

Listing of Job Titles (cont.)

ID number	Job title	Plant
88	Shipping Loader	Fiberwood
89	Chip-N-Saw Operator	Sawmill
90	Debarcker Operator	Sawmill
91	Edger Operator	Sawmill
92	Sorter Tender	Sawmill
93	Forklift	Sawmill
94	Chipper	Sawmill
95	Chip Truck Driver	Sawmill
96	Trimmer Operator	Sawmill
97	Line Tender	Sawmill
98	Utility (Sawmill)	Sawmill
99	Clean-up	Sawmill
100	Handyperson	Sawmill
101	Saw Filer	Sawmill
102	Stacker Operator	Sawmill
103	Stick Layer	Sawmill
104	Kiln Tender	Sawmill
105	Kiln Forklift	Sawmill
106	Stick Cutter	Sawmill
107	Utility (Planer Mill)	Sawmill
108	Stick Catcher	Sawmill
109	Clean-up/Relief	Sawmill
110	Strapper	Sawmill
111	Puller	Sawmill
112	Stacker	Sawmill
113	Forklift (Small)	Sawmill
114	Forklift (Large)	Sawmill
115	Trimmer (Planer Mill)	Sawmill
116	Grader	Sawmill
117	Planer Feeder	Sawmill
118	Planer Operator	Sawmill
119	Planer Set-up	Sawmill
120	Shipping Forklift	Sawmill
121	Strapper Loader	Sawmill

Appendix B

Multimethod Job Design Questionnaire (MJDQ)

Note. (P) indicates job included in pilot sample.

MOTIVATIONAL JOB DESIGN QUESTIONNAIRE

Mike Campion
Personnel Dep.

Job Design Questionnaire
(MJDQ)
Multimethod

Date: _____
I.D. Code: _____
Job Title: _____
Plant: _____

1. Autonomy, responsibility, vertical loading, and the job allow autonomy? That is, to what extent does the job allow freedom, independence, or discretion in work scheduling or sequence, work methods, procedures, or quality control, etc.? In different terms, how much freedom or responsibility for decision making concerning the work does this job allow? In short, is the job vertically loaded?
 5. The job allows almost complete autonomy in work sequencing, methods, etc. Employee has almost complete responsibility for decision making concerning the work.
 3. The job allows some autonomy and responsibility for decision making, but some of the decisions are fixed or made by supervisors or others within the organization.
 1. The job allows very little autonomy and responsibility for decision making. Almost all decisions concerning scheduling, methods, procedures, etc., are fixed or made by others.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

2. Intrinsic job feedback: Does the job provide a high level of feedback? That is, to what extent does carrying out the job activities provide the individual with direct and clear information about the effectiveness (e.g., quality and quantity) of his or her performance? In different terms, to what extent does performing the job provide intrinsic job feedback?
 5. The job itself provides a great amount of direct and clear feedback as to the effectiveness (e.g., quality and quantity) of the employee's performance. That is, feedback is available on a continuous or immediate basis and is specific to the employee.
 3. The job provides a moderate amount of performance feedback. That is, feedback is available on an intermittent basis, and/or is a function of the efforts of many employees.
 1. The job provides a limited amount of performance feedback. That is, it is rarely available and/or is completely contaminated by factors beyond the employee's control.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

3. Extrinsic job feedback: Does the job provide feedback from other persons in the organization? That is, to what extent do supervisors, co-workers, QC technicians, etc., provide feedback or reinforcement for job performance (e.g., quality and quantity)?
 5. Other persons in the organization (e.g., supervisors, inspectors, other workers, etc.) provide a great amount of direct and clear feedback as to the effectiveness (e.g., quality and quantity) of the employee's performance. This feedback is given on a regular or immediate basis, and is specific to the employee.
 3. Other persons in the organization provide a moderate amount of performance feedback. The feedback is given on an intermittent basis, and/or is a function of the efforts of many employees.
 1. Other persons in the organization provide a limited amount of performance feedback. Feedback is rarely if ever given, and/or is completely contaminated by factors beyond the employee's control.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

7. **ABILITY/SKILL REQUIREMENTS AND VARIETY:** Does the job require significant amounts and variety of knowledges, skills, and abilities (KSAs)? That is, to what extent does the job require a fairly high level of knowledges, skills, and abilities, and/or a variety of knowledges, skills, and abilities for task performance?
 5. The job requires a great amount and variety of KSAs. That is, the job requires a high level of KSAs (e.g., training or experience of from a year to a few years) and requires a great variety of KSAs for successful performance.
 3. The job requires a moderate amount and variety of KSAs. That is, the job requires a moderate level of KSAs (e.g., training or experience of from a few weeks to a few months) and a moderate amount of variety of KSAs. If either level or variety are high, give a 4 rating.
 1. The job requires a limited amount and variety of KSAs. That is, the job requires a low level of KSAs (e.g., training or experience of from a few hours to a few days) and a small amount of variety of KSAs. If either level or variety are moderate, give a 2 rating.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)
 Comments:

8. **Task identity:** Does the job provide task identity? That is, to what extent does the job require the completion of a whole and identifiable piece of work, or a natural unit or module of work, etc.?
 5. The job provides a great amount of task identity. The job requires completion of whole and identifiable pieces of work that are attributable entirely to the employee.
 3. The job provides a moderate amount of task identity. That is, the job involves some activities that result in the completion of a whole piece of work product, or other activities do not, or the whole pieces of work products are the result of the efforts of a small group of employees; or the units of work produced are not totally complete and whole, but are close, etc..
 1. The job provides a limited amount of task identity. The job requires completion of only a small part of the whole unit of work; the whole units produced are the combined result of many employees and processes; etc..

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)
 Comments:

9. **Task significance:** To what extent is the job significant and important compared with other jobs in the organization? That is, to what extent does the job have an impact on other people in the organization, or upon the organization goals?
 5. The job has a great amount of significance and importance. That is, the work produced by the job is very important to other people in the organization or to the organization goals.
 3. The job has a moderate amount of significance and importance to other people in the organization or to the organization goals.
 1. The job has a limited amount of significance and importance to other people in the organization or to the organization goals.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)
 Comments:

4. **Social interaction:** Does the job allow for positive social interactions? That is, to what extent does the job include team work, optional interaction, co-worker assistance, social support, etc.?
 5. The job allows frequent opportunities for positive social interactions. This includes both interactions that are requested by the job and interactions that are optional. That is, there are opportunities for positive social interactions (optional, not likely to be conflict situations). A job could be rated high on this even though individual employees may not take advantage of these opportunities.
 3. The job allows occasional opportunities for positive social interactions. This also includes jobs where there are many opportunities, but the opportunities are both positive and negative.
 1. The job allows only infrequent opportunities for positive social interactions. This also includes jobs where there are many opportunities, but most of the interactions available are negative.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)
 Comments:

5. **Task/goal clarity:** To what extent are the job's duties, requirements, instructions, performance levels, goals, etc., clear and specific? For example, a goal can be clear, but not specific (e.g., do the best you can vs. produce 5 units).
 5. The job's tasks and goals are clear and specific almost all of the time. That is, either from the nature of the job itself or from instructions given by others, the exact tasks and performance goals are almost always clear and specific for the employee.
 3. The job's tasks and goals are clear and specific most of the time. That is, sometimes the tasks or goals are ambiguous or nonspecific.
 1. The job's tasks and goals are clear and specific only a moderate amount of the time. That is, frequently the tasks or goals are ambiguous, non-specific, or nonexistent.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)
 Comments:

6. **Task variety, horizontal loading:** Does the job allow task variety? That is, to what extent does the job allow object variety (e.g., parts, tools, controls), motor variety (e.g., pace, location, operations), variety of different activities, etc.? In short, is the job horizontally loaded?
 5. The job has a great amount of variety of tasks, activities, objects, motor movements throughout the day, and/or changes significantly from day-to-day or from project-to-project.
 3. The job has a moderate amount of task variety. That is, the tasks change only intermittently, and/or all the tasks are fairly similar in nature.
 1. The job has only a limited amount of task variety. That is, the job consists only of a few distinct tasks, and/or all the tasks are very similar in nature.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)
 Comments:

- 13. **Participation:** Does the job allow participation in decision making? That is, to what extent is the employee allowed to participate in work-related decisions that affect his or her job such as work methods, scheduling, quality standards, problems, etc.?
 The job allows a great amount of participation in decision making concerning the job (e.g., schedules, methods, QC, problem solving). 80% or more).
 5. The job allows a moderate amount of participation in job-related decision making. That is, the employee is involved in nearly every decision affecting the job (e.g., 80% or more).
 3. The job allows a limited amount of participation in job-related decision making. That is, the employee is involved in very few decisions (e.g., less than 20%).
 1. The job allows a minimal amount of participation in job-related decision making. That is, the employee is involved in almost no decisions (e.g., less than 5%).
 3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:
 14. **Communication:** To what extent do the incumbents in this job have access to all communication channels and information flow relevant to themselves and their job?
 5. The incumbents in this job have a great amount of access to communication channels. That is, they receive sufficient information to perform their job, and they receive information relevant to themselves in general. Information comes from many sources (e.g., supervisor, manager, other workers).
 3. The incumbents in this job have a moderate amount of access to communication channels. That is, they receive sufficient information to perform their job, but they receive information from only a few sources. Most direct information comes from the supervisor, but co-workers may also contribute.
 1. The incumbents in this job have a limited amount of access to communication channels. That is, they receive only the minimum necessary to perform their job, but little or no information from other sources.
 3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

- 15. **Pay adequacy:** To what extent is the pay adequate and equitable for the job? That is, is the pay commensurate with the job requirements, and the level in similar jobs outside (or elsewhere in) the organization?
 5. The pay is more than adequate considering the job requirements, and the pay is higher than that in similar jobs outside (or elsewhere in) the organization. (Note: one SE other condition for a rating.)
 3. The pay is adequate considering the job requirements, and the pay is at the same level as that in similar jobs outside (or elsewhere in) the organization.
 1. The pay is less than adequate considering the job requirements, and the pay is lower than that in similar jobs outside (or elsewhere in) the organization. (Note: one or other condition for a rating.)
 3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

- 10. **Growth, learning, advancing responsibility:** Does the job allow growth in terms of learning and increasing responsibility within the job itself? That is, to what extent does the job allow opportunities for learning and growth in competence on the job, for increasing responsibility and proficiency on the job, etc.?
 5. The job allows a great amount of opportunity for growth in terms of learning and increasing responsibility. That is, the job either requires or encourages the employee to increase competence, proficiency, or responsibility, whether or not the employee does so.
 3. The job allows a moderate amount of opportunity for growth in terms of learning and increasing responsibility. This includes situations where growth is possible but not encouraged.
 1. The job allows a limited amount of opportunity for growth in terms of learning and increasing responsibility. In this job, little or no opportunity is available for growth.
 3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

- 11. **Promotion:** Does the job allow adequate opportunity for promotion? That is, to what extent are there opportunities for advancement to higher level jobs, and are the promotion practices fair and standardized?
 5. The job allows a great amount of opportunity for promotion. That is, promotional opportunities are possible on this job, they occur at reasonable time intervals, and they are administered fairly (e.g., all employees are treated equally; criteria are job-related, standardized, and uniformly applied; etc.).
 3. The job allows a moderate amount of opportunity for promotion. That is, promotional opportunities are possible but not frequent, or they are not always administered in a standardized and job-related manner.
 1. The job allows a limited amount of opportunity for promotion. That is, promotional opportunities are not possible or are very infrequent, and they are not always administered in a standardized and job-related manner.
 3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

- 12. **Achievement:** To what extent does the job allow for feelings of achievement and task accomplishment?
 5. The job allows a great amount of opportunity for feelings of achievement and task accomplishment. That is, there are many opportunities for achievement and persistence.
 3. The job allows a moderate amount of opportunity for feelings of achievement and task accomplishment. That is, the opportunities for these feelings exist on the job, but are less frequent.
 1. The job allows a limited amount of opportunity for feelings of achievement and task accomplishment. That is, there are few opportunities for these feelings on the job.
 3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

MECHANISTIC JOB DESIGN QUESTIONNAIRE

1. Task fractionalization/specialization: To what extent is the job highly specialized in terms of function and/or activity? In other words, is the work performed in this department highly fractionalized so that each job represents only a very small piece of the total work performed?
 5. The job is extremely specialized in function and activity. The job represents only a very small piece of the total work performed, and involves only a few different activities.
 3. The job is fairly specialized in function and activity. The job represents a moderate piece of the total work performed, and involves a moderate number of different activities.
 1. The job is only somewhat specialized in function and activity. The job represents a fairly large piece of the total work performed, and involves a large number of different activities.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

2. Specialization of materials, tools, procedures: To what extent are the materials, tools, equipment, methods, etc., used on the job highly specialized in terms of function and/or purpose?
 5. Taken as a whole, the materials, tools, and procedures used on this job are extremely specialized. Most are designed to have only a single function or purpose.
 3. Taken as a whole, the materials, tools, and procedures used on this job are fairly specialized. Many are designed to have only a single or a few functions or purposes.
 1. Taken as a whole, the materials, tools, and procedures used on this job are only somewhat specialized. Most are designed for only a single or a few functions or purposes.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

3. Task simplification: To what extent are the tasks on this job simplified, and is the worker required to do only one thing at a time? In other words, to what extent are the tasks as uncomplicated as possible, and to what extent do they not require that the worker do many tasks or activities simultaneously or in very close succession?
 5. The tasks on this job are extremely simplified. The tasks are designed to be very uncomplicated, and the worker rarely has to perform multiple tasks simultaneously or in very close succession.
 3. The tasks on this job are fairly simplified. The tasks are designed to be uncomplicated, but moderately complex, and the worker only occasionally has to perform multiple tasks simultaneously or in close succession.
 1. The tasks on this job are only somewhat simplified. Many of the tasks are quite complex, and the worker frequently has to perform multiple tasks simultaneously or in close succession.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

16. Job security: To what extent do the incumbents on this job have high job security? That is, to what extent is the job unlikely to be eliminated or discontinued, is the incumbents' employment with the company assured, and the conditions of employment unlikely to change, etc., in the foreseeable future?
 5. This job has a great amount of job security. That is, neither the job, nor the incumbents' employment status, nor the conditions of employment are likely to change substantially in the foreseeable future.
 3. This job has a moderate amount of job security. That is, there is a chance that either the incumbents' employment status, or the conditions of employment could change in some manner in the foreseeable future.
 1. This job has a limited amount of job security. That is, it is very likely that the job, the incumbents' employment status, or the conditions of employment will change in the foreseeable future.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

4. **Skill Simplification:** To what extent is the job designed in such a way that it requires as little skill and training time as possible? In other words, to what extent can nearly anyone perform the job with little practice?
- The job requires very little skill and training time. Most anyone can perform the job with little practice. Training time is only from a few hours to a few days.
 - The job requires only moderate amounts of skill and training time.
 - Complete mastery of the job takes from a few weeks to a few months.
 - The job requires a great deal of skill and training time. Training time for this job/skill takes from a year to a few years.
 - Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)
- Comments:
5. **Repetition/pacing:** To what extent does the job require repetition or pacing? Examples include performing the same activity repeatedly continuously, making several identical items at the same time, machine or conveyor pacing of work, etc.
- The job is almost completely repetitious and/or paced. The same activity is performed repeatedly and continuously; and/or the work is paced by machine, conveyor, or assembly line; etc.
 - The job is moderately repetitious and/or paced. The job frequently involves repeating the same activity, or making several identical items at the same time, or is influenced by a machine cycle or pace, etc.
 - The job is repetitious or paced to only a very limited amount. Only occasionally are tasks repeated or many identical items made at the same time, and the work is not machine paced.
 - Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)
- Comments:
6. **Idle Time/Capacity:** To what extent is idle time and/or capacity minimized in the design of this job? In other words, is the time between tasks or activities minimized, and is the worker loaded to optimal capacity?
- The job has only a limited amount of idle time and/or capacity. There is little time between tasks or activities, and the worker is fully loaded most of the time.
 - The job has only a moderate amount of idle time and/or capacity. There is only a moderate time between tasks or activities, and the worker is adequately loaded most of the time.
 - The job has quite a bit of idle time and/or capacity. There is considerable time between tasks or activities, and the worker is NOT fully loaded most of the time.
 - Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)
- Comments:
7. **Motion economy -- materials handling:** To what extent is this job surrounded by motion economy in terms of materials handling? In other words, to what extent is the movement of materials in the area of this job minimized but in as efficient a manner as possible? Interest here is NOT in worker muscle between operations, the physical handling or process flow (e.g., arrangement of workstations, efficient conveyor and forklift routes, more efficient use of gravity in material movement, etc.).
- The job is surrounded by a great deal of motion economy in terms of material handling. The movement of materials to and from the work station is minimized and efficient.
 - The job is surrounded by only moderate amounts of motion economy in terms of material handling. That is, there are some instances when distances are not minimized, or when inefficient (e.g., high energy usage) material movement techniques must be used.
 - The job is surrounded by very little motion economy in terms of material handling. Much of the material is moved in inefficient ways, and many distances are not minimized.
 - Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)
- Comments:
8. **Motion economy -- prepositioning of materials, tools:** To what extent are all tools, controls, and materials prepositioned and located so that the hands travel the shortest distance, the fewest activities are performed, and the best travel the motions is possible? For example, to what extent are controls, tools, and materials located in fixed places close to the point of use?
- Almost all materials, tools, and controls are prepositioned and arranged so as to achieve maximum economy of motion and activity to accomplish the task.
 - Many of the materials, tools, and controls are prepositioned and arranged so as to achieve maximum economy of motion and activity to accomplish the task.
 - Only a few of the materials, tools, and controls are prepositioned and arranged so as to achieve maximum economy of motion and activity to accomplish the task.
 - Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)
- Comments:
9. **Motion economy -- eye and head movements:** To what extent is the job designed to require as little eye and head movement as possible?
- The job requires only occasional eye and head movements to perform the primary tasks within the visual field. The work is performed at a single and stationary point within the visual field. Some eye movement, but almost no head movement is required for the primary tasks.
 - The job requires frequent eye and head movements to perform the primary tasks. Most of the work is in one location in the visual field, but the eyes, but much head movement is also necessary. Most of the movement is made with the periphery, but much head movement is also required.
 - The job requires almost continuous eye and head movements to perform the primary tasks. The work requires scanning of the entire visual field. Both eye and head movements are needed on a constant basis.
 - Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)
- Comments:

10. **Motion economy -- muscle movement:** To what extent is the job designed to require the greatest muscle movement possible? In other words, to what extent does machinery provide the power and momentum used to accomplish the task, such that the worker is simply a monitor of the process?

5. The job requires a limited amount of muscle movement. That is, most arm movements are within normal reach, momentum is used frequently, few muscles are usually required, etc.
3. The job requires a moderate amount of muscle movement. That is, occasional extreme reach movements are required, momentum is only occasionally used, a fair number of muscles are required, etc.
1. The job requires a great amount of muscle movement. Extreme arm movements are frequently necessary, muscle movements frequently have to work against momentum, a large number of muscles are required, etc.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

11. **Motion economy -- muscle rhythm:** To what extent is the job designed to allow an easy and natural working rhythm? In other words, to what extent is the work arranged to allow smooth, continuous motions and a free rhythm of muscle movements?

5. The job allows a great amount of free and natural working rhythm. That is, the workplace is arranged to allow a great amount of smooth, continuous, and rhythmic muscle movements.
3. The job allows a moderate amount of free and natural working rhythm. That is, the workplace is arranged to allow a moderate amount of smooth, continuous, and rhythmic muscle movements.
1. The job allows a limited amount of free and natural working rhythm. That is, the workplace is arranged to allow a limited amount of smooth, continuous, and rhythmic muscle movements.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

12. **Motion economy -- muscle movement style:** To what extent is the job designed to allow favorable muscle movement style? For example, to what extent can movements be favored by both hands simultaneously in opposite or symmetrical directions: in curved, arched, or circular rather than straight lined motions; in ballistic rather than highly controlled movements, etc.?

5. The job allows an extremely favorable muscle movement style. The workplace is designed so that many movements are made with both hands simultaneously, in curved motions, using ballistic movements, etc.
3. The job allows a somewhat favorable muscle movement style. Some simultaneous hand movements are allowed, some motions are curved and others are straight, both ballistic and highly controlled movements are required, etc.
1. The job requires an unfavorable muscle movement style. Many two-hand movements are not simultaneous and most movements are highly controlled, etc.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

13. **Mechanization:** To what extent is the job designed to be highly mechanized and automated? In other words, to what extent does machinery provide the power and momentum used to accomplish the task, such that the worker is simply a monitor of the process?

5. There is a great amount of mechanization in the design of this job. Machinery provides the power and control; the worker only monitors the process. The job is almost completely automated.
3. There is a moderate amount of mechanization in the design of this job. The machinery provides the power, but the worker controls and monitors the process. For example, many power tools are used.
1. There is a limited amount of mechanization in the design of this job. The worker provides the power, and controls and monitors the process. For example, much work is done by hand or with the use of hand tools.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

BIOLOGICAL JOB DESIGN QUESTIONNAIRE

1. Seating: What is the overall quality of the seating arrangements available on the job? In other words, if the job primarily requires standing up, is there occasional opportunity and arrangement for sitting down to rest or some other means for occasionally resting (e.g., leaning on something, leaning against a formal break, etc.)? If the job requires sitting, is the seating adequately comfortable, good postural support and comfort (i.e., adjustable seat height, lumbar support, padding, etc.)?
5. The seating arrangements available on this job are very adequate. The job allows the worker to sit or stand at will, and the seating provides adequate postural support and comfort.
3. The seating arrangements available on this job are adequate. Either sitting only is required and the postural support and comfort provided are only marginal, or the job requires mostly standing with only occasional opportunities to sit.
1. The seating arrangements available on this job are inadequate. Either sitting only is required and postural support and comfort are poor, or the job requires standing only.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

2. Tool design: What is the overall quality of the design of the tools used on this job in terms of their biomechanical features? For example, is the grip the proper thickness, shape, and length to ensure adequate control and minimal stress concentration; is the grip surface comfortable and operated by the elements in the tool that the index finger; can the trigger be operated with either hand; is the tool the proper weight; does the tool operation allow wrists to be straight; are associated gloves adequately designed; etc.?
5. There is a great amount of quality in the design of the tools used on this job. Most of the biomechanical features above are satisfied, and there are no significant violations.
3. There is a moderate amount of quality in the design of the tools used on this job. Many of the biomechanical features above are satisfied, but there are a few minor violations.
1. There is only a limited amount of quality in the design of the tools used on this job. Most of the biomechanical features above are not satisfied, and there are significant violations.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

3. Anthropometry: To what extent is the job designed to allow for anthropometric differences between people? That is, do requirements for clearance, reach, eye height, leg room, etc., allow for differences in sizes of people from the 5th to the 95th percentiles of the population? Also, one must consider sex differences and the effects of clothing. Designing for the extremes and adjustability are positive features.
5. This job places no limitations on the anthropometric differences of potential workers. All relevant anthropometric allowances on this job can accommodate a reasonable range (i.e., 5th to 95th) of dimensions.
3. This job places some minor limitations on the anthropometric differences it can accommodate. Either slight limitations are placed on a number of dimensions, or moderate limitations are placed on one or two dimensions.
1. This job places significant limitations on the anthropometric differences it can accommodate. Either there are moderate limitations on a number of dimensions, or severe limitations on one or two dimensions.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

4. Static effort: To what extent is the job designed to minimize static muscular effort? In other words, does the job require the arms to be kept down (i.e., elbows near the sides), holding the body segments horizontalized; is the head position at an optimum (i.e., not tilted up or too far down); is unavoidable static effort less than 15% of maximum; etc.?
5. The job requires only a limited amount of static muscular effort. Required static effort is intermittent and short term, and/or is well below acceptable levels (e.g., below 15% of max.).
3. The job requires a moderate amount of static muscular effort. Required static effort is discontinuous and short term, moderate but discontinuous, or at a low level but continuous.
1. The job requires a great amount of static muscular effort. Required static effort is difficult and frequent, or moderate and continuous.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

5. Endurance: To what extent is the required muscular endurance (i.e., dynamic effort) within reasonable limits? In other words, continuous work should not exceed 30% of maximum, and intermittent work should not exceed 50% of maximum.
5. The job requires only a limited amount of muscular endurance. Required endurance is low or of very short duration; the level of physical fitness needed is about at the average level of the general population.
3. The job requires a moderate amount of muscular endurance. Required endurance is either to move the body or external objects, is below the maximum for continuous work and below 50% for intermittent work, or the level of physical fitness needed is slightly above the average level of the general population.
1. The job requires a great amount of muscular endurance. Required endurance is at or above 30% of maximum for continuous work or at or above 50% for intermittent work; the level of physical fitness needed is well above the average level of the general population.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

6. Strength: To what extent are the muscular strength requirements of the job reasonable? That is, do any of the tasks require strength levels that exceed the capabilities of the workers required to perform them? If so, from what strength levels required, also consider the continuous versus intermittent nature of the tasks.
5. This job requires only a limited amount of muscular strength. Only minimal strength is required for continuous tasks, and only moderate strength is required for intermittent tasks; strength levels required would not exceed the average capability level of the general population.
3. The job requires a moderate amount of muscular strength. Only moderate strength is required for continuous tasks, and higher levels of strength are required only intermittently; strength levels required would slightly exceed the average capability level of the general population.
1. The job requires a great amount of muscular strength. High levels of strength are required on a continuous basis, and strength levels required would greatly exceed the average capability level of the general population.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

10. Wrists: To what extent does the job allow the wrists to remain straight and free of excessive movement?

- 5. The job requires a limited amount of wrist bending or movement. Performance of the primary task allows the wrists to remain straight with little movement most of the time.
- 3. The job requires a moderate amount of wrist bending or movement. Performance of the primary task requires some wrist bending and movement, but it is not excessive or continuous.
- 1. The job requires a great amount of wrist bending or movement. Performance of the primary task requires much wrist bending and movement on an excessive or continuous basis.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

11. Stress concentration: To what extent is the worker protected from various forms of stress concentration? For example, avoid the concentration of stress on bones and joints (e.g., many finger-grooved tools damage bones in the hand); make sure floors are insulated or provide mats as air or else insulate them; make sure surfaces of objects or machines are smooth or padded, etc.

- 5. The worker is exposed to a limited amount of stress concentration on this job. None of the above or similar recommendations are violated on a regular basis.
- 3. The worker is exposed to a moderate amount of stress concentration on this job. One or more of the above or similar recommendations are violated, but the stress concentration is not frequent, excessive, or long-term.
- 1. The worker is exposed to a great amount of stress concentration on this job. One or more of the above or similar recommendations are violated, and the stress concentration is frequent, excessive, or long-term.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

12. Vibration: To what extent is the vibration impacting the human body kept to a reasonable level? In other words, is the vibration products (esp. feet, hands, and buttocks) kept to reasonable levels and durations to avoid any adverse physiological effects?

- 5. The worker is exposed to a limited amount of vibration on this job. Either the worker is exposed to no significant vibration, or the vibration is small in magnitude and short in duration.
- 3. The worker is exposed to a moderate amount of vibration on this job. The vibration is either medium in magnitude but short in duration, or small in magnitude but long in duration.
- 1. The worker is exposed to a great amount of vibration on this job. The vibration is large in magnitude, and moderate to long in duration.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

7. Lifting: To what extent are the lifting requirements of the job reasonable? In other words, less lifting is better than more lifting; the weights lifted should not be excessive (e.g., occasionally, 40/50 lbs. for men; 20/30 lbs. for women); the weights should be designed appropriately (i.e., 40/50 lbs. for men; 20/30 lbs. for women); the weights should be designed to be close to body, off rise on surface; loads should be designed to be kept near to the body when carrying; etc.

- 5. The lifting requirements on this job are minimal. For example, little lifting is required, the weights lifted are light, the lifting and carrying tasks are designed appropriately, etc.
- 3. The lifting requirements on this job are moderate. For example, some lifting is required, but the weights lifted are usually acceptable, etc. and the lifting and carrying tasks are not usually unacceptable, etc.
- 1. The lifting requirements on this job are excessive. For example, much lifting is required, and/or the weights lifted are excessive, and/or lifting and carrying tasks are poorly designed, etc.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

8. Posture, lower back: To what extent does the job avoid requiring any posture or movement that may have an adverse effect on the lower back? In other words, avoid any kind of bent or unnatural posture, minimize moments acting on the vertebral column, avoid excessive torsional movements under a load, avoid the need for extensive sidestepping, etc.

- 5. The job rarely requires any posture or movements that may have an adverse effect on the lower back. That is, these postures and movements are never, or only infrequently, required in the performance of the primary tasks.
- 3. The job occasionally requires postures or movements that may have an adverse effect on the lower back. That is, these postures and movements are sometimes required (e.g., daily), but are not long-term or frequent in the performance of the primary tasks.
- 1. The job very often requires postures or movements that may have an adverse effect on the lower back. That is, these postures and movements are frequently or continuously required in the performance of the primary tasks.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

9. Muscular adequacy: To what extent does the design of the job maintain muscular adequacy? In other words, avoid muscular fatigue; avoid antagonistic fatigue; use an appropriate grip; use the preferred hand, do not allow awkward postures to require excessive muscular exertion, distribute workload among limbs, etc.

- 5. The job almost always allows muscular adequacy to be maintained. None of the above or similar recommendations are violated on a regular basis.
- 3. The job usually allows muscular adequacy to be maintained. Some of the above or similar recommendations are regularly violated, but the condition is not frequent or long term.
- 1. The job frequently does not allow muscular adequacy to be maintained. Many of the above or similar recommendations are regularly violated, and the condition is frequent or long-term.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

13. **Noise:** To what extent are the adverse effects of noise reduced or minimized? Noise is especially burdensome if it is very loud (even with hearing protection), if it is of a high frequency, if it is intermittent and unexpected, if verbal communication is required, if high attention is required, etc..
5. The worker is exposed to a limited amount of burdensome noise on this job. For example, the noise is not loud or of a high frequency; it is not unexpected; it does not inhibit communication or attention; etc..
3. The worker is exposed to a moderate amount of burdensome noise on this job. For example, the noise is fairly loud or of a fairly high frequency, but hearing protection is adequate; it is occasionally unexpected and intermittent; verbal communication and attention are occasionally inhibited; etc..
1. The worker is exposed to a great amount of burdensome noise on the job. For example, the noise is sufficiently loud or of such a high frequency that it is bothersome even with hearing protection; it is frequently unexpected and intermittent; it significantly interferes with communication and attention; etc..
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)
- Comments:**
14. **Climate:** To what extent is the working climate comfortable? That is, are the conditions of the work and clothing required? It is important to find out about fluctuations during the year.
5. The worker is infrequently exposed to uncomfortable climatic conditions on this job. That is, the working climate remains within reasonable temperature range (i.e., 20 - 25 C. for sedentary, 15 - 20 C. for physical work) and humidity ranges (i.e., 30 - 70%), and there are no adverse air currents. (Year around)
3. The worker is sometimes exposed to uncomfortable climatic conditions on this job. For example, temperature is frequently above or occasionally too high or too low, job involves some outside work during extreme weather, etc.
1. The worker is very frequently exposed to uncomfortable climatic conditions on this job. For example, temperature is frequently above or occasionally too high by season, humidity is high, or humidity producing equipment, extremes of both temperature and humidity must be tolerated, etc..
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)
- Comments:**
15. **Atmosphere:** To what extent is the quality of the air at the workplace adequate? That is, is the atmosphere at the workplace reasonably free of pollution, excessive dust, fumes, toxins, stale air, etc.?
5. The worker is exposed to a limited amount of atmospheric pollution on this job. The air at the workplace is either totally free of pollution, or the pollution is very slight or of short duration.
3. The worker is exposed to a moderate amount of atmospheric pollution on this job. There are often some pollutants in the air, but they are only bothersome and do not require breathing protection.
1. The worker is exposed to a great amount of atmospheric pollution on this job. There are almost always some pollutants in the air, and breathing protection is sometimes required.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)
- Comments:**

16. **Worker protection -- safety:** To what extent are devices for worker protection from safety hazards available and adequate at the workplace? That is, are eye protection, hearing protection, head protection, foot protection, hand protection, special masks, goggles, screens, or clothing, etc., available and adequately designed where needed at the workplace?
5. All the necessary safety devices are available and adequate on this job.
3. Most of the necessary safety devices are available and adequate on this job. For example, one necessary device is not readily available or adequately designed.
1. Some of the necessary safety devices are available and adequate on this job. For example, more than one necessary device is not readily available or adequately designed.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)
- Comments:**
17. **Work breaks:** Are the breaks and rest facilities adequate for the job? In other words, are the work breaks sufficiently long and frequent given the physical demands of the work and clothing required by the job; is drinking water available near the work site; are facilities available for drinks, snacks, and hot meals; are the restroom facilities adequate, etc.?
5. The work breaks and rest facilities are fully adequate on this job. All of the requirements above are fully satisfied.
3. The work breaks and rest facilities are minimally adequate on this job. For example, one significant requirement above is not satisfied.
1. The work breaks and rest facilities are less than adequate on this job. For example, more than several significant requirements above are not satisfied.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)
- Comments:**
18. **Shift work:** To what extent is the adverse effects of shift work and overtime minimized? In general, both are minimized if possible. If shift work is unavoidable, rotation nights or only 2 - 3 nights in a row is advisable, short working scattered better than long term ones, 7-3-11 or 8-4-12 is better than 8-12-10 shift plan, etc..
5. The job requires little or no shift work or overtime.
3. The job requires shift work of frequent overtime. (Notes: Assign 4 and 2 ratings depending on design of shift schedule and relative frequency/severity of overtime.)
1. The job requires both shift work and frequent overtime.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)
- Comments:**

3. Control and display identification: To what extent are the controls and displays on this job adequately identified? In other words, to what extent are the controls and displays identified by one or more of the following: labeling, location, grouping, size, color, etc.?

5. The controls and displays on this job are very adequately identified. Two or more of the above identification methods are used, and misidentification is very unlikely.

3. The controls and displays on this job are adequately identified. One or more of the above identification methods are used; but misidentification is possible, although probably not frequent.

1. The controls and displays on this job are inadequately identified. Identification is poor or confusing, and misidentification is likely.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

4. Display visibility/legibility: To what extent are the displays on this job highly visible and legible? In other words, are the displays as given viewed from a distance and angle, illuminated, contrast, display sizes, etc.; and are the scales easy to read? Do they increase in a logical direction (e.g. clockwise, counter-clockwise, left-to-right), are well laid-out in terms of scale breaks, zero points, and zone markings, are the scale numerals and graduations easy to read, and is there little parallax, etc.? Also consider the visibility and legibility of controls that are designed to be their own displays.

5. The displays on this job are highly visible and legible. Nearly all of the above considerations are satisfied, and mistakes and difficulty in reading the displays are unlikely.

3. The displays on this job are fairly visible and legible. Many of the above considerations are satisfied, but mistakes and difficulty in reading the displays are possible, although probably not frequent.

1. The displays on this job are marginally visible and legible. Many of the above considerations are not satisfied, and mistakes and difficulty in reading the displays are likely.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

5. Displays -- information content: To what extent do the displays present information content of the appropriate level? In other words, do the displays use the appropriate amount of information that fulfill the needs of the operator; do the displays present the information that is wanted in an immediately useful form without mental conversion; are they appropriately designed given their function (e.g., monitoring, briefing, searching), given the nature of the information (e.g., qualitative vs. quantitative), given the needs for setting, tracking, check reading, etc.?

5. The displays on this job present highly appropriate information content. All the above considerations are well satisfied.

3. The displays on this job present fairly appropriate information content. One of the above considerations is not well satisfied, and some improvement is possible.

1. The displays on this job present marginally appropriate information content. One or more of the above considerations is violated, and much improvement is possible.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

PERCEPTUAL/MOTOR JOB DESIGN QUESTIONNAIRE

1. Workplace lighting -- general: To what extent is the workplace adequately illuminated and appropriately colored? In other words, is the general level of lighting satisfactory; is supplemental lighting used for finer detail; are the reflectances of the ceilings, walls, floors, and equipment appropriate; are pure colors, highly saturated colors, and fluorescent colors avoided for large areas (e.g., walls) and big objects (i.e., are colors used for identification purposes); are non-contrasting colors used slightly differently to enhance visual acuity; are colors used to provide orderliness, to identify safety devices, to make a pleasant environment; etc.?

5. The workplace illumination and coloring are fully adequate on this job. There are no significant violations of the above recommendations.

3. The workplace illumination and coloring are minimally adequate on this job. There are one or two violations of the above recommendations, but they are not a major hindrance to the performance of the job.

1. The workplace illumination and coloring are less than adequate on this job. There are major violations of the above recommendations, and they create a hindrance to performance of the job.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

2. Workplace lighting -- glare/contrast: To what extent is the workplace lighting free of glare and reflection hazards, and excessive contrast? For example, the following should be avoided: reflective table tops, polished machine parts, bright windows, very bright walls and dark flooring, sharp boundaries or large areas of contrast, any bright light source within 60° of the center of the visual field and any light source within 30°, etc. Contrast ratio should be 20:1 between light source and background of the visual field. One should strive for visual field illumination and brightness by the use of shields, shades, proper positioning of lights, dull mat surfaces, etc.

5. The workplace for this job has only a limited amount of glare, reflection hazards, and excessive contrast. There are no significant violations of the above recommendations.

3. The workplace for this job has only a moderate amount of glare, reflection hazards, and excessive contrast. There are one or two violations of the above recommendations, but they are not a major hindrance to the performance of this job.

1. The workplace for this job has a great amount of glare, reflection hazards, and excessive contrast. There are major violations of the above recommendations, and they create a hindrance to the performance of the job.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

8. Control resistance/feedback: To what extent do the controls provide appropriate resistance and adequate sensory feedback. In other words, are the types and levels of resistance and other forms of feedback (e.g., sounds) from the controls appropriate? Requirements for feel, control activation feedback, force feedback, etc. (e.g., movement needed, type of control, movement needed) accidental activation prevention, force capabilities of the limb, returning to null position, limb support, etc.?
5. The resistance/feedback of the controls on this job are highly appropriate. All of the above considerations are satisfied.
3. The resistance/feedback of the controls on this job are minimally appropriate. One or more of the above considerations is not well satisfied, but no significant operating problems are created (i.e., only minor inconveniences).
1. The resistance/feedback of the controls on this job are inappropriate. Many of the above considerations are not satisfied, and operating problems or inconveniences are likely.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

Controls -- accidental activation: To what extent are the controls designed to prevent accidental activation and slipping? In other words, to what extent are controls protected from accidental activation by secondary actions such as covering, locking, operation sequencing, resistance coding, etc.? Also, do control surfaces provide adequate frictional resistance to prevent slipping?

5. The controls on this job are designed for almost complete protection from accidental activation and slipping. Accidental activation is nearly impossible, and slipping is unlikely.

3. The controls on this job are designed for moderate protection from accidental activation and slipping. Accidental activation and/or slipping are very possible and occur frequently.

1. The controls on this job are designed for only minimal protection from accidental activation and slipping. Accidental activation and/or slipping are very possible and occur frequently.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

Controls -- anthropometry/biomechanics: To what extent are the controls designed to take into account anthropometric and biomechanical considerations? In other words, are the maximum forces, pressures, and accuracy requirements within the limitations of the safe working range of the operator? Are there sufficient differences between controls for the size and movement requirements of the limbs? Are the hand groups involved appropriate given the requirements for precision and force of control movements? Are the controls appropriately designed to take account of the anatomy of the limb? Are the controls designed to prevent any biomechanical disadvantage (e.g., muscular inefficiency)? Are controls designed to take account of the anatomy of the limb (e.g., prevent compression ischemia); etc.?

5. The controls on this job are designed to take into account almost all of the anthropometric and biomechanical considerations. Nearly all of the above considerations are satisfied.

3. The controls on this job are designed to take into account most of the anthropometric and biomechanical considerations. There are minor violations of some of the above considerations, but significant problems are not created (i.e., only minor inconveniences).

1. The controls on this job are designed to take into account only some of the anthropometric and biomechanical considerations. There are major violations of some of the considerations, and significant problems and inconveniences are created.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

6. Control/display movement relationships: To what extent are the movements of controls and the relationships between controls and the associated displays appropriate? In other words, C/D direction of movement relationships are appropriate? Design practice, standardization and consistency, etc. Also, the following function - control action rules should be met.

Control Action

- Up, right, forward, pull
- Down, left, rearward, push
- Clockwise, right
- Counterclockwise, left
- Up, rearward
- Down, forward
- Right, up, pull, counterclockwise, up
- Left, down, push, clockwise, down
- Increase Right, up, forward
- Decrease Left, down, rearward

5. The control movements and C/D movement relationships on this job are very adequate. None of the above recommendations are violated.
3. The control movements and C/D movement relationships on this job are adequate. There are minor violations of the above recommendations, but errors or significant problems are not likely.
1. The control movements and C/D movement relationships on this job are inadequate. There are major violations of the above recommendations, and errors or significant problems seem likely.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

Control/display ratios: To what extent are the C/D ratios appropriate? In other words, are the control movement/display movement ratios adequate in terms of the total adjustment time (i.e., slewing plus fine adjustment) required to make the desired control movements? In different terms, are the controls at the correct sensitivity given the nature of the adjustments required? Consideration here must be given to display size and range, tolerance, time delay, etc.?

5. The C/D ratios on this job are highly appropriate. All C/D ratios seem optimal, over or under adjustments rarely occur, and total adjustment times are minimal.
3. The C/D ratios on this job are minimally appropriate. One or more C/D ratios are too high or too low, over or under adjustments occasionally occur, and total adjustment times could be slightly less.
1. The C/D ratios on this job are inappropriate. Some of the C/D ratios are too high or too low, over or under adjustments occur regularly, and total adjustment times could be much less.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

14. Panel layout: To what extent are control/display panels laid-out in a logical and clear manner? To what extent is the relationship between each control/display pair readily identifiable through the use of grouping, locating, patterning, coding, standardizing, etc.. In terms of the entire panel, controls, standard-plays can be grouped based on function, sequence, or location. Location, location, ease of reading, etc.. Also, location priorities must be considered. Primary and most important controls should be in the central field of vision and within the most comfortable reach zones; secondary controls and displays should be located to require only minor eye/head and reach/body movements; warning displays must be well located; etc..
5. The C/D panels on this job are laid-out in a highly logical and clear manner. The relationships between controls are grouped in terms of two or more criteria; the displays on the C/D panels are grouped in terms of two or more criteria; and the location priorities are considered.
3. The C/D panels on this job are laid-out in a moderately logical and clear manner. One or more of each criterion is satisfied; but some confusion is possible, although probably not frequent.
1. The C/D panels on this job are not laid-out in a logical and clear manner. Few of the criteria are satisfied, and confusion and errors seem likely.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

15. Input requirements: To what extent are the information input requirements on the job within the limitations of the least capable potential worker? In other words, considering all forms of information, the quantity of information, the rate presented, the quality (e.g., reliability) of the stimuli, etc., result in job requirements that could be met by the least capable potential worker?
5. The information input requirements on this job are minimal. They are within the capabilities of nearly all potential workers, and require little mental effort or training/experience.
3. The information input requirements on this job are moderate. They are within the capabilities of only average potential worker, but require some mental effort and/or training/experience.
1. The information input requirements on this job are considerable. They are within the capabilities of only the above average potential worker, and require much mental effort and/or training/experience.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

16. Output requirements: To what extent are the output requirements on the job within the limitations of the least capable potential worker? In other words, considering all forms of output (e.g., both action and communication), the quantity of output, the rate of output, the quality of output (e.g., precision, accuracy, etc.), exceed physical strength and endurance requirements, but with psychomotor or informational types of outputs?
5. The output requirements on this job are minimal. They are within the capabilities of nearly all potential workers, and require little mental effort or training/experience.
3. The output requirements on this job are moderate. They are within the capabilities of the average potential worker, but require some mental effort and/or training/experience.
1. The output requirements on this job are considerable. They are within the capabilities of only the above average potential worker, and require much mental effort and/or training/experience.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

11. Controls - motion economy: To what extent are the controls designed to allow economy of movement? In other words, are the number of controls kept to the minimum necessary? To what extent do the control movements as simple and easy as possible? Are minimum reach distances maintained? To what extent are the controls arranged to reduce movements as much as possible? Are the controls grouped and arranged to minimize body movements? To what extent are the controls located where such that no one limb is overburdened (e.g., as with controls used where possible and desirable, are controls available to both hands); etc.?
5. The controls on this job are designed to allow a great deal of motion economy. Nearly all the above considerations are satisfied.
3. The controls on this job are designed to allow moderate motion economy. Some of the above considerations are not well satisfied, but this creates only minor additional effort for the worker.
1. The controls on this job are designed to allow very little motion economy. Many of the above considerations are not satisfied, and this creates much additional effort for the worker.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

12. Warning devices: To what extent are warning devices appropriately designed? In other words, what extent do the warning devices (e.g., lights, alarms) alert the operator of a busy or bored operator, tell what is wrong, and what action to take, not prevent continued attention to other duties, not likely to fail or give false signals, etc.?
5. The warning devices on this job are highly appropriate. They satisfy all of the above considerations.
3. The warning devices on this job are minimally appropriate. Some of the above considerations are not well satisfied, but this does not create any major problems, dangers, or inconveniences.
1. The warning devices on this job are inappropriate. They violate some of the above considerations, and they may create significant problems, dangers, or inconveniences.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

13. Printed job materials: To what extent are printed job materials designed to be highly readable? In other words, are printed job materials such as instructions, manuals, checklists, labels, decals, graphs, tables, scales, etc., laid-out well and easy to read and interpret?
5. The printed materials on this job are highly readable and interpretable. They are legible, the content is appropriate, the reading level is reasonable, the scales and graphs are interpretable, etc..
3. The printed materials on this job are moderately readable and interpretable. There are some minor problems, but this does not result in errors or detract significantly from their utility.
1. The printed materials on this job are only minimally readable and interpretable. That is, there are some major problems, and this could result in errors or detract significantly from their utility.
3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

- 17. **Information processing requirements:** To what extent are the information processing requirements on the job within the limitations of the least capable worker? In other words, considering all forms of thinking, decision making, and problem solving necessary to effectively perform the job, does the level of processing and the difficulty of the processing result in requirements that could be met by the least capable potential worker?
- 3. The information processing requirements on this job are minimal. They are within the capabilities of nearly all potential workers, and require little mental effort or training/experience.
- 3. The information processing requirements on this job are moderate. They are within the capabilities of the average potential worker, but require some mental effort and/or training/experience.
- 1. The information processing requirements on this job are considerable. They are within the capabilities of only the above average potential worker, and require much mental effort and/or training/experience.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

- 18. **Memory requirements:** To what extent are the memory requirements on this job within the capabilities of the least capable potential worker? In other words, do the demands on both short and long term memory necessary to do the job, does the quantity of information to be recalled, the length of time it must be retained, the ease with which it can be recalled, etc., result in requirements that could be met by the least capable potential worker?
- 5. The memory requirements on this job are minimal. They are within the capabilities of nearly all potential workers, and require little mental effort or training/experience.
- 3. The memory requirements on this job are moderate. They are within the capabilities of the average potential worker, but require some mental effort and/or training/experience.
- 1. The memory requirements on this job are considerable. They are within the capabilities of only the above average potential worker, and require much mental effort and/or training/experience.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

- 19. **Boredom:** To what extent is the job designed to avoid boredom? In other words, to what extent are sufficient level and variety of sensory stimulation and activity provided so that workers on this job do not become bored?
- 5. Significant boredom is not likely on this job. There are few (if any) monotonous or repetitive tasks, and there are a sufficient level and variety of stimulation and activity such that boredom should not be expected.
- 3. Significant boredom is possible but uncertain on this job. There are some monotonous or repetitive tasks, and the level and variety of stimulation and activity are average. Boredom may occur, but it should not be excessive.
- 1. Significant boredom is very likely on this job. There are many monotonous or repetitive tasks, and the level and variety of stimulation and activity are low. Worker boredom is highly probable.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

- 20. **Arousal:** To what extent is the job designed to maintain an optimal level of arousal? That is, does the job provide a sufficient level and variety of stimulation and activity to enhance performance and avoid boredom, but not so much that the worker becomes stressed or overwhelmed?
- 5. The job maintains a highly appropriate level of arousal. The job provides optimal levels of stimulation and activity to avoid either boredom or stress, and to enhance performance.
- 3. The job maintains a minimally appropriate level of arousal. The levels of stimulation or activity are slightly too high or too low, but significant boredom, stress, or performance decrement are not likely.
- 1. The job maintains an inappropriate level of arousal. The levels of stimulation and/or activity are far too high or too low, and significant boredom, stress, and/or performance decrement are likely.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

- 21. **Stress:** To what extent is the job designed to avoid stress? In other words, are speed stress (i.e., too high a signal rate), load stress (i.e., too many types of input), mental task overload (i.e., too many things to do), and qualitative overload (i.e., tasks are beyond capabilities) avoided, etc.?
- 5. Significant stress is not likely on this job. None of the above sources of stress exist on this job to any marked degree.
- 3. Significant stress is possible but uncertain on this job. One or more of the above sources of stress may exist, but it does not cause excessive stress on a frequent or long-term basis.
- 1. Significant stress is very likely on this job. Some of the above sources of stress do exist, and significant resulting stress on the workers is highly probable.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

- 22. **Workplace layout -- safety:** To what extent are special safety features designed into the workplace surrounding this job? For example, are all work and approach areas adequately illuminated? Are "no step" markings used on stairs, catwalks? Are emergency exits well marked? Are handrails and safety chains used wherever persons are likely to fall from an elevation (e.g., stairs, platforms, floor openings)? Are parts of machinery and equipment (e.g., pulleys, gears, belts, blades) protected with safety guards? Are areas well identified where protective clothing, tools, or equipment are kept; etc.?
- 5. There are a great number of safety design features in the workplace surrounding this job. No departures from the above recommendations are noted.
- 3. There are a considerable number of safety design features in the workplace surrounding this job. There are some minor departures from the above recommendations, but no significant safety risks are created.
- 1. There are a moderate number of safety design features in the workplace surrounding this job. There are some major departures from the above recommendations, and significant safety risks may be created.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

- 26. Maintainability -- tools and equipment: To what extent are there sufficient tools and equipment for maintenance purposes? In other words, are the correct tools available for all the maintenance needs, the need for special purpose tools minimized, are tools that have been certified reasonably complete and of a reasonable weight, is there adequate maintenance support equipment (e.g., vehicles, stands, dollies, etc.)?
- 5. Tools and equipment for maintenance are fully adequate on this job. All the above considerations are satisfied, and tools and equipment are rarely a problem.
- 3. Tools and equipment for maintenance are minimally adequate on this job. Some of the above considerations are not well satisfied; tools and equipment are occasionally a problem, but usually they are just inconvenient.
- 1. Tools and equipment for maintenance are less than adequate on this job. The above considerations are not satisfied, and tools and equipment frequently impose significant problems.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

- 27. Maintainability -- safety: To what extent are there special design features to promote safety in maintenance? Does the design do access covers, cases, handles, etc., have rounded corners? Does the design have sharp edges and sharp protruding objects minimized in maintenance areas to the extent possible? Are conspicuous warnings, rotating machinery, etc.; are access covers that are completely removable, self-supporting in the open position, and weigh in excess of 45 lbs. have lock-out provisions for power sources? Is all necessary safety equipment available; are first-aid procedures available; are all maintenance workers trained in safety and first-aid procedures; etc.?
- 5. There are a great number of design features on this job to promote safety in maintenance. Nearly all the above recommendations are satisfied.
- 3. There are a considerable number of design features on this job to promote safety in maintenance. There are some minor departures from the above recommendations, but no significant safety risks are created.
- 1. There are a moderate number of design features on this job to promote safety in maintenance. There are some major departures from the above recommendations, and significant safety risks may be created.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

- 23. Workpiece layout -- visual and auditory links: To what extent have visual and auditory links been considered with the workpiece, outside the workplace, can the operator see and/or hear the workpiece, and can the worker hear well (e.g., oral communications, ear phones, warning signals, equipment operation, etc.)?
- 5. Visual and auditory links have been given great consideration in the design of this workplace. The worker can see and/or hear all relevant stimuli.
- 3. Visual and auditory links have been given adequate consideration in the design of this workplace. The worker can see and/or hear all the task-critical stimuli.
- 1. Visual and auditory links have been given limited consideration in the design of this workplace. The links are limited, including some of the links important to effective job performance.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

- 24. Maintainability -- access: To what extent is there sufficient access for gain access to the equipment or component, is there enough clearance to use tools, is there enough room for removal and replacement of components (e.g., without having to remove other components), are all sides of the equipment accessible, are inspection panels properly located, are functions designed to be reliable? Concern here (and in items 25, 26, and 27) is with all types of maintenance including inspecting, troubleshooting, adjusting, replacing, repairing, and servicing.
- 5. Access for maintenance is fully adequate on this job. Most of the above considerations are satisfied, and access is rarely a problem.
- 3. Access for maintenance is minimally adequate on this job. Some of the above considerations are not well satisfied; access is occasionally a problem, but usually it is just an inconvenience.
- 1. Access for maintenance is less than adequate on this job. There are some severe violations of the above considerations, and access is frequently a significant problem.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

- 25. Maintainability -- information/labeling: To what extent are there sufficient information and labeling for maintenance purposes? In other words, is there enough information available for maintenance in the form of procedures and job aids, manuals, handbooks, instructions, checklists, schematics, diagrams, etc.) where needed and appropriate? Also, is there sufficient labeling (e.g., identification (e.g., of units, parts, controls, displays, test points, etc.) and for the presentation of critical maintenance procedures or safety information?
- 5. Information and labeling for maintenance are fully adequate on this job. All the above considerations are satisfied, and information/labeling is rarely a problem.
- 3. Information and labeling for maintenance are minimally adequate on this job. The above considerations are not fully satisfied; information/labeling is occasionally a problem, but usually it is just an inconvenience.
- 1. Information and labeling for maintenance are less than adequate on this job. The above considerations are not satisfied, and information/labeling is frequently a significant problem.

3. Highly relevant 2. Minimally relevant 1. Irrelevant (not rated)

Comments:

