Thames Valley District School Board | **PROCEDURE**

Title	**Lockout - Energy Isolation**	Procedure No.	**5011**a
Department	**ORGANIZATIONAL SUPPORT SERVICES (HUMAN RESOURCES)**		
Reference(s)	- Policy: Health and Safety	Effective Date	2007 April 30

It is the intent of the Thames Valley District School Board to continue with its commitment to ensure the health and safety of its employees. This procedure is established to protect all employees from injury due to unexpected energy surge, start-up, or release of stored energy from the system. Persons permitted to work on equipment are qualified staff members (maintenance, custodial, technology teachers) and contract workers. Persons permitted to work on electrical circuitry and systems shall be appointed by Facility Services. This procedure will also establish a standardized method of locking out and tagging of various equipment and energy sources.

1.0 The term **lockout** refers to methods and procedures for preventing the sudden and uncontrolled release of energy from a machine or piece of equipment. Workers have often been injured when a machine suddenly starts up while they are adjusting or maintaining it. Examples of uncontrolled energy in the workplace include electricity, hydraulic and pneumatic pressure, steam, and gravity. A lockout procedure is a set of safe work practices that make it impossible for workers to come into contact with these energy sources.

2.0 Sometimes a hazard is created when someone turns a machine on manually, or when power is restored after an outage. Automatic controls compound the problem. Computer-controlled machines and equipment are now widespread in Canadian industry. These systems start and stop production processes in ways that have become increasingly unpredictable. The trend towards automatic control means that an effective lockout and tagging program is more essential than ever.

3.0 Typically, a lockout procedure involves placing a padlock and personal protection tags on a control point, such as a switch or valve, to lock it in the **off** position. That way, the equipment can be started only after every worker who may be exposed removes his or her lock and tag.

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4.0 In order to control exposure to energy hazards, it is first necessary that workers learn to recognize and assess them. Then effective controls, that combine engineered solutions with worker education, must be designed and implemented. Procedures alone cannot succeed without a total dedication to the lockout philosophy by everyone in the workplace.

5.0 To perform service and maintenance work on equipment safely, one must understand the importance of energy control and lockout / tag out standards. A worker must also know how to apply energy isolation and lockout / tag out.

The attached information and protocol (Appendix # 1) is intended to provide qualified staff members with an understanding of lockout procedures including the principles that underlie them, and their practical application. It is divided into six main sections:

1. Energy Hazards

2. Assessing Energy Hazards

3. Controlling Energy Hazards

4. Lockout Devices

5. Roles of the Workplace Parties

All staff must receive adequate training. Prior to working on any equipment requiring lockout, once qualified staff are trained, the attached Appendix # 2 must be filled out and properly filed at the work site.

Lockout Tag Out Protocol

Experience has shown that most accidents are caused by the uncontrolled release of hazardous energy from the accidental starting of machines while others are working in, on, or near them. Work on machines is seldom routine. It is often done during other than normal working hours. There is usually a sense of urgency. Workers may be separated or out of communication with those near the controls. All factors which contribute to the possibility of the accidental starting of a machine. Many of these accidents can be avoided by using proper lockout / tag out procedures. The only positive method of protecting workers from the hazards associated with the accidental starting of machines is to lock the main controls in the **off** position and ensure that the machinery is in the **Zero Energy State**.

1. Energy Hazards

What is Energy?

Energy is the capacity to do work. It is the capability of acting or being active. Whether the power switch is on or off, energy of some sort is always present in any powered equipment.

Normally energy is conducted safely through the system. Energy conducting materials such as cable, pipes, reservoirs, vessels, and machines make up the system. They are usually made of strong, non-corrosive and insulated materials which effectively conduct the energy to where it is to be used. Hazards exist when energy is not controlled or used by the system.

Energy can come from many different sources, but is always one of two types:

1. **Kinetic Energy:** The force caused by the motion of an object.
2. **Potential Energy:** The force stored in an object that is not moving.

Examples of energy in the workplace include:

- electricity (main and stored i.e. battery)
- pneumatic pressure (compressed air)
- hydraulic pressure
- mechanical energy
- thermal energy

< chemical energy

Energy sources can be classified as either **main** or **stored**. Main energy sources provide power to a system from outside. Electricity, pneumatics, and hydraulics are all forms of main energy. Stored energy remains in the system after the main sources are turned off. This type of energy is particularly dangerous because it is not obvious until it is released.

Some equipment has more than one source of energy. This increases the hazard of uncontrolled energy because there will be multiple control points.

Energy Sources

Main Energy Sources supply power into a system from outside. They are:

< electric energy
< compressed air or pneumatics
< hydraulics
< gas, water, steam, and chemical, or
< any combination of these sources

These sources are delivered to the vessels and equipment and are converted or used to produce other forms of energy. Therefore, energy exists in the system even when the main energy sources are turned off. This residual energy left in the delivery system and machine parts is called **stored energy**.

Stored Energy Sources include:

< mechanical motion or kinetic motion
< gravity
< mechanical energy (spring)
< thermal energy
< electrical energy
< pneumatic pressure
< hydraulic pressure
< static
< gas / water / steam / chemical

Uncontrolled energy exposes workers to three major hazards:

1. **Main Energy:** Dangerous Energy Sources
2. **Stored Energy:** Unexpected Energy Stored
3. **Main and Stored Energy:** Mechanical Movement

Electricity

Electrical energy can exist as generated electrical power or static electricity.

Generated electricity is used to transmit energy to machines and equipment. It may be stored in batteries or capacitors which can retain large amounts of energy even after the main power is disconnected. If a worker comes into contact with electrical energy, it can flow through the body, causing shock or even death. The greater the voltage and current involved, the greater the hazard.

Static electricity is a form of potential energy produced by friction between different materials. Static electricity can be dissipated by grounding, but faulty or missing grounds can cause unexpected discharges.

The principal hazards of static electricity are fire and explosion. Flammable or explosive vapours, gases or dust particles can be ignited by sparks from static discharges. Workers may also be startled by sudden discharges, which can cause slips or falls.

Pressure

Hydraulic and pneumatic pressure are commonly used to transmit energy from a source to the active parts of machinery and equipment. Hydraulic energy comes from pressurized liquids, while pneumatic energy comes from pressurized air.

Hydraulic and pneumatic pressure can be hazardous because the energy can escape from its containment system. This might happen due to the failure of parts of the system, or during maintenance operations. For example, bleeding air pressure at a valve can be hazardous because the compressed air may escape with enough force to cause injury. Escaping pressure may also propel dust or objects towards workers at great velocity.

Energy storing equipment such as accumulators, holding tanks, and boilers can also be sources of dangerously excessive pressure.

Mechanical Energy (Movement)

Any one or a combination of main energy sources can be used to activate mechanical equipment. The equipment moves in one of three ways:

< Rotation: Circular movement
< Reciprocating Motion: Movement back and forth or up and down
< Transverse Motion: Movement in a straight continuous line

The equipment becomes more complex whenever there is a combination of these movements. The energy used to cause these motions is often stored in the equipment, even when it is not operating. The unexpected release of this energy can cause severe injury or death.

Workers may come into contact with uncontrolled mechanical energy while performing maintenance or making adjustments. For example, a machine might jam or malfunction, requiring the worker to temporarily remove or bypass machine guards to

correct the situation. The worker will then have to come into contact with the system. If all energy sources are not controlled, there is the hazard of mechanical movement. The worker could be pinched, pulled, crushed, cut, or caught by moving parts.

Sudden mechanical movement can also startle a worker, leading to a slip, fall, or other injury. The unexpected release of material from robot grippers, conveyers, or other equipment also creates mechanical hazards.

Thermal and Chemical Energy

Pressurized fluids are pumped along pipes or hoses to activate equipment, for processing or treatment purposes. These fluids may be cooled or heated. They may be corrosive, flammable, or toxic. Whatever the physical nature or purpose of fluids, they are hazards for workers who must service any part of the system.

Super cooled fluids like liquid nitrogen contain thermal energy, as do superheated fluids like steam or hot water. Treatment vessels and fluid reservoirs themselves become very hot. They may cause burns, including severe tissue damage, to those who work with or near them. Even when processes have been shut down for maintenance or repair, the residual thermal or pressure energy stored in these fluids and vessels present hazards.

In a similar way, the hazardous chemical characteristics of some fluids remain capable of causing harm despite the shutdown of the process. Many of the chemicals used in industrial processes, ammonia and chlorine for example, are corrosive or flammable.

Workers have been burned or asphyxiated when they have opened valves to unmarked energy lines or process supply lines. Those who service the system wear protective equipment, but those who work nearby may be unprotected. They can be harmed by an unexpected release of thermal or chemical energy.

Those who must work in confined spaces are especially vulnerable to such hazardous releases of thermal or chemical energy. Their movement is often restricted. The confined space atmosphere can fill rapidly with toxic or explosive materials.

Protective Engineering

Examples of protective engineering are:

< machine guards
< electrical disconnects
< mechanical stops, such as pins and valves
< engineering lockouts, which provide automatic protection against human error

However, any engineering safety feature can be defeated if one is to try, so **never**:

< bypass an engineering lockout or let another person do so

- rely blindly on engineering safety features

2. Recognition of Energy Hazards

Recognizing the sources of energy in the workplace is the first step in ensuring that they are controlled. Recognizing energy hazards means understanding the types of energy present in the workplace and how a worker may come into contact with them.

3. Assessment of Energy Hazards

Any lockout system has the ultimate goal of controlling hazards that could result in injury or death of an employee. A critical step towards this control is an in-depth assessment to identify all potential hazards.

The ultimate objective is a **zero energy state**, before any worker is exposed to the active parts of a machine or system. Zero energy means that all forms of energy in a machine or system have been controlled or isolated.

The assessment should involve all those in the workplace who are familiar with the potential hazards. It should be carried out systematically and notes and diagrams should be carefully maintained.

Stages of an Assessment

A systematic assessment of energy hazards includes the follow steps:

1. Check previous history of any lockout problems.
2. Conduct an in-depth physical inspection of the workplace accompanied by experienced persons.
3. Review any accident/incident reports.
4. Determine how to achieve a zero energy state in each situation where energy is present.
5. Consider the five (5) Key Elements of an effective lockout procedure.

4. Key Elements of a Lockout Procedure

1. **When** is the lockout required?
2. **Where** is the lockout required?
3. **What** is to be included in the plan?
4. **Who** is to be included in the plan?

5. **How** are they to be informed?

When all relevant data has been gathered, and a workplace inspection completed, the information must be evaluated so that controls can be recommended. This means systematically analyzing each source of energy and how it is controlled. The participation of all those in the workplace who are familiar with or affected by the hazards is essential.

5. Control of Energy Hazards

Energy hazards are controlled by making it impossible for workers to come into contact with energy. When equipment or machinery is in operation, this is achieved through a variety of guards and engineering controls. But these controls are often disabled or removed during maintenance or adjustment operations. Lockout procedures are used to prevent contact with energy during these operations.

Lockout procedures prevent exposure to energy sources through two separate steps:

1. **Isolate** all main sources of energy
2. **Neutralize** all stored energy

Both steps are essential for any lockout procedure.

Isolation

Isolation of main energy sources is achieved by securing points of control. Each control must physically cut off the main energy supply to the equipment. All energy sources and systems which affect the equipment being serviced must be isolated. For this to be effective, the main energy source must be totally disconnected, and it must be impossible for the equipment to be accidentally re-energized.

Neutralization

Isolation of the main energy sources alone does not effectively control the energy hazard. It is also necessary to neutralize all stored energy in the system. Stored energy may remain in the equipment even after the main energy source has been cut off. In some ways, stored energy is even more hazardous than main energy, since it is not always obvious.

There are three methods of neutralizing stored energy:

1. **Control:** Using a block to secure machine part affected by gravity.
2. **Dissipation:** Waiting for hot equipment to cool off.
3. **Release:** Discharging batteries or cycling the equipment to drain energy.

6. Lockout of Equipment

Energy isolation and lockout is to be applied only by trained employees authorized to perform service or maintenance. Before lockout is applied, all employees who work in the affected area must be notified. The responsibility for seeing that this procedure is followed and is binding upon all employees.

Lockout Procedures

A lockout procedure is based on a combination of energy **isolating devices** and **lockout devices** to obtain a zero energy state. Together, they ensure that energy to the equipment is turned off and stays turned off until the equipment is returned to normal operation. Workers apply **lockout devices** to energy isolating devices. This usually involves applying a padlock, for which the worker holds the only key, to hold the energy isolating device in a safe position. A tag is usually attached, identifying the worker who owns the lock and the work being performed.

Some isolating devices, such as electrical switch boxes and some types of valves, have built-in lockable features. Others, such as wheeled valves can be secured with a chain and padlock. To isolate pipe lines, bolted blanks must be used to block and isolate the source of energy.

An effective lockout procedure requires a combination of energy isolation and neutralization methods. It depends upon physical means being available. Newer equipment designs usually provide locking capacity. Older equipment must often be modified to accept padlocks. A lockout procedure also requires methods of verifying that equipment is de-energized. All the methods used to isolate, neutralize, and lockout energy must be fail-safe.

Energy must be locked out whenever anyone works around a machine or system where an unexpected or unintended motion or release of stored energy could occur.

Examples of when lockout procedures are required include:

< clearing blocked or jammed mechanisms
< maintenance or repair work on equipment with moving parts
< replace saw blades
< repairs or installations on electrical circuits

In a tag out, the energy isolating device is placed in the safe position and a written warning tag is attached to it. Energy isolating devices are effective disconnect points under two conditions:

1. They have a mechanism that effectively cuts off the energy supply to the machine.
2. They can be padlocked so only those working on the equipment can reconnect

the power.

Disconnects are normally located at an entry point of power to the system or machine.

Preparation for Shutdown

Before any equipment is to be turned off for lockout / tag out, the following must be known:

< types and amounts of energy that powers the equipment
< hazards of the energy
< sources of the energy
< how the energy can be controlled
< what work, if any, has been previously done

Any questionable identification of sources shall be cleared by the employees with their supervisors.

Equipment Shutdown

< Notify all affected employees that a lockout is required and the reason.
< Shut the system down by the normal stopping procedure using its operating controls (depress stop button, reverse toggle switch, etc.) ensuring to follow whatever procedure is right for the equipment, so that no person is endangered during shutdown.
< Visually check to see that all motors and other moving parts have stopped moving.

Equipment Isolation

< Operate the switch, valve, or other energy isolating device so that the energy source (electrical, mechanical, hydraulic, etc.) is disconnected or isolated from the equipment.
< Stored energy, such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, air, gas, steam or water pressure, etc. must be dissipated or restrained by methods such as grounding, repositioning, blocking, bleeding down, etc.

Important Notes:

< Never pull an electrical switch while it is under load.
< Never remove a fuse instead of disconnecting.

A variety of lockout procedures are in use, but to be truly effective, six steps must be followed.

1. Shutdown equipment.
2. Verify all moving parts have stopped.
3. Lock and tag each energy isolating device, such as: switch or valve in proper sequence and with appropriate lockout devices.
4. Verify that each lockout application has in fact accomplished its purpose and that the equipment is completely isolated from all energy sources.
5. Neutralize all stored energy.
6. Verify that the system has actually been neutralized.

7. Lockout Devices

Lockout devices include a range of locks and tags, and other devices that can be used to control energy sources. For example blanks, blocks, pins, chains, or cables may be needed to prevent certain kinds of energy release.

It is essential that only good quality equipment be used for a device that becomes part of a lockout system. Key-operated, case hardened steel locks should be a basic requirement. This equipment must be inspected and tested at regular intervals.

Personal Locks

Typically, a keyed padlock (not a combination lock) is issued to an employee when he or she is trained. This lock is for personal use only. Locks may be painted different colours to identify shifts. Each lock should be marked with the worker=s name. The worker is responsible for the lock and key.

An essential principle of lockout is: **one worker, one lock, one key**. If more than one lock is required for continued use by any worker, multiple locks are issued to that worker. There may be instances where locks are issued on some other basis, such as taking equipment out of service for an extended period. Such exceptions must be strictly controlled as discussed below.

Multiple Lock Adapters

Multiple lock adapters, also known as **scissors**, are devices that permit the application of several padlocks, by more than one person, on one piece of equipment.

Electrical Plug lock-out box

This device allows employees to work on electrical equipment which is not directly wired. These boxes are to be closed over the electrical plug and padlocked in place.

Chains, Slings, Cables

Sometimes the equipment is too complex to be locked out with a single lockable isolation device. In these cases, devices like chains or slings may be used. They are attached to the equipment in such a way that the equipment cannot be operated. Then the chain itself is secured with a padlock.

Insulated Fuse Pullers

Removal of fuses is one way to isolate electrical equipment, but removing fuses can in itself be a hazardous activity. The insulated fuse puller is a personal protective device sometimes used for this purpose. These devices should be used only by employees trained in their use, and employing safe work practices.

Blocks and Pins

Blocks and pins are used to physically block or restrain stored energy. There are many different types. Customized blocks and pins should be designed for specific systems or machines. These devices should always be located near the machinery. They should be used only for that specific piece of equipment.

Tags

A **personal protective tag** is a distinctive tag applied to the lock. It indicates who locked out the equipment and why. It names the worker, his or her department, the date and the time. A **status tag** includes much more detail, such as a description of the status of the equipment.

Stickers

Stickers may be applied to equipment to identify points of control. Using the same identification method on all components avoids confusion and allows control points to be quickly identified. Workers should not have to trace complex systems or rely on memory to locate isolation devices.

Record Log

A log should be maintained to record the details of each lockout. The log should indicate the lockout application date and purpose as well as when and by whom it was removed. Entries should be made by authorized workers before locks and tags are applied or removed.

Control

It is essential that a system of control be established for all locks and that direct responsibilities be clearly defined. Any replacements must be subject to a detailed control procedure. Locks should be issued only subject to a strict procedure.

The lockout procedure must define exact responsibility for the control, administration and use of the lockout system. Responsibilities should be set out for each of the following:

- department head (if involved)
- supervisor
- specialized tradespeople
- individual employee

Rules must be established to determine who will issue locks and when and to whom they will be issued. Procedures for dealing with lost locks and similar problems must be stated. Explanations must be given for any temporary issuance of a lock, sub-system lock, departmental lock, and other exceptions.

The employer should issue a written set of clear and definitive lockout instructions. They should be well publicized and included as part of all training. The instructions should include the following:

- A general explanation of the company=s lockout system
- How and when to apply personal issue locks and tags
- Procedure for use of temporary locks, where applicable
- Descriptions of specific situations that may deviate from the fundamental procedure

8. Lockout Process

Application of Lockout Device

- Lockout the energy isolating devices with an assigned individual lock.
- Apply a tag to the energy isolating device that details the following:
- printed name
- signature

< department
< expected completion

Isolation Verification

< Ensure that no personnel are exposed.
< To check that all energy sources are disconnected, operate the push button or other normal operating controls to make certain the equipment will not operate.
< Return operating controls to neutral position after the test.

Removal of Lockout

When the job is complete and equipment is ready for testing or normal service:

< Make sure the equipment is safe to operate by removing all tools from the work area and ensure the system is fully assembled.
< Safeguard all employees by conducting a head count to make sure everyone is clear.
< Notify everyone who works in the area that lockout / tag out is being removed.
< Remove lockout / tag out devices. Each device must be removed by the person who put it on.

The energy isolating devices may be operated to restore energy to equipment.

Note: The complete process must be logged (see Appendix 3)

Lock-Ins

A lock-in keeps a person, object, force, process, or other factor from leaving a restricted zone. Locking a switch on a circuit to prevent it from being energized is a lockout, a similar arrangement on a live circuit to prevent current from being shut off is a lock-in.

9. Lockout Standards

Specific lockout standards are included in the regulations and under the Occupational Health and Safety Act and also in a variety of guidelines and codes.

Regulations

Lockout legislation included in the Industrial, Mining, Construction, and Health Care Regulations. Electrical and confined-space hazards are the subject of particular attention in these regulations. Workers are responsible for following the regulations. They need to know the hazards present in the workplace in order to apply the prescribed lockout measures.

Guidelines and Codes

Lockout guidelines and codes provide additional details and often make application of regulations more specific. They provide standards for effective lockout procedures.

The Electrical Safety Code is a regulation under the Power Corporation Act, which regulates the establishments, operation, and power of Ontario Hydro. It sets out safety standards for electrical wiring, equipment, and installation. The Industrial, Mining and Construction Regulations under the OHSA all refer either to the Electrical Safety Code or CSA standard on which the code is based.

10. Roles of the Workplace Parties

A lockout program might seem to be an unnecessary chore to stop machinery, go through a procedure, then reverse the procedure to start up again. Sometimes shortcuts look easier and quicker, and production keeps going. Adjusting equipment, retrieving an object, and clearing a jam are all situations that invite exceptions to the lockout rules.

If the lockout system has not become a part of the workplace culture, then this kind of thing can happen, and tragedy may result. To make lockout procedures effective, everyone in the workplace must play a role.

Management

It is management=s responsibility to ensure that there is a general lockout policy in effect. This procedure must be applied to every work station through written lockout procedures (see Sample in Appendix 3). Ongoing training and promotion of the lockout policy can help to ensure that it works. Lockout procedures must be updated when new equipment is installed or processes are changed.

Supervisors

It is essential that supervisors embrace the lockout philosophy and show, by example, the importance of every element of the procedure. Constantly monitoring worker compliance with lockout procedures and enforcing a no-exceptions policy is a key part of the supervisor=s job. Training, re-training and documentation (Appendix 2) should also be part of his or her responsibility.

Workers

Workers have a duty to report unsafe conditions in the workplace to the employer. It is important that they take this duty seriously. An unrecognized hazard is an uncontrolled hazard. If the employer is aware of such hazards action can be taken to control them. Workers should also collaborate with their JHSC members. Once they are aware of health and safety problems, they can deal with them in committee meetings.

11. Procedure Involving More Than One Person

Using the preceding steps, if more than one person is required to lockout equipment, each shall place their own personal lock on the energy isolating device(s). One designated individual of the work crew, or a supervisor, may be given the responsibility for the whole crew. In such cases, a multiple lockout device shall be placed by the supervisor or person in charge of the work being done. It shall be the responsibility of this individual to make sure all steps of the lockout procedure are carried out. All workers required to attach their locks to a multiple lockout device shall make sure it is securely attached to the proper disconnect and power cannot be reactivated until they remove their **own** lock.

Additionally, the designated individual shall remove their lock last when it has been verified that all individuals and equipment are clear.

Special Situations

Contractors

When contractors or other outside workers are performing service or maintenance within facilities, they will adhere with these procedures or their own if approved by Facility Services.

Shifts

If servicing lasts more than one work shift, lockout / tag out protection must not be interrupted.

Replacement Personnel (Transfer of lock-out)
Employees leaving work do not remove their locks until the replacement employee arriving is ready to lockout / tag out.

An employee leaving work will not remove their lock until the replacement employee has arrived and has placed their padlock on the locked out equipment. This information must be properly logged as a lockout transfer to provide clarity.

Rules for Using Lockout Procedure

All equipment shall be locked out to protect against accidental or inadvertent operation when such operation could cause injury to personnel. **Do not** attempt to operate any switch, valve, or other energy isolating device bearing a lock.

12. Specific Methods of Lockout

Electric

Electric energy is the most common source of power for machines and equipment motors. The motor control center supplies electricity through an electrical circuit to many machines. All machines and devices powered by electric current contain an electrical circuit.

The various components of an electrical energy system are:

- main disconnects
- control switches
- fuses
- circuit breakers
- conduit wiring
- bus bars
- motors

Method

As Main Energy Source

The operating controls of a machine are usually not electrical disconnects. The disconnect in an electrical system mechanically opens the electrical circuit. It completely cuts the power supply to the circuitry of the machine. Electrically, the disconnect switch is opened to turn power off. This means the handle or lever of the disconnect switch is moved to the off position.

As an added precaution from electrical flashes or arcing, stand beside the switch box and face away from the switch as the circuit is opened.

Energy is locked out by placing the lock through the handle and the control panel. This prevents the handle from being able to be moved to the on position by accident.

Only a qualified worker, can disconnect energy at the main control center. If so, the electricity is disconnected by removing fuses or tripping breakers in the control panel. Electrical testers are used to test power above and below the switch. If there is no power reading **above** the switch, the control is not a live supply box. If there is power **below** the switch, then current is coming from another source. In either case, the disconnect will not be effective if locked out at this point. It will require a qualified electrician to fully investigate and resolve the problem before the lockout can proceed.

As Stored Energy Source

Stored electrical energy is held in batteries or capacitors even though the main disconnect has been locked off. Batteries shall be disconnected before any work can begin.

Capacitors must be fully discharged to neutralize stored electricity. The system or machine may be cycled in order to help drain power from capacitors. Discharging is only to be done according to manufacturer=s instructions.

Caution: Power may still be retained if it is below the amount needed to move one complete cycle. Tools, such as screwdrivers, etc., should **never** be used to discharge electrical stored energy.

13. Lockout Checklists (see Appendix 3)

The following checklists (App. 3) should be documented before a lockout is carried out and after service is completed.

If the answer is **no** to any of these questions, then corrective measures are required.

14. References

Occupational Safety Management and Engineering; Fourth Edition: Willie Hammer, Prentice Hall 1989

Accident Manual for Business Engineering and Technology; 10th Edition, National Safety Council 1992

Zero Energy - An Effective Lockout Procedure Revisited; UAW Health & Safety, Vol. 5 1992

IAPA, **Lockout Procedures: A Case Study**; Grain, Feed & Fertilizer Accident Prevention Association 1991

Utility Work 5/82 and **Waterworks Operation** 1/91; Electrical Utilities Safety Association Safe Practice Guides

Lockout Training

I have received and reviewed the Thames Valley District School Board Procedure, Protocol document and participated in the Lockout Training Session:

Name: _____

(Please Print)

School: _____

Date: _____

Lock / Scissor / Tag are present on Site: Yes "

No "

Lock Number: _____

Signature: _____

Remove this page when training is complete and

hand in to the Leader / Supervisor / Department Head

***Copies to remain in file at the School / Workplace**

Lockout / Tagout

Questions & Answers

1.	Give six (6) examples of energy in the workplace:			
	1.		4.	
	2.		5.	
	3.		6.	
2.	Name two (2) types of energy sources:			
	1.		2.	
3.	What are the five (5) key elements of a lockout procedure?			
	1.		4.	
	2.		5.	
	3.			
4.	What two (2) steps in a lockout procedure prevent exposure to energy sources?			
	1.			
	2.			
5.	What six (6) steps should be followed in order to maintain an effective lockout / tag out procedure?			
	1.		4.	
	2.		5.	
	3.		6.	