OCCUPATIONAL HEALTH PROGRAMS

CLINICAL TESTING PROCEDURES

Revised November 2024

Page

CARDIOVASCULAR TESTING

BLOOD PRESSURE MEASUREMENT

Several factors can cause significant deviations in measured blood pressure. These include room temperature, exercise, alcohol or nicotine consumption, positioning of the arm, muscle tension, bladder distension, talking, and background noise. For these reasons, measurements shall be taken in a quiet and well-lit environment, at least 30 minutes after the last ingestion of caffeine, alcohol, or nicotine, and after the patient has been comfortably seated in a chair with the back support for 3 to 5 minutes. The following are some details for consideration while taking blood pressure measurements:

1) Ask the patient to remove all clothing that covers the location of cuff placement. At a minimum, no tight or constrictive clothing shall be present on the limb.

2) Instruct the patient to relax as much as possible, not cross the legs, and not talk during the measurement.

3) Position and support the patient's upper arm such that the middle of the cuff on the upper arm is at the level of the right atrium (the mid-point of the sternum).

4) Evaluate the patient's bare upper arm for the appropriate size cuff. The recommended cuff sizes are:

   a. For arm circumference of 22 to 26 cm, use a small adult or pediatric cuff.

   b. For arm circumference of 27 to 34 cm, use an adult cuff.

   c. For arm circumference of 35 to 44 cm, use a large adult cuff.

   d. For arm circumference of 45 to 52 cm, use a thigh cuff.

5) Place the cuff on the patient's upper arm, with the lower edge of the cuff 2-3 cm above the antecubital fossa. The cuff must be pulled snugly around the arm.

6) If the BP is ≥ 120 systolic or 80 diastolic, wait at least one minute, and repeat to obtain a second blood pressure measurement. Record the results of both measurements on the appropriate Examination Data form. If there is > 5 mm Hg difference between the first and second readings, an additional reading must be obtained and recorded.

7) If the average reading is ≥ 140/90, ask the patient whether hypertensive medications have been prescribed, and whether the patient took them today.

Reference: American Heart Association Council on High Blood Pressure (http://hyper.ahajournals.org/cgi/ content/full/45/1/142).

ELECTROCARDIOGRAM (ECG/EKG - CARDIOLOGY REQUIREMENT)

All ECG's must be read by a cardiologist unless a computerized interpretation indicates that the tracing is normal or has insignificant findings. Insignificant findings are defined as (and limited to) the following:

1. Atrial arrhythmia
2. Sinus arrhythmia
3. Ectopic atrial rhythm
4. Non-specific intraventricular delay without axis shift, BBB, or hemiblock
5. Non-specific ST changes
6. Mild bradycardia (rate of 50 or more)
7. 1st degree AV block (rate of 50 or more)
8. Incomplete RBBB
9. Early repolarization
10. Decreased anterior forces in person without history of MI

CARDIAC STRESS TEST(CST)

General Considerations

Testing Duration: Patients should be fully informed that optimal diagnostic and fitness assessment results are obtained only when a true maximal effort is given. Patients should be continually encouraged to continue the treadmill test to the best of their ability, and informed that some degree of exertional discomfort is necessary and unavoidable. This should be clearly differentiated from abnormal sensations such as chest pain, shortness of breath, nausea, loss of balance, or orthopedic problems, which would warrant immediate consideration for test termination. Assuming the absence of any ECG or other abnormalities, the test should be terminated only when the patient has reached volitional fatigue and not at any pre-determined heart rate or workload. Always be sure to document the reason for test termination.

Blood Pressure Monitoring: Blood pressures should be measured in the supine and standing positions prior to exercise. A reading should be obtained prior to the end of the warm-up (0) stage. Exercise blood pressures should be measured approximately every three minutes thereafter. A measurement during a later stage of the test should be obtained, but care must be taken not to disrupt the patient's balance or provide support. Therefore, unless an abnormal response is anticipated, a measurement at peak exercise may not be practical. A measurement shall be taken immediately post-exercise, and every few minutes thereafter until the readings approach pre-test values.

Handrail Support: Allowing handrail support can result in significant errors (over 30%) in fitness assessment and should be allowed only to prevent falling. Following any contact with the handrail, the patient must be able to keep up with the treadmill completely unassisted for at least one minute in order to be given credit for the energy expenditure for that time.

Selection of Protocol: CST should be administered using the following protocols:

Reason for Testing	Protocol
Fire Wellness	Gerkin (Bruce by request)
Pre-Placement	Bruce (Gerkin for Fire Dept Applicants)
SCUBA Medical	Bruce or Gerkin

Interpretation: All results must be interpreted by a Board-Certified Cardiologist or licensed MD/DO who has training and experience in reading CSTs.

GERKIN PROTOCOL

Use the Gerkin Protocol Worksheet and the Protocol below.

1) Instruct the patient to straddle the treadmill belt until it begins to move. At approximately 1 mph, instruct the patient to step onto the belt and increase the belt speed to 3 mph at 0% grade. The patient warms up at 3 mph at 0% grade for 3 minutes.

2) During the warm-up, advise the patient of the following:

    a. The evaluation is a series of 1-minute exercise stages, alternating between percent grade and speed (i.e., first minute percent grade is increased; second minute speed is increased, etc.).

    b. The patient will be permitted to either walk or run, whichever feels more comfortable.

    c. If at any time during the evaluation, the patient experiences chest pain, light headedness, ataxia, confusion, exhaustion, leg cramping, nausea, or clamminess, they must ask the evaluator to terminate the evaluation.

3) At the completion of the first minute (stage 1: 4.5 mph @ 0% grade), increase the grade to 2%. Subsequently, after every odd minute, increase the grade an additional 2%. After every even minute, increase the speed by 0.5 mph. This will continue until the patient reaches volitional fatigue or demonstrates any of the criteria for early termination.

4) If the evaluation is terminated early, document the stage at which the evaluation is terminated and the reason for the termination on the Gerkin Protocol Worksheet. Note that the evaluation was terminated.

5) Instruct the patient to remain on the treadmill for a cool-down period for a minimum of three minutes at 3 mph, 0% grade. Continue cardiac monitoring (with tracings) for at least 5 minutes into recovery. Record the heart rate after one minute of cool down.

6) Use the time completed with the Prediction Table below to estimate VO2max. Note that failure to reach a time benchmark results in a VO2max estimate at the next lower benchmark. For example, a run time of 10:35 generates a VO2max of 39.5 rather than 40.0. Enter this value on the Gerkin Protocol Worksheet.

7) Use the table of Cardiovascular Fitness Percentiles on page 8 to look up the patient's percentile for age. Enter this value on the Gerkin Protocol Worksheet.

8) Have a qualified physician or cardiologist complete the interpretation of the tracings.

VO2 MAX PREDICTION TABLE FOR GERKIN PROTOCOL

Stage	Total Time Completed	Speed (mph)	% Grade	Predicted VO2 max ml/kg/min
0 (warm-up)	1:00	3.0	0	13.3
	2:00	3.0	0	13.3
	3:00	3.0	0	13.3
1	3:30	4.5	0	15.3
	4:00	4.5	0	17.4
2	4:30	4.5	2	19.4
	5:00	4.5	2	21.5
3	5:30	5.0	2	23.6
	6:00	5.0	2	27.6
4	6:30	5.0	4	28.7
	7:00	5.0	4	29.8
5	7:30	5.5	4	31.2
	8:00	5.5	4	32.7
6	8:30	5.5	6	33.9
	9:00	5.5	6	35.1
7	9:30	6.0	6	36.6
	10:00	6.0	6	38.2
8	10:30	6.0	8	39.5
	10:40	6.0	8	40.0
	11:00	6.0	8	40.9
9	11:30	6.5	8	42.6
	12:00	6.5	8	44.3
10	12:30	6.5	10	45.7
	13:00	6.5	10	47.2
11	13:30	7.0	10	49.0
	14:00	7.0	10	50.8
12	14:30	7.0	12	52.3
	15:00	7.0	12	53.9
13	15:30	7.5	12	55.8
	16:00	7.5	12	57.8
14	16:30	7.5	14	59.5
	17:00	7.5	14	61.2
15	17:30	8.0	14	63.2
	18:00	8.0	14	65.3
16	18:30	8.0	16	67.1
	19:00	8.0	16	68.9
17	19:30	8.5	16	71.1
	20:00	8.5	16	73.3

VO2 MAX PREDICTION TABLE FOR BRUCE PROTOCOL

Seconds	VO2 max ml/kg/min	Seconds	VO2 max ml/kg/min	Seconds	VO2 max ml/kg/min
180-186	16.5	485-492	31.5	785-792	46.2
187-194	16.8	493-499	31.9	793-799	46.5
195-201	17.2	500-507	32.2	800-807	46.9
202-208	17.5	508-513	32.6	808-814	47.2
209-215	17.9	514-519	32.9	815-822	47.6
216-222	18.2	520-525	33.3	823-829	47.9
223-229	18.6	526-531	33.6	830-837	48.3
230-236	18.9	532-537	34.0	838-843	48.6
237-243	19.3	538-544	34.3	844-849	49.0
244-250	19.6	545-552	34.7	850-855	49.3
251-257	20.0	553-559	35.0	856-861	49.7
258-264	20.3	560-567	35.4	862-867	50.0
265-271	20.7	568-574	35.7	868-874	50.4
272-278	21.0	575-582	36.1	875-882	50.7
279-285	21.4	583-589	36.4	883-889	51.1
286-292	21.7	590-597	36.8	890-897	51.4
293-299	22.1	598-604	37.1	898-904	51.8
300-306	22.4	605-612	37.5	905-911	52.1
307-313	22.8	613-619	37.8	912-918	52.5
314-320	23.1	620-627	38.2	919-925	52.8
321-327	23.5	628-634	38.5	926-931	53.2
328-334	23.8	635-642	38.9	932-939	53.5
335-341	24.2	643-649	39.2	940-946	53.9
342-348	24.5	650-657	39.6	947-953	54.2
349-355	24.9	658-664	39.9	954-960	54.6
356-362	25.2	665-672	40.3	961-967	54.9
363-369	25.6	673-679	40.6	968-974	55.3
370-376	25.9	680-687	41.0	975-981	55.6
377-383	26.3	688-693	41.3	982-988	56.0
384-390	26.6	694-699	41.7	989-995	56.3
391-397	27.0	700-705	42.0	996-1001	56.7
398-404	27.3	706-711	42.4	1002-1008	57.0
405-411	27.7	712-717	42.7	1009-1015	57.4
412-418	28.0	718-724	43.1	1016-1021	57.7
419-425	28.4	725-732	43.4	1022-1028	58.1
426-432	28.7	733-739	43.8	1029-1035	58.5
433-439	29.1	740-746	44.1	1036-1042	58.8
440-447	29.4	747-754	44.4	1043-1049	59.2
448-454	29.8	755-762	44.8	1050-1056	59.5
455-462	30.1	763-769	45.1	1057-1063	59.9
463-469	30.5	770-774	45.5	1064-1070	60.2
470-477	30.8	775-784	45.8	1071-1077	60.6
478-484	31.2			1078-1084	60.9

CARDIOVASCULAR FITNESS PERCENTILES

MALES:

		VO2 max (ml/kg/min)			
	Percentile	20-29	30-39	40-49	50-59
	99	>58.8	>58.9	>55.4	>52.5
SUPERIOR	95	54.0	52.5	50.4	47.1
	90	51.4	50.3	48.2	45.3
EXCELLENT	80	48.2	46.8	44.1	41.0
	70	46.8	44.6	41.8	38.5
GOOD	60	44.2	42.4	39.9	36.7
	50	42.5	41.0	38.1	35.2
FAIR	40	41.0	38.9	36.7	33.8
	30	39.5	37.4	35.1	32.3
POOR	20	37.1	35.4	33.0	30.2
	10	34.5	32.5	30.9	28.0
VERY POOR	5	31.6	30.9	28.3	25.1

FEMALES:

		VO2 max (ml/kg/min)			
	Percentile	20-29	30-39	40-49	50-59
	99	>53.0	>48.7	>46.8	>42.0
SUPERIOR	95	46.8	43.9	41.0	36.8
	90	44.2	41.0	39.5	35.2
EXCELLENT	80	41.0	38.6	36.3	32.3
	70	38.1	36.7	33.8	30.9
GOOD	60	36.7	34.6	32.3	29.4
	50	35.2	33.8	30.9	28.2
FAIR	40	33.8	32.3	29.5	26.9
	30	32.3	30.5	28.3	25.5
POOR	20	30.6	28.7	26.5	24.3
	10	28.3	26.5	25.1	22.3
VERY POOR	5	25.9	25.1	23.5	21.1

PHYSICAL FITNESS TESTING

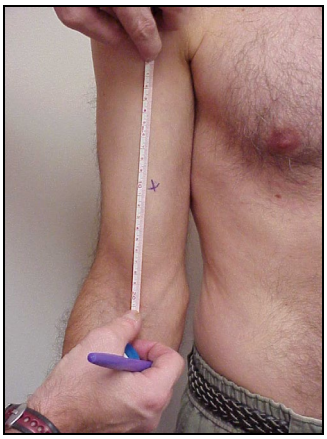
BODY FAT MEASUREMENT

The County requires that contractors use the following four-site skin fold procedure to estimate body fat from regression equations published by Durnin and Rahaman (British J. of Nutrition, 21:681-689, 1967).

SKIN FOLD SITES:

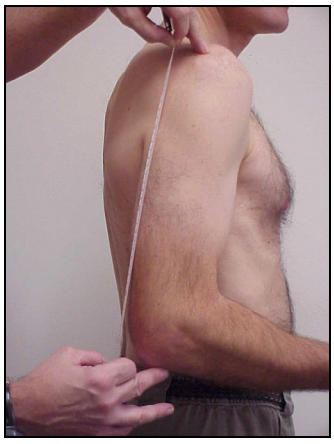
1) Biceps: Vertical fold on the front of the upper arm over the belly of the biceps muscle at mid–point of the muscle belly.

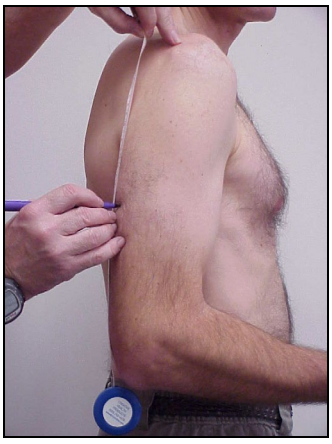
   Figure 1: Biceps skin fold site



2) Triceps: Vertical fold on the midline on the back of the upper arm over the mid-point of the muscle belly, mid-way between the olecranon process (tip of the elbow) and the lateral margin of the acromion process (top of the shoulder, lateral to the collarbone).

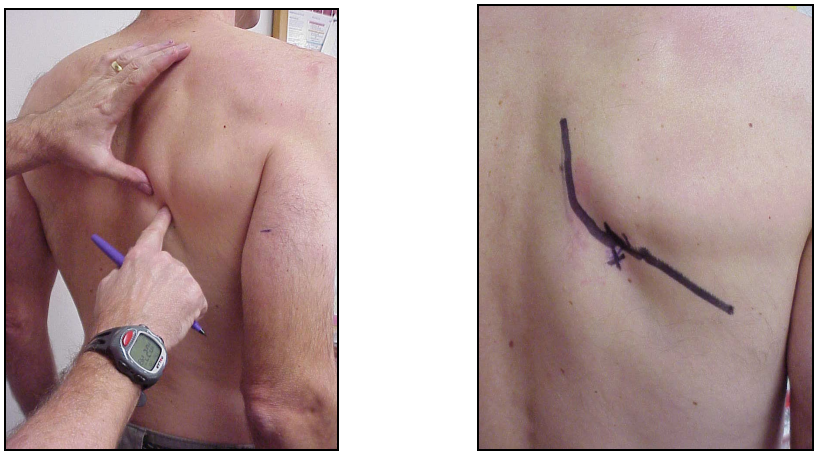
   Figure 2: Triceps skin fold site





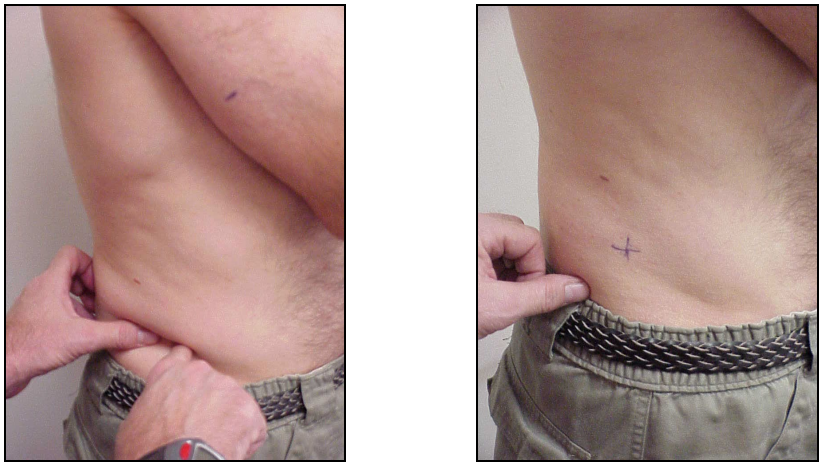
3) Subscapular: Diagonal fold (at a 45-degree angle) 1 to 2 cm below the inferior angle of the scapula

Figure 3: Subscapular skin fold site



4) Supra Iliac: Locate the crest of the ileum. Pinch horizontal fold 1 cm above the crest, in the mid-auxiliary line.

Figure 4: Supra iliac skin fold site



PROCEDURES

All measurements must be made on the right side of the body with the patient standing upright. If client is an applicant, note any evidence suggestive of liposuction at pinch sites.

1. Pinch first site firmly with your thumb and forefinger and lift gently away from the body.

2. Hold calipers in your other hand, open the jaws, and place heads directly on the skin surface 1 cm away from your thumb and forefinger, halfway between the crest and base of the skin fold. Hold the calipers perpendicular to the skin fold.

Figure 5: Biceps Pinch

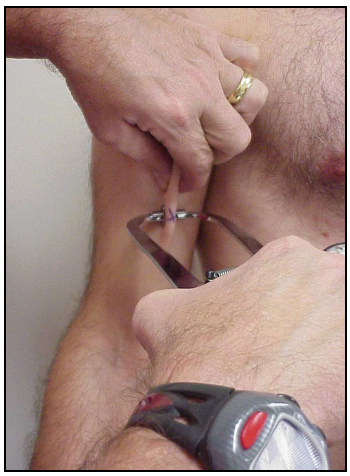


Figure 6: Triceps Pinch

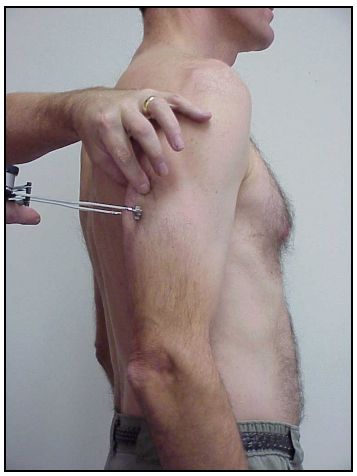


Figure 7: Subscapular Pinch

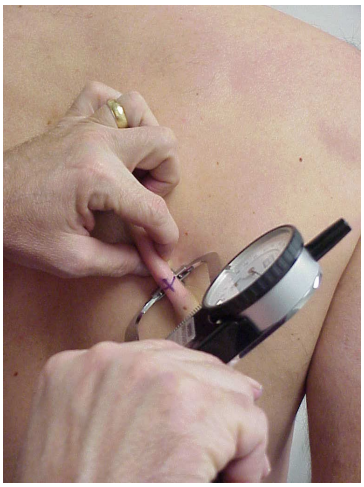
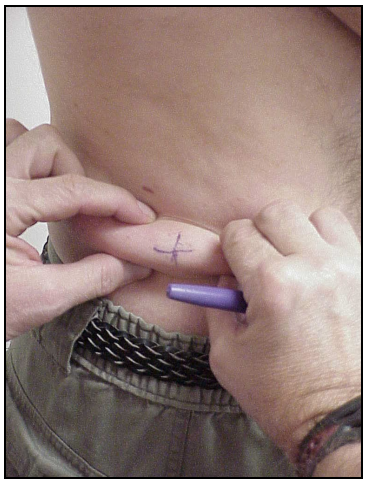


Figure 8: Supra Iliac Pinch



3. Maintain pinching for 1 to 2 seconds (but not longer) before reading caliper.

4. Record measurement to the nearest 0.5 mm on the Body Fat Worksheet.

5. Go to the next site and complete testing at all four sites.

6. Repeat steps 1-5, taking duplicate measurements at all four sites in the same order.

7. Take a third measurement at any site if duplicate measurements at that site are not within 1.0 to 2.0 mm.

8. Use the Durnin Conversion Table below and the average of the duplicate measurements (or if three measurements were done, the average of the two measurements that are closest in value) to calculate the patient's estimated body fat.

DURNIN CONVERSION TABLE

Sum of 4 Skin folds	% Body Fat		Sum of 4 Skin folds	% Body Fat		Sum of 4 Skin folds	% Body Fat	
	Male	Female		Male	Female		Male	Female
22	10.0	16.3	53	20.5	28.7	84	26.2	35.5
23	10.5	17.0	54	20.8	29.0	85	26.4	35.7
24	11.0	17.5	55	21.0	29.3	86	26.5	35.9
25	11.5	18.1	56	21.2	29.5	87	26.7	36.0
26	11.9	18.7	57	21.4	29.8	88	26.8	36.2
27	12.4	19.2	58	21.6	30.1	89	27.0	36.4
28	12.8	19.7	59	21.8	30.3	90	27.1	36.5
29	13.2	20.2	60	22.0	30.5	91	27.3	36.7
30	13.6	20.6	61	22.3	30.8	92	27.4	36.9
31	14.0	21.1	62	22.5	31.0	93	27.5	37.0
32	14.4	21.6	63	22.7	31.3	94	27.7	37.2
33	14.8	22.0	64	22.8	31.5	95	27.8	37.3
34	15.1	22.4	65	23.0	31.7	96	27.9	37.5
35	15.5	22.8	66	23.2	31.9	97	28.1	37.7
36	15.8	23.2	67	23.4	32.2	98	28.2	37.8
37	16.2	23.6	68	23.6	32.4	99	28.3	38.0
38	16.5	24.0	69	23.8	32.6	100	28.4	38.1
39	16.8	24.3	70	24.0	32.8	101	28.6	38.3
40	17.1	24.7	71	24.1	33.0	102	28.7	38.4
42	17.4	25.1	72	24.3	33.2	103	28.8	38.6
42	17.7	25.4	73	24.5	33.4	104	28.9	38.7
43	18.0	25.7	74	24.7	33.6	105	29.1	38.9
44	18.2	26.1	75	24.8	33.8	106	29.2	39.0
45	18.5	26.4	76	25.0	34.0	107	29.3	39.1
46	18.8	26.7	77	25.2	34.2	108	29.4	39.3
47	19.1	27.0	78	25.3	34.4	109	29.5	39.4
48	19.3	27.3	79	25.5	34.6	110	29.7	39.6
49	19.6	27.6	80	25.6	34.8	111	29.8	39.7
50	19.8	27.9	81	25.8	35.0	112	29.9	39.8
51	20.0	28.2	82	25.9	35.1	113	30.0	40.0
52	20.3	28.5	83	26.1	35.3			

CURL-UP EVALUATION

1) Advise the patient of the following general considerations:

   a. The evaluation is a series of curl-ups performed in a 3-minute period.

   b. As an alternate procedure, the patient may perform a prone static plank (see separate protocol below). Performance of either procedure will potentially qualify patient for a pay bonus.

   c. To provide consistent measurements from year-to-year, the testing should be standardized as much as possible. This is best obtained by use of a metronome for pacing. However, the decision to utilize the metronome is up to the patient.

2) Instruct the patient of the following:

   a. The evaluation is initiated from the supine position with knees bent at a 90-degree angle, hands cupped over the ears or at the temples and with hand and arm position maintained for the entire duration of the evaluation.

   b. The patient's feet will be secured by a bar or a second administrator, but the holding or bracing of the knees and or ankles is not allowed.

   c. The curl-up is initiated by flattening the lower back followed by actively contracting the abdominal muscles and then continuing the movement until the trunk reaches a 45-degree angle with respect to the floor. This is followed by curling down of the trunk with the lower back fully contacting the mat before the upper back and shoulders. A rocking or bouncing movement is not permitted and the buttocks must always remain in contact with the mat.

   d. If at any time during the evaluation the patient experiences back pain, chest pain, light-headedness, ataxia, confusion, nausea, or clamminess, the evaluation should be terminated.

   e. If used, the metronome is set at a speed of 70 allowing for 35 curl-ups per minute. Patients should perform curl-ups in time with the cadence, one beat up and one beat down.

3) The administrator shall observe the evaluation from the side to ensure that each curl-up is performed correctly and shall stop the evaluation when the patient:

   a. Reaches 105 curl-ups;
   b. Reaches 3 minutes;
   c. Performs three consecutive incorrect curl-ups; or
   d. Does not maintain continuous motion.

4) The administrator shall note the number of curl-ups successfully completed within the first 60 seconds and record this number on Fitness for Life Medical Exam Compliance Form.

5) Record the highest number on the Strength and Flexibility Worksheet.

FLEXIBILITY ASSESSMENT (SIT AND REACH)

1) Advise the patient of the following:

   a. The evaluation is a series of 3 measurements that will evaluate the flexibility of the lower back, hamstring muscles, and shoulders.

   b. The flexion required during this evaluation must be smooth and slow, as the patient advances the slide on the box to the most distal position possible.

   c. If at any time during the evaluation the patient experiences back pain, chest pain, light-headedness, ataxia, confusion, nausea, or clamminess, they should terminate the evaluation.

2) Instruct the patient to sit on the floor ensuring the head, upper back, and lower back are in contact with the wall. Instruct the patient to place the legs together, fully extended. The sit and reach box with the sliding measurement guide is placed with the box flat against the feet.

3) While maintaining head and upper/lower back contact with the wall, instruct the patient to extend arms fully in front of their body with the right hand overlaying the left hand, with middle finger of each hand directly over each other. The rule is set to 0.0 inches at the tips of the middle fingers. Then instruct the patient to exhale slowly while stretching slowly forward, bending at the waist, and pushing the measuring device with the middle fingers. During the stretch, legs are to remain together and fully extended and hands are to remain overlaid. The stretch is held momentarily, and the distance obtained. If the patient bounces, flexes knee or uses momentum to increase distance, the evaluation is not counted.

4) Instruct the patient to relax for 30 seconds.

5) Record the distance (rounded to the nearest 1/4 inch) on the Strength and Flexibility Worksheet.

6) Once the patient has completed the 30-second recovery period begin the second evaluation. Repeat evaluation for the third time using the same procedure.

GRIP STRENGTH TEST (JAMAR DYNAMOMETER)

1) Advise the patient of the following:

   a. The evaluation is a series of 6 measurements-three for each hand.

   b. The isometric contraction (squeezing) required during this evaluation must be eased into and then released slowly, without swinging arm, pumping arm or jerking hand.

   c. If, at any time during the evaluation, the patient experiences chest pain, light-headedness, ataxia, confusion, nausea, or clamminess, the evaluation must be terminated.

2) Instruct the patient to towel the hands to ensure dryness.

3) Instruct the patient to place dynamometer in the hand to be evaluated.

4) Adjust the dynamometer to ensure that the bottom of the handle clip fits snugly in the first proximal interphalangeal joint. Rotate the red peak-hold needle counterclockwise to the "0" position.

5) Instruct the patient to assume a slightly bent forward position, with elbow bent at a 90-degree angle, shoulder adducted and neutrally rotated, forearm and wrist in neutral position.

6) Instruct the patient to squeeze with maximum strength 2-3 seconds while exhaling and then slowly release grip. The peak-hold needle will automatically record the peak force exerted.

7) Record the peak force to the nearest kilogram on the Strength and Flexibility Worksheet.

8) Measure the strength in the other hand.

9) Repeat testing of both hands alternatively until three evaluations per hand are completed.

HEIGHT AND WEIGHT MEASUREMENT

Height and weight must be measured in socks or bare feet. Height must be measured using a stadiometer.

PLANK TEST

1) Advise the patient of the following general considerations:

   a. The plank is an optional test that can be done in-lieu of curl-ups.

   b. The evaluation involves maintenance of a rigid prone posture during a two-minute period.

   c. If at any time during the evaluation the patient experiences chest pain, light-headedness, ataxia, confusion, nausea, or clamminess, the evaluation must be terminated.

2) Instruct the patient to lie face down, keep shoulders elevated, supported by the elbows. Raise hips and legs off the floor, supporting the body on forearms and toes. Position elbows directly under the shoulders. Maintain straight body alignment from shoulders through hips, knees, and ankles.

3) The ankles should maintain a 90° angle, the scapula should stay stabilized, and the spine should remain in a neutral position for the duration of the assessment.

4) Once the feet are in position, the individual then extends the knees, lifting off the floor, while supporting the body from the forearms and toes.

5) Instruct the individual to contract the abdominals to support the back. The back should remain flat in the neutral position for the duration of the assessment.

6) Once in position, start the stopwatch, and record the total time that body alignment can be maintained.

7) Any deviations from the above postures or techniques will warrant 2 verbal warnings. If a 3rd infraction occurs stop the watch and terminate the assessment.

8) The administrator shall stop the evaluation when the individual:
   a. reaches 2 minutes; or
   b. is unable to maintain proper form after the second warning.

9) Once the test is complete, stop the watch, and record the time on Fitness for Life Medical Exam Compliance Form (provided by patient).

PUSH-UP EVALUATION

1) Advise the patient of the following general considerations:

   a. The evaluation is a series of push-ups performed in a two-minute time period.

   b. To provide consistent measurements from year-to-year, testing should be standardized as much as possible. This is best obtained by use of a metronome for pacing. However, the decision to utilize a metronome is up to the patient.

   c. The patient may use push-up stands if they wish.

2) Give the patient the following instructions:

   a. The evaluation is initiated from the "up" position (hands are shoulder width apart, back is straight, and head is in neutral position).

   b. Feet are not allowed to be against a wall or other stationary item.

   c. The back must be straight at all times.

   d. Patients must push up to a straight arm position.

   e. Patients must continue performing push-ups in time with the cadence of the metronome, one beat up and one beat down.

   f. If at any time during the evaluation the patients experience chest pain, light-headedness, ataxia, confusion, nausea, or clamminess, they should terminate the evaluation.

3) The evaluator places the 5-inch prop on the floor (or, if push-up stands are used, on top of an object which approximates the height of the push-up stands) beneath the patient's chin. The patient must lower their body to the floor until the chin touches this object.

4) If used, the metronome should be set at a speed of 80, allowing for 40 push-ups per minute.

5) The administrator shall stop the evaluation when the patient:
   a. Reaches 80 push-ups;
   b. Reaches 2 minutes;
   c. Performs three consecutive incorrect push-ups; or
   d. Does not maintain continuous motion.

6) The administrator shall note the number of push-ups successfully completed within the first 60 seconds and record this number on Fitness for Life Medical Exam Compliance Form (provided by patient).

7) Record the highest number of successfully completed push-ups on the Strength and Flexibility Worksheet.

WAIST MEASUREMENT

1) Place the tape at the level of the iliac crest (hip bone). Special attention must be taken to ensure the tape is horizontal and not twisted throughout its entire length. Because it is difficult to see around the patient, the use of a mirror or additional observer is suggested.

2) Standing on one side of the patient, hand the tape measure to the patient and instruct them to place the tape flat on the opposite hip bone.

3) Check for proper placement on the hip bone and pull the tape around and instruct the patient to release the tape and relax their arm at their side.

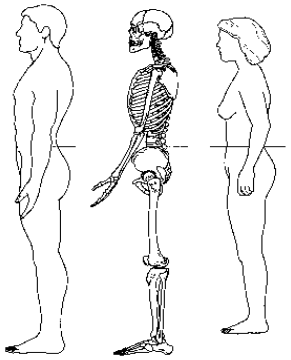
4) Pull tape until it meets at the top of the hip bone. Pull with enough tension so that the red mark on the tension gauge is exposed. Check to make sure tape is level throughout the circumference.

5) Read measurement to nearest 0.5 cm where the zero marker intersects with the length, and record on the FFL Examination Data Form.

6) Repeat measurement, and record on the FFL Examination Data Form.

7) If the measurements are within 2cm of each other, calculate the average, and record on the FFL Examination Data Form.

8) If the measurements are > 2cm apart, do a third measurement. Calculate the average of the two measurements that are closest in value, and record on the FFL Examination Data Form.



PULMONARY TESTING

EXERCISE CHALLENGE TEST (ECT)

The purpose of this test is to detect and evaluate the severity of exercise-induced asthma. Use of OHP's ECT form is required.

1) Ask the patient if they have used any the following "quick relief" inhalers or pills on the day of the test:

Albuterol	Maxair	ProAir	Ipratropium
Alupent	Proventil	Accuneb	Primatene
Atrovent	Ventolin	DuoNeb	Adrenaline
Combivent	Xopenex	Metaproterenol	Epinephrine

The test should be canceled if any of these medications or any other bronchodilators have been used within the past 6 hours.

2) Ask the patient if they are having any current symptoms related to asthma. The presence of any current symptoms should be documented, and the test cancelled.

3) If indicated by the Protocol Sheet, draw a serum albuterol level.

4) Perform pre-test spirometry. The screening spirogram cannot substitute for this unless it was done within one hour on the same spirometer. Repeated efforts from the patient are required as needed to obtain two FEV1 values within 5% of each other. Record the time that the spirometry is completed directly on the spirogram.

5) Give the patient standard instructions for running on a treadmill, including reporting of symptoms that would warrant stopping the test. Encourage the patient to run as long as possible (do not use heart rate criteria for stopping). Tell the patient that less than maximal effort may result in an un-interpretable test which will need to be repeated on another day.

6) Run the patient on a treadmill, preferably using the Bruce Protocol (Use Gerkin for Fire Department applicants). Record the treadmill start time. Note: No ECG tracing is necessary unless a simultaneous CST is indicated.

7) At termination, record the reasons for termination and treadmill stop time.

8) Perform spirometry at 5-, 10- and 20-minutes post-treadmill. At each interval, only one blow should be done (unless the FEV1 is clearly not valid). However, both unique volume-time and flow-volume graphs must be printed for testing at each interval. Record any reports of symptoms on the spirograms. NOTE: Exercise-induced bronchospasm is usually a self-limited, temporary condition. However, if the patient becomes symptomatic or anxious, they have failed the test, and may be permitted to use any inhaler they may have brought with them.

9) The FEV1 should bottom out at either the 5- or 10-minute measurements. If the FEV1 at 20 minutes is less than the 10-minute FEV1, repeat the spirogram every 10 minutes until the FEV1 is observed to rise. NOTE: It is not necessary to observe the FEV1 return to the pre-test value.

SPIROMETRY

With spirometry testing, poor preparation, screening, instruction, and/or coaching by the technician can have a significant negative impact on the test results. For this reason, technicians performing spirometry for the County must be proficient in the proper testing protocol and must have been trained and supervised by a clinical staff who has completed a NIOSH-approved spirometry course within the last five years. Each spirometry performed must indicate the name of the technician. Spirometers must be programmed to use NHANESIII predicted values.

The County of Los Angeles requires that the performance of the testing be consistent with the procedures recommended by NIOSH. These can be reviewed at http://www.cdc.gov/niosh/docs/2004-154c/pdfs/2004-154c-ch4.pdf. Note that we do not require the use of a nose clip.

The following is a partial checklist of minimum performance criteria required by the County to ensure good quality testing:

1) Prepare the patient.

   a. Explain the purpose of spirometry--"I want to learn how hard and fast you can breathe."

b. Determine if spirometry should be postponed using the following criteria:
    - Patient has smoked cigarettes, pipes, or cigars within the last hour
    - Patient has eaten within the last hour
    - Patient has loose dentures

c. All testing should be done in standing position. For safety, a chair must always be placed behind the patient. Alternatively, testing from a seated position is also acceptable.

d. Instruct the patient to loosen tight clothing or other items that could restrict hard and fast breathing.

e. Have the patient elevate the chin and extend the neck slightly.

f. Explain and demonstrate how to perform the forced expiratory maneuver using a mouthpiece. -- "When you are ready, take the deepest possible breath, place your mouth firmly around the mouthpiece, and without further hesitation, blow into the spirometer as hard, fast, and completely as possible, without stopping until I tell you."

2) Perform the test.

a. Instruct the patient to position the mouthpiece with a tight lip seal without obstruction from teeth or tongue.

b. Actively and forcefully coach the patients as they perform the maneuver. Encourage them to "Blast the air out, keep blowing, keep blowing!"

c. Keep coaching until the volume-time tracing becomes almost flat. The test can be stopped when there is less than a 50 ml volume change over the last second.

3) Check the acceptability of each tracing before continuing the testing.

a. Acceptable spirograms are free from:
    - Hesitation or false starts
    - Cough
    - Variable effort
    - Glottis closure
    - Termination before a plateau is reached
    - Leaks
    - Baseline error
    - Falsely elevated FVC: FVC values which are > 150% predicted warrant either verification that entries for age, race, and height are correct, or that the calibration of the spirometer be rechecked. These efforts must be documented on the spirogram if it is to be considered as valid.

b. Review causes of errors with the patient if needed.

c. Repeat testing until three acceptable tracings have been obtained or fv + eight tracings have been completed.

4) Check the repeatability of the best two efforts.

   If the FEV1 and FVC values of the best two efforts differ by more than 5%, additional efforts are required, up to a maximum of eight trials.

DRUG TESTING

URINE COLLECTION AND TESTING

1) All urine specimen collections must be performed by a technician who possesses a current DOT Drug Test Collector Certificate.

2) Collection procedures must be consistent with those required under Federal DOT regulations (49 CFR Part 40 and Part 382).

3) On the same day of the appointment, each patient who is required to provide a urine specimen for drug testing must read and complete the County of Los Angeles – Drug Test Notification form. If the patient refuses to sign this form, the collection process is terminated.

4) The patient must not leave the medical facility, even on a temporary basis, or leave the drug collection area, until the drug testing collection procedure is completed.

5) The drug test panel must include the following - amphetamines/methamphetamines, benzodiazepines, barbiturates, cocaine, methadone, opiates, and phencyclidine. The drug test panel must be analyzed using a standard immunoassay screening test. The positive result from the immunoassay test must be confirmed by gas chromatography/mass spectrometry (GC/MS) quantitative techniques. If a drug screening is found positive, the patient has the option to request a test of the split sample from the original specimen by a County-contracted qualified laboratory.

6) The patient must provide enough urine (about ¼ cup) so that the sample can be divided into two bottles. Both specimen bottles must be sealed in the patient's presence. The specimen must be transported to a certified drug testing laboratory in a timely manner. The laboratory will unseal the first bottle and will use that specimen to conduct the drug test.

7) For additional information, refer to the Statement of Work.

BREATH ALCOHOL TESTING

The patient will be required to breathe into a breath alcohol device to determine their blood alcohol concentration (BAC) at the time of testing.

VISION TESTING

REMOVAL OF CONTACT LENSES

To ensure accurate measurement of uncorrected far acuity, contact lenses must be removed at least 30 minutes prior to vision testing. If necessary, patients must be provided with clean single use containers and saline solution to temporarily store their lenses.

FAR ACUITY CHART TEST

The County requires contractors to use only visual acuity charts which meet, or exceed, the ANSI Z80.21 (2020) standard. The Bailey-Lovie chart and the ETDRS chart both meet this standard.

SET-UP OF TESTING AREA

Lighting: The chart should have relatively even luminance (brightness) across its surface. Luminance should be 160 cd/m2, with an acceptable range between 80-320 cd/m2 (25-100 foot-candles). In an otherwise darkened room, a 100-watt light bulb in an auxiliary lamp holder at about 2.5 feet from the chart should provide this luminance level. However, illumination within this range must be confirmed with a light meter. Most fluorescent lit rooms, unless they are highly lit, will require some auxiliary lighting to accomplish 160 cd/m2.

Layout: The testing area must provide sufficient viewing distance for the chart. The testing line for the proper positioning of the patient must be marked on the floor.

Chart Storage: The chart face must be kept covered or non-visible at all times when not in use. This is necessary to prevent inadvertent reading by applicants prior to testing.

TESTING PROCEDURES

1) Monocular testing must precede binocular testing. Care must be taken to prevent the patient from inadvertently viewing the chart binocularly.

2) Uncorrected acuities must be measured before corrected acuities. Care must be taken to prevent the patient from inadvertently viewing the chart with correction.

3) Carefully inspect the patient's eyes to ensure that contact lenses are not worn during uncorrected testing.

4) Inform the patient that they must not squint during the testing. Observe the patient's eyes during the entire testing period to ensure compliance. Use a hand-held small copy of the chart for scoring, so that it is not necessary to turn away from the patient to glance at the wall chart.

5) An occluder must be used by patients undergoing monocular testing. The occluder can simply be an index card which is held by the patient.

6) Ask the patient to read progressively smaller lines until they make one or more errors on a given line.

SCORING

1) Scoring shall be recorded on a separate scoring sheet. The name of the technician who administered the test must be documented.

2) The patient's score is the line on which all letters were read correctly plus the number of letters read correctly on the next most difficult line. For example, if the patient properly read the entire 20/30 line and two additional letters on the 20/25 line, the score would be 20/30+2.

HRR COLOR VISION TEST

SET-UP OF TESTING AREA

Testing must be done in a room whose only light source is the illumination provided by a Richmond Products True Daylight Illuminator (with slant easel) utilizing a single Verilux F15T8VIX 15w tube. Room lights shall be turned off so that most extraneous light is eliminated.

TESTING PROCEDURES

1) Prior to entering the testing room, carefully inspect the patient's eyes to ensure that colored contact lenses (such as a red X-Chrom lens or similar) are not worn during testing. Additionally, use of tinted glasses (such as the Color-Max or similar) is not permitted.

2) Seat the patient so that their eyes are about 30 inches from the test book when it is placed on the easel of the Illuminator.

DEMONSTRATION PLATES (1-4):

1) Show the first plate in the sequence and then say:

   "I am going to show you four pages that are for practice only. They are not part of the test. Each page may have colored symbols or be empty. These symbols may appear in any of the four corners of the page. Without touching them, tell me how many do you see?

   "Where are they?" Please trace the symbols that you see with this brush.

2) Show the second demo plate and then say:

   "How many colored symbols do you see here?"

   "Please trace them with the brush."

3) Repeat these instructions with the third and fourth demo plates.

4) After the fourth plate, say:

   "The test itself is made up of just these three symbols, an "X", an "O", or a triangle, with two symbols, one symbol, or no symbols on a page. Some of them will be harder for you to see as they may be less strong in color.

   "It is important for you to tell me immediately how many symbols you see, and you cannot change your answer. Also, if you do not give me an answer within 3 seconds, I will have to turn the page.

   "*Do you understand the instructions" Do you have any questions*?"

TEST PLATES

"OK, we are now ready to start the test."

Turn to the first test plate and proceed.

"How many colored symbols do you see here?"

"Please trace them with the brush."

If the patient responds within 3 seconds, then record the response (using X, O, ►) in the box provided for on the scoring sheet, recording the exact symbols seen in the location indicated by the patient.

Remember: It is important to obtain an **IMMEDIATE** response (within 3 seconds) as to the number of symbols seen. No revision of the patient's opinion on this point is allowed. If no response in 3 seconds, then turn the page and mark "NR" on score sheet.

SCORING

1) An error is any omitted figure, an incorrectly identified figure, or a figure placed in the wrong quadrant.

2) Individual responses on the County-customized scoring sheet must be organized into test plate number sequence using the manufacturer provided scoring sheet. This additional step is required because the order of presentation of the test plates are randomized to ensure that examinees are not advantaged by prior experience with the test. Scoring to determine the presence and severity of color vision deficiency is completed following the manufacturer's instructions.

TITMUS SIGNAL LIGHT COLOR VISION TEST

TESTING PROCEDURES

1) Carefully inspect the patient's eyes to ensure that colored contact lenses (such as a red X-Chrom lens or similar) are not worn during testing. Additionally, use of tinted glasses (such as the Color-Max or similar) is not permitted.

2) Ask the patient to identify the colors on each of the four rows or columns on the Titmus slide SCI-1. Start with a row or column other than the first one to prevent memorization. Also, consider asking the patient to name the colors from right to left, or bottom to top.

3) Record the answers on either the LA County Titmus form with Signal Lights (contact OHP for a copy) or an equivalent form that clearly shows which targets were not correctly identified.

4) Do not administer this test more than once.

SCORING

A passing score is 16/16 correct.

EQUIPMENT CALIBRATION AND MAINTENANCE

Audiometer: Calibrations must be consistent with the requirements of Sec. 5097(f) of Cal/OSHA G.I.S.O. which mandate daily functional (biological) checks, annual acoustic checks, and a biannual exhaustive calibration.

Audiometric booth: Background sound pressure levels shall be measured at least every five (5) years, and shall not exceed those listed in Table C-1 of Appendix C in Sec. 5097 of Cal/OSHA G.I.S.O.

Spirometer: Accuracy checks shall be done at least daily when the spirometer is in use. Three liters (L) of air must be injected at three different speeds (6 L/sec for 1 second, 1 L/sec for 3 seconds, and 0.5 L/sec for 6 seconds). An acceptable spirometer response to each injection is a value between 2.90-3.10L. Calibration syringes must be checked for leakage monthly.

Sphygmomanometers: Aneroid devices must be checked annually for leaks, incorrect zero, and calibration. Mercury devices must be checked annually for leaks, oxidation, and proper functioning of the mercury column. Both must give readings that are no more than 3 mm difference from the reference device at 100 and 150 mmHg.

ECG: Must be checked annually for electrical safety, and proper paper speed, and tracing size.

Treadmill: Must adhere to the manufacturer's recommended periodic maintenance schedule.

Scales and Stadiometers: Equipment with digital components must be checked annually for accuracy.

All annual and biannual maintenance, calibration, and accuracy checks must be completed by an independent medical equipment professional who shall provide the Contractor with a written report.

Maintenance, calibration, and accuracy check records shall be kept for the duration of the contract and shall be provided to the County upon request.

SPECIAL RADIOGRAPHIC STUDIES

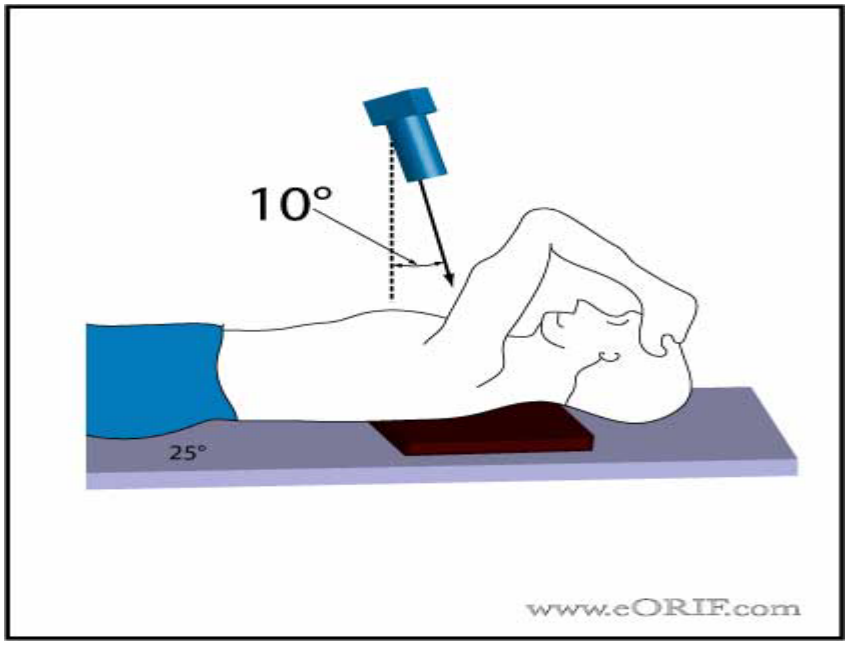
The purpose of this section is to provide contractors with references for less commonly used radiographic techniques for work fitness evaluation.

SHOULDER: STRYKER NOTCH VIEW

The purpose of this view is to determine if the patient has a Hills-Sach's compression fracture which would be indicative of a past shoulder dislocation.

- Position: Patient supine with cassette posterior to the shoulder. The hand placed on top of the head. The elbow should point straight upward.

- Beam directed 10° superiorly/toward the head, centered over the coracoid process.



(Hall RH, JBJS 1959;41-A:489-94)