Our City, Our People, Our Duty

North Las Vegas Fire Department

Firefighter Trainee and Firefighter/Paramedic Recruitment 2008

Fitness Assessment Protocols

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Recommended Physical Training for Improvement of Fitness Levels

This program was developed in partnership with University of Nevada – Las Vegas Office of Research and Development for Firefighter Wellness and Fitness

NOTE: The City of North Las Vegas and the University of Nevada – Las Vegas Office of Research and Development for Firefighter Wellness and Fitness assumes no responsibility or liability in the participation of any of the fitness testing routines recommended in this document. The information supplied is educationally-based and provided to assist healthy adults achieve improved levels of performance as measured by each of the tests. Any fitness routine should be initiated only following clearance from your own licensed medical specialist.

NLVFD Firefighter Trainee and Firefighter/Paramedic Fitness Assessment Protocols and Recommended Physical Training for Improvement of Fitness Levels

The guidelines below are the protocols for the fitness assessments for NLVFD Firefighter Trainee and Firefighter/Paramedic candidates. Additional information about each of the four tests can be obtained by contacting the listed source for each [1, 2]. These protocols are provided to you as an opportunity to review the assessments and be able to practice/prepare prior to your actual testing date. The minimum acceptable thresholds for each activity are noted in **BOLD CAPS** under each assessment [3]. Following these protocols is information on recommended methods for improving your fitness. Utilizing the recommendations along with conducting self-assessments using the protocols below may assist you in overall performance during the test.

1 – Tests selected are consistent with tests and categories established by IAFF / IAFC Wellness and Fitness Initiative and with NFPA Standard 1582.
2 – All tests have been nationally validated and are considered reliable.
3 – Set by North Las Vegas Fire Department Firefighter and Administrative Personnel, December 2007

Aerobic Capacity

Equipment: A) A step, bench, or bleacher step that is 16.25 inches from ground level, B) a stopwatch, clock, or watch with a second hand, and C) a metronome or similar cadence device.

Preparation: Before beginning the test, practice stepping up onto and down from the step. Each step has four beats: up-up-down-down. The metronome set for a rate of 96 beats per minute, or 24 steps per minute, for men; and a rate of 88 beats per minute, or 22 steps per minute, for women.

Instructions:

1. Warm up before taking the test. Walking or an easy jog, and then stretch.
2. Set the metronome at the proper rate. An assistant should call out starting and stopping times.
3. Begin the test and continue to step at the correct pace for 3 minutes.
4. Stop after 3 minutes. Sit down on the bench / step and immediately count your pulse for a 15-second period then multiply by 4 to obtain your heart rate.

THE PASSING THRESHOLD FOR AEROBIC CAPACITY IS A MAXIMUM OF:

164 bpm (males)[4] **128 bpm** (females)[4]

Source: Fahey, T.D., Insel, P.M., & Walton, T.R. (2003). *Fit and Well: Core Concepts and Labs in Physical Fitness and Wellness* (5th ed.). Boston: McGraw Hill.

4 – The heart rate is measured immediately following the test. The beats per minute (bpm) value calculates to a minimum of 42.00 ml/kg/min VO_2 maximum estimate. BPM value minimums are different due to cadence differences between the men's and women's test.

Abdominal Endurance

Equipment: A) Stopwatch or clock with a sweep second hand to time the sit-ups and B) a mat.

Instructions:

1. Assume a supine position (on back - face up) on the floor, the knees bent at right angles (heels about 18 in. from the buttocks) and fingers next to the ears. A partner should hold the ankles firmly for support.
2. At a "go" signal from the partner, perform as many correct sit-ups as possible within a 1-minute period. The elbows should alternately touch the opposite knee as the participant comes into the up position. The partner should maintain the count. After each up movement return to the supine position before going up again; shoulders must be returned to touch the mat, but the head need not touch.
3. Score the number of repetitions in 1 minute.

THE MINIMUM PASSING THRESHOLD FOR ABDOMINAL ENDURANCE IS 40 SIT-UPS IN ONE MINUTE

Source: Golding, L., Myers, C.R., and Sinning (1989) Y's *Way to Physical Fitness* (3rd edition). Champaign: Human Kinetic

Upper Body / Arm Muscular Endurance

Equipment: Mat or towel (optional)

Instructions:

1. Push-ups: Start in the push-up position with your body supported by your hands and feet. Your arms and your back should be straight and your fingers pointed forward.
2. Lower your chest to the floor with your back straight, and then return to the starting position.
3. Perform as many push-ups as you can without breaking rhythm. The count ends when the *rhythm of the exercise changes* (usually slows down), NOT at exhaustion.

THE MINIMUM PASSING THRESHOLD FOR UPPER BODY / ARM MUSCULAR ENDURANCE IS 40 PUSH-UPS

Source: Fahey, T.D., Insel, P.M., & Walton, T.R. (2003). *Fit and Well: Core Concepts and Labs in Physical Fitness and Wellness* (5th ed.). Boston: McGraw Hill.

Back / Hamstring Flexibility

Equipment: Use a modified Wells and Dillon flexometer or equivalent manufactured "sit and reach" device. (See Flexibility Testing Apparatus Options Below)

Preparation: Warm up muscles with a low-intensity activity such as walking or easy jogging followed by slow stretching movements for each leg and the lower back.

Instructions:

1. Remove shoes and sit facing the flexibility measuring device. Knees are fully extended and your feet flat against the device about 10 centimeters (4 inches) apart.
2. Reach as far forward as possible, with palms down, arms evenly stretched, and knees fully extended: hold the position of maximum reach for about 2 seconds.
3. Perform the stretch 3 times, recording the distance of maximum reach to the nearest 0.5 centimeters.

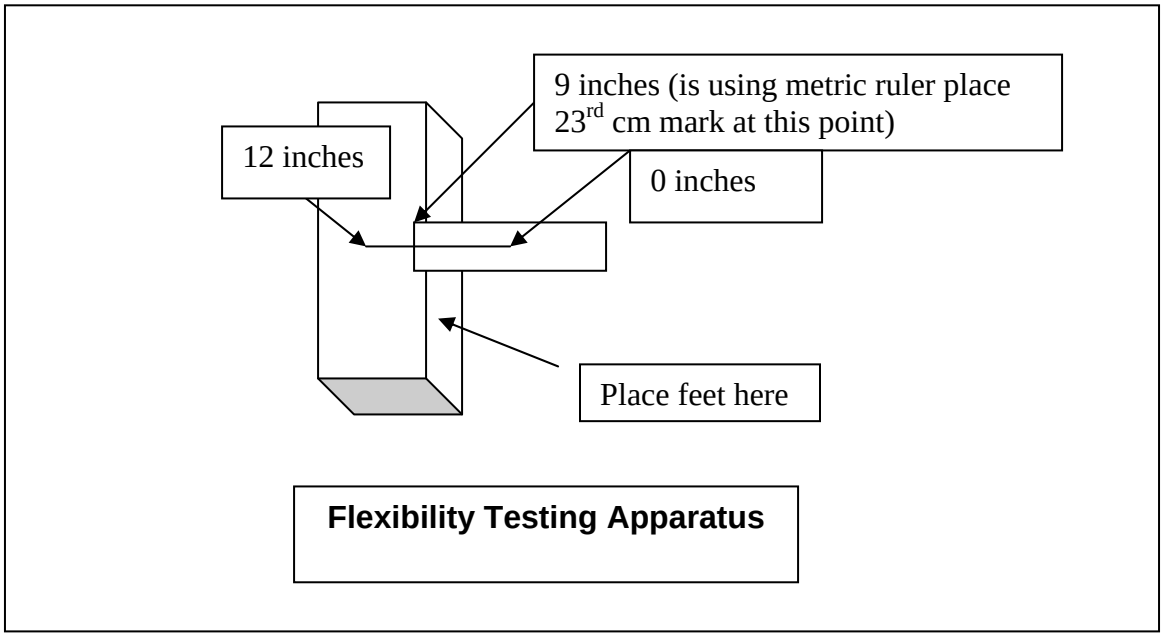
THE MINIMUM PASSING THRESHOLD FOR BACK / HAMSTRING FLEXIBILITY IS 30 CENTIMETERS 0R 11.8 INCHES (SEE BELOW)

Source: Fahey, T.D., Insel, P.M., & Walton, T.R. (2003). *Fit and Well: Core Concepts and Labs in Physical Fitness and Wellness* (5th ed.). Boston: McGraw Hill.

Flexibility Testing Apparatus Options (see figure below)

1. Find a sturdy cardboard box at least 12 inches tall. Turn the box so that the bottom is up. Tape a yardstick to the bottom. The yardstick must be placed so that the 9-inch mark is exactly in line with the vertical plane against which the subject's feet will be placed and the 0-inch end is nearer the subject.

2. Find a bench that is about 12 inches wide. Turn the bench on its side. Tape a yardstick to the bench so that the 9-inch mark is exactly in line with the vertical plane against which the subject's feet will be placed and the 0-inch end is nearer the subject.



Flexibility Testing Apparatus

Recommended Physical Training For Improvement of Select Fitness Level Components

To improve identified "less than desirable" scores in aerobic capacity (as measured by the step test), upper body muscular endurance (as measured by the push ups test), abdominal muscle endurance (as measured by the bent leg sit ups test), and / or back and hamstring flexibility (as measured by the sit and reach test), the workouts listed below should be completed at least 3 days per week. **Caution: for reasons of safety, at least one day per week should be a rest day (i.e. Saturday or Sunday).** A 20-minute lower body flexibility routine can be done on the designated "rest day". Additional internet based informational resources are included for your use.

Test	Ways to Improve
Step Test (measures aerobic capacity)	• Dumbbell step ups (using a 20 – 24" bench / step). Dumbbell weight should be 15 – 20 pounds with weight increasing over time. • Squats; 3 sets of 12 reps. Start with 60% of 1 RM increase to 80%. (SEE BELOW FOR INFORMATION ON 1 RM) • Walking Dumbbell Lunges; 20' distance 6 "cycles", dumbbell weight should be at 15 – 20 pounds, may be increased over time. • Cardio workout using either stationary bicycle or running. Maintain target heart rate at 70% of maximum for at least 30 minutes. Can increase to 80% of maximum over time. NOTE: Target heart rate is calculated as follows: 220 minus age = Maximum 70% of maximum = Target Example: 220 minus 20 years old = 200 maximum 200 x .7 = 140 beats per minute ALTERNATE TO STEP TEST (FOR PREPARATION ONLY) • Complete a 1 and ½ mile run in a maximum time of 12 minutes and 30 seconds. American College of Sports Medicine (1995) Guidelines *for exercise testing and prescription* (Philadelphia, PA: Lippencott, Williams and Wilkins) 113-115.

Push ups (measures upper body muscular endurance)	• Weighted push-ups 3 sets to exhaustion; using a spotter, free weight plate placed on the back, start with 25 pounds increase weight by 5 pounds each increase over time. • Bench press using either barbells or dumbbells; 3 sets of 12; start with 60% of 1 RM increase to 80%. (SEE BELOW FOR INFORMATION ON 1 RM)
Sit ups (measures abdominal muscular endurance)	• Medicine ball sit-ups; 3 sets to failure; increase the weight of the medicine ball over time. • Machine (if available) forward crunches 3 sets to failure.
Sit and Reach (measures back / hamstring flexibility)	Notes: Each stretch should be held for at least 30 seconds. Each stretch should be completed twice for each body part e.g. each leg). The following should be followed AFTER a 5 minute warm-up: • Wall-aided calf stretches, wall-aided Achilles stretches, wall-aided outside hip stretches, curb-aided Achilles stretches, knee to chest standing hamstring stretch, table-aided bent-leg hamstring stretch, table aided straight-leg hamstring stretch, isolated leg toe-touch stretch, squat lower back stretch, prone position single leg to chest, prone position both legs to chest, prone position elongation stretch. NOTE: The following link provides useful information and illustrations for proper stretching techniques. http://orthoinfo.aaos.org/topic.cfm?topic=A00310

1 RM (one repetition maximum)

1 RM is the abbreviation for one repetition maximum. This is associated with using weights during your physical training activities. When you can only do one repetition of the weight, you have reached your repetition maximum (1 RM).

To determine your 1 RM, it is best (from a safety perspective) to work with a spotter. Start with a light weight warm-up of the target muscle group(s). Start with a weight below what you estimate to be your maximum capacity to "lift" and attempt at least 5 reps of that weight. If successful, add additional weight, wait at least 2 minutes for muscle recovery, and then try again. Make sure you are using correct form!

NOTE: For power movements, those activities that utilize more than one muscle group (e.g. squats), you can add 20-30 pounds between attempts. For isolator movements, those activities that focus on one muscle group (e.g. leg extension), add 10 to 20 pounds between attempts.

1RM Sample

If you have safely determined that your maximum strength for 1 repetition of a bench press is 220 pounds, to calculate 60% of that weight, the chart provided shows that 60% of 220 pounds is 132 pounds. On the same chart, 80% of 220 pounds is 176 pounds. (SEE EXAMPLE TABLE)

1 RM Weight Conversion Example

Percent of Weight **Weight**	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
210	105	116	126	137	147	158	168	179	189	200
220	110	121	132	143	154	165	176	187	198	209
240	120	132	144	156	168	180	192	204	216	228

1 RM Weight Conversion Table

Percent of Weight **Weight**	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
20	10	11	12	13	14	15	16	17	18	19
30	15	17	18	20	21	22	24	26	27	29
40	20	22	24	26	28	30	32	34	36	38
50	25	28	30	33	35	38	40	43	45	48
60	30	33	36	39	42	45	48	51	54	57
70	35	39	42	46	49	53	56	60	63	67
80	40	44	48	52	56	60	64	68	72	76
90	45	50	54	59	63	68	72	77	81	86
100	50	55	60	65	70	75	80	85	90	95
120	60	66	72	78	84	90	96	102	108	114
140	70	77	84	91	98	105	112	119	126	133
160	80	88	96	104	112	120	128	136	142	148
180	90	99	108	117	126	135	144	153	162	171
200	100	110	120	130	140	150	160	170	180	190
210	105	116	126	137	147	158	168	179	189	200
220	110	121	132	143	154	165	176	187	198	209
240	120	132	144	156	168	180	192	204	216	228
250	125	138	150	163	175	188	200	213	225	238
260	130	143	156	169	182	195	208	221	234	247
270	135	155	162	181	189	203	216	230	243	257
280	140	154	168	182	196	210	224	238	252	266
290	145	160	174	189	203	218	232	247	261	276
300	150	165	180	195	210	225	240	255	270	285
310	155	171	186	202	217	233	248	264	279	295
320	160	176	192	208	224	240	256	272	288	304
330	165	182	198	215	231	248	264	281	297	314
340	170	184	204	221	238	255	272	289	306	323
350	175	293	210	238	245	263	280	298	315	333

NOTE: To determine the appropriate percentage of weight above 350 pounds, look at a weight that is half the value of the desired weight and double the suggested percentage in that row.

For example, if the user desires to know 80% of 480 pounds, look at the row that lists 240, find the 80% column and double that value (2 x 192) to determine 384 pounds is 80% of 480 pounds.

Wellness and Fitness Website Resource List

Isometric (calisthenics) exercise routine for 20 minutes	Donatelle, R.J. (2004). Access to Health. San Francisco: Pearson Benjamin Cummings. (page 308-309). Fahey, T.D., Insel, P.M., & Roth, W.T. (2003). Fit & Well: Core Concepts and Labs in Physical Fitness and Wellness. Boston: McGraw-Hill.
Abdominal (core muscle group) workout	American Council on Exercise Fit Facts: http://www.acefitness.org/fitfacts/fitfacts_display.cfm?ItemID=129 Quinn, E. Core stability training. *Sports Medicine.* http://sportsmedicine.about.com/cs/conditioning/a/aa052002a.htm
Ball Sports for 20 minutes	http://www.cdc.gov/nccdphp/dnpa/physical/recommendations/adults.htm The Presidents Council on Physical Fitness and Sports. http://www.fitness.gov/adults.htm
Bike Riding (workout)	http://healthlink.mcw.edu/article/908757695.html American Council on Exercise Fit Facts: http://www.acefitness.org/fitfacts/fitfacts_display.cfm?itemid=85 and http://www.acefitness.org/fitfacts/fitfacts_display.cfm?ItemID=75
Challenge Hiking for 30 minutes	http://www.cdc.gov/nccdphp/dnpa/physical/recommendations/adults.htm American Council on Exercise Fit Fact: http://www.acefitness.org/fitfacts/fitfacts_display.cfm?ItemID=68
Home-based fitness equipment workout for 20 minutes.	American Council on Exercise Fit Fact: http://www.acefitness.org/fitfacts/fitfacts_display.cfm?ItemID=50 Health Status: The benefits of home exercise. http://www.healthstatus.com/health_fair_exercise.html
Rock Climbing for 30 minutes	American Council on Exercise Fit Fact: Battling Boredom. http://www.acefitness.org/fitfacts/fitfacts_display.cfm?ItemID=18 Yahoo! Health Fitness Center: http://health.yahoo.com/health/centers/fitness/4013
Stretching	Fahey, T.D., Insel, P.M., & Roth, W.T. (2003). Fit & Well: Core Concepts and Labs in Physical Fitness and Wellness. Boston: McGraw-Hill. (page 124-128). Anderson, B. (2000). Stretching, 20th Anniversary Edition. Bolinas, CA: Shelter Publications, Inc.
Video – exercise routine for 20 minutes minimum	American Council on Exercise Fit Fact: http://www.acefitness.org/fitfacts/fitfacts_display.cfm?ItemID=125 American Heart Association, Physical Activity in Your Daily Life. http://www.americanheart.org/presenter.jhtml?identifier=2155
Walking (aerobic) for 30 minutes	American Council on Exercise Fit Facts: http://www.acefitness.org/fitfacts/fitfacts_display.cfm?ItemID=96 and http://www.acefitness.org/fitfacts/fitfacts_display.cfm?ItemID=37
Weight Training for 20 minutes (minimum)	Fahey, T.D., Insel, P.M., & Roth, W.T. (2003). Fit & Well: Core Concepts and Labs in Physical Fitness and Wellness. Boston: McGraw-Hill. (page 80-81). American Council on Exercise Fit Fact: http://www.acefitness.org/fitfacts/fitfacts_display.cfm?ItemID=78

Aerobics-based class - group (60 minutes)	American Heart Association. Rhythms and moves for healthy hearts. http://www.americanheart.org/presenter.jhtml?identifier=3008924 ShapeFit.com http://www.shapefit.com/aerobics.html
Road Race (minimum distance of 5K)	American Council on Exercise Fit Fact: http://www.acefitness.org/fitfacts/fitfacts_display.cfm?ItemID=147 Runner's World Magazine. http://www.runnersworld.com
Rope jumping for 20 minutes	American Council on Exercise Fit Fact: http://www.acefitness.org/fitfacts/fitfacts_display.cfm?itemid=36 Jump Rope for Heart Program. http://www.aahperd.org/jump/index.html
Running / Jogging	American Council on Exercise Fit Fact: http://www.acefitness.org/fitfacts/fitfacts_display.cfm?itemid=83 Runner's World Magazine. http://www.runnersworld.com
Swimming	American Council on Exercise Fit Fact: http://www.acefitness.org/fitfacts/fitfacts_display.cfm?ItemID=77 American Heart Association. Tips for exercise success. http://www.americanheart.org/presenter.jhtml?identifier=2218
Triathlon	Runner's World Magazine. http://www.runnersworld.com www.usatriathlon.com
Workout for 30 minutes	American Council on Exercise Fit Facts: http://www.acefitness.org/fitfacts/fitfacts_display.cfm?ItemID=96 and http://www.acefitness.org/fitfacts/fitfacts_display.cfm?ItemID=37