



# Cole Metal Products Ltd

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## THERMIC LANCE USER GUIDE

### What is a Thermic Lance?

The thermic lance is a consumable steel tube, packed with low carbon steel wires. They are usually supplied in three metre lengths with varying diameters. The lance is attached to a '**lance holder**', which is connected to a suitable oxygen hose fitted to a high-pressure oxygen supply.

Thermic lancing is the process of cutting and removing stubborn materials by thermo-chemical reaction. When ignited the lance will burn at intense temperatures and is capable of cutting or boring through almost any material.

Thermic lance boring is a method of boring and severing concrete, steel, cast iron and hard to clean materials without noise or vibration in a fraction of the time taken by conventional methods. It is ideal for demolition work, where noise and vibration are unacceptable, or where speed is essential particularly on reinforced concrete. The equipment is extremely simple and easy to operate, and the capital cost in comparison to drills etc. is negligible.

The process was developed in France following the Second World War, as a means of assisting the break-up of gun emplacements, submarine pens, and other large concrete structures. Thermic lancing depends on the fact that red-hot steel will oxidize very rapidly in an atmosphere of pure oxygen. When the steel is at red heat, it has reached ignition (oxidation) temperature. A stream of pure oxygen directed at the red-hot area will immediately form a film of iron oxide. A Thermic reaction occurs when burning a Thermic Lance creating molten iron oxide at approx. 4000 degrees Celsius, greater than the melting point of most materials. By the way of comparison, concrete melts at 1800 - 2500 degrees Celsius and steel at less than 1500 degrees Celsius.

The velocity of the high-pressure oxygen blows the oxide film away and another film of oxide is instantly formed and blown away. This reaction is exothermic (gives off self-generated heat) and will continue as long as red heat and the oxygen stream are present. The intense heat generated at the end of the thermic lance, when applied to a material will quickly burn through it and will also consume the lance. The burning action can be stopped anytime by turning off the oxygen supply.

### Operating Procedures

The lance is fitted into a valve operated **lance holder**. The oxygen regulator is set at approximately 80-100 psi depending on the conditions. The lance is ignited by heating the first inch (25mm) to oxidation temperature (red heat) and then opening the oxygen valve on the lance holder. The high-pressure flow of oxygen through the lance to the red-hot end will cause the lance end to burn fiercely. The burning end of the lance is then applied firmly to the material to produce the cut. Bore holes inclined upwards at 5-10 degrees will assist the flow of slag and aid the operation.

Full training for thermic lance cutting and boring is available at [www.meg.co.uk](http://www.meg.co.uk)

### Equipment required

1. Supply of thermic lances.
2. **Lance holder.**
3. Oxygen hose and connections (including flash-back arrestors).
4. Supply of oxygen - usually 3 or more 240-300 ft (2500-3000 psi) cylinders.
5. High pressure oxygen regulator.

N.B. Heating the lance end with an oxy-flame torch usually attains the initial ignition temperature. This additional piece of equipment could be required.



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## Operating Data

Lance Type (Nominal Bore)	Oxygen Pressure (lb./sq.in)	Oxygen Consumption (cu.ft. /hr)
10mm (3/8")	80	860
"	90	980
"	100	1100
20mm (3/4")	80	1300
"	90	1600
"	100	1700

## User guide

Thermic lancing should be carried out in the open air, although good ventilation could allow work inside. Always ensure good ventilation and/or wear an approved respirator. Remove all flammable materials for a distance of at least ten metres from the place of work. Suitable fire precautions should be taken (i.e. fire fighting equipment made available) and protecting gas cylinders from sparks. The operator and other working personnel must work upwind of the lancing operation. Other personnel working downwind of the lancing operation must be at least 10 metres away. Sufficient sand should be made available to contain the molten material from the lancing operation.

Oxygen has no smell or taste and is difficult to detect. Normal oxygen content of air is 21%; if it becomes enriched by leaking oxygen to 30% there is an acute increase in the speed at which material will burn. Fires in oxygen enriched atmospheres are VERY difficult to extinguish and can spread rapidly across combustible materials from a single source such as a spark from a cigarette. In the presence of oil or grease, it can cause rapid oxidation that produces so much heat, that ignition can occur. Therefore, oil and grease on overalls or gas equipment can cause severe burns.

1. Turn off oxygen supply when not required
2. Prevent and test for any oxygen leakage
3. Test equipment daily for oxygen leaks, any leaks should be immediately rectified.

### Minimum Requirements:

1. Welding helmet/goggles for eye protection.
2. Flame retardant safety clothing (i.e. leather apron, caps etc.)
3. Respiratory equipment (i.e. type 3 disposable respirators)
4. Ear protection
5. Safety footwear
6. Hard hat depending on work area
7. Leak detection solution
8. Flash back arrestors



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It is the users' duty under the Management of Health and Safety at work regulations to conduct a risk assessment, prior to commencing thermic lancing operations.

There is a statutory requirement covering this type of operation embodied in Section 30 of the Factories Act 1961 and the use of oxygen CODE OF PRACTICE 7 The Safe Use of Oxy-Fuel Gas Equipment Revision 7: 2014

There are also general requirements under Section 2 of the Health and Safety at Work Act 1974, to provide both a safe place of work and safe working systems. To ensure a safe system of working it may be necessary in some circumstances to use a Permit to Work procedure.

Clients should consider the products of combustion and refer to the COSHH Regulations 1999 and the current HSE Guideline Notes EH40 (Occupational Exposure Limits), EH54 (Assessment of exposure of fumes from welding and allied processes) and EH55 (the method of exposure to fumes from welding, brazing and similar processes).

## General Safety Points

- \* Check regulator pressure.
  - \* Use effective protective equipment and wear it.
  - \* Point lance in a safe direction when igniting.
  - \* Handle the ignited lance with due caution and take care not to impinge on anything but the work in hand.
  - \* Concentrate on watching closely the progress of the work.
  - \* Hold the lance with sufficient grip to ensure full control at all times.
- \* If vision becomes impaired for any reason during the operation, turn off the oxygen supply, clear vision, re-ignite and continue operation. **Do not attempt to work with impaired vision.**
- \* Do not operate in the overhead position.
  - \* Always comply with prescribed safety precautions and fire prevention procedures.

Disclaimer: This information is taken from sources or based upon data believed to be reliable. However, Cole Metal Products Ltd makes no warranty as to the correctness or sufficiency of any of the forgoing, or that additional or other measures may not be required under particular conditions.