CALIBRATION AND HV TESTING

HV testing of safety equipment, tools, and working equipment; along with the calibration of electrical test equipment and instruments, is not currently governed by a national standard or code of practice. It is governed instead by local state regulations, acts or guidelines that vary greatly and often provide little in terms of consistency, or methodology behind what their guidance is based on.

The purpose of this article is not to discuss guidelines for testing and calibrating your equipment in your state or territory. It is designed to help educate the reader on the risks and hazards involved when equipment is untested, show statistical evidence of failure rates, and provide guidance and knowledge to base testing frequency decisions on, if not regulated in your state or territory already.

WHY DOES SAFETY EQUIPMENT FAIL?

The risks and hazards involved in using an incorrect or faulty piece of equipment are indisputable. Safety equipment is designed to protect the worker by insulating them from exposure to live circuits. When the insulation on safety equipment is faulty, be it gloves, mats or any other safety equipment, this barrier is no longer going to protect the worker from live electricity. This is why periodic HV testing of safety equipment is mandated in so many product standards, and also some regulations and acts. The only effective way to ascertain if the insulation is still providing the appropriate protection is to perform a HV test. This allows faulty items to be found and taken out of service. Most insulated products are made from rubber or latex, which causes the products to deteriorate over time. This excludes some operating/hot sticks and tiger tails that are usually fiberglass or PVC respectively. How fast the product deteriorates varies greatly depending on its use, storage conditions, material composition of the insulation material, and many more hard-to-measure factors. All of this means it is impossible to predict or visually see when an insulated safety item is no longer fit for service. Regular HV testing is the only way to ensure integrity of equipment and safety of employees.

WHAT ARE THE RISKS OF USING FAULTY EQUIPMENT?

In regards to Test & Measurement equipment, once again it is not possible to visually ascertain if equipment is functioning correctly or reading accurately. The only way to ensure this, across all ranges and function of a meter, is to perform a full calibration regularly. The risks in using an un-calibrated and possibly inaccurate or faulty meter can vary. The most concerning issue when looking at calibrations is that a meter could be reading extremely inaccurately, or not reading at all on critical safety functions such as voltage or current. If a meter or instrument is used to test for dead, and reads inaccurately, a worker could be given a false negative reading on voltage presence which could result in a variety of safety issues from arc flash incidents to contact with live parts, and thus electric shock/electrocution risks.

SIGNED OFF WITH UNCALIBRATED METERS

There are other risks in not having equipment regularly calibrated, that are not as immediately obvious or well known. One must consider, what if you or your staff were using an un-calibrated meter, and were testing vital readings on your (or a clients) electrical system. Or what if you or your staff were testing electrical work, providing test certificates and signing off on work with incorrect readings. In most cases the results of this may be negligible, or not 'rear their head' for many years; but they could also be major if an incident were to occur. Clients are also within their rights to request calibration certificates for all instruments used in the issuing of test certificates or testing of work. Not having calibrated meters leaves risk of exposure where a client may be within their rights to not to pay for work that was done with uncalibrated meters. One electrical contractor, who is now a Mobile Test n Cal customer, had their entire site shut down, costing over $100,000/hr, due to work being done and signed off with uncalibrated meters.

WHAT ARE THE CHANCES OF EQUIPMENT FAILURE?

Now that you are aware of the risks of neglecting HV Testing and Calibration, we will analyse the pass/failure rate of equipment when tested. The figures provided are the failure rates when testing is conducted on a six monthly basis. From this data, non-linear extrapolation is applied to project what a failure rate would be if tests/calibrations were not carried out six monthly; but instead at 12 monthly, 18 monthly or 24 monthly intervals. This graphically illustrates the exponential increase in risk and the larger percentage of equipment that will be in service while in a 'fail' state, the longer test intervals are made.

TOTAL SAMPLE RESULT SUMMARIES
HV TESTING RESULTS

	TESTED	PASS	FAIL	FAIL PERCENTAGE RATE
Gloves	429	393	36	8.39%
Mats	159	150	9	5.66%
Kits	171	121	50	29.24%
Total	759	664	95	12.52%

Figure 1 *This is the raw HV testing failure data that parts of this paper are based on. Testing on this equipment was at six monthly intervals.*

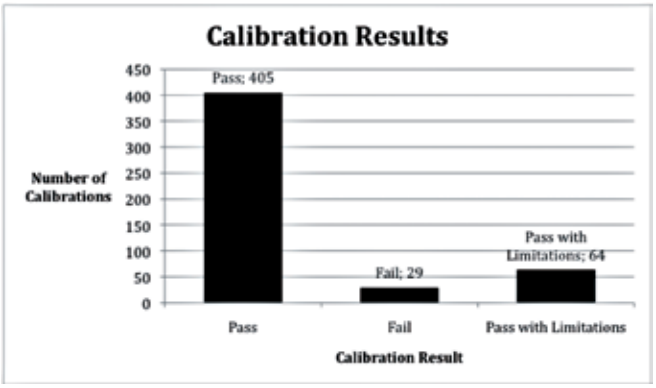

Figure 2 *This is the raw calibration failure data that parts of this paper are based on. Calibration on this equipment was at six monthly intervals.*

INSULATED GLOVES

Insulating Gloves are a vital protection mechanism for electrical workers, especially linesman. The below graph illustrates that when six monthly testing is carried out, under 10% of gloves fail, meaning that under 10% of workers have at some point in the past six months been exposed to risk when wearing them. The graph also illustrates that, when this failure rate is projected forward to greater testing intervals, the failure rate and therefore risk exposure rate becomes much greater.

Figure 3 *Percentage of gloves tested that are expected to fail if various test intervals are used, using the actual 6 monthly fail percentage rate of 8.39% found in this study, and a non-linear appreciation model. For a full breakdown of glove failures by brand please contact Mobile Test n Cal for further details.*

RESCUE KITS

The following data considers LV rescue kits and pole top rescues, which are mandated in most states. A kit is considered failed if any of its contents are missing or faulty (testing includes a visual inspection and verification of fitness for use). Rescue kits have a high failure rate, even at 6 monthly testing intervals, because of the large amount of equipment inside them and therefore greater statistical likelihood of something failing or being misplaced and missing. It is clear that rescue kits should be tested and inspected at the very least every 6 months, possibly more frequently.

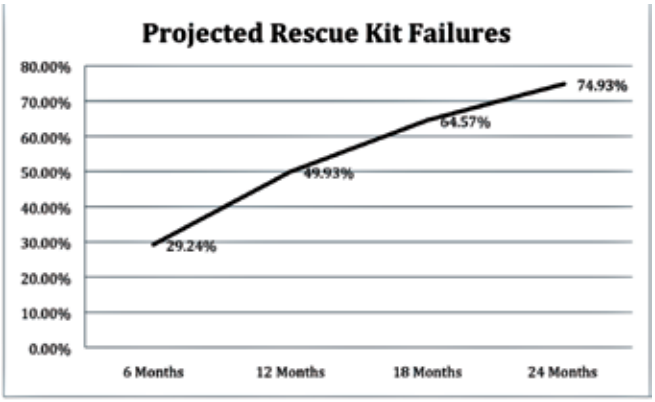

Figure 4 *Percentage of kits tested that are expected to fail if various test intervals are used, using the actual 6 monthly fail percentage rate of 29.24% found in this study, and a non-linear appreciation model. For a full breakdown of kit failures by item please contact Mobile Test n Cal for further details.*

INSULATED MATS

The following data relates to insulating mats. This includes all classes of floor mats, line mats, busbar mats/curtains, and any other mat form of insulation. The below graph illustrates that when six monthly testing is carried out, just over 5% of gloves fail, meaning that over 5% of workers have at some point in the past six months been exposed to risk when wearing them. The graph also illustrates that, when this failure rate is projected forward to greater testing intervals, the failure rate and therefore risk exposure rate becomes much greater and unacceptable. Due to the fact that most mats are floor mats, their exposure to risk is very high in terms of damage (from contaminants on the floor, dropped tools, screws etc), so six monthly testing is recommended.

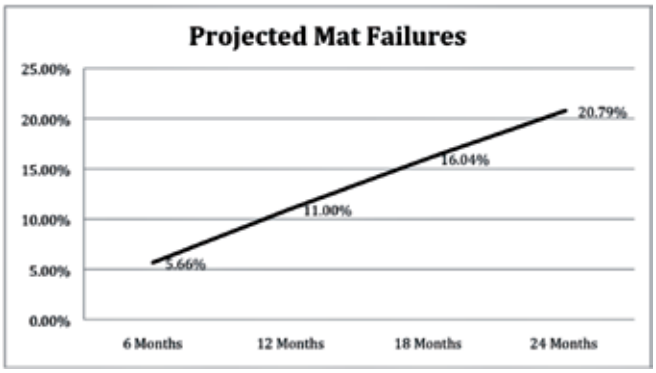

Figure 5 *Percentage of mats tested that are expected to fail if various test intervals are used, using the actual 6 monthly fail percentage rate of 5.66% found in this study, and a non-linear appreciation model. For a full breakdown of mat failures by type please see contact Mobile Test n Cal.*

INSTRUMENT CALIBRATION

The final table shows the failure rate, and pass with limitation rate on a variety of electrical test instruments. The six monthly rate is from the raw data, with the rest extrapolated using non linear progression. This shows us that a total of 18.67% of meters had some sort of fault when calibrated six monthly, with 5.82% being a total failure. As per the other graphs, this means that 18.67% of meters were in service in an inaccurate, faulty or dangerous condition and were picked up at six monthly calibrations. Extending calibration intervals further than six months, results in a large increase in fault meters in service before they would be picked up and taken out of service or adjusted back into specification. It is clear that six monthly intervals are required for calibration to ensure accuracy and safety of equipment in the field.

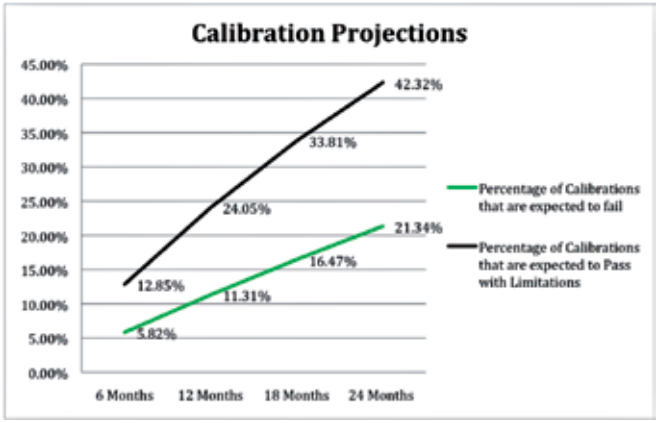

Figure 6 *Percentage of Calibrations that are expected to fail or pass with limitations if various test intervals are used, using the fail percentage rate of 5.82% and 12.85% respectively found in this study of six monthly calibrations, and a non-linear appreciation model. For a full breakdown of calibration failures and pass with limitations by brand or meter type please contact Mobile Test n Cal for further details.*

CONCLUSION

In summary, it is clear from the data provided that six monthly testing and calibration is vital, to ensure that faulty equipment is found and taken out of service or repaired in a timely fashion. Longer test intervals expose staff to far greater and unacceptable levels of risk, by leaving fault equipment in service for longer. If you local regulations don't stipulate six monthly test intervals like leading states do, six monthly is clearly the test period that should be chosen. Longer intervals expose the staff and company to extra risk, which is far greater than the cost of more frequent testing.