

**OBJECTIVE MEASUREMENT
OF
SOFT TISSUE INJURY**

FEASIBILITY STUDY

EXAMINER'S MANUAL

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Table of Contents

California Functional Capacity Protocol.....	3
General Test Battery Criteria.....	4
Special Criteria for the California Project.....	5
Special Evaluation Issues	7
Currently Available Systems.....	9
Implementation of Feasibility Trials	10
Application of the California FCP	11
Injury Severity Index	12
Focus of Test Battery Tasks	13
Order of the California FCP.....	15
Daily Evaluation Schedule	16
Structured Interview	17
Health Questionnaire.....	18
Perceived Physical Capacity.....	19
Pain and Sensation Drawing	23
Job Demands Questionnaire.....	24
Lateral Pinch Strength.....	25
Power Grip Strength.....	29
Standing Range of Motion	32
Progressive Lift Capacity	34
Carry 100 Feet.....	35
Climb Ten Feet.....	36
Cal-FCP Analysis and Interpretation.....	37
Cal-FCP Standard Report Form	38
Cal-FCP Sample Report Verbiage	39
Feasibility Survey.....	41
Appendix	
Daily Schedule	A
Evaluation Record.....	B
Health Questionnaire.....	C
Whole Body Symptom Description.....	D
Hand Symptom Description	E
Job Demands Questionnaire.....	F
EPIC Lift RAW to Normal Lift Capacity Translation	G
Work Capacity Decision Tree	H
Standard Report Form	I
Informed Consent.....	J

Letter from Dr. Mooney K
“Guidelines for Functional Capacity Evaluation of People with Medical Conditions” L

California Functional Capacity Protocol

We make the assumption that a significant soft tissue injury which hinders work place performance is painful, and function is reduced because of pain. It must be remembered that tests for the severity of soft tissue injury are in the context of work place injuries for which medical care and disability awards, if necessary, are to be supplied consistent with the labor code of the State of California. The individual is compared to his/her previous level of function with the assumption that he/she was able to carry out this job without limitation before injury. Thus, disability ratings are based on loss of pre-injury work capacity. For the majority of workers who have reached permanent and stationary status and have achieved maximum medical improvement, residual functional status can be estimated by the treating physician based on the testing to be described below.

The decision to return the injured worker to his or her usual and customary job assumes that the physical demands of this job are known. Thus, the perception of the job demands by the injured worker must be known. When the worker has reached a plateau in an active treatment program, but cannot return to the previous job, identification of the previous job's physical demands is necessary. Functional testing as described below will be useful to assist the physician to define the level of discrepancy. These tests are not designed to replace physician judgment in assessing disability, but to offer an objective data base on which to make judgment of subjective severity

General Test Battery Criteria

Based on the review of the literature, there are five issues which must be addressed in the selection and use of any functional test in a patient population. These issues, presented in hierarchical order, are:

1. Safety - Given the known characteristics of the patient, the procedure should not be expected to lead to injury;
2. Reliability - The test score should be dependable across evaluators, patients, and the date or time of test administration;
3. Validity - The interpretation of the test score should be able to predict or reflect the patient's performance in a target work setting;
4. Practicality - The cost of the test procedure should be reasonable and customary. Cost is measured in terms of the direct expense of the test procedure plus the amount of time required of the patient, plus the delay in providing the information derived from the procedure to the referral source;
5. Utility - The usefulness of the procedure is the degree to which it meets the needs of the patient, referrer, and payor.

This is a hierarchical listing based on standards and guidelines provided by major professional organizations in the United States and by governmental agencies. The hierarchy requires that each of the factors be addressed in a manner such that the factors that are presented earlier must be maintained as subsequent factors are addressed. For example, it is not permissible to sacrifice safety for the sake of practicality. In addition, the first four factors must be adequately addressed in order for utility to be achieved. Of course, without utility, the test is of no value.

Special Criteria for the California Project

Evaluation of the general functional consequences of soft tissue injury within the context of the California workers' compensation system requires additional specification of each of the factors. These are presented below:

1. Safety - Because the patient may not be medically stable, the test battery must be able to be safely administered under specified circumstances. These are:
 - a. Appropriate diagnostic procedures must have been completed to confirm that the FCP test procedures can be administered safely and/or appropriate guidelines for safe test administration can be specified.
 - b. The test battery must be administered by an appropriately trained physician or by appropriately trained personnel under the supervision of a physician.

2. Reliability - Because the test battery will be provided by personnel with many different types of professional preparation in many different settings to many different types of patients, special efforts must be made to insure reliability. These include:
 - a. The test battery must be standardized and invariant without regard to the patient.
 - b. Each instrument in the test battery must have a standardized administration protocol.
 - c. The formal reliability of each test protocol must have been demonstrated experimentally.
 - d. The instruments in the test battery must require no calibration or must be able to be easily calibrated.
 - e. The formal reliability of each instrument must have been demonstrated experimentally.
 - f. The oral and written instructions must be able to be presented in an understandable manner to the patient, making allowance for the language and level of sophistication of the patient.

- a. The injured worker's ability to return to his or her usual and customary employment.
- b. When a functional plateau has occurred during treatment.
- c. The functional level at which the patient is likely to return to work.

Specific Evaluation Issues

California Schedule for Rating Permanent Disabilities

The current system for rating permanent disabilities in California depends on descriptions of eight disability categories which are found in the *Schedule for Rating Permanent Disabilities* (1978). The “Guidelines for Work Capacity” provide brief narrative descriptions of the work capacity of the injured worker with a corresponding “standard rating” of lost work capacity, which are presented below:

- A. Disability Precluding Very Heavy Lifting**
Contemplates the individual has lost approximately one-quarter of his pre-injury capacity for lifting.
- B. Disability Precluding Very Heavy Work**
Contemplates the individual has lost approximately one-quarter of his pre-injury capacity for performing such activities as bending, stooping, lifting, pushing, pulling and climbing or other activities involving comparable physical effort.
- C. Disability Precluding Heavy Lifting**
Contemplates the individual has lost approximately half of his pre-injury capacity for lifting.
- D. Disability Precluding Heavy Lifting, Repeated Bending and Stooping**
Contemplates the individual has lost approximately half of his pre-injury capacity for lifting, bending and stooping.
- E. Disability Precluding Heavy Work**
Contemplates the individual has lost approximately half of his pre-injury capacity for performing such activities as bending, stooping, lifting, pushing, pulling, and climbing or other activities involving comparable physical effort.
- F. Disability Resulting in Limitation to Light Work**
Contemplates the individual can do work in a standing or walking position, with a minimum of demands for physical effort.
- G. Disability Resulting in Limitation to Semi-Sedentary Work**
Contemplates the individual can do work approximately one half the time in a sitting position, and approximately one half the time in a standing or walking position, with a minimum of demands for physical effort whether standing, walking or sitting.
- H. Disability Resulting in Limitation to Sedentary Work**

Contemplates the individual can do work predominantly in a sitting position at a bench, desk or table with a minimum of demands for physical effort and with some degree of walking and standing being permitted.

For each category, a standard rating is assigned. The standard rating takes into account the loss of lift capacity and modifies this loss in terms of other factors which may be affected by an injury and which may, in turn, affect the injured worker's ability to work.

The categorical descriptions lend themselves to a decision tree analysis, which is presented in Figure 1. In this analysis, redundant factors are not listed.

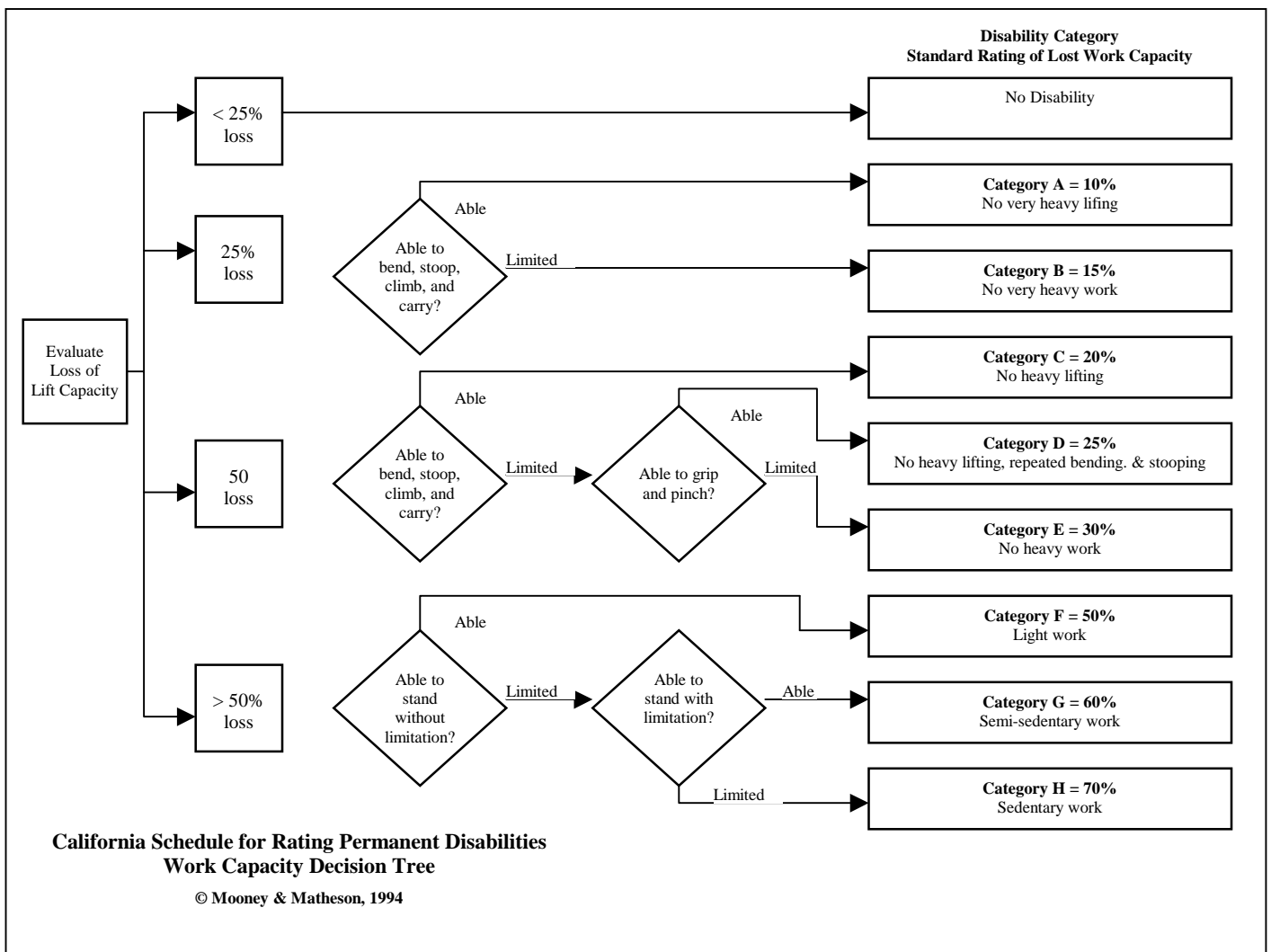


Figure 1. Decision tree for disability rating: California Division of Workers' Compensation system.

The standard rating is used by Disability Raters as one variable in a formula that also considers the worker's age, occupation and diagnosis to develop a disability rating. Additional criteria for a useful evaluation protocol are suggested by this decision tree. For example, the evaluation of lift capacity must allow measurement of lost pre-injury lift capacity and measurement must be accurate to the tolerances described in the system.

Currently Available Systems

A thorough review of the literature identified twelve different functional capacity evaluation systems in use in the United States and Canada at this time. None of the systems meet the criteria presented. The most common criteria violations involve reliability and practicality. Few of the systems have demonstrated reliability of the test protocols or equipment through formal reliability studies. All of the systems provide an evaluation that requires at least four hours of professional time or require users to make a substantial investment in capital equipment and/or staff training. Costs for acquisition of capital equipment and staff development commonly range from \$8,000 to \$36,000 with some systems requiring expenditures in excess of \$100,000.

Thus, the currently available functional capacity evaluation systems are not able to be used in this project. However, several of the systems have components that are useful and, thus, have been combined in the California Functional Capacity Protocol (Cal-FCP). In addition, the framework of the Cal-FCP has been designed to allow substitution of other tests as they become available and/or meet the above-listed criteria.

Implementation of Feasibility Trials

The Cal-FCP will be field-tested at several sites that currently utilize most or all of the test battery components in various locales in California.

Intra-rater reliability of each evaluator will be assessed with formal test-retest methods following standard criteria. Reliability of the interpretations of information supplied by the Cal-FCP will be assessed on an intra-rater and on an inter-rater basis. A qualitative analysis of the feasibility trials will be undertaken through the use of structured telephone interviews with patients, evaluators, and physicians.

It is recognized that this test protocol is evaluation extensive and time-consuming. However, we believe that the most cost-effective tests have been selected so that the investment of time and effort will be the best possible. One additional justification for the length of the seated tests is to evaluate the patient's sitting tolerance, an important issue for many people with soft tissue injuries to the spine or lower extremities. In addition, we recognize that there are several separate tests which have some correlation one with the other. It is anticipated that field trials in the community can develop a hierarchy of the most sensitive and specific tests to measure the disability and impairment associated with the pain of soft tissue injury. It is possible that continuing experience will indicate that some of the testing is redundant and adds little to the accuracy of report. In addition, it may be appropriate to develop decision rules for test administration beyond those that are inherent in the California Functional Capacity Protocol that can further streamline its use. It is for these reasons that the field trials are necessary to complete the project.

Application of the California FCP

The California Functional Capacity Protocol (Cal-FCP) should be utilized four weeks after injury when the injured worker has not returned to his or her usual and customary job and continues in medical treatment. It is recognized that most soft tissue injuries resolve spontaneously, leave no significant residuals, and allow the worker to return to full duty within a few weeks. Efforts to document severity are unwarranted for the first four weeks after injury.

The Cal-FCP may be used at any time after four weeks after injury, as long as the patient's doctor believes that the evaluation tasks are not likely to harm the evaluatee. It can be used to provide information about progress in treatment and for rating purposes when the patient has reached permanent and stationary status.

Prior to performing the Cal-FCP, the patient should be medically cleared by his or her doctor to participate. In addition, the evaluator should follow the "*Guidelines for Functional Evaluation of People with Medical Conditions*" (Appendix L) in this Manual. In particular, the evaluatee should receive a musculoskeletal screening exam prior to participation.

Injury Severity Index

The California Functional Capacity Protocol will utilize an injury severity index for general statistical purposes. It is anticipated that this will be an important variable in a database that will provide future opportunities for development of case management decision rules.

One simple and dependable indicator of the severity of an injury is time off work. Another useful indicator of severity is the amount of time in treatment. The Cal-FCP injury severity index is merely the sum of time off work defined as the reported date of injury (DOI) plus the time in an active treatment program, presented in terms of weeks. An active treatment program is one which is monitored by an appropriate physician or therapist and utilizes a treatment program which requires active participation by the patient. It should include documentation of patient compliance and functional measures.

Focus of Test Battery Tasks

The Cal-FCP test battery is designed to focus on the “general work capacity” of a wide variety of injured workers. Based on the literature review, it appears that the most broadly-based physical work demands center around the *strength* of the worker. Strength has been defined as the maximum voluntary force a worker is willing to exert in a single attempt.

Within the context of strength, the worker’s demonstrated *lifting capacity* and *grasping capacity* are the two most frequently encountered issues. In addition, lifting and grasping are excellent index variables. Research has demonstrated that information about each variable explains substantial proportions of the variance of other physical functional abilities. Thus, components of the Cal-FCP test battery will focus on strength in terms of lifting and grasping.

Additional work capacity factors of standing range of motion, climbing and carrying will also be addressed. Other work capacity factors will be addressed through a structured clinical interview and testing of perceived functional capacity.

The most broadly-based physical work demands taxonomy in use today is that which has been developed by the United States Department of Labor's Manpower Administration, presented in the *Dictionary of Occupational Titles* and companion documents. In this system, the strength demands of work are summarized in the *Physical Demand Characteristics* chart, presented below:

PHYSICAL DEMAND CHARACTERISTICS OF WORK
1993 Leonard N. Matheson, PhD

PHYSICAL DEMAND LEVEL	OCCASIONAL 0 - 33% of the workday	FREQUENT 34 - 66% of the workday	CONSTANT 67 - 100% of the workday	Typical Energy Required
SEDENTARY	10 lbs.	Negligible	Negligible	1.5 - 2.1 METS
LIGHT	20 lbs.	10 lbs. and/or Walk/Stand/Push/Pull of Arm/Leg controls	Negligible and/or Push/Pull of Arm/Leg controls while seated	2.2 - 3.5 METS
MEDIUM	20 to 50 lbs.	10 to 25 lbs.	10 lbs.	3.6 - 6.3 METS
HEAVY	50 to 100 lbs.	25 to 50 lbs.	10 to 20 lbs.	6.4 - 7.5 METS
VERY HEAVY	Over 100 lbs.	Over 50 lbs.	Over 20 lbs.	Over 7.5 METS

This taxonomy provides a common basis on which job analysis data have been collected in California for more than thirty years. Databases of job analysis information have been developed by the federal government and various private organizations. This has become the most widely-used taxonomy of job demands in North America. Thus, this project has selected the United States DOL Physical Demand Characteristics system as its primary reference. Items in the Cal-FCP test battery in part were selected based on their ability to link to this system and through this system to other components of the test battery.

Order of the California FCP

The Cal-FCP has a standardized order of testing which must be followed. This order is presented below:

<u>Order</u>	<u>Task</u>	<u>Posture</u>	<u>Duration</u>	<u>Cum Time</u>
1	Structured Interview	Sit	20	20
2	Health Questionnaire	Sit	5	25
3	Perceived Physical Capacity	Sit	15	40
4	Pain & Sensation Drawing	Sit	5	45
5	Job Demands Questionnaire	Sit	5	50
6	Lateral Pinch Test	Sit	5	55
7	Power Grip Test	Sit	5	60
8	Standing ROM	Stand	10	70
9	Lift Capacity Test	Stand	35	105
10	Carrying Test	Stand	5	110
11	Climbing Test	Stand	5	115
12	Cool-down	Stand	5	120

The duration of each task will vary from patient to patient but has been shown in practice to conform to these general parameters. Patients with special communication needs may require additional time for item #1.

The order and grouping of tasks is intentional to allow optimal observation of prolonged sitting. Thus, the lengthy paper and pencil activity is a functional activity in itself in that sitting tolerance can be assessed.

The Cal-FCP test battery is designed to be administered to 90% of patients within a two-hour period. Estimated cumulative completion related to the time required is presented in the table below:

Elapsed Time	Percent of Typical Caseload Completed
90 minutes	25%
105 minutes	50%
120 minutes	90%
135 minutes	95%

Based on these figures, establishment of a set fee for administration of the Cal-FCP test battery should be quite straightforward.

Daily Evaluation Schedule

The evaluatee will be asked to complete the symptom drawing on the back of the Daily Evaluation Schedule (Appendix A) to describe symptoms **at this time**. The visual analog scale will also be completed.

Over the course of the Cal-FCP, time, activity and posture will be recorded on the Daily Evaluation Schedule. As the evaluatee progresses through the Cal-FCP, each activity and posture will be recorded, corresponding with the appropriate time. Comments can be made in the right margin.

Activities and posture are able to be recorded in five minute segments. Each segment will be filled in with black pencil. Red pencil will be used for unscheduled breaks, an example being if the evaluatee requests to take a rest break, and interrupt the testing process.

On completion of the CAL-FCP, the time will be recorded, and the evaluatee will be again asked to complete the symptom drawing on the back of the Daily Evaluation Schedule to describe symptoms **at this time**. The visual analog scale will also be completed.

Structured Interview

Basic information concerning the patient's demographics and current status is collected through the use of the structured interview. This segment of the Cal-FCP test battery requires the use of the Cal-FCP *Evaluation Record* (Appendix B) in an interview of the patient in a quiet and private area. The evaluator interviews the patient concerning items in Section 1 on the evaluation record and records his or her responses.

Functional activities are rated on a one to five scale, from "Able" to "Unable". Questions are posed about the evaluatee's ability to **currently** perform each task, compared with his or her ability **prior** to the injury. For example, the evaluator would ask:

How would you rate your ability to sit in an office chair now as compared with prior to the injury?

or ...

How would you rate your ability to lift an object from waist to shoulder height with your right hand now as compared with prior to the injury?

Based on the evaluatee's response, categorize his or her current rating. Follow the criteria below for rating each functional ability:

Circle 1. "Able" - Compared with his or her ability prior to the injury, the evaluatee can perform the activity with no difficulty.

Circle 2. "Slightly Restricted" - Compared with his or her ability prior to the injury, the evaluatee can perform the task, but is slightly restricted.

Circle 3. "Moderately Restricted" - Compared with his or her ability prior to the injury, the evaluatee can perform the task, but is moderately restricted.

Circle 4. "Very Restricted" - Compared with his or her ability prior to the injury, the evaluatee can perform the task, but is very restricted.

Circle 5. "Unable" - Compared with his or her ability prior to the injury, the evaluatee cannot perform the activity at all.

The structured interview is also necessary to allow the evaluator to establish rapport with the patient, explain the purpose and structure of the evaluation, and set the stage for completion of the pain drawing.

Health Questionnaire

The most physically demanding aspect of the Cal-FCP is the lift capacity test. Because evaluatees must be screened for cardiovascular risk factors prior to undertaking such a test, a health questionnaire (Appendix C) will be administered and resting blood pressure and heart rate will be recorded.

After these items are completed, the evaluatee's health questionnaire is reviewed by the evaluator. Items that indicate medical instability or excess cardiovascular risk are noted and explored fully and a determination is made whether or not the full lift capacity test battery can be administered.

Perceived Physical Capacity

Perceived functional capacity is an important indicator of the effect of injury. In order to standardize collection of information concerning perceived functional capacity, two instruments will be used, the Spinal Function Sort and the Hand Function Sort. The former instrument has been tested in a wide variety of clinical settings and has been found to be reliable. The latter instrument is a recent modification of the Spinal Function Sort for use with individuals who have upper extremity impairment. It is also based on earlier work conducted by the contractor with two instruments that are in widespread use to evaluate the functional capacity of people with upper extremity impairments, the Loma Linda Activity Sort and the WEST Tool Sort.

For those individuals with only pain complaints in the forearm and hand, the Hand Function Sort is appropriate. All others should complete the Spinal Function Sort.

One or the other of the perceived function sorts are completed by the patient with the assistance of the evaluator after the pain drawing has been completed. The patient is provided instructions and allowed to work on a self-paced basis. The evaluator is available for questions.

Instructions

This is a test of your current ability to perform work tasks. There are 50 (62) drawings of work tasks in this booklet. Each drawing has a short description of a work task. Look at each drawing and read the description. On a separate answer sheet, indicate your current level of ability to perform the task in the written description. You do not have to do the task exactly as the drawing. The drawing is meant to help explain the written task description.

If you can perform the task with no difficulty, circle #1, “Able”.

If you cannot perform the task at all, circle #5, “Unable”.

If you can perform the task, but you have some difficulty, circle #2, #3,, or #4, “Restricted”.

Be sure to circle only one number. If you circle #2. this would indicate that you are only slightly restricted.

If you circle #4. this would indicate that you are very restricted, almost unable to do the task.

The patient marks answers on the provided answer sheet. The answer sheet is scored by the evaluator and a rating is provided with reference to the Physical Demand Characteristics of Work system. Gender-based normative data, provided in terms of a percentile ranking, are also used to compare the patient’s responses to healthy same-gender individuals.

Reliability Check - Spinal Function Sort

A simple check of reliability is provided by the inclusion of highly similar tasks. Item #17 is very similar to item #49, and item #6 and item #50 are nearly identical.

Prior to scoring the test, a reliability check should be conducted by reviewing these items for consistency and by counting the number of “?” items. Refer to the reliability check box in the lower left corner of the answer sheet. There are four levels of interpretation based on a combination of the value of the discrepancy between the reliability check item pairs (under “Dis” in the Box) and the number of “?” items (under “DK” in the Box). Each level is numbered under “Int” in the Box. Follow these guidelines for interpretation:

Int 1 - Reliable. Score and report result.

Int 2 - Questionable. Ask the evaluatee to review the “?” items for resolution. Score and report result after this review.

Int 3 - Questionable. Review discrepancies with the evaluatee. Score and report result after this review.

Int 4 - Unreliable. Review discrepancies with the evaluatee. Retest and report the result. If the evaluatee continues to achieve unreliable results, report the finding of unreliability.

Reliability Check - Hand Function Sort

A simple check of reliability is provided by the inclusion of highly similar tasks. Item #1 and item #14, item #18 and item #33, and item #55 and item #60 are tasks that require nearly identical demands.

Prior to scoring the test, a reliability check should be conducted by reviewing these items for consistency and by counting the number of “?” items. Refer to the reliability check box in the lower right corner of the answer sheet. There are three levels of interpretation based on a combination of the value of the discrepancy between the reliability check item pairs (under “Dis” in the Box) and the number of “?” items (under “DK” in the Box). Each level is numbered under “Int” in the Box. Follow these guidelines for interpretation:

Int 1 - Reliable. Score and report result.

Int 2 - Questionable. Review discrepancies with the evaluatee. Score and report result after this review.

Int 3 - Unreliable. Review discrepancies with the evaluatee. Retest and report the result. If the evaluatee continues to achieve unreliable results, report the finding of unreliability.

RPC Score Calculation

After performing the Internal Validity Check, score the Evaluation Record with the following procedures:

1. Sum the number of responses in each column and place the total number of responses for that column in the box immediately below that column.
2. After the number of responses is summed for each column, the total in each column is multiplied by a weighted factor. The weighted factors are:
 - Column #1 = 4
 - Column #2 = 3
 - Column #3 = 2
 - Column #4 = 1

3. After each of the products of the total number of responses and the factor weight are placed in the box below the total, the row of products is summed. The sum for each row is placed in the "Total" box.
4. Once each of the section totals have been derived for each side of the Evaluation Record, these are summed and placed in the "RPC" box. This sum is taken as the "Rating of Perceived Capacity" of the evaluatee. For the Spinal Function Sort, this will range from 0 to 200 and for the Hand Function Sort, from 0 to 248.

Interpretation of Sort Results

The United States Department of Labor has developed guidelines for rating the strength demands of work. Most jobs in the competitive labor market can be considered in terms of placement on one or another of the levels in the PDC Chart.

The Spinal Function Sort and Hand Function Sort can be used to screen for adequacy of the evaluatee's functional level through the use of the tables below. These tables present the minimum RPC score that would be necessary if the evaluatee is to fully function at the target physical demand characteristics level.

PDC Level	Spinal Function Sort Minimum RPC Range	Hand Function Sort Minimum RPC Range
Sedentary	100 - 110	100 - 136
Light	125 - 135	154 - 190
Medium	165 - 175	200 - 228
Heavy	180 - 190	238 - 248
Very Heavy	196 - 200	

RPC scores in one of these ranges can be taken as an indicator of the evaluatee's perception of capacity as being sufficient for that PDC level. This can give the evaluatee important information about his or her progress toward a particular PDC level. It also provides a useful basis from which to undertake a functional capacity evaluation to confirm or challenge the evaluatee's perception.

Pain & Sensation Drawing

Symptoms are an important indicator of injury, although the contribution of symptoms to the severity of an injury is not straightforward. In order to standardize collection of information concerning symptoms, two separate forms have been developed. These are presented in Appendix D and E. For individuals with only pain in the forearm and hand, the hand pain drawing is appropriate. All others should fill out the body drawing.

The pain and sensation drawings are completed by the patient with the assistance of the evaluator. The pain drawings allow a record to be made of pain in terms of these factors:

- a. Location - The patient uses a red pen or pencil to draw on the figure the location of the pain.
- b. Type - The patient draws on the figure the type of pain at each location. Adjectives which are commonly used to describe symptoms are provided with a reference key.
- c. Intensity of Worst Pain - The patient draws an "X" on the 10 cm analog scale at the bottom of each drawing with the red pen or pencil at the bottom of each figure to describe "your highest level of pain ... over the past week". The patient draws a line from the analog scale to each pain location. The pain is rated according to the following scale:

Rating	Interpretation
Severe	> 7.6 cm
Moderate	5.1 cm to 7.5 cm
Slight	2.6 cm to 5.0 cm
Minimal	< 2.5 cm

- d. Frequency of Worst Pain - After the patient has completed the intensity rating of each symptom area, the evaluator asks the patient about the frequency of this (these) symptom (s) and records the frequency of the drawing according to the following rating scale:

Rating	Interpretation
Constant	Most of the waking and sleeping hours.
Frequent	Most of the waking hours.
Intermittent	Several times during the waking hours.
Occasional	A few times during the waking hours.

- e. Intensity of Usual Pain - The patient draws an “O” on the analog scale with the red pen or pencil to describe “your usual level of pain ... over the past week” and a line from the analog scale to each pain location.
- f. Frequency of Usual Pain - The evaluator asks the patient about the frequency of this (these) symptom (s) and records the frequency of the drawing according to the above rating scale.

Job Demands Questionnaire

A short questionnaire (Appendix F) that structures input from the evaluatee in terms of his or her job demands is completed as the last step in the seated segment of the Cal-FCP. The purpose of this exercise is to provide information about the evaluatee's perception of the job demands against which the performance test measures can be compared. In addition, this activity extends seated task duration.

This information is not included in the disability rating but will be useful to the treating doctor. Accordingly, it is included as an attachment to the Cal-FCP Standard Report form that is provided to the doctor at the conclusion of treatment.

Lateral Pinch Strength

Lateral pinch (also known as “key pinch”) strength is through the use of the B & L Pinch Gauge following the protocol endorsed by the American Society of Hand Therapists because normative data are based on this protocol.

The evaluatee will be placed in a seated position, with feet placed firmly on the floor, shoulder width apart. The evaluatee is required to grasp the Pinch Gauge using a lateral grasp with the pad of the thumb against the upper side of the gauge placed in the ridge of the gauge. The radial side of the second phalange of the index finger is placed in the groove on the bottom edge of the gauge. The elbow will be to the side of the body, in a right angle position.

The evaluator should begin each test session by explaining the purpose of the test to the evaluatee. The text that is presented in bold and large type below can be read to the evaluatee. It is permissible for the evaluator to rephrase this text as necessary to suit the needs of the evaluatee and the communication style of the evaluator.

This is a test of your maximum strength to pinch this handle with as much force as you can safely and dependably produce.

You will hold that effort for a count of three. I will count off for you. Do not release the handle until I complete the count.

Do you have any questions?

After answering any questions the evaluatee may have, ask the evaluatee to do a sub-maximal demonstration of what he/she believes you want. Provide these instructions:

Let’s give it a try. This will be a practice trial. Just give me partial effort.

Ready? Set! Go! One-one-thousand, two-one-thousand, three-one-thousand. Release and relax. Thank you.

Caution the evaluatee that during the test trials you will guard against the following “cheating” behaviors that may adversely affect the test results:

1. The fingers are not consistently replaced at the start of each trial.
2. The fingers are moved during the trial.

At the conclusion of the practice trial, ask the evaluatee for any questions or concerns. Handle these appropriately.

Prior to initiation of the test trial, ask the evaluatee if he/she is able to perform this task to maximum. With an affirmative answer, proceed.

When all is ready, provide these instructions:

Ready? Set! Go! One-one-thousand, two-one-thousand, three-one-thousand. Release and relax. Thank you.

The evaluatee completes three test trials with a 15-second rest interval between trials. The evaluatee’s dominant hand is tested first. After one trial is completed, the non-dominant hand is tested before the second trial on the dominant hand is undertaken. Thus, the evaluatee’s right hand and left hand are tested intermittently.

Record each trial on the *Evaluation Record*. The evaluatee is rated at the “limited” level as long as the evaluatee’s performance is equal to or less than the limited rating. For example, a 30-year-old female whose pincher strength on the dominant hand is 13 pounds of force or less would be considered “limited”. Rate the evaluatee to be “limited” if either hand is at or below the limited rating.

After testing has been concluded, the average of the three trials and the coefficient of variation can be calculated and entered on the *Evaluation Record* in the appropriate locations. The coefficient of variation is the standard deviation divided by the mean, expressed as a percentage. For evaluators who are not familiar with these calculations, they have been described below in use with the Casio fx-300H, an inexpensive (\$12) and widely-available calculator. The calculations are for scores of 18, 20, and 15 on the pinch gauge:

	Values
Turn it on..... Press {AC}	
Select Standard Deviation program..... Press {MODE}, Press {3}	
Clear data registers Press {SHIFT}, Press {AC}	
Enter data..... Press {18}, Press {M+}	
Enter data..... Press {20}, Press {M+}	
Enter data..... Press {15}, Press {M+}	
Recall population standard deviation Press {SHIFT}, Press {2}	2.054
Divide by mean (average) Press {÷}	
Recall mean (average)..... Press {SHIFT}, Press {1}	17.666
..... Press {=}	0.116

Values are rounded off. In this example, the mean is **17.67** while the population standard deviation is **2.05** and the coefficient of variation is **11.6%**. This is below the 15% limit and, therefore acceptable. As a reminder, rounding off is always up when the last numeral is 5 and the preceding numeral is odd. If the preceding numeral is even and the last number is 5, round down. For example:

11.925.....	11.92
11.935.....	11.94
120.465.....	120.46
120.455.....	120.46

After calculating the average and coefficient of variation, use the tables on the next pages to rate the evaluatee's average. Normative values based on an average of three trials are available for age and gender and have been summarized below for ease of use.

Female

Dominant Hand										
Rating	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69
Excellent	22	22	25	21	23	24	22	21	21	20
Above Average	20	20	22	19	20	21	19	18	18	18
Average	18	18	19	17	17	18	17	16	16	15
Below Average	16	16	16	15	14	14	14	13	13	12
Limited	14	14	13	13	11	11	12	11	10	10

Non-Dominant Hand										
Rating	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69
Excellent	20	21	25	21	22	22	22	19	19	20
Above Average	18	19	21	19	19	20	19	17	17	17
Average	16	17	18	16	16	17	16	15	14	14
Below Average	14	15	14	13	13	14	13	13	12	12
Limited	12	12	11	11	10	11	11	10	9	9

Male

Dominant Hand										
Rating	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69
Excellent	33	37	36	33	31	34	36	33	34	31
Above Average	30	32	31	29	28	30	31	28	29	27
Average	26	27	26	26	26	26	27	24	23	23
Below Average	23	22	22	23	23	22	22	20	18	20
Limited	19	17	17	20	20	18	18	16	12	16

Non-Dominant Hand										
Rating	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69
Excellent	32	34	36	33	33	34	35	32	30	29
Above Average	28	29	31	30	29	29	30	28	26	26
Average	25	25	26	26	25	25	26	23	22	22
Below Average	21	21	21	22	21	20	22	18	18	18
Limited	18	16	16	18	17	16	18	14	14	15

Power Grip Strength

Grip strength is evaluated in a seated position through the use of the JAMAR Hand Dynamometer following the protocol endorsed by the American Society of Hand Therapists. Position #2 on the dynamometer handle is utilized because normative data are based on testing with this span.

The evaluatee will be placed in a seated position, with feet placed firmly on the floor, shoulder width apart. The elbow will be to the side of the body, in a right angle position. The wrist is essentially neutral for radial or ulnar deviation, and the forearm is in neutral position.

The evaluator should begin each test session by explaining the purpose of the test to the evaluatee. The text that is presented in bold and large type below can be read to the evaluatee. It is permissible for the evaluator to rephrase this text as necessary to suit the needs of the evaluatee and the communication style of the evaluator.

This is a test of your maximum strength to squeeze this handle with as much force as you can safely and dependably produce.

You will hold that effort for a count of three. I will count off for you. Do not release the handle until I complete the count.

Do you have any questions?

After answering any questions the evaluatee may have, ask the evaluatee to do a sub-maximal demonstration of what he/she believes you want. Provide these instructions:

Let's give it a try. This will be a practice trial. Just give me partial effort.

Ready? Set! Go! One-one-thousand, two-one-thousand, three-one-thousand. Release and relax. Thank you.

Caution the evaluatee that during the test trials you will guard against the following "cheating" behaviors that may adversely affect the test results:

1. The grip is not consistently replaced at the start of each trial.
2. The evaluatee pulls back on the handle, exerting force with the entire upper arm and/or thorax, rather than just the hand.

At the conclusion of the practice trial, ask the evaluatee for any questions or concerns. Handle these appropriately.

Prior to initiation of the test trial, ask the evaluatee if he/she is able to perform this task to maximum. With an affirmative answer, proceed.

When all is ready, provide these instructions:

Ready? Set! Go! One-one-thousand, two-one-thousand, three-one-thousand. Release and relax. Thank you.

The evaluatee completes three test trials with a 15-second rest interval between trials. The evaluatee's dominant hand is tested first. After one trial is completed, the non-dominant hand is tested before the second trial on the dominant hand is undertaken. Thus, the evaluatee's right hand and left hand are tested intermittently. Record each trial on the *Evaluation Record*. After calculating the average and coefficient of variation, use the tables on the next pages to rate the evaluatee's average. The evaluatee is rated at the "limited" level as long as the evaluatee's performance is equal to or less than the limited rating.

Female

Non-Dominant Hand										
Rating	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69
Excellent	99	102	117	96	97	92	89	82	75	69
Above Average	85	88	98	85	84	77	77	70	65	59
Average	70	75	79	74	70	62	66	57	55	50
Below Average	56	61	60	63	57	47	54	45	45	40
Limited	41	47	40	53	43	32	43	32	35	30

Non-Dominant Hand										
Rating	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69
Excellent	87	88	103	90	90	81	79	71	66	57
Above Average	74	76	86	78	76	69	68	59	56	49
Average	61	64	68	66	62	56	57	47	46	41
Below Average	48	51	50	55	49	43	47	35	36	33
Limited	35	39	33	43	35	31	36	24	26	25

Male

Non-Dominant Hand										
Rating	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69
Excellent	162	167	167	168	158	156	150	155	131	132
Above Average	142	144	144	144	138	133	132	128	110	112
Average	121	121	122	120	117	110	114	101	90	91
Below Average	100	98	99	96	96	87	96	74	69	71
Limited	80	75	77	72	75	64	77	48	49	50

Non-Dominant Hand										
Rating	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69
Excellent	148	143	154	156	150	146	136	130	117	116
Above Average	126	127	132	135	132	124	119	107	97	97
Average	105	111	110	113	113	101	102	83	77	77
Below Average	83	94	89	91	94	78	85	60	57	57
Limited	61	78	67	70	75	55	68	36	36	37

Standing Range of Motion

The Standing Range of Motion test measures anthropometric range of motion, that is, using the evaluatee's own stature as a frame of reference. The evaluator should begin each test session by explaining the purpose of the test to the evaluatee. The text that is presented in bold and large type below can be read to the evaluatee. It is permissible for the evaluator to rephrase this text as necessary to suit the needs of the evaluatee and the communication style of the evaluator.

The evaluatee will stand in front of a solid wall, at a distance with arms outstretched, hands can be comfortably placed on the wall. Feet will be shoulder width apart. When all is ready, the following instructions will be given:

This is a test of your ability to reach with both hands to various heights while standing, stooping, crouching and kneeling.

I will be asking you to maintain each of these postures for fifteen seconds.

As we go through this test, I will be interested in any symptoms that you may have. Please let me know.

Do you have any questions?

The evaluator answers any questions posed by the evaluatee. The evaluator then inquires whether or not the evaluatee understands what is wanted. With an affirmative response, the evaluator proceeds to initiate the test process.

The evaluatee is instructed to move from a standing position to each posture and to return to a standing position according to the heights listed below:

Height	Posture
Shoulder Level	Stand
Eye Level	Stand
Knee Level	Stoop
Knee Level	Crouch
Knee Level	Kneel

Up to a one-minute standing rest is allowed between postures. The evaluator counts down 15 seconds for the evaluatee on each of the five postures.

As the evaluatee performs the various standing-range-of-motion tasks, the evaluator rates the evaluatee's performance in terms of the following scale:

1. Able. Able to perform the task with no restrictions.
2. Slightly restricted. Able to perform the task with slight restrictions. Can hold the hands at the designated level for 15 seconds.
3. Moderately restricted. Able to assume the proper position, but is unable to maintain the position for 15 seconds.
4. Very restricted. Able to assume the position, but unable to hold the position for more than five seconds.
5. Unable. Unable to assume the position.

Progressive Lift Capacity

An isoinertial measure of progressive lift capacity has been selected, the EPIC Lift Capacity test (ELC). The ELC was selected because it meets the criteria for test selection that are described above. It has been in clinical use at the contractor's clinical facility for more than two years. It is in use in more than 100 rehabilitation centers throughout the United States and Canada and has been selected by the Canadian Back Institute as its standard test of lift capacity. It requires inexpensive equipment and training. It has been formally tested for reliability in a large study, normative data are available, and reference to the Physical Demand Characteristics system is provided.

The ELC is administered following the standard procedures that are presented in the ELC Examiner's Manual. Performance is recorded on the ELC evaluation record and summary data are transferred from this form to the *Cal-FCP Evaluation Record*.

After completing the test, calculate the relative acceptable weight for Test #3 by dividing the maximum acceptable weight by the evaluatee's body weight. Place this value in the "RAW" section on the *Cal-FCP Evaluation Record*.

Next, look up the "% Normal" lift capacity for Test #3 by using the EPIC R.A.W. to Normal Lift Capacity Translation table for the subject's age (Appendix G). For example, a 42-year-old 180-pound male who achieved 60 pounds maximum acceptable weight, would have a "-6%" of normal written in the "% Normal" space on the *Evaluation Record*, meaning that he is 6% below normal. In another example, a 27-year-old 120-pound female who achieved 30 pounds maximum acceptable weight, would have a "+%" of normal written in the "% Normal" space on the *CAL-FCP Evaluation Record*, meaning that she is above normal.

Carry 100 Feet

The evaluatee's ability to carry the loads that he or she was able to lift in ELC Test #3 is assessed through the use of a structured task simulation.

The evaluatee is instructed to carry the ELC crate with each of the loads that were used for each stage of ELC Test #3 while walking on a 100-foot course over a flat and unobstructed surface at 3 miles per hour. The evaluatee will require approximately 20 seconds to 25 seconds to complete each cycle.

The evaluatee begins with the starting load for ELC Test #3 and completes one cycle. After a 20-second standing rest, the load is incremented by 10 pounds and the evaluatee completes another cycle. The test progresses in this manner until the maximum acceptable weight achieved in ELC Test #3 is reached.

After the evaluatee completes the carrying task, the evaluator rates the evaluatee's performance according to the following scale:

1. No restrictions. Able to carry the maximum acceptable weight from ELC Test #3 for 100 feet without slowing down or taking a break.
2. Slightly restricted. Able to carry the maximum acceptable weight from ELC Test #3 for 100 feet at a slower-than-usual walking pace.
3. Moderately restricted. Able to carry the maximum acceptable weight for 100 feet, but requires one rest break.
4. Very restricted. Unable to carry the maximum acceptable weight for 100 feet even with one rest break. Able to carry 10 pounds for 100 feet or able to carry the maximum acceptable weight for 50 feet.
5. Unable. Unable to carry any weight for 100 feet.

Climb Ten Feet

The evaluatee's ability to climb while carrying the maximum load that he or she was able to lift in ELC Test #3 is assessed through the use of a structured task simulation. This task simulates climbing up and down one ten-foot flight of stairs in an office building.

The evaluatee is instructed to carry the ELC crate with the maximum acceptable weight achieved in ELC Test #3 while stepping up and down an eight-inch high step for 15 cycles with a cadence of one-step per second. Cadence is counted by the evaluator. Alternately, a metronome can be used. The evaluatee will require 60 seconds to complete this task.

The evaluatee's ability to complete this task is rated by the evaluator according to the five-point ability scale, from able to unable. After the evaluatee completes the climbing task, the evaluator rates the evaluatee's performance on the following basis:

1. No restrictions. Able to complete 15 cycles in one minute.
2. Slightly restricted. Able to complete 15 cycles, but requires between one minute and one minute and 15 seconds to complete the task.
3. Moderately restricted. Able to complete 15 cycles within one minute and 30 seconds.
4. Very restricted. Able to complete 15 cycles within two minutes.
5. Unable. Unable to complete 15 cycles within two minutes.

Cal-FCP Analysis and Interpretation

After the conclusion of the Cal-FCP test battery, the evaluator performs the calculations for each of the variables described earlier in this *Manual* and prepares a report, sample verbiage of which is presented below. Subsequently, the information is conveyed to the evaluatee's physician who will make the categorical determination of disability. The Work Capacity Decision Tree that was presented earlier in this *Manual* is used by the physician. This is also presented below (Appendix H), with modifications made to the loss of lift capacity categories in order to provide continuity.

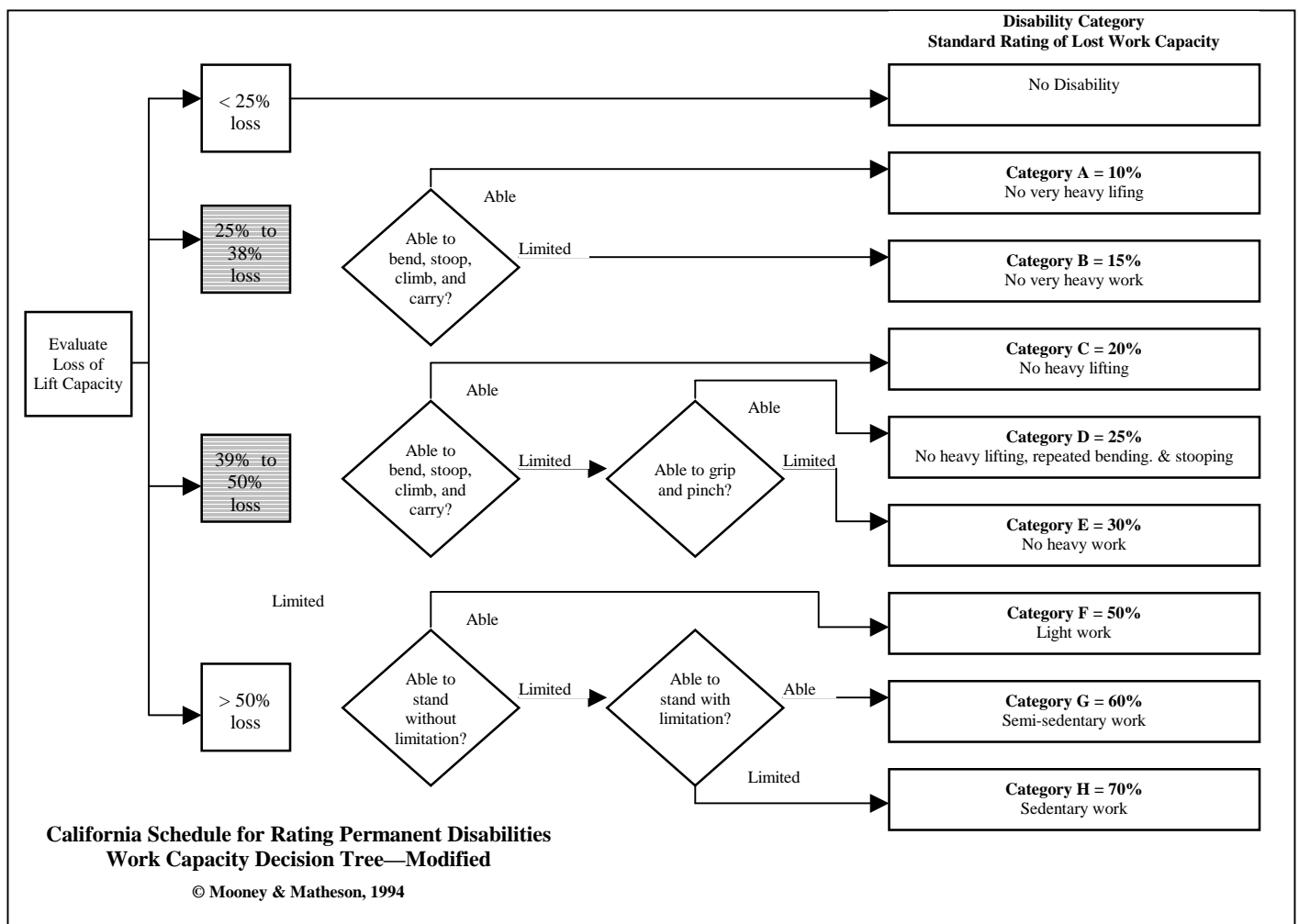


Figure 2. Modified decision tree for disability rating.

Cal-FCP Standard Report Form

As an alternative to preparing a narrative report, the evaluator can use the *California Functional Capacity Protocol Standard Report Form* (Appendix I) to communicate the findings of the evaluation to the patient's doctor.

The patient's name, date of the evaluation, and evaluator are filled in. A disability rating grid is used to record findings. Under "Lost Lift Cap" the percentage of lost lift capacity is entered in the open box. For each of the remaining categories that are listed "Able/Limited", the evaluator circles the proper responses in that row. The evaluator does not select the Category, nor does the evaluator select a Restriction from the last two columns in the grid. This is reserved for the use of the treating doctor.

The evaluatee's pain frequency and severity are indicated by checking the appropriate boxes for both the evaluatee's usual pain and the evaluatee's worst pain. One box should be checked in each of the four rows in this section.

The evaluatee's perceived physical capacity should be indicated by checking one box in each of the two rows in this section. The reliability of the evaluatee's responses is indicated in the first row. In the second row, the PDC rating according to the Hand Function Sort or Spinal Function Sort is indicated.

Any comments that the evaluator would care to make concerning the evaluatee's performance are listed in the "Comments" section.

Cal-FCP Sample Report Verbiage

100 lbs 36 year old female, 25 lbs on ELC Test #3:

Ms. Smith was evaluated with a standardized protocol designed to quantify the functional consequences of soft tissue injury. She performed consistently throughout the functional test session. Ms. Smith currently demonstrates 25 pounds of lift capacity. Based on a comparison to normative data for women of her size, this translates into a 20% loss from her probable pre-injury lift capacity.

Ms. Smith is unrestricted in her ability to perform bending and stooping on a repetitive basis. She is moderately restricted in terms of her ability to performing carrying and climbing tasks. Grip and pinch strength are both below average. She is unrestricted in her ability to perform standing or sitting up to one hour at a time.

In terms of access to jobs in the labor market, Ms. Smith can perform work at the “light” physical demand characteristics level as defined by the United States Department of Labor. However, Ms. Smith perceives her functional capacity to be substantially lower, below the sedentary physical demand characteristics level.

150 lbs 36 year old female, 25 lbs on ELC Test #3:

Ms. Smith was evaluated with a standardized protocol designed to quantify the functional consequences of soft tissue injury. She performed consistently throughout the functional test session. Ms. Smith currently demonstrates 25 pounds of lift capacity. Based on a comparison to normative data for women of her size, this translates into a 46% loss from her probable pre-injury lift capacity. In terms of access to jobs in the labor market, she can perform work at the “light” physical demand characteristics level as defined by the United States Department of Labor.

Ms. Smith is unrestricted in her ability to perform bending and stooping on a repetitive basis. She is moderately restricted in terms of her ability to performing carrying and climbing tasks. Grip and pinch strength are both below average. She is unrestricted in her ability to perform standing or sitting up to one hour at a time.

In terms of access to jobs in the labor market, Ms. Smith can perform work at the “light” physical demand characteristics level as defined by the United States Department of Labor. However, Ms. Smith perceives her functional capacity to be substantially lower, below the sedentary physical demand characteristics level.

200 lbs 36 year old female, 25 lbs on ELC Test #3:

Ms. Smith was evaluated with a standardized protocol designed to quantify the functional consequences of soft tissue injury. She performed consistently throughout the functional test session. Ms. Smith currently demonstrates 25 pounds of lift capacity. Based on a comparison to normative data for women of her size, this translates into a 62% loss from her probable pre-injury lift capacity. In terms of access to jobs in the labor market, she can perform work at the “light” physical demand characteristics level as defined by the United States Department of Labor.

Ms. Smith is unrestricted in her ability to perform bending and stooping on a repetitive basis. She is moderately restricted in terms of her ability to performing carrying and climbing tasks. Grip and pinch strength are both below average. She is unrestricted in her ability to perform standing or sitting up to one hour at a time.

In terms of access to jobs in the labor market, Ms. Smith can perform work at the “light” physical demand characteristics level as defined by the United States Department of Labor. However, Ms. Smith perceives her functional capacity to be substantially lower, below the sedentary physical demand characteristics level.

Feasibility Survey

The feasibility of adoption of the Cal-FCP Protocol is dependent on its acceptance by both the patient and the treating doctor. In order to evaluate this, the patient will be asked to complete a short questionnaire and return it to Dr. Matheson in a stamped addressed envelope. In order to participate in this survey, the patient must provide informed consent. An informed consent document is included as Appendix J. Please review this with the patient after the evaluation has been concluded and solicit the patient's participation. If the patient declines to participate, do not send his or her test materials to Dr. Matheson. If the patient wants to participate in the study and signs the Informed Consent document, copy these materials:

1. Evaluation Schedule (front & back)
2. Evaluation Record (front & back)
3. Symptom Description form(s)
4. Job Demands Questionnaire
5. SFS of HFS Answer Sheet
6. EPIC Lift Capacity Evaluation Record
7. Standard Report Form or narrative report of test results
8. Referring doctor's name, address, and telephone number
9. Signed Informed Consent Document

Forward these materials to Dr. Matheson at: Suite 106, 600 South Grand Avenue, Santa Ana, CA 92705. Questionnaires with stamped envelopes will be sent to the evaluatee and his or her doctor.

In order to solicit the support of physicians, a letter from Vert Mooney, MD is also enclosed (Appendix K). The Informed Consent Document and letter from Dr. Mooney can be copied for your use.