working with video-recorded material, most people were able to use the assessment aid successfully. Most agreed that the aid would be easier to apply when viewing a task directly and several commented that it had enhanced their understanding of the problems associated with occupationally-related upper limb disorders.

As a result of this exercise and subsequent discussions, a series of simple diagrams and explanatory notes were added to help identify the joint angles and movements involved. The recording chart was also slightly modified to clarify its completion. Finally, it was suggested that a training video, demonstrating each of the elements, with examples from industrial tasks, would be beneficial both for the postural analysis and the preceding task description.

## 5. CONCLUSIONS AND RECOMMENDATIONS

An aid has been developed to assist non-ergonomists to examine industrial worktasks and to identify those which may predispose workers to upper limb disorders. It has been produced as being complementary to a general checklist of risk factors. The assessment is based upon current scientific information. However, it must be recognised that this information is incomplete and that modification of the assessment charts may be desirable in the light of future research developments.

It was possible to test the application of the prototype using people from a variety of occupations including hygienists, physicians and managers. All found it possible to use the aid although a number suggested additional material which was subsequently incorporated into the aid.

Most found some brief additional instruction to be beneficial. It is recommended that this should be produced as an instructional video which could explain and illustrate the action verbs and the elements of the postural assessment.

It has not been possible, in this small study, to carry out any formal evaluation of the reliability and replicability of the aid. It would probably be more appropriate for any additional training material to be produced before such an exercise is carried out.

Ultimately, the effectiveness of the assessment aid must be judged not by how easily and reliably it can be applied but by how successful it is in leading to identification and subsequent prevention of work-related upper limb disorders. It is therefore recommended that, following the production of a training package and its subsequent dissemination, a procedure should be established either via EMAS or the Factory Inspectorate whereby its subsequent utility and effectiveness can be monitored.



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## APPENDIX 1

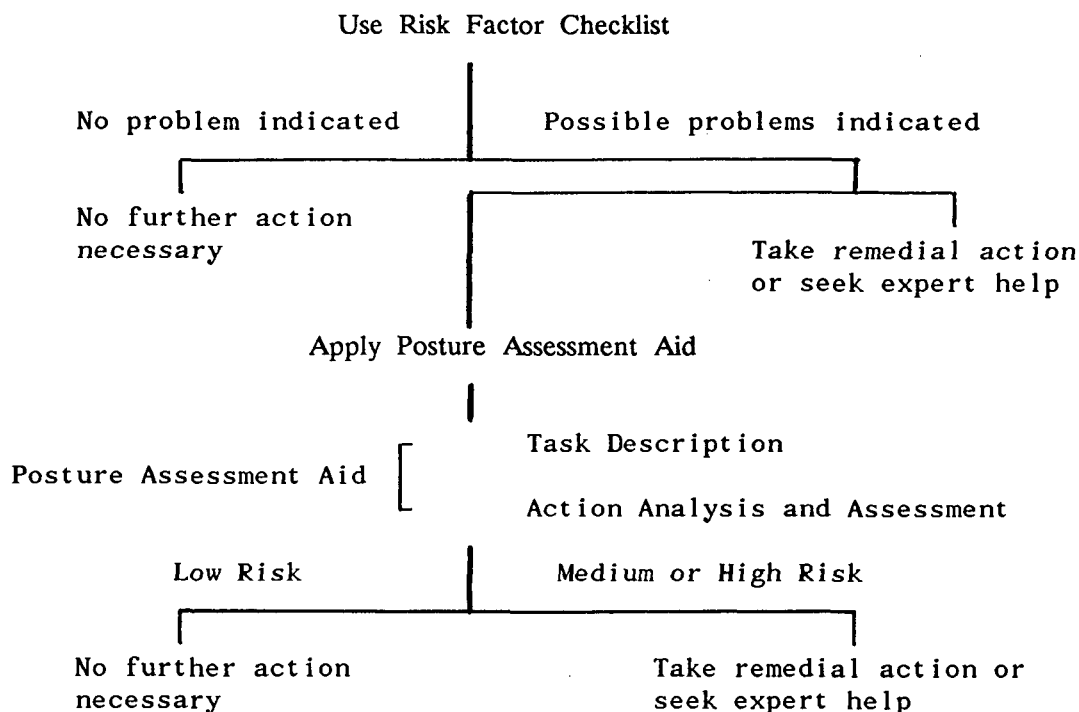
**WORK RELATED UPPER LIMB DISORDERS:-  
A WORKPLACE ASSESSMENT GUIDE****INTRODUCTION**

The HSE guide to the prevention of work-related upper limb disorders (HSE, in preparation) recommends a three step approach to prevention. The first of these is to identify the problem - 'using appropriate job analysis techniques to identify whether or not a problem exists'. The guide states: 'in many instances, expert help from an ergonomist or human factors specialist will be required to undertake such procedures'.

This assessment guide is intended to provide non-experts with the means whereby they can carry out their own initial problem identification exercise in an industrial environment. It is not intended to remove the need for expert help. Its purpose is to act as an initial screening device to encourage the user to seek help elsewhere for expert assessment and remedial action should a potential problem be indicated.

The relationships between work activities and upper limb disorders are not fully understood and research is being carried out in Britain and elsewhere to extend our knowledge. This assessment cannot therefore be expected to provide complete answers. Nevertheless it incorporates much of what is currently known or believed about these disorders and provides for an initial evaluation of the probability that a particular work task may cause problems.

The assessment guide itself is in two parts. The first of these is a Risk Factor Checklist. It provides for a general assessment of the work place and working environment. Ultimately, it is hoped to provide assessment aids to facilitate a more detailed evaluation of each of the sections within this checklist. The second part of this guide provides for an expansion of one major section, that on posture. Figure A1 shows a flow diagram for the use of the various parts of this guide.

Figure A1 Workplace Assessment Guide – FlowchartRisk Factor Checklist

The checklist shown in Figure A2 is intended for a preliminary assessment. It should be applied to a general view of each job rather than to a detailed breakdown of each task element. The individual responses should be used as the basis for deciding whether more detailed assessment is required (either by using the Posture Assessment Aid or by obtaining expert guidance). The percentage of 'yes' scores should not be used to generate a relative risk score (ie all 'yes' answers would indicate a job was completely safe) as the questions do not make any provision for indicating the severity of the conditions and the individual elements may not therefore be comparable.



Figure A2 The Risk Factor Checklist**1. Physical stress**

- 1.1 Can the job be done without hand/wrist contact with sharp edges? [YES] [NO]
- 1.2 Is the tool operating without vibration? [YES] [NO]
- 1.3 Are the worker's hands protected from exposure to cold surfaces or products? [YES] [NO]
- 1.4 Can the job be done without using gloves? [YES] [NO]

**2. Force**

- 2.1 Does the job require exerting less than 4.5Kg (10 lbs) of force? [YES] [NO]
- 2.2 Can the job be done without using finger pinch grip? [YES] [NO]
- 2.3 Can the job be done without gripping between palm and finger surfaces? [YES] [NO]

**3. Posture**

- 3.1 Can the job be done without flexion or extension of the wrist? [YES] [NO]
- 3.2 Can the tool be used without flexion or extension of the wrist? [YES] [NO]
- 3.3 Can the job be done without deviating the wrist from side to side? [YES] [NO]
- 3.4 Can the tool be used without deviating the wrist from side to side? [YES] [NO]
- 3.5 Can the worker be seated while performing the job? [YES] [NO]
- 3.6 Can the job be done without "clothes wringing" motions? [YES] [NO]
- 3.7 Can the job be done without bending the thumb? [YES] [NO]
- 3.8 Can the tool be used without bending the thumb? [YES] [NO]
- 3.9 Does the job require the arms to be raised above the shoulders, particularly where there is rotation of the latter? [YES] [NO]

**4. Workstation design**

- 4.1 Can the orientation of the work surface be adjusted? [YES] [NO]
- 4.2 Can the height of the work surface be adjusted? [YES] [NO]
- 4.3 Can the location of the tool be adjusted? [YES] [NO]

**5. Repetitiveness**

5.1 Is the cycle time longer than 30 seconds? [YES] [NO]

**6. Tool design**

6.1 Are the thumb and finger slightly overlapped in a closed grip? [YES] [NO]

6.2 Is the span of the tool's handle between 5 and 7cm (2-2.75 inches)? [YES] [NO]

6.3 Is the handle of the tool made from material other than metal? [YES] [NO]

6.4 Is the weight of the tool below 4Kg (9 lbs)? [YES] [NO]

6.5 Is the tool suspended? [YES] [NO]

'No' responses to these questions are indicative of conditions associated with increased risk of upper limb disorders.

Adapted from Lifshitz, Y and Armstrong, T 1986. A design checklist for control and prediction of cumulative trauma disorders in hand intensive manual jobs. Proceedings of the 30th Annual Meeting of Human Factors Society, Santa Barbara: Human Factors Society 837-841.

## Posture Assessment Aid

If the initial Risk Factor Checklist indicates a possible problem with the postures or limb positions, which a worker is seen to adopt as part of her or his job, then a more detailed evaluation can be carried out using the Posture Assessment Aid. This consists of two phases: the Task Description and the Action Analysis and Assessment.

### Task Description

The purpose of this is to provide a systematic description of the task or tasks in question. The description also provides the framework for the subsequent, more detailed, action analysis as the structure of this analysis is based on action verbs used.

#### Method:

A textual description of each work task of concern should be written using the action verbs provided. The text should be in the form of notes which will provide the breakdown into task components for the subsequent analysis. These notes can therefore either be divided to give one verb per note (Example A) or written as a short paragraph (Example B).

Example A:

1. Reach to the right
2. Grip meter in tray
3. Lift meter
4. Move meter to front of body
5. Position meter in carrier assembly

Example B: Reach to the right, grip a meter in the tray, lift it and move it to the front of the body positioning it in the carrier assembly.

Figure A3 lists the action verbs and a brief definition of their intended meaning. Figure A4 provides an example of a record sheet with a list of action verbs as a reminder.

Figure A3 Definitions of Action Verbs

## 1) Passive actions: no movement or force involved

Search	Looking for something with the eyes
Wait	Inactivity, whether due to delay, pause to plan, or any other reason
Rest	Taking weight of limb on surface

## 2) Contact actions: form of contact with object

Touch	Flat contact with an object by hand or fingers
Grip	Grasping an object with the hand or fingers

## 3) 'Static' force actions: application of force subsequent to a contact (squeeze, press) or dynamic (hold) action

Squeeze	Applying a compressive force
Press	Pushing an object with little or no movement
Hold	Exerting force to hold an object at a fixed location

## 4) Dynamic actions: normally involving movement

Reach	Moving the hand to some object or location within arms length
Stretch	Moving the hand to some object or location, bending or leaning to reach
Move	Movement of some object from one location to another
Lift	Raising (or lowering) an object
Push/Pull	Moving an object without taking its weight
Position	Placing an object reasonably precisely into a particular location
Twist	Rotating a control or object, mainly movement around the wrist
Turn	Moving or rotating part or all an object, mainly with elbow movement

## 5) Composite actions: normally movement and postures involved will have been described separately

Select	Locating one object possibly mixed with others
Inspect	Examining an object by sight, sound, touch etc.
Assemble	Joining together two or more objects
Disassemble	Separating two or more objects
Use	Manipulating a tool or device with the hand
Release	Letting go of a tool or object

Figure A4 Task Description record sheet

## TASK DESCRIPTION – RECORD SHEET

Verb	Definition
Search	Looking for something with the eyes
Wait	Inactivity, whether due to delay, pause to plan, or any other reason
Rest	Taking weight of limb on surface
Touch	Flat contact with an object by hand or fingers
Grip	Grasping an object with the hand or fingers
Squeeze	Applying a compressive force
Press	Pushing an object with little or no movement
Hold	Exerting force to hold an object at a fixed location
Reach	Moving the hand to some object or location within arms length
Stretch	Moving the hand to some object or location, bending or leaning to reach
Move	Movement of some object from one location to another
Lift	Raising (or lowering) an object
Push/Pull	Moving an object without taking its weight
Position	Placing an object reasonably precisely into a particular location
Twist	Rotating a control or object, mainly movement around the wrist
Turn	Moving or rotating part or all an object, mainly with elbow movement
Select	Locating one object possibly mixed with others
Inspect	Examining an object by sight, sound, touch etc.
Assemble	Joining together two or more objects
Disassemble	Separating two or more objects
Use	Manipulating a tool or device with the hand
Release	Letting go of a tool or object

Location .....

Task .....

Observer .....

Date .....

Description:

### Action Analysis and Assessment

The purpose of this is to examine each of the individual actions involved with each task being assessed, in order to determine the likelihood of any particular aspect of the tasks predisposing individuals to upper limb strain disorders.

#### Method:

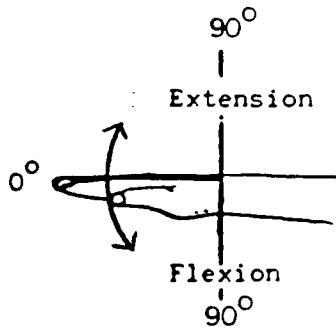
Taking each of the action verbs from the Task Description in turn, an Action Assessment Sheet should be completed. Figure A5 provides a detailed breakdown of three aspects of the upper arm activity: the actual posture or position of the arm (mainly described as a series of joint angles); the form of contact or interface used; and the force applied. The postural categories given in A5 are explained below. The appropriate category should be selected from each of these and entered onto the Action Assessment Sheet (Figure A6). The recorded activities can then be interpreted using the assessment grids given in Figure A7. These indicate the probability of a particular combination of actions causing or exacerbating upper limb disorders according to a simple low, moderate or high probability rating. Figure A8 shows a completed sequence of Task Description and Action Assessment for a simple industrial task.

#### Explanation of Postural Categories

The arm consists of three joints, the wrist, elbow and shoulder. Movements of the arm are not always what they seem, for example 'wrist rotation' actually occurs at the elbow joint. Although there are technical terms for many of the movements (e.g. pronation and supination) these have been avoided as they are unfamiliar to most people – although they are shown on the diagrams.

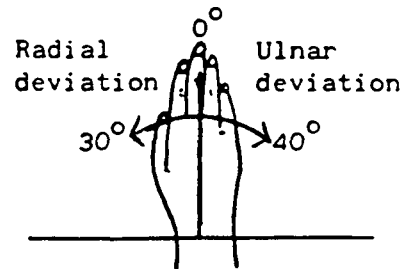
### Wrist Angle

The wrist joint moves in two planes. With the palm down these can be regarded as 'up and down' and 'side to side'. Obviously, if the wrist is rotated these will change. The neutral position (mid-point zero) is with the wrist in a straight line with the forearm. The range of movement varies with the direction of travel but is approximately  $90^{\circ}$  each way up and down and  $30-40^{\circ}$  from side to side.



Bending of Wrist

(up and down)

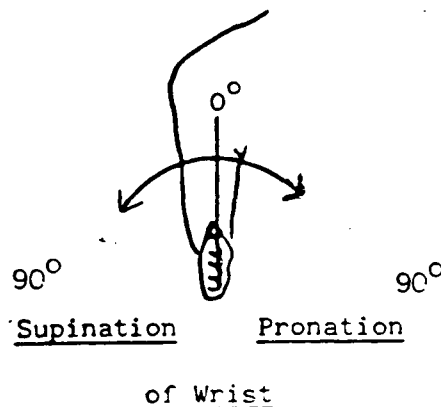


Deviation of Wrist

(side to side)

### Wrist Position

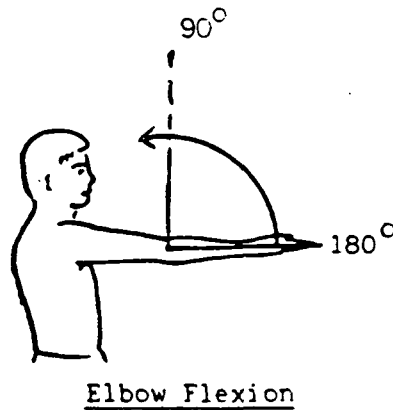
As stated above, rotation of the elbow will change the position of the wrist. A neutral middle zone can be identified ranging from palm down to the palm vertical (facing across the body). The effective range of further movement is about  $90^{\circ}$  in each direction.



of Wrist

### Elbow Angle

Probably the simplest angle to identify, ranging from the arm straight (EA4 -  $180^{\circ}$ ) to the arm fully bent (EA1 -  $<60^{\circ}$ ).

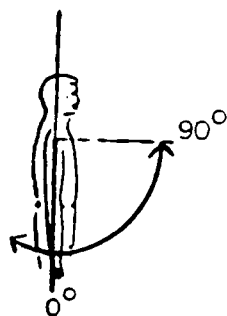


### Elbow Rotational Movement

Rotation of the elbow produces the changes in wrist position described above. This entry is solely concerned with whether or not the elbow is actually being rotated.

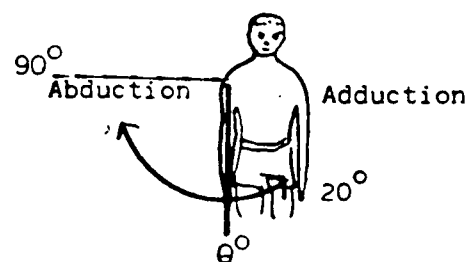
### Shoulder (Arm) Position

The shoulder is probably the hardest of the three joints to assess. The relatively wide freedom of movement makes it difficult to identify exactly what position it is in. Forwards and backwards, as in a marching movement, and outwards (and across the body) in a flapping motion are relatively straightforward in isolation. However, the actual position is likely to be a composite of these two and both should be noted.



Shoulder Forward Flexion

forwards - backwards



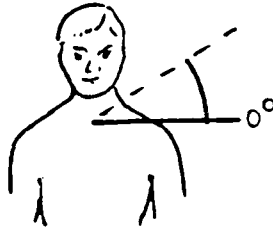
Shoulder Ab-Adduction

side to side



### Shoulder Elevation

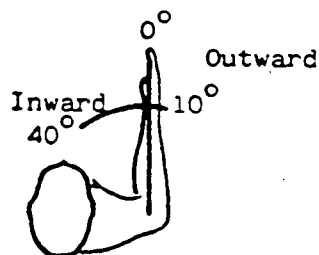
Shoulder elevation is not always easy to identify – although, if it is not particularly apparent, it probably is not sufficient to have much influence on the potential for problems. Pointers to watch for are working with the elbows on a surface where, if the surface is too high the shoulders may be raised; and working with the upper arms elevated sideways – which often seems to produce a reflex 'hunching' of the shoulders.



Shoulder Elevation

### Shoulder Rotation

This again may be difficult to identify. Substantial arm rotation with a straight arm probably involves a combination of elbow and shoulder rotation. Rotation when the elbow is bent is more apparent as the forearm amplifies the visible movement.



Shoulder Rotation

**Concluding Remarks**

The causation of Upper Limb Disorders is complex and not fully understood and an assessment of a particular action as 'high probability' does not mean that it will cause or exacerbate such disorders. Nevertheless, should high ratings be obtained, it is recommended that expert ergonomics advice be sought.

Finally, no specific provision is made in this aid for assessing the influence of two further factors: frequency and duration. The frequency with which a task is repeated has long been recognised as an important factor – hence the earlier generic title of repetitive or repetition strain injuries. However, beyond the simple statement that the more often an action is repeated the higher the risk, it has not been possible to establish any meaningful criteria to indicate gradations of risk. Some jobs with repetitive cycles of 300/day have been shown to produce strain – in others 300/hour would seem slow. Similar strictures apply to duration.

Figure A5 Action Assessment definitions

**ACTION ASSESSMENT : DEFINITIONS SHEET ONE****Action Verbs**

Verb	Definition
*Search	Looking for something with the eyes
*Wait	Inactivity, whether due to delay, pause to plan, or any other reason
*Rest	Taking weight of limb on surface
Touch	Flat contact with an object by hand or fingers
Grip	Grasping an object with the hand or fingers
Squeeze	Applying a compressive force
Press	Pushing an object with little or no movement
Hold	Exerting force to hold an object at a fixed location
Reach	Moving the hand to some object or location within arms length
Stretch	Moving the hand to some object or location, bending or leaning to reach
Move	Movement of some object from one location to another
Lift	Raising (or lowering) an object
Push/Pull	Moving an object without taking its weight
Position	Placing an object reasonably precisely into a particular location
Twist	Rotating a control or object, mainly movement around the wrist
Turn	Moving or rotating part or all an object, mainly with elbow movement
*Select	Locating one object possibly mixed with others
*Inspect	Examining an object by sight, sound, touch etc.
*Assemble	Joining together two or more objects
*Disassemble	Separating two or more objects
*Use	Manipulating a tool or device with the hand
*Release	Letting go of a tool or object

\* no further assessment normally necessary

**Interface categories:****Touch:**

T1 – fingertip – fingers straight  
 T2 – fingertip – fingers bent  
 T3 – palm  
 T4 – heel of hand

**Grip:**

G1 – thumb to pad of finger(s)  
 G2 – thumb to flat of finger(s)  
 G3 – thumb to side of finger  
 G4 – fingers to palm  
 G5 – clench grip

**Force Categories:**

a) light: up to 15% of maximum force in that posture  
 b) moderate: 15 – 40% of maximum force in that posture  
 c) heavy: over 40% of maximum force in that posture

Figure A5 continued

## ACTION ASSESSMENT : DEFINITIONS SHEET 2

### Postural categories

#### Wrist Angle (from mid-point zero, in any direction)

WA1	0 - 25% of movement range
WA2	25 - 50% of movement range
WA3	over 50% of movement range

#### Wrist Position

WP1	palm down to vertical (neutral range)
WP2	up to 50% beyond neutral range
WP3	over 50% beyond neutral range

#### Elbow Angle

EA1	angle less than 60°
EA2	angle 60 - 100°
EA3	angle more than 100° less than 180°
EA4	angle 180°

#### Elbow Rotational Movement

ER1	no
ER2	yes

### Shoulder

#### shoulder (arm) position

SP1	vertically down 0°
SP2	forwards 0 - 45°
SP3	forwards 45 - 90°
SP4	forwards more than 90° (ie above shoulder)
SP5	backwards 0 - 30°
SP6	backwards more than 30°
SP7	outwards 0 - 30°
SP8	outwards 30 - 60°
SP9	outwards more than 60°
SP10	across body 0 - 20°
SP11	across body more than 20°

#### shoulder elevation

SE1	no
SE2	yes

#### shoulder rotation

SR1	no
SR2	yes

Figure A6 Action Assessment recording sheet

**ACTION ASSESSMENT SHEET**

(circle appropriate descriptors)

Record the Action Verb for this entry : .....

Arm being assessed : Left Right

Interface category (Touch or Grip)

: T1 T2 T3 T4 G1 G2 G3 G4 G5 None

Force : light moderate heavy actual force.....kg (if known)

Posture : Wrist Angle WA1 WA2 WA3

: Wrist Position WP1 WP2 WP3

: Elbow Angle EA1 EA2 EA3 EA4

: Elbow Rotation movement ER1 ER2

: Shoulder (Arm) Position

: Backwards/forwards SP6 SP5 SP1 SP2 SP3 SP4

: Across/outwards SP11 SP10 SP1 SP7 SP8 SP9

: Shoulder Elevation SE1 SE2

: Shoulder Rotation SR1 SR2

Assessment rating (from grids)

Record the Action Verb for this entry : .....

Arm being assessed : Left Right

Interface category (Touch or Grip)

: T1 T2 T3 T4 G1 G2 G3 G4 G5 None

Force : light moderate heavy actual force.....kg (if known)

Posture : Wrist Angle WA1 WA2 WA3

: Wrist Position WP1 WP2 WP3

: Elbow Angle EA1 EA2 EA3 EA4

: Elbow Rotation movement ER1 ER2

: Shoulder (Arm) Position

: Backwards/forwards SP6 SP5 SP1 SP2 SP3 SP4

: Across/outwards SP11 SP10 SP1 SP7 SP8 SP9

: Shoulder Elevation SE1 SE2

: Shoulder Rotation SR1 SR2

Assessment rating (from grids)

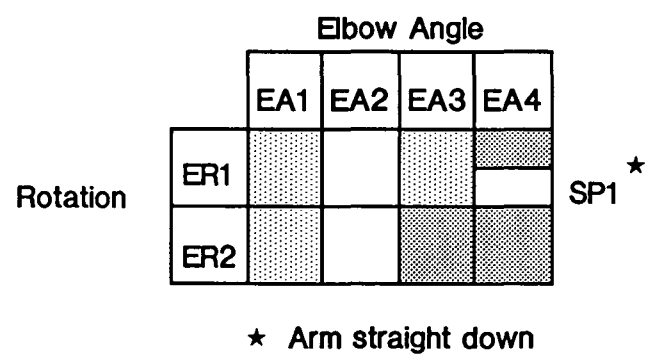
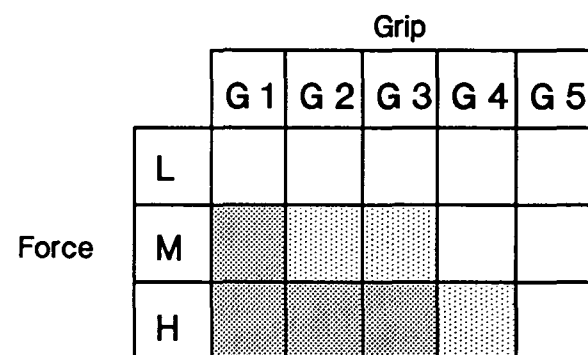
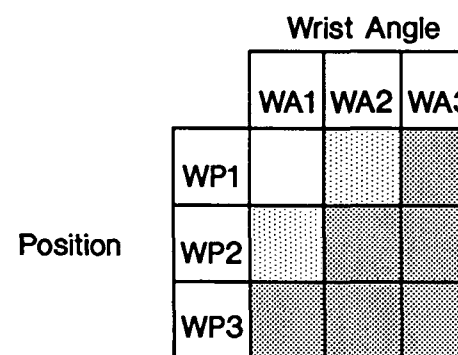
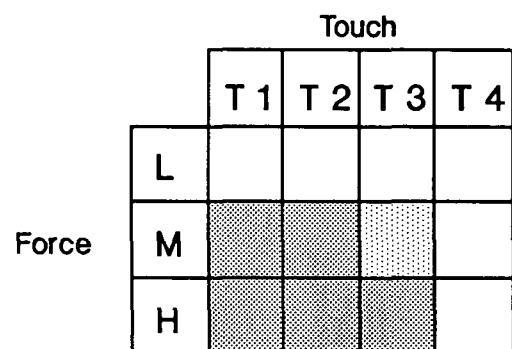


Figure A7 Assessment Grids (continued)



		Shoulder/Arm Position					
		SP6	SP5	SP1	SP2	SP3	SP4
Shoulder Elevation or Rotation	SE1 SR1	High Risk	Medium Risk	Low Risk	Low Risk	Medium Risk	High Risk
	SE2	High Risk	High Risk	Medium Risk	Medium Risk	High Risk	High Risk
	SR2	High Risk	High Risk	Medium Risk	Medium Risk	Medium Risk	High Risk
	SE2 +SR2	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk

		Shoulder/Arm Position					
		SP11	SP10	SP1	SP7	SP8	SP9
Shoulder Elevation or Rotation	SE1 SR1	Medium Risk	Low Risk	Low Risk	Low Risk	Medium Risk	High Risk
	SE2	High Risk	Medium Risk	Medium Risk	Medium Risk	High Risk	High Risk
	SR2	High Risk	Medium Risk	Medium Risk	Medium Risk	Medium Risk	High Risk
	SE2 +SR2	High Risk	High Risk	High Risk	High Risk	High Risk	High Risk

Figure A8 Completed Task Assessment (1)

## TASK DESCRIPTION - RECORD SHEET

Verb	Definition
Search	Looking for something with the eyes
Wait	Inactivity, whether due to delay, pause to plan, or any other reason
Rest	Taking weight of limb on surface
Touch	Flat contact with an object by hand or fingers
Grip	Grasping an object with the hand or fingers
Squeeze	Applying a compressive force
Press	Pushing an object with little or no movement
Hold	Exerting force to hold an object at a fixed location
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Push/Pull	Moving an object without taking its weight
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Turn	Moving or rotating part or all an object, mainly with elbow movement
Select	Locating one object possibly mixed with others
Inspect	Examining an object by sight, sound, touch etc.
Assemble	Joining together two or more objects
Disassemble	Separating two or more objects
Use	Manipulating a tool or device with the hand
Release	Letting go of a tool or object

Location Bottling Ltd.Task Bottle labelling machine operatorObserver John BrownDate 1. 4. 90Description:

Reach for bottle with right hand, grip neck of bottle lift it and move it towards machine. Position it in the machine and hold it in position. Reach for bottle with left hand, release right hand, grip bottle with left. Lift bottle and move it from machine. Twist the bottle so that the label faces the front, position it on the conveyor and release it.



Figure A8 Completed task assessment (continued) (2)

**ACTION ASSESSMENT SHEET**

(circle appropriate descriptors)

Record the Action Verb for this entry : ..... Reach .....Arm being assessed : Left Right

Interface category (Touch or Grip)

: T1 T2 T3 T4 G1 G2 G3 G4 G5 NoneForce : light moderate heavy actual force.....0kg (if known)

Posture

: Wrist Angle WA1 WA2 WA3: Wrist Position WP1 WP2 WP3: Elbow Angle EA1 EA2 EA3 EA4: Elbow Rotation movement ER1 ER2

: Shoulder (Arm) Position

: Backwards/forwards SP6 SP5 SP1 SP2 SP3 SP4: Across/outwards SP11 SP10 SP1 SP7 SP8 SP9: Shoulder Elevation SE1 SE2: Shoulder Rotation SR1 SR2

Assessment rating (from grids)

Interface - lowWrist - mediumElbow - lowShoulder - Low/MediumRecord the Action Verb for this entry : ..... Grip .....Arm being assessed : Left Right

Interface category (Touch or Grip)

: T1 T2 T3 T4 G1 G2 G3 G4 G5 NoneForce : light moderate heavy actual force.....kg (if known)

Posture

: Wrist Angle WA1 WA2 WA3: Wrist Position WP1 WP2 WP3: Elbow Angle EA1 EA2 EA3 EA4: Elbow Rotation movement ER1 ER2

: Shoulder (Arm) Position

: Backwards/forwards SP6 SP5 SP1 SP2 SP3 SP4: Across/outwards SP11 SP10 SP1 SP7 SP8 SP9: Shoulder Elevation SE1 SE2: Shoulder Rotation SR1 SR2

Assessment rating (from grids)

Interface - lowWrist - MediumElbow - lowShoulder - Low/Medium

Figure A8 Completed task assessment (continued) (3)

**ACTION ASSESSMENT SHEET**  
(circle appropriate descriptors)

Record the Action Verb for this entry : ..... Lift .....

Arm being assessed : Left Right

Interface category (Touch or Grip)

: T1 T2 T3 T4 G1 G2 G3 G4 G5 None

Force : light moderate heavy actual force.....kg (if known)

Posture

: Wrist Angle WA1 WA2 WA3

: Wrist Position WP1 WP2 WP3

: Elbow Angle EA1 EA2 EA3 EA4

: Elbow Rotation movement ER1 ER2

: Shoulder (Arm) Position

: Backwards/forwards SP6 SP5 SP1 SP2 SP3 SP4

: Across/outwards SP11 SP10 SP1 SP7 SP8 SP9

: Shoulder Elevation SE1 SE2

: Shoulder Rotation SR1 SR2

Assessment rating (from grids)

Interface - Low

Elbow - Low

Wrist - Medium

Shoulder - Medium / Medium

Record the Action Verb for this entry : ..... Move .....

Arm being assessed : Left Right

Interface category (Touch or Grip)

: T1 T2 T3 T4 G1 G2 G3 G4 G5 None

Force : light moderate heavy actual force.....kg (if known)

Posture

: Wrist Angle WA1 WA2 WA3

: Wrist Position WP1 WP2 WP3

: Elbow Angle EA1 EA2 EA3 EA4

: Elbow Rotation movement ER1 ER2

: Shoulder (Arm) Position

: Backwards/forwards SP6 SP5 SP1 SP2 SP3 SP4

: Across/outwards SP11 SP10 SP1 SP7 SP8 SP9

: Shoulder Elevation SE1 SE2

: Shoulder Rotation SR1 SR2

Assessment rating (from grids)

Interface - Low

Elbow - Medium

Wrist - Low

Shoulder - High

Figure A8 Completed task assessment (continued) (4)

**ACTION ASSESSMENT SHEET**

(circle appropriate descriptors)

Record the Action Verb for this entry : ..... Position .....

Arm being assessed : Left

Right

Interface category (Touch or Grip)

: T1 T2 T3 T4

G1

G2

G3

G4

G5

None

Force

: light

moderate heavy

actual force.....kg (if known)

Posture

: Wrist Angle

WA1

WA2

WA3

: Wrist Position

WP1

WP2

WP3

: Elbow Angle

EA1

EA2

EA3

EA4

: Elbow Rotation movement

ER1

ER2

: Shoulder (Arm) Position

: Backwards/forwards

SP6

SP5

SP1

SP2

SP3

SP4

: Across/outwards

SP11

SP10

SP1

SP7

SP8

SP9

: Shoulder Elevation

SE1

SE2

: Shoulder Rotation

SR1

SR2

Assessment rating (from grids)

As for MoveRecord the Action Verb for this entry : ..... Hold .....

Arm being assessed : Left

Right

Interface category (Touch or Grip)

: T1 T2 T3 T4

G1

G2

G3

G4

G5

None

Force

: light

moderate heavy

actual force.....kg (if known)

Posture

: Wrist Angle

WA1

WA2

WA3

: Wrist Position

WP1

WP2

WP3

: Elbow Angle

EA1

EA2

EA3

EA4

: Elbow Rotation movement

ER1

ER2

: Shoulder (Arm) Position

: Backwards/forwards

SP6

SP5

SP1

SP2

SP3

SP4

: Across/outwards

SP11

SP10

SP1

SP7

SP8

SP9

: Shoulder Elevation

SE1

SE2

: Shoulder Rotation

SR1

SR2

Assessment rating (from grids)

Interface - LowWrist - LowElbow - LowShoulder - Medium / Medium

Figure A8 Completed task assessment (continued) (5)

**ACTION ASSESSMENT SHEET**

(circle appropriate descriptors)

Record the Action Verb for this entry : ..... Reach .....Arm being assessed : Left Right

Interface category (Touch or Grip)

: T1 T2 T3 T4 G1 G2 G3 G4 G5 None

Force : light moderate heavy actual force.....kg (if known)

Posture

: Wrist Angle WA1 WA2 WA3: Wrist Position WP1 WP2 WP3: Elbow Angle EA1 EA2 EA3 EA4: Elbow Rotation movement ER1 ER2

: Shoulder (Arm) Position

: Backwards/forwards SP6 SP5 SP1 SP2 SP3 SP4: Across/outwards SP11 SP10 SP1 SP7 SP8 SP9: Shoulder Elevation SE1 SE2: Shoulder Rotation SR1 SR2

Assessment rating (from grids)

Interface - LowWrist - LowElbow - LowShoulder - Medium / MediumRecord the Action Verb for this entry : ..... Grip .....Arm being assessed : Left Right

Interface category (Touch or Grip)

: T1 T2 T3 T4 G1 G2 G3 G4 G5 NoneForce : light moderate heavy actual force.....kg (if known)

Posture

: Wrist Angle WA1 WA2 WA3: Wrist Position WP1 WP2 WP3: Elbow Angle EA1 EA2 EA3 EA4: Elbow Rotation movement ER1 ER2

: Shoulder (Arm) Position

: Backwards/forwards SP6 SP5 SP1 SP2 SP3 SP4: Across/outwards SP11 SP10 SP1 SP7 SP8 SP9: Shoulder Elevation SE1 SE2: Shoulder Rotation SR1 SR2

Assessment rating (from grids)

Interface - LowWrist - MediumElbow - LowShoulder - High / Medium

Figure A8 Completed task assessment (continued) (6)

**ACTION ASSESSMENT SHEET**

(circle appropriate descriptors)

Record the Action Verb for this entry : ..... Lift .....Arm being assessed : Left Right

Interface category (Touch or Grip)

: T1 T2 T3 T4 G1 G2 G3 G4 G5 NoneForce : light moderate heavy actual force.....kg (if known)

Posture

: Wrist Angle WA1 WA2 WA3: Wrist Position WP1 WP2 WP3: Elbow Angle EA1 EA2 EA3 EA4: Elbow Rotation movement ER1 ER2

: Shoulder (Arm) Position

: Backwards/forwards SP6 SP5 SP1 SP2 SP3 SP4: Across/outwards SP11 SP10 SP1 SP7 SP8 SP9: Shoulder Elevation SE1 SE2: Shoulder Rotation SR1 SR2

Assessment rating (from grids)

Interface - Low Wrist - Low  
 Low - Low Shoulder - High / High

Record the Action Verb for this entry : ..... Move .....Arm being assessed : Left Right

Interface category (Touch or Grip)

: T1 T2 T3 T4 G1 G2 G3 G4 G5 NoneForce : light moderate heavy actual force.....kg (if known)

Posture

: Wrist Angle WA1 WA2 WA3: Wrist Position WP1 WP2 WP3: Elbow Angle EA1 EA2 EA3 EA4: Elbow Rotation movement ER1 ER2

: Shoulder (Arm) Position

: Backwards/forwards SP6 SP5 SP1 SP2 SP3 SP4: Across/outwards SP11 SP10 SP1 SP7 SP8 SP9: Shoulder Elevation SE1 SE2: Shoulder Rotation SR1 SR2

Assessment rating (from grids)

Interface - Low Wrist - medium  
 Elbow - Low Shoulder - High / High

Figure A8 Completed task assessment (continued) (7)

**ACTION ASSESSMENT SHEET**  
(circle appropriate descriptors)

Record the Action Verb for this entry : ..... *Twist* .....

Arm being assessed : Left Right

Interface category (Touch or Grip)

: T1 T2 T3 T4 G1 G2 G3 G4 G5 None

Force : light moderate heavy actual force.....kg (if known)

Posture

: Wrist Angle WA1 WA2 WA3

: Wrist Position WP1 WP2 WP3

: Elbow Angle EA1 EA2 EA3 EA4

: Elbow Rotation movement ER1 ER2

: Shoulder (Arm) Position

: Backwards/forwards SP6 SP5 SP1 SP2 SP3 SP4

: Across/outwards SP11 SP10 SP1 SP7 SP8 SP9

: Shoulder Elevation SE1 SE2

: Shoulder Rotation SR1 SR2

Assessment rating (from grids)

*Interface - Low      Wrist - High*  
*Elbow - Low      Shoulder - High/High*

Record the Action Verb for this entry : ..... *Position* .....

Arm being assessed : Left Right

Interface category (Touch or Grip)

: T1 T2 T3 T4 G1 G2 G3 G4 G5 None

Force : light moderate heavy actual force.....kg (if known)

Posture

: Wrist Angle WA1 WA2 WA3

: Wrist Position WP1 WP2 WP3

: Elbow Angle EA1 EA2 EA3 EA4

: Elbow Rotation movement ER1 ER2

: Shoulder (Arm) Position

: Backwards/forwards SP6 SP5 SP1 SP2 SP3 SP4

: Across/outwards SP11 SP10 SP1 SP7 SP8 SP9

: Shoulder Elevation SE1 SE2

: Shoulder Rotation SR1 SR2

Assessment rating (from grids)

*Interface - Low      Wrist - High*  
*Elbow - Low      Shoulder - High/High*

**HEAD OFFICE:**

Research Avenue North,  
Riccarton,  
Edinburgh, EH14 4AP,  
United Kingdom  
Telephone: +44 (0)870 850 5131  
Facsimile: +44 (0)870 850 5132

**Email:** [iom@iom-world.org](mailto:iom@iom-world.org)

Tapton Park Innovation Centre,  
Brimington Road, Tapton,  
Chesterfield, Derbyshire, S41 0TZ,  
United Kingdom  
Telephone: +44 (0)1246 557866  
Facsimile: +44 (0)1246 551212

Research House Business Centre,  
Fraser Road,  
Perivale, Middlesex, UB6 7AQ,  
United Kingdom  
Telephone: +44 (0)208 537 3491/2  
Facsimile: +44 (0)208 537 3493

Brookside Business Park,  
Cold Meece,  
Stone, Staffs, ST15 0RZ,  
United Kingdom  
Telephone: +44 (0)1785 764810  
Facsimile: +44 (0)1785 764811