



## Equipment Inspection & Maintenance

Equipment inspection and maintenance is the process of preparing gear for the next job. The process involves not only checking equipment but may also involve cleaning, maintenance, calibration and re-supplying.

### Equipment Inspections

Preparing for the next project begins with the present job. There are many types of equipment inspections. Inspections vary in focus (what is looked at), depth (how much scrutiny) and frequency (how often). A description of each type of check is provided below.

1. Visual Check (most often type of inspection) verifies not only it's presence but also verifies that any indicators on the device say it's working.
2. Pre Use Checks are done just before using the device to ensure it does work.
3. Accuracy Tests (usually called calibrations) are to ensure the device accurately measures and/or operates within manufacturer's specifications.
4. Operations Check reviews the gear to determine it's strength, cleanliness and operatable before going out to work.

It is important to determine the focus of the Inspection as it will determine the competency required of the people to conduct the inspection.

### Operations Checks

Operations Checks are the least frequent type of inspection, however they are the most important. To conduct this type of check, personnel must be thoroughly familiar with the equipment they are inspecting. Components that may need to be inspected can include:

1. Drivers (eg. power supply, wheels, gears, pulleys and handles)
2. Structure (eg. walls, plates, housings and brackets)
3. Connectors (eg. piping, tubing, belts and chains)
4. Indicators (eg. Id markings, gauges, buttons and dials)
5. Consumables (eg. gas, air, materials)

A component based inspection examines the equipment in detail. You can see the unit "deteriorate" and track it's demise. This tracking develops a greater trust of the device by limiting "surprise failures" in the field. It enables maintenance personnel to perform preventative maintenance reducing failure costs ranging from lost productivity to loss of pride.

Each of the above components can have the following issues:

1. Cleaning of dirt or bio materials
2. Maintenance caused by wear & deterioration issues or damage
3. Inaccuracy (eg. malfunction, inaccurate indications)
4. Voids (eg. empty vessels such as tanks, area on shelves, missing markings or items)

For every issue found during the rehab process a remedial action must be taken.

## **Cleaning**

The most common remedial action is cleaning (eg. water or mineral residue, markings/stains, powders, oils and adhesives) and/or disinfecting (eg. body fluids, mould, and feces). Cleaning can be accomplished by physically removing contaminants by scraping, brushing, vacuuming, washing/rinsing, and/or wiping. You can also chemically remove contaminants by neutralizing the material with an antidote or disinfecting/sterilizing. When cleaning, you need to consider:

- what is needed to remove the type of dirt (cleaning products, tools and materials)
- restrictions (contact with water, cleaning product, use of scrub brushes, etc.)
- how to dry the device, and
- what are the expectations - how "clean" is clean,

Each "dirt" type is removed differently. For instance, bio materials use a disinfectant where as powders need vacuuming. No matter the process however, Safetyscope's standard or benchmark of cleaning and disinfecting is that each piece of equipment is clean enough to contact your face.

## **Maintenance**

Maintenance is traditionally a three phase process. The process begins with the one who finds the failure. The second step is diagnosing the issue and the third step is then repairing or replacing the device.

The inspection may find a part has deteriorated and the wear and tear drops the part below the manufacturer's specifications/standard. For instance, with gas monitors, regular bump testing a sensor shows the deterioration of the cell long before it fails. Reviewing a log that captures things such as the incident in which the failure occurred. You could log sounds it makes or nuances seen, smelled or heard while using the device or just prior to or just after a device failure needs to be recorded. Your experience with the device could also provide an insight. With experience, you may be able to predict when the accuracy will fail. Repairing and/or adjusting equipment to remediate wear, deterioration and damage may also have to be completed.

## **Calibration**

Many pieces of equipment need calibration to verify performance. The process uses special equipment and trained individuals to perform the checks. These checks collaborate the accuracy of the device.

Calibration can also determine where in the life cycle a part or device is. Calibration can show the deterioration of the item. In order for this deterioration to show, you need more than one test at a single point of time. Many of the parts that the calibration process tests deteriorate over time but you need a collection of them to see the big picture. All calibration reports must be saved in order to compare, not just with the last one but maybe the last five or six before you begin to see a pattern. To simplify seeing the big picture, many calibration services now provide graphs in their reports that show what's gone on since the purchase of the device. Therefore the more the information, the better decisions can be regarding device replacement.

## **Re-supplying**

Filling the voids is what re-supplying is all about. This is your inventory check (absence or presence) of

all the little pieces (eg. four carabineer) listed on the Inventory Tag that must be found or replaced as necessary. At this stage you are restocking the supplies, however it doesn't end there. For instance all vessels must be looked at and be topped up. Vessels include air tanks as well as tires. The big issue in re-supplying is keeping the inventory levels topped up so that re-supplying can occur when needed.

### **Documentation**

Each time a check is conducted, calibration performed or restocking completed a piece of paper will be generated. The documentation does a number of things. First, it proves a thought out approach was used. Secondly it enables cost tracking and third the paperwork provides advice. Each properly completed piece of paper provides information that is necessary for our operation and even sometimes the client. For instance:

- inspection sheet proves we've complied with the Confined Space legislation,
- Equipment Inventory Sheets enables us to track what is deployed,
- repair tag helps with the diagnosis,
- equipment log helps us to track where the device is in the repair process, and
- bump test sheets or Certificates of Calibration verify the needed performance levels.

### **Summary**

Maintenance is a whole process. Untrained inspectors check only the operability of the pencil they are using. This doesn't help anyone. By following standard practices, a trained inspector can ensure that failure and the resulting embarrassment is greatly reduced.

## Equipment Inspection Chart

Item	Pre Job Inspect	Post Use Rehab	Monthly Visual	Calibration	Yearly Inspect	Hydro Stat
Electrical Equipment		✓				
Gas Monitors	✓	✓		✓		
Harnesses	✓	✓			✓	
Winch	✓	✓				
SRL	✓	✓			✓	
Davit Arm/Tripod	✓	✓			✓	
Retrieval Rope	✓	✓				
Retrieval Hardware	✓	✓				
Air/Oxygen Cylinders	✓	✓			✓	✓
Air/Oxygen Regulators	✓	✓			✓	
Respirator Masks		✓			✓	
O2 Delivery Gear		✓				
Defibrillator		✓	✓			
Fire Extinguishers		✓	✓			✓
Mobile Equipment	✓	✓			✓	
Vehicles	✓	✓			✓	

### Expectations of Rehabilitation

Step	Benchmark/Expectations	Restrictions
Clean	Clean enough to kiss	<ul style="list-style-type: none"> <li>* Different dirt have different cleaning processes</li> <li>* Different equipment have different cleaning processes</li> </ul>
Counting	The numbers must match	If a part is missing, a replacement may take up to two weeks to arrive
Maintenance/Adjusting	ID Phase - a good description of the issue is on the repair tag	Sometimes the problem is hard to define
	Diagnose Phase - pinpoint problem by next shift	Varying technical ability may hamper this
	Repair/Replace Phase - back in service	If a part is missing, a replacement may take up to two weeks to arrive
Ops Testing	Does it work the way it should.	Experience may create a variance of acceptability.
Calibration	Is it within tolerance range	Lack of documentation may make manufacturer tolerances unavailable.