

# Testing Ladders -- Compliments of DUO Safety Ladder Corp.

## HOW TO TEST YOUR LADDERS

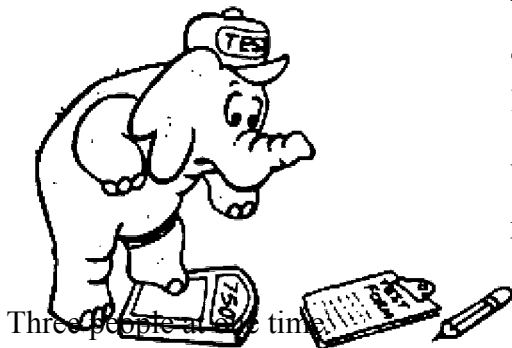
**Suggestions:** How to start a ladder testing program. Remember if your ladders are O.K., service testing, as required by N.F.P.A.-1932 **are** not destructive. The only ladders that will not be able to pass the N.F.P.A.-1932 tests are ladders you should not be using in the first place. Fire service ladders are assumed to be able to safely support a 750 lb. working load with a 4:1 safety factor. Industrial ladder equipment uses a maximum load of 300 lbs. with a 4:1 safety factor. Surely, the fire service ladders can handle **at least twice** that load.

## ARE YOU SURE?

The only way you and your department can be absolutely sure your ladders are safe to use at 750 lbs. is to test.

**Why 750 lbs.?** What does this mean?

Any ladder with a 750 lb. capacity and a 4:1 safety factor as required by N.F.P.A.-1932 can be used as follows:



1. Three firefighters with full turnout gear and air packs.
2. Two firefighters and an unconscious victim.
3. Two firefighters and a charged hose.

**4:1 Safety Factor?** What does this mean?

The 4:1 safety factor used in the design and manufacture of ladders today means that the ladder, once in perfect erected position, is really able to support 4 times the 750 lb. specified load. (That is 3,000 lbs.)

**Why such a high load rating?** Seems 3,000 lbs. is a bit higher than needed.

## NO WAY.

The load is a static load only - nothing moving, no shock loads, no dynamic loads. Once a smaller load starts to move on a ladder, the dynamic load increases rapidly. Did you know it is possible for one man to put over a 2,000 lb. load on a ladder by himself? All you have to do is decrease the climbing angle to say, only 45° instead of 75.5° and have the man violently bounce up and down on the ladder. Therefore, when two or three firefighters are moving and working from the ladder, the dynamic loads are way over their simple combined weight. It becomes very obvious that fire service ladders must have at least a 4:1 safety factor to be able to withstand their design loads.

Why does the N.F.P.A.-1932 standard require a **500 lb.** horizontal bend test instead of a **750 lb.** test?

N.F.P.A.-1932 standard recognizes the 750 lb. test requirement in the Design verification part of its standard in N.F.P.A.-1931. this standard is a design verification standard to be used by Ladder Manufacturers only. The service testing standard -N.F.P.A.-1932 uses the 500 lb. test with a pass - no pass permanent set requirement instead of a 750 lb. test which only has to be able to be passed **set in the ladder is allowed**, and after the 750 lb. test is passed, the ladder is destroyed. Therefore, the 500 lb. service test is a ladder test and is not destructive. If your ladder can pass the 500 lb. test, you are assured of at least a 500 lb. capacity with a 4:1 safety factor and probably more, and of course, the test has not destroyed the ladder. If you still think a 500 lb. test is a destructive test, we can only ask . . . What happens to your ladder every time you load it at a fire? It must be rapidly being destroyed?

## **NO WAY.**

Proper use of a properly designed ladder does not hurt it in any way.



### **How can I get a copy of N.F.P.A.-1932?**

Your Fire Department must obtain a copy of N.F.P.A.-1932: Use, Maintenance, and Service Testing of Fire Department Ground Ladders. 1984 Edition.

Item No. M2-1932-84

National Fire Protection Association

Batterymarch Park

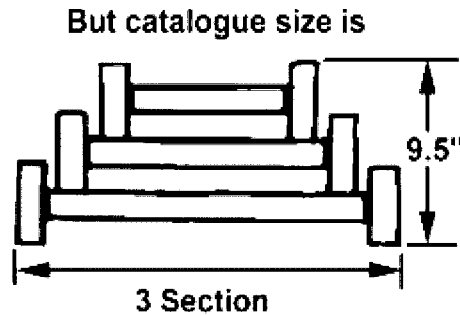
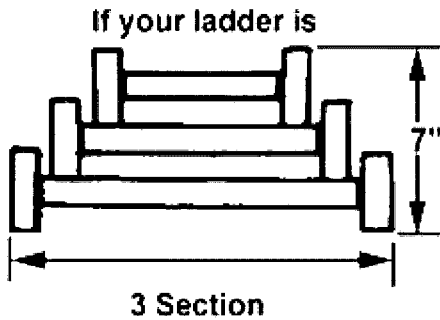
Quincy, MA 02269

After you have received and read your copy of N.F.P.A.-1932 you are ready to start your own (in house) testing program.

### **Think Before You Test**

Ground ladder testing can become an expensive lesson for the unprepared Fire Department. We suggest all departments considering/or preparing to test their ground ladders do their homework before testing any ladders. Because the new N.F.P.A. standard 1932-1984 edition changes many requirements for all fire department ground ladders, it becomes very obvious that some of the ladders manufactured before 1984 may not be able to pass the new required test. The homework we suggest would be to get a copy of the ladder manufacturers present ladder catalogue and check the listed sizes against the sizes you have in service.

If the nested height of your ladder is less than the present nested height in the catalogue for the same length and style of ladder, you can assume yours probably will not pass the tests. We also suggest you check the catalogue for ladder rail sizes. If the catalogue sizes are larger than your rail sizes for the same length and style you probably will not pass the tests.



**you will not pass the test.**

If your homework has shown that you may be in trouble, we suggest you consider removing the fly section from the 3 section models and use the mid and base section only as a 2 section ladder. This 2 section will probably pass the requirements easily. Then put a set of roof hooks and feet onto the fly section and you have saved all of the ladder and can pass the test. Of course, you still do not have as long of a ladder as you started with, but at least you have something you can use, instead of junk.

This homework still may not guarantee your ladder can pass the test, as several other factors can enter into the problem: earlier use, abuse, heat exposure, how often it has been dropped, earlier damages, etc. . . The best suggestion is still to check your nested heights and rail sizes against current production models, and if your ladder can measure up to the sizes, at least you have a good chance to pass the tests.

Think about the problem before you test, you can save yourself a lot of embarrassment and expense if you qualify your ladders before the test program starts.

## **ROOF HOOKS:**

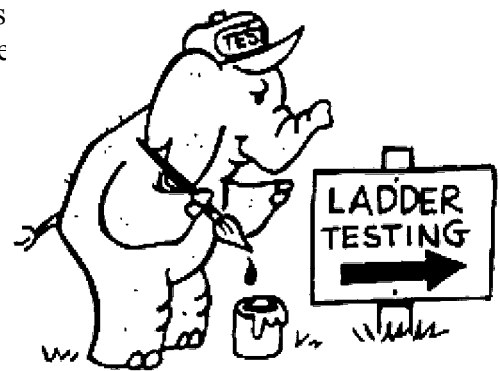
Do not waste the time testing old 5/8" diameter roof hooks. The old standard for roof hooks only called for 1/2 of the load requirement as is now specified. All new roof hooks after 1984 are 3/4" diameter and will meet/or exceed all the new specifications and can easily be retrofitted on your older roof ladders.

We suggest you budget for/or replace your roof hooks as time allows  
If you insist upon testing them at once, you can replace them all at the same time.

We hope our comments and suggestions help your department save time, money, and most important - some ladders.

## **LADDER TESTING HINTS:**

1. Do not attempt to test all the ladders in your Department at the same time. Only do one truck set at a time.
2. Attempt to qualify the ladders over 30 ft. in length by nested height of the rails against current production models.
3. The longer ladders are the ones most likely to fail the horizontal bend test.
4. Roof hooks less than 3/4" diameter probably will not pass the roof hook test.
5. Use sand bags for your tests as sand is cheap and soft if it falls.
6. Load the sand bags carefully so the ladder does not tip or twist during the test.



7. Record the test results on a permanent form and keep the test sheets for reference next time.
8. After the tests have been passed, consider the purchase of heat sensor labels for your aluminum ladders for fast visual checking of any possible overheating of the aluminum.
9. Remove all ladders from service that fail the tests and destroy.
10. Testing your ladders is easy once you understand how to go about the job and have the equipment.

## BASIC EQUIPMENT REQUIRED FOR TESTING

1. One pair of strong saw horses (at least 3 ft. high).
2. 20 each - 50 lb. bags of common sand - we suggest any lumber yard and be sure to put the sand bags inside strong plastic garbage bags to stop leakage.
3. Tape measure (your choice).
4. 1" to 2" wide straps - prefer leather, heavy canvas or nylon webbing.  
These straps are used to hang the sand bags from the rungs so all the weight is not in one spot. We suggest nylons traps with a large loop sewed in both ends so the strap is easy to loop around the rungs and then you can hang your sand bags with a loop of rope or a bent steel S hook.
5. Piece of Plywood, ½" thick or so, 32" x 24" to support the sand bags in the horizontal bending test.
6. Your own Forms you have made up to record these results for record purposes. (You may use the form as shown in N.F.P.A.-1932, page #8) or you can make up your own form to suit your needs.

The form used is not as important as the fact that you at least record the test results and actually perform the tests.



## HORIZONTAL BEND TEST

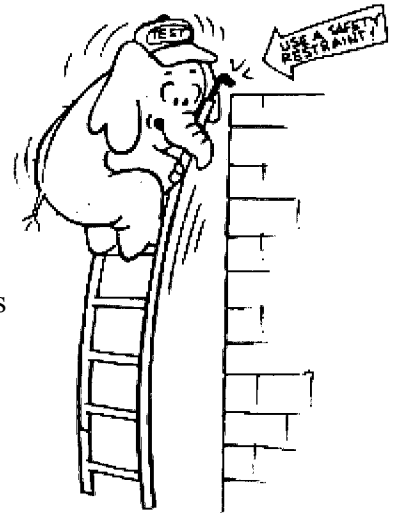
The most important test is the Horizontal Bending Test. This is also probably the easiest one. If the ladder can pass this test, it will almost certainly pass all the rest.

**NOTE:** Hardness tests can only be substituted for the horizontal bend test after the horizontal bend test has been passed at least once. (The alloy can be perfect, but if the rail size is too small, the ladder will never pass the load test required.)

**NOTE:** Folding ladder horizontal bending test under Section 5-2 of N.F.P.A.-1932. All folding ladders are to be tested at 300 lbs. for the horizontal bend test, not 500 lbs. No pre-load required.

## ROOF HOOK TEST

All pre-1984 roof hooks were approximately 5/8" diameter steel hooks and were required to hold 1,000 lbs. per pair. The new post-1984 roof hooks are required to hold 2,000 lbs. per pair. From this, it is obvious that the older hooks will not pass the new requirements. Because of the difficulty and the failure rate on the roof hook test, we suggest you do not do this test unless your roof hooks measure at least 3/4" diameter. In any case, when doing the roof hook test, be sure to use a safety restraint of some sort so the ladder does not get away during the test. (Small diameter roof hooks will bend (open.)



The restraints can be rope, canvas, nylon webbing, a 2" x 4" wood cross enclosure, almost anything, just be sure to restrain the ladder. (Allow some slack for the movement.)

## HARDWARE TEST

The hardware test is meant to test all components of the extension ladder at once. The test load is applied to as many rungs as needed to get the required 1,000 lb load applied. (Be sure the feet or butt spurs are on a soft surface - such as dirt, gravel or plywood **-not smooth concrete.**) The sand bags are again hung from the your straps behind the ladder. This test will show loose feet, loose lock assemblies, loose end caps and/or improper section engagement.

## POMPIER LADDER TEST

Because pompier ladder use is very rare, most Fire Departments can ignore this test. However, if your Department uses pompier ladders, this test should be run. As in the roof hook test, you may use as many rungs as needed to hang your weight. Be sure to restrain the pompier ladder from more than one spot, as lots of side movement will occur as you load your sand bags. Allow **downward** slack in your restraints so the test load can be allowed to work.

Please read and study the N.F.P.A. tests shown in N.F.P.A. -1932 carefully before you start. Test some of your shorter ladders first, to gain experience with the process, and remember, the horizontal bend test is the **most critical test** If you pass the horizontal bend test, you will probably pass all the tests.

Best of luck with your test program.

*Compliments of DUO-SAFETY LADDER CORPORATION*



Copyright © WFR Wholesale Fire & Rescue Ltd.