

# CARE, MAINTENANCE, AND TESTING OF HOT LINE TOOLS



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## INTRODUCTION

Part of our continuing effort here at HASTINGS is to provide you, the customer, not only quality hot line tools but also with the same quality of customer service. It is for this reason that we would like to share our skills and expertise with you regarding the proper care and maintenance of your hot line tools.

As you, the end user, are well aware the technology and manufacturing processes to build hot line tools is constantly improving. We are aware of the fact that some wooden hot sticks are still being utilized.

However, because of increased technology and updated regulations, the emphasis of these remarks will be directly related to the care and maintenance of fiber glass tools and not the older style wooden hot stick.

## NEW TOOL TESTING

Each hot stick that leaves HASTINGS has passed a dielectric test with an electrical gradient of 100KV per foot in accordance with industry standards such as ASTM, OSHA and IEC. In our test facility the glass being tested is monitored by sensitive micro-ammeters during the test which will completely shut down the test equipment if there is either a flash over or if the leakage current exceeds the allowable levels.

An employee must manually remove any piece of fiberglass that fails the test. The failure is then reported to the department supervisor and our engineering department for analysis. The stick may or may not be destroyed during the analysis but it will be destroyed. No stick that fails the dielectric test is used for any reason. Once the manufacturing process has been completed and the hot stick has been packed and shipped, proper care and maintenance is turned over to you.

## FIELD CARE OF TOOLS

In the daily use of your hot stick, precautions should be taken to prevent contamination or moisture build-up. Many of you can probably recall your first day on the line crew when you put a hot stick on the ground and heard – “Hey! Don’t lay that hot stick on the ground!” From that point on you knew that special precautions must be taken in the handling of hot sticks. It might have involved leaning the stick up against your line truck or maybe a nearby tree.

In the event your job involves several hot sticks, a tarp or a tool rack is recommended.

If your hot sticks are still reasonably clean and glossy, a daily inspection and a thorough wiping of the stick to remove dust and other contaminants is still recommended to maintain the dielectric strength of the tool.

## FIELD CLEANING

A silicone treated wiping cloth will do the job of wiping down the stick. By doing this you are also adhering to OSHA Rule 1926.951:Sub-Part V: Tools & Protective Equipment. This rule states

“All live line tools shall be visually inspected before use each day. Tools to be used shall be wiped clean and, if any defects are indicated, such tools shall be removed from service.” This rule is also printed on the package that the silicone cloth is shipped in.

As this stick is being wiped down not only is the dust being wiped off but, by using a silicone treated cloth, a fine silicone film is being deposited on the surface of the stick. This will aid in repelling water and contamination helping to maintain the dielectric properties when the tool is used under wet or adverse conditions.

If the marks or contamination on your hot sticks are more than what can be removed by simply wiping down the stick, a hot stick cleaner wipe should be used. If the contaminants on your hot stick are more than the silicone cloth or cleaner wipe can handle, then we recommend using All Purpose Cleaner.

### COMPLETE CLEANING

Our All Purpose Cleaner can be used on hot sticks, and it is also excellent for cleaning bucket and booms, rigid cover-up, and your rubber goods. This cleaner should be applied with a clean, soft cloth or a sponge. To avoid any waste or possible spillage, the cleaner can be poured into a hand dispenser and then applied. If the contaminants on your sticks cannot be removed with the cloth or sponge, then a non-metallic cleaning pad should be used. Once again, spray your stick with cleaner and, just as you used your cloth or sponge; repeat the cleaning procedure with the non-metallic pad. The All Purpose Cleaner is already pre-mixed for your use.

Based on your needs, it may be to your advantage to use this same All Purpose Cleaner in the concentrate form. The concentrate can be purchased by the gallon, 6-gallon case, or 5-gallon drum. A 6-pack of concentrate is also available. The mixture of the concentrate is 20 parts water to one (1) part concentrate. If your cleaning task is a large one, you can see that the All Purpose Cleaner Concentrate would certainly be to your advantage.

One final note to mention is that the HASTINGS All Purpose Cleaner is: bio-degradable, non-toxic, non-alkali, non-acid, non-flammable, and gentle to the skin. Ventilation is not required with this cleaner. Also, we can provide, upon your request, a Material Safety and Data Sheet (MSDS) for any of the cleaning agents we supply.

### WAX

After thorough cleaning with the non-abrasive cleaning pad, fiber glass wax should be used to restore and retain the surface gloss on your stick. A glossy surface is required on all hot line tools in the event they are used under wet or rain conditions. A glossy surface makes moisture “bead up” and eliminates a potential blanket effect on the surface.

Once you have used the non-abrasive cleaning pad, we recommend two (2) coats of Hot Stick, Boom, and Bucket Wax be applied. This high grade Carnuba wax will slow down the buildup of contaminants not only on your hot sticks but also on your fiber glass booms and fiber glass buckets. Precautions should be taken, however, to avoid any wax build-up. Waxing should only be done on a clean stick in good conditions.

## REFINISHING

After extended periods of use and because of nicks, scratches, scrapes, and exposure to the elements, general wiping off and cleaning may not improve the outward appearance of your hot sticks. Unless the tool is mechanically damaged, this is not a reason to discard it for a new one.

The use of a refinishing kit can restore the finish to new condition with little effort. Because it takes a minimum drying time of 24 hours when using the refinishing kit, downtime on rainy days or inclement weather would be excellent opportunities for refinishing your hot sticks. The HASTINGS Epoxy Refinishing Kit is a two-part system (parts A and B) that is mixed in two equal parts. It is available in “clear” for hot line tools and “white” for refinishing buckets and booms that are also white. The kit comes complete with sand-paper, the two-part mixture, and thinner (to use if necessary for thinning and to clean your brush when finished.)

For the best results when refinishing your sticks it may be necessary to disassemble them. When removing disconnect heads, hooks, and etc., first drive out any roll pins that may be in the head. More than likely it will be necessary to apply a moderate amount of heat to the end of the stick and fitting. This can be done with a heat gun or portable hair dryer. Once you are able to twist the fitting, pull it straight off. Do not pry or bend so that no damage is done to the stick itself.

Once you have your sticks disassembled, sand-paper is used to remove the old finish along with those surface nicks and scratches. Either dry sanding or wet sanding is acceptable.

After sanding the stick thoroughly to remove all dents, scratches, and nicks, clean and dry the stick to remove any dust or other contaminants using a lint-free cloth. A final wiping with a lint-free cloth and a spray cleaning solvent will remove any potential residue.

Once all of your sanding and cleaning has been completed, you are ready to mix parts A and B to begin refinishing:

1. Measure out and mix equal parts of both A and B.
2. Be sure this mixture is thoroughly stirred and directions are followed accordingly.
3. Once mixed, the epoxy finish should be used within a few hours or the hardener in the epoxy will start to setup. (The shelf life of the epoxy kit is indefinite before mixed, as long as the lids are kept on tightly.)
4. A coat of epoxy is now applied to the full length of the tool being refinished. After each coat the tool is then allowed to dry for 24 hours.
5. If desired, additional coats may be applied for a long lasting finish, but they can only be applied after each “24 hour drying period.”
6. This epoxy coating leaves few or no brush marks and provides a hard, tough, moisture-resistant high gloss finish of high dielectric strength and is easily cleaned.

As previously mentioned, this refinishing kit works equally well with aerial devices; such as, buckets and fiber glass booms. Your safety rules, along with the condition of these units will dictate how often this refinishing should be done. Your hot sticks, booms, and buckets are your means of protection – the same as your rubber gloves and sleeves. They should be maintained in first class condition.

Once your epoxy refinishing process has been completed, we again recommend that you apply two (2) coats of Hot Stick, Boom, and Bucket Wax. This slows down the build-up of contaminants, makes them easier to clean and maintain, and will prolong the life of the fiber glass. Never wax without a thorough cleaning.

An additional product we offer at HASTINGS is our Epoxy Patch Kit. This can be used on those small nicks and scratches that sanding did not eliminate.

**OSHA TESTING REQUIREMENTS**

On January 31, 1994 OSHA published the Final Rule on 29 CFR Part 1910 which contains the paragraph (269 paragraph j) that mandated not only design requirements for Hot Line Tools but also the condition in which they shall be maintained. The enforcement of this rule was stayed until November 1, 1994.

OSHA regulations are available online at [www.osha.gov](http://www.osha.gov). The 1910.269 (j)(2) states:

1910.269(j)(2)

“Condition of tools.”

1910.269(j)(2)(i)

Each live-line tool shall be wiped clean and visually inspected for defects before use each day.

1910.269(j)(2)(ii)

If any defect or contamination that could adversely affect the insulating qualities or mechanical integrity of the live-line tool is present after wiping, the tool shall be removed from service and examined and tested according to paragraph (j)(2)(iii) of this section before being returned to service.

The first two sentences of this section (1910.269 paragraph (j)(2)) on the “condition of tools” are straight forward. The tool shall be wiped clean and inspected prior to use each day, and if any defect is present the tools shall be removed from service. This takes a good common sense practice and makes it the law.

1910.269(j)(2)(iii)

Live-line tools used for primary employee protection shall be removed from service every 2 years and whenever required under paragraph (j)(2)(ii) of this section for examination, cleaning, repair, and testing as follows:

The third section of “condition of tools” is much more controversial. This is the section that contains the language that requires testing on two-year intervals. The controversy is the result of the language in three specific areas. First is the definition of what is a live line tool vs. what is auxiliary equipment. In a conversation with OSHA Washington, we were informed that ladders, auxiliary arms, platform boards and the like are auxiliary equipment and not live line tools. Therefore they are not covered by this rule. If you intend to omit some fiberglass equipment from testing, there will be gray areas that should be worked out between the utilities and the local OSHA compliance officer. Wire tongs would be a good example of a device that could be considered either a tool or auxiliary equipment depending on how it is used.

This raises the second area of controversy, which is the definition of “primary employee protection”. In an effort to prevent the need to test tools, some people are taking the stand that their rubber gloves are their primary protection and that the live-line tools are a secondary means of protection, therefore relieving them from the requirements of this section. After reviewing this with the OSHA compliance officers in Washington, we learned that OSHA does not concur with this position. The issue of the live-line tool touching the worker in areas other than his hands cannot be ignored. Nor can the possibility that other persons such as a contractor may use the same tool be ignored. If it is a live-line tool it can be used for primary employee protection and therefore falls under these test requirements.

The third controversy revolves around the statement that the tools shall be tested “.....unless the tool is made of FRP rod or foam-filled FRP tube and the employer can demonstrate that the tool has no defects that could cause it to fail in use.” Again in an effort to eliminate or minimize testing, some people are hanging their hats on this statement and interpret it to say that the tool only needs to be tested if defects are found during examination. This position doesn’t address the need to “demonstrate that the tool has no defects”. However, there are variations in how the OSHA regulations are enforced. The local compliance officer appears to be the first line of interpretation of the rules which results in the possibility of variations from one utility to another.

A clarification letter addressing these issues will be re-printed following the remainder of 1910.269(j)(2)

1910.269(j)(2)(iii)(A)

Each tool shall be thoroughly examined for defects.

1910.269(j)(2)(iii)(B)

If a defect or contamination that could adversely affect the insulating qualities or mechanical integrity of the live-line tool is found, the tool shall be repaired and refinished or shall be permanently removed from service. If no such defect or contamination is found, the tool shall be cleaned and waxed.

1910.269(j)(2)(iii)(C)

The tool shall be tested in accordance with paragraphs (j)(2)(iii)(D) and (j)(2)(iii)(E) of this section under the following conditions:

1910.269(j)(2)(iii)(C)(1)

After the tool has been repaired or refinished; and

1910.269(j)(2)(iii)(C)(2)

After the examination if repair or refinishing is not performed, unless the tool is made of FRP rod or foam-filled FRP tube and the employer can demonstrate that the tool has no defects that could cause it to fail in use.

1910.269(j)(2)(iii)(D)

The test method used shall be designed to verify the tool’s integrity along its entire working length and, if the tool is made of fiberglass-reinforced plastic, its integrity under wet conditions.

1910.269(j)(2)(iii)(E)

The voltage applied during the tests shall be as follows:

1910.269(j)(2)(iii)(E)(1)

75,000 volts per foot (2461 volts per centimeter) of length for 1 minute if the tool is made of fiberglass, or

1910.269(j)(2)(iii)(E)(2)

50,000 volts per foot (1640 volts per centimeter) of length for 1 minute if the tool is made of wood, or

1910.269(j)(2)(iii)(E)(3)

Other tests that the employer can demonstrate are equivalent.

Note: Guidelines for the examination, cleaning, repairing, and in-service testing of live-line tools are contained in the Institute of Electrical and Electronics Engineers Guide for In-Service Maintenance and Electrical Testing of Live-Line Tools, IEEE Std. 978-198

**Following is a clarification letter (also available online) from OSHA addressing the issues of recurrent testing.**

February 2, 1995

Dear Mr. Peach:

This is in further response to your December 6 letter, requesting clarification of the Electric Power Generation, Transmission, and Distribution Standard, 29 CFR 1910.269. Specifically, you requested clarification of testing required by section 1910.269(j)(2)-Condition of tools.

Paragraph 1910.269(j)(2)(iii) requires that a live-line tool be removed from service and examined and tested according to paragraph 1910.269(j)(2)(iii) when any defect or contamination is present that could adversely affect its insulating qualities or mechanical integrity. Also, paragraph 1910.269(j)(2)(iii) requires (as categorized in the fourth paragraph of the letter) the thorough examination, cleaning, repair, and testing of live-line tools used for primary employee protection on a two year cycle. The performance-oriented Electric Power Generation Standard does not specify under whose direction, that is, the employer, a contracted testing facility or others, the 1910.269(j)(2) activities including examination, cleaning, waxing, repair, refinishing and testing of live-line tools are performed; however, the employer is held responsible for compliance under the Occupational Safety and Health Act. Safety reference sources applicable to these activities include national consensus standards (See Appendix E to Section 1910.269), manufacturer recommendations and other recognized safe working practices of the industry.

The employer must be able to demonstrate to the Occupational Safety and Health Administration, that is, the Compliance Safety and Health Officer (CSHO) during an inspection of the work site, that the aforementioned activities meet 1910.269(j)(2) requirements. The CSHO would determine compliance by inspecting live-line tools at the work site, by looking at available documentation and by interviewing employees who are assigned work involving live-line tools.

By paragraph 1910.269(j)(2)(iii)(C), a test must be performed after the aforementioned two year cycle examination when:

The live-line tool has been repaired or refinished regardless of its composition;

The live-line tool is made of wood or hollow fiberglass reinforced plastic (FRP);

The live-line tool is made of solid or foam-filled FRP tube, unless the employer can demonstrate that the examination has revealed all defects that could cause the live-line tool to fail in use. The employer has to be prepared to demonstrate that integrity has not been compromised, for example, by a contamination that could conduct harmful electrical energy, along the foam-filled portion of a live-line tool.

The test method used must be designed to verify the integrity of the live-line tool along its full working length. Full working length means the entire length of a single piece and the extended length of an adjustable, including telescoping, live-line tool. Live-line tools made of FRP include, singularly or in combination, solid, hollow or foam-filled configurations.

In consideration of the performance-oriented requirement of 1910.269(j)(2)(iii)(D), OSHA intends that an effective testing method be used. The testing method, whether wet or dry, must be designed to verify the tool's integrity under wet conditions. Guidelines for the examination and testing of live-line tools are contained in the Institute of Electrical and Electronic Engineers (IEEE) "Guide of In-Service Maintenance and Electrical Testing of Live-Line Tools," IEEE Std. 978-1984, which is mentioned in the note following paragraph 1910.269(j)(2)(iii)(E)(3) and is listed in Appendix E of the Electric Power Generation Standard. We appreciate your interest in employee safety and health. If we can be of further assistance, please contact Mr. Ronald Davies of my staff, telephone 202-219-8031, extension 110.

Sincerely,

Joseph A Dear Assistant Secretary



## STICK FAILURES

### TYPES OF FAILURES

There are several mechanisms that will cause a fiberglass tool to “fail”. By fail, we mean to have an increased leakage current or to flash-over when subjected to test conditions. The track record for fiberglass tools used in this industry has been outstanding. In talking about failures today we are not stating that the tools would have failed in field use, only that it has or would have failed a specified electrical test.

The required OSHA re-test for live line tools is primarily a test of the surface condition of the tool. Because the surface of the live line tools receives the most abuse from daily work, it makes sense to inspect and test it on a regular basis. The surface will be the first to be scratched, to lose its gloss, to be contaminated by dirt, oil, creosote and moisture. Most but not all of these defects can be detected visually. The majority of sticks that will fail the OSHA test will fail due to the lack of gloss on the surface. Moisture will collect on the surface with “sheeting action” the same as on an un-waxed stick and will provide a direct path for leakage current to follow from one electrode to another. Here we see a “glossy” tool. A tool in this condition will usually pass the OSHA test as water will “bead up” on the surface. However, a visual inspection will not always reveal all defects. The opposite end of the same stick “while appearing glossy” does not pass the electrical test. Water does not bead on the surface as it did on the other end. A stick that fails this type of test can be waxed or refinished, depending on its surface condition, to produce a surface finish that will then pass. Obviously, any conductive material on the surface must also be removed to pass the test.

It is possible to have a live line tool that has been over stressed mechanically to the point that it has cracks in the wall of the fiberglass. These cracks will, according to Murphy, fill themselves with whatever will most adversely affect their intended function. In this case it is moisture from the air. This will increase the leakage of a tool prior to the application of water for the OSHA wet test.

It is also possible to have voids in the foam core due to over stressing, poor repair procedures or even manufacturing defects. We prefer to believe that the latter, while theoretically possible, is the most remote of these possibilities. In the manufacture of foam filled fiberglass tools, a great deal of time and effort is spent in making sure the internal core is properly manufactured, as after it is produced, visual inspections and/or repairs are not possible. In this case, there is a puncture in the center of the stick that has been filled with what appears to be an RTV type of sealant. The internal damage is not readily apparent. Any void internal to the tool, regardless of how it got there, tends to fill with moisture and becomes detectable with a sensitive test. While not required by OSHA, a dry test can be utilized first to detect these types of defects. The magnitude of leakage currents during a dry test must be lower than that of a wet test due to the more subtle nature of the defect. Once detected the tool can then be further inspected, repaired or retired. Waxing or refinishing the outside of a tool such as this would be a waste of time. Trying to determine whether the defect is internal or external with only a wet test would be very difficult.

### TYPES OF TESTS

OSHA requires a 75,000 volt test under wet conditions for fiberglass. The details of how to perform the test and the pass/fail criteria are not contained in the OSHA wording but must be taken from the IEEE 978 guide. This guide gives the requirements for the conductivity of the water, how it is to be applied, and a recommended acceptance criteria of a steady or decreasing leakage current.

In order to develop a portable tester that operated at a voltage and distance other than the OSHA recommended 75,000 per foot, we had to determine how the stick would actually fail under the OSHA setup. The two possibilities were if the tool flashed over prior to 1 minute or if the leakage reading were increasing. After reviewing test data collected over many years of full scale testing, it was observed that flashovers were nearly always preceded by unstable leakage readings, and that these readings occurred with regularity at levels above 200 micro amperes. It is conceivable that problems would result at, or slightly below, 200 micro amperes, however we feel that 200 micro amperes is as close to an exact match for the OSHA requirement (based on leakage current) as one could choose. Since the possibility for error does exist a safety factor should be used, as such we currently recommend that 75 micro amperes be used as the cutoff point for wet test acceptance. This was taken into account in our design and can be seen on the upper scale labeled “wet test” where the red range starts.

Once the acceptance value, based on leakage current, has been established, all that was left to do was to design a tester that will measure leakage current at a reduced voltage and then amplify the current reading to correlate with the full scale voltage values. In other words, the reading the operator receives will be representative of the reading he would have received at 75,000 volts per foot. To provide the capability of a dry test, to check for defects not measurable with the wet test, the tester was equipped with a more sensitive scale, which is selectable from the front panel. While the dry scale appears to be five times more sensitive from the fact that the full scale reading is 40 micro amperes instead of 200 micro amperes, it is actually more than six times more sensitive. This is because the dry readings on the dry scale are referenced to 100KV per foot instead of 75KV per foot. This is the most typical voltage used for dry stick testing by OSHA, ASTM, and IEC to name a few.

One factor that does make portable testers more critical than a full scale test is that the electrode spacing is usually less than one foot. This will enable the tester to detect a smaller defect as it will be a larger portion of the stick being tested. Here we have a 3 inch defect on a 4 foot tool. If we space our electrodes at 12 inches, we will have 9 inches of good pole insulating the 3 inch defect. If we reduce the electrode spacing, the defect becomes a larger percentage of the tool being tested resulting in an increased leakage reading and a more sensitive test. Internal defects can also be detected as they are capacitively coupled with the electrodes. This enables the tester to “see inside” the tool. While some have a hard time accepting that current will flow through good dielectric material to detect the internal defect, it is really no different than what happens on the outside of the tool. There will almost always be sections of good fiberglass surrounding the defects. The capacitive coupling allows these defects to be detected.

While the path of the capacitive current is slightly longer than the straight line surface leakage path, the defect is still readily detectable. As the diameter of the tool increases the current path may also increase. If the diameter gets larger, or the defect gets further from the outside, the change in the length of the leakage path can become excessive when compared to the length of the straight line leakage path across the surface. For this reason, it is desirable for the distance between the electrodes to be at least twice the diameter of the tool being tested. Since most hot line tools are 3 inch diameter or smaller, we designed our tester to have an electrode spacing of 6 inches. The electrode spacing may not be apparent if you only examine the outside of a portable tester.

While a full scale test is always an option, there are several disadvantages associated with it. As we mentioned earlier, the resolution with electrodes spaced one foot apart is less than the resolution with closer spaced electrodes. But larger problems are associated with the elevated voltage levels. Metering is more of a problem as the higher voltage also results in more energy being available should the tool flash over. Since the current is being monitored, the flash over will take its toll on the meter. There are various schemes to protect the meter and all I will say about that is that some of them will work some of the time. Even if you don't blow your meter, you will most certainly be putting the tool at risk.

We have heard from several customers who have ruined tools by flashing them over due to poor surface finishes. These tools could have been waxed or refinished to make them serviceable again but because of the power unleashed at the instance of flash over, the tool was burned and/or small fiberglass slivers were blown out in the vicinity of the electrodes, making a major repair or retirement of the tool necessary. One customer now uses a portable tester to screen his tools prior to full scale testing.

Operator safety, convenience, and the time to complete the test are also more of a problem with full sale testing.

When talking about full scale testing, we believe that the choice of A.C. or D.C. is more of an operator preference. Both have advantages and disadvantages. When a reduced voltage is used, we feel it is necessary for the applied voltage to be A.C.. To produce a leakage current when there is not a solid conductive path between the electrodes, we need the capacitive effect offered by A.C. to get the most critical test results. This also allows us to "see" inside the fiberglass and to detect problems that are insulated from the electrodes by good fiberglass. D.C. will not allow this. As I mentioned earlier it is important to keep the electrode spacing as close together as possible for maximum surface sensitivity. For maximum internal sensitivity it is important not to reduce the spacing below twice the diameter of the tool being tested.

If you want additional information on the tester that was designed not only to meet the OSHA rules but to give you additional information about the quality of the tools being tested, please contact us.

Our purpose at HASTINGS is to serve you, the customer, in the best manner possible and to provide for your needs. Please do not hesitate to contact our factory representative in your area or the factory for any of your needs. Our research and development talents and manufacturing capabilities are available to you from concept to the finished product.

Thank You.



6799

**HOT STICK TESTER**

- Test hot sticks wet or dry. The tester has a selector switch for wet or dry tests and a dual range scale which gives the operator leakage current values in micro amps.
- Utilizing a 2,500 volt output, the meter is calibrated to indicate the leakage values that would be present if 75KVAC were applied to a 12” section of the fiberglass tool for the wet test and 100KVAC per foot for the dry test.
- Portable and lightweight for easy use. Two models available 120 volt or 220 volt systems. The tester is designed to protect the operator while in use.
- The tester comes complete with a padded carrying case and directions for proper use. A testing bar is also provided to ensure the tester is working properly.
- Application and training video included with purchase.

CAT NO	DESCRIPTION	LBS
6799	HOT STICK TESTER COMPLETE WITH CARRYING CASE AND TEST BAR OPERATES ON 120 VOLT SYSTEM	5.3
6781	HOT STICK TESTER COMPLETE WITH CARRYING CASE AND TEST BAR OPERATES ON 220 VOLT SYSTEMS	8.2

## HASTINGS HOT STICK TESTER

### Catalog No. 6799

The HASTINGS Hot Stick Tester is designed to test sticks according to the new OSHA 29 CFR Part 1910 Standards.

The OSHA regulations require a test of 75KV per foot of length for 1 minute under wet conditions.

They (OSHA) also reference IEEE 978-1984 as a guideline for the examination, cleaning, repairing, and in-service testing of live-line tools.

IEEE 978 lists a variety of ways to test tools. One method outlined in section 5.3 “High-Potential AC Test Method” defines a method of testing at 75KV per foot under wet conditions as stated by OSHA. The only reference to acceptable performance is contained in the last portion of section 5.3 that states “If the current continues to rise after full voltage is reached, the test should be discontinued, the pole cleaned or refinished, and re-tested. If the condition is not corrected the pole should be removed from service.” In other words, if full voltage can be applied without flashover, and the leakage current, regardless of value, is stable, the test sample is considered to have passed.

The 6799 Hot Stick Tester is designed to perform two tests, the newly required OSHA/IEEE style wet test and a dry test. It is our belief that both tests can detect defects the other cannot.

The spacing between the electrodes is 6 inches and the applied voltage is 2,500 volts. The leakage current measured between these electrodes is amplified to give the same results as will be achieved when using full voltage and full distance for the testing. An amplification factor of 15 is used during the wet testing and a factor of 20 used during the dry test. The factors are different as the wet test is referenced to a 75KV per foot voltage while the dry test is referenced to a 100 KV per foot voltage.

In addition to being calibrated to both of the required voltages used in industry at this time, the acceptable limits will also be displayed on the meter face. There are no standards for either the wet leakage current values or the values for dry testing of “in-use sticks”. The values we are requiring for our hot sticks for the wet test will not only be below the level where flashover might occur, but will be sufficiently low to have about a four to one safety factor.

The dry test values will be set according to the various industry standards for new poles, i.e., IEEE, ASTM, and IEC, and will be more critical test for internal defects in a tool.

Operator safety features include a fully insulated case, current limiting resistors to keep the available current below acceptable limits, and an over current relay to shut off power to the unit should excessive current be detected.

HASTINGS Hot Line Tools & Equipment

## ALL PURPOSE CLEANER

- Excellent cleaner for the following: hot line tools, trucks, buckets, booms, rubber goods, rigid cover up, painted surfaces and aluminum metal, shop machinery, hand cleaner, all plastic surfaces
- Safe and gives the following benefits: biogradable, non-toxic, non-alkali, non-acid, non-flammable, gentle to the skin, requires no ventilation
- Can be applied with a soft cloth, sponge or hand dispenser
- Concentrate formula mixing ratio is 20 parts water to 1 part concentrate

CAT NO	DESCRIPTION	LBS
10-169	ALL PURPOSE CLEANER - PREMIXED ONE GALLON	8.0
10-172	ALL PURPOSE CLEANER - PREMIXED ONE CASE (6 GALLONS)	48.0
10-168	ALL PURPOSE CLEANER - CONCENTRATE ONE GALLON	8.0
10-194	ALL PURPOSE CLEANER - CONCENTRATE ONE CASE (6 GALLONS)	48.0
10-195	ALL PURPOSE CLEANER - CONCENTRATE 5 GALLON DRUM	40.0



**10-169**



**10-089-3**

## HAND DISPENSER

- Hand trigger action pump with adjustable nozzle produces a fine mist or a pin stream
- Use with All Purpose Cleaner to direct cleaner in confined areas

CAT NO	DESCRIPTION	LBS
10-089-3	HAND DISPENSER	1.0

## HOT STICK BOOM AND BUCKET WAX

- High grade carnuba wax specially formulated for application to fiberglass finishes
- Properly applied, the wax will produce a hard tack-free weather resistant surface - resistant to temperatures and weather extremes
- Wax may be applied by hand and hand polished - wax on / wax off
- Do not let wax dry on stick

CAT NO	DESCRIPTION	LBS
10-091	WAX - 1 CAN (14 oz)	1.7
10-091-1	WAX - 1/2 CASE (6 CANS)	8.0
10-091-2	WAX - 1 CASE (12 CANS)	15.0



**10-091**

FIBERGLASS CLEANING AND REFINISHING KIT

- Kit includes items necessary to clean and/or restore fiberglass hot sticks, booms, and buckets
- Kit consists of...
- All Purpose Cleaner - The all purpose cleaner provides a safe non-toxic liquid to aid in removing dirt, grease, metal oxides and other contaminants which accumulate on fiberglass
- Ultra Fine Non-Metalic Abrasive Pads - Pads can be used with the all purpose cleaner to remove stubborn contamination. Note - fiberglass wax may be required after use of cleaner and/or pads to retain surface gloss.
- Clear Epoxy Refinishing Kit - The two part finish kit is used to bring the tool surface back to its original finish if normal cleaning is not sufficient
- Silicone Treated Wiping Cloths - Wiping cloths are used to remove light dust and dirt from stick surfaces. It is also needed after light cleaning of tool with all purpose cleaner to allow moisture to bead up on tool.



10-171

CAT NO	DESCRIPTION	LBS
10-171	COMPLETE CLEANING KIT	11.0
10-169	1 GALLON ALL PURPOSE CLEANER	8.0
10-170	BOX OF 20 ULTRA FINE NON METALIC PADS	0.5
10-100	1 QUART (TWO PARTS) CLEAR EPOXY REFINISH KIT	2.0
10-090	SILICONE TREATED WIPING CLOTH	0.1

EPOXY REFINISH KIT

- Kit provides all the necessary materials with complete instructions for restoring, fiberglass hot line tools and aerial lift booms and buckets equal to their original finish
- The epoxy coating provides a hard, tough, moisture resistant high-gloss finish of high dielectric strength and is easily cleaned
- Included in the kit are complete instructions, sandpaper, paint brush, and epoxy solvent
- One quart of epoxy coating covers approximately 32 square feet of surface
- The coating is a two-part system, available in both white and clear, dries dust free in approximately 1 1/2 hours and cures completely within 24 hours



10-100

CAT NO	DESCRIPTION	LBS
10-100	EPOXY REFINISHING KIT - CLEAR 1 PINT EACH COMPONENT A, B, AND THINNER	4.0
10-110	EPOXY REFINISHING KIT - CLEAR 2 QUARTS EACH COMPONENT A & B AND 1 QUART THINNER	10.0
10-101	EPOXY REFINISHING KIT - WHITE 1 PINT EACH COMPONENT A, B, AND THINNER	4.0
10-111	EPOXY REFINISHING KIT - WHITE 2 QUARTS EACH COMPONENT A & B AND 1 QUART THINNER	10.0
A30108	EPOXY THINNER - 1 PINT	1.0
A30109	EPOXY THINNER - 1 QUART	2.0

## SIX PACK ALL PURPOSE CONCENTRATE CLEANING KIT

- Includes the following: (6) 7 oz. ready to mix plastic containers of concentrated all purpose cleaner, (14) ultra fine non-metallic pads, (6) large adhesive backed identification labels to affix to your gallon containers after mixing
- Each plastic bottle contains the correct amount of concentrate to mix with one gallon of water
- Convenient to store-compact box with closable lid stores easily and you only mix when needed
- Saves shipping costs of pre-mixed gallon containers

CAT NO	DESCRIPTION	LBS
10-197	SIX PACK CLEANING KIT	3.5



**10-197**

## SILICONE TREATED WIPING CLOTH

- For added safety and increased life of live line tools
- Deposits a water repellent film while removing dust and dirt particles from the surface of hot sticks and insulated tool handles
- The 18" x 18" cotton cloth is an open-type weave specially selected for removing foreign material from the surface of insulated tools and has bound edges to eliminate fraying which extends the life of the cloth
- The cloth is packaged in a sealed plastic bag with instructions for compliance with OSHA regulations for cleaning and inspection of live line tools
- Regular use of the silicone treated cloth will add to the life and safety of the tools

CAT NO	DESCRIPTION	LBS
10-090	SILICONE TREATING WIPING CLOTH	0.1

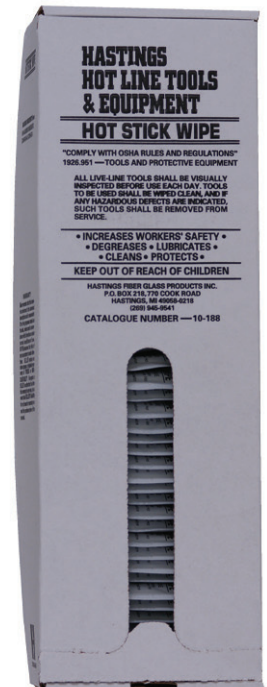


**10-090**

## HOT STICK WIPES

- Excellent for daily wiping of your hot sticks prior to use
- Removes contaminants such as dirt, oils, creosote, and other undesirable matter
- 50 wipes in a heavy duty cardboard dispenser box that can be installed on a wall or post in a convenient location to the line trucks, each are individually packaged
- Leaves a silicone moisture barrier which enables water to bead up. This eliminates the blanket effect when using hot sticks in wet conditions.
- Environmentally safe, the used wipes can be disposed of in normal waste containers

CAT NO	DESCRIPTION	LBS
10-188	HOT STICK WIPES 50 WIPES PER BOX	1.3



**10-188**





A-12

**EPOXY ADHESIVE KIT**

- Two component epoxy resin for permanent bonds - metal to fiber-glass, wood, steel and brass
- Kit contains all necessary parts and instructions for mixing and apply adhesive

CAT NO	DESCRIPTION	LBS
A-12	EPOXY ADHESIVE KIT	0.4

**EPOXY ADHESIVE**

- For hot line tool construction and repair
- Epoxy is a general purpose non-sag, high viscosity, two-part adhesive specially formulated for difficult bonding applications where high performance is required
- High impact resistance and good flexibility
- Has excellent adhesion to plastics, fiberglass, metal, wood, concrete and other surfaces
- Same material used in construction of HASTINGS tools - safety yellow color

CAT NO	DESCRIPTION	LBS
10-097-1	EPOXY ADHESIVE 1 PINT EACH COMPONENT A&B	3.0

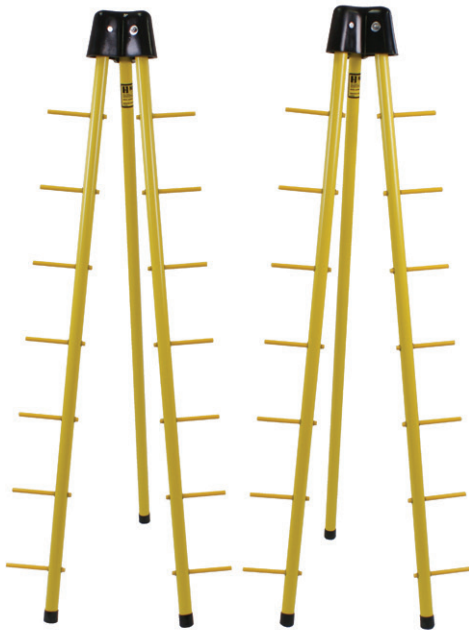


10-097-1

**HOT LINE TOOL RACKS**

- Tool racks are made from fiberglass components
- Will accommodate up to 14 hot line tools
- Support legs collapse for easy storage and transportation

CAT NO	DESCRIPTION	LBS
6708	PAIR OF HOT LINE TOOL RACKS	8.2
6707	SINGLE TOOL RACK	4.1



6708

**HOT STICK CLEANING KIT**

- Kit provides the brushes and sectional fiberglass rods needed to thoroughly clean the inside of telescoping hot sticks and internal rod shotgun sticks
- Kit includes: (1) Heavy duty vinyl fold up storage case with pockets to store cleaning rods and brushes - additional pockets are provided for storage of other cleaning items, (3) Fiberglass sectional rods each 3' long, (5) Heavy duty industrial type nylon bristle brushes to accommodate all inside diameters of telescoping tools

CAT NO	DESCRIPTION	LBS
10-337	COMPLETE CLEANING KIT	3.5
A15579	FIBERGLASS HANDLE 3'	0.4
A15580	FIBERGLASS EXTENSION 3'	0.3
P30724	3/4" DIAMETER BRUSH	0.2
P30725	1" DIAMETER BRUSH	0.2
P30726	1 1/2" DIAMETER BRUSH	0.2
P30727	2" DIAMETER BRUSH	0.2
P30728	2 1/2" DIAMETER BRUSH	0.2
P30723	STORAGE CASE	1.0



10-337

## CARE AND MAINTENANCE

December 31, 2003

MEMO

TO: ALL HASTINGS REPS  
ATTN: FIELD SALESMEN

SUBJECT: PRODUCTS FOR CARE & MAINTENANCE OF LIVE LINE TOOLS

Dear HASTINGS Factory Rep!

Over the years we have had many questions from customers asking us what to use to clean their hot sticks and live line tools. These questions have become more frequent since the inception of the OSHA rule requiring testing of in-service tools once every two years. Believe it or not, we have been asked if the following products are acceptable for cleaning hot sticks... WD-40, brake fluid, engine degreaser, and kitchen cleanser. As we hope you would guess, our answer to these products was an absolute NO!

As a manufacturer of live line tools for the electric utility industry, we are required to meet stringent specifications before our tools can go out the door. The most rigid of these specifications is the electrical test of 100 KV per foot and the alternate test of 50KV per every six inches. These tools are the "life-line" of the lineman when they are working high voltage with hot sticks. OSHA states that after a new tool has been placed in service, it must be electrically tested at least once every two years. Also, it must be tested under wet conditions. To pass this OSHA wet-test, the tool will need to be cleaned so that the surface condition has had all contaminants removed. The contamination on the surface of a hot stick comes from many sources out there, some of which are carbon tracking and carbon marks from conductor, weather proof insulation when wet becomes conductive, and daily dirt and greases from storage on line trucks. It is imperative that any type of contamination on the surface be removed so that the live line tool can pass the in-service electrical test.

To assist our customers with cleaning their tools, you know that we have developed an extensive product line of cleaning products. All of the products that we offer are user friendly. All are non-toxic and biodegradable. All of our cleaning products are also compatible with our fiber glass and resins and do not degrade the fiber glass or the ultraviolet inhibitors that we use. For these reasons we cannot and will not recommend any after market cleaner or wax for the cleaning and maintaining of our fiber glass sticks.

Some of you have asked us if its okay to use cleaners made by other hot stick manufacturers. While we would naturally prefer that customers use our cleaners, we believe that as long as the cleaner is made or manufactured by a hot stick manufacturer, it is acceptable to HASTINGS. There is however one cleaner on the market made by another manufacturer that we do not recommend. One manufacturer in our industry makes a combination cleaner/wax that is a cream and is called One Part Hot Stick Cleaner & Wax. It has gritty and grainy texture and we believe this degrades the surface condition of the stick and we do not recommend it.

Remember...

- You want your stick appearance to be "clean & glossy"
- NOT "dull & dirty"
- Use only approved cleaners from a reputable hot stick manufacturer!
- DO NOT USE the following products to clean your sticks...
  - WD-40
  - Engine Degreaser
  - Brake Fluid
  - Kitchen Cleansers
  - Metallic cleaning or scouring pads
  - Any type of industrial cleaning agent
  - Any type of after market automotive wax
- USE ONLY APPROVED CLEANERS FROM THE STICK MANUFACTURER!

Sincerely,  
HASTINGS HOT LINE TOOLS

April 24, 1997

COPY - HASTINGS FILE LETTER

SUBJECT: Utility Board of City of Key West  
ST-235 Returned For Evaluation

Per our telephone conversation of earlier this week, I am following up in writing to you the results and / or findings of our evaluation on the above stick.

**Visual Inspection:**

Upon receipt of this stick, we (Lewis Shaw, Chief Engineer and myself) visually inspected this tool. The base or bottom section of the stick was cracked at the top of the section, right above the label. All other sections were OK in general appearance. However, five (5) of eight (8) sections had brown streaks or smudges on the tool that appeared to be some sort of residue. Overall, the general appearance of the tool was quite good for a 1993 model stick. It did appear that some maintenance had been done on this tool.

**Preliminary Electrical Test:**

After receiving the stick, visually inspecting, and performing NO cleaning what so ever, we tested the Tel-O-Pole using the HASTINGS Portable Hot Stick Tester, Model No. 6799. To verify the integrity of the glass and check for moisture trapped inside the tool, we tested using the "dry test" feature, which is more critical than the "wet" test. The results we found were similar to those described in your memo (attached); all sections excluding the tip section failed the dry test. After the failures, our next step was to disassemble the tool.

**Tool Disassembly:**

Upon disassembling the tool, we first discovered heavy dirt, mildew, and moisture build-up inside the base cap itself. As we disassembled each section and removed each lock assembly, all were extremely dirty and moisture-laden. Also, all of the sections were wet on the inside. Our conclusions were that it had been a very long time since this tool was disassembled and properly cleaned and dried, if ever.

**Further Cleaning and Testing:**

Our next step was to do more extensive testing and evaluation of one of the sections that was failing. We took the no. 7 section, (the section next to the base/bottom) and thoroughly cleaned the inside of the tube. We then immediately performed the "dry" test on this section again. As we suspected, it did fail. This is because the dry test is so critical it will go to "fail" at the slightest amount of moisture. Our next step was two-fold in nature. We took this same no. 7 section and cut it into several pieces to perform what we call a "wicking" test. The purpose of this test is to see if moisture will wick up into, (or seep into) exposed fibers. This test will tell us if the fiber glass is defective. At the same time, we place all of the other sections in one of our ovens to expedite (speed-up) the drying process. The results of the "wicking" tests were negative! Moisture would not wick into the exposed fibers, therefore the quality of the fiber glass was good. After removing the remaining sections from the oven, all of them were once again tested with the "dry" test feature. All sections passed with flying colors. The leakage current was at similar readings of a newly manufactured stick.

**Final Conculsions:**

Based on these findings, it is our determination that the ST-235 sent into us was not defective and did not have any flaws, other than the cracked base section and the brown discoloration. Please note that we did not do any evaluationg or testng of the base section because of the visible crack. After our "dry" tests were complete, we did not proceed with any further work. Even if the remaining sections might fail the "wet" test, proper cleaning would have resolved those issues, if they existed. The bottom line; this stick was failing the dry test because of dirt, moisture, and mildew build-up on the inside of the stick!



Hastings Fiber Glass Products strive to be the industry leader in producing quality products, with timely deliveries, and continued customer satisfaction. If you have any questions on care, maintenance or testing of your hot sticks, please do not hesitate to contact us.