Hot Work Protocol

Article 1

Purpose

Vanier College has established a Hot Work Protocol to minimize the potential for injuries and loss of property due to fire or explosion as a result of hot work.

Article 2

Scope

This protocol applies to any employee, including Vanier College employees, trade workers, or outside contractors who will be performing hot work on Vanier College property.

Article 3

Definition

"Authority Having Jurisdiction" (AHJ): An organization, office or individual responsible for the enforcement of codes and standards, approval of equipment, materials, installation or procedure. For the purpose of this protocol, the Authority Having Jurisdiction is Safety & Security Services.

"Permit Authorizing Individual" (PAI): Office or individual responsible for issuing hot work permit and enforcing the present protocol. For the purpose of this protocol, the *PAI* is Safety & Security Services Management.

"Hot work": Temporary operation involving open flames or which produces heat and/or sparks and/or slag. This includes, but is not limited to: Brazing, Cutting, Grinding, Soldering, Thawing Pipe and welding.

"Operator": The person performing the hot work operation and the person primarily responsible for the safety of the hot work.

"Shielded": Items or material must be protected by an approved welding pad, welding blanket or equivalent protection.

Article 4

Roles and responsibilities

4.1 Roles and Responsibility of management

a. Ensure the compliance of employees and contractors to the current protocol and any applicable laws and codes
b. Ensure that the operators are trained and are aware of the applicable procedures.
c. When equipment is found incapable of reliable safe operations, the equipment shall be repaired by qualified personnel prior to its next use, or be withdrawn from service and its use prohibited.
d. Ensure that the proper personal protection equipment is available to college employee operators
e. When managing a contractor, file the hot work permit requests for any hot work operations.

4.2 Roles and responsibility of Safety & Security Services

a. Develop and revise this protocol as needed
b. Review and approve permits for all hot work activities on campus
c. Stop hot work activities that do not have a proper permit on display
d. Contact the *operator* or supervisor to obtain more specific information about hot work operations, or visit the work site, as deemed necessary
e. Respond to locations whenever a fire safety problem exists, to provide advice
f. Provide fire watch services when required by the hot work permit or requested by the supervisor responsible

4.3 roles and responsibility of the *operator*

a. The *operator* must perform hot work operations in respect of the current protocol and all applicable laws and codes.
b. The *operator* must verify that welding equipment is in good working order.
c. The *operator* must report any abnormality with the hot work equipment to his/her supervisor and stop any operation until the equipment is inspected, repaired if necessary and deemed safe.
d. The *operator* must ensure that a valid permit has been issued and is posted at the entrance of the work site prior to starting any hot work operations.

4.4 Roles and responsibility of the contractor

a. The contractor must perform hot work operations in respect of the current protocol and all applicable laws and codes
b. The contractor must consult with the project manager in regards to any planned hot work operations to ensure that the proper permits are requested within the appropriate time frame

4.5 Roles and responsibility of the fire watch

a. The fire watch must maintain constant surveillance of the hot work site as requested by the permit issuer. This task is to be done exclusively.
b. Maintains the surveillance of the immediate site or adjacent areas, these include areas above and below if there are openings present.
c. In case of a fire, raises the general alarm and follows established emergency procedures.
d. Ensures the presence of a functional and certified fire extinguisher on site and uses it, if it is safe to do so, to extinguish a fire.
e. Advises the *operator* on changing conditions such as excessive smoke, combustibles in the area which weren't present previously or any deficiency in the hot work conditions established by the permit
f. Verifies that the permit is posted at the entrance of the work site and that appropriate signage and barriers are being used.
g. Once surveillance is completed, signs off on the permit and brings it back to Safety & Security Services.

Article 5

Protocol

All work must be done in accordance to all applicable laws, codes and regulations, in particular:

5.1 Designated Hot Work Areas

a. A designated hot work area is a permanent location designed for hot work.
b. For a room to be identified as a designated hot work area, it must:
    - Be of non-combustible or fire-resistant construction
    - Be free of combustible and flammable content
    - Be suitably segregated from adjacent areas
    - Be equipped with at least 1 fire extinguisher
    - Have been inspected and approved by Safety & Security Services
c. Hot work done inside a designated hot work area does not require a permit

5.2 Precaution

a. General fire precautions to be followed before a permit can be issued:
    - The hot work equipment must be in good operating condition and in good repair
    - When work is done near combustible construction material (walls, partitions, ceiling, etc.), the material must be *shielded*
    - Ducts and conveyor systems that might carry sparks must be *shielded* and/or shut down
    - If hot work is done on one side of a wall, partition, ceiling or roof:

- Precautions must be taken to relocate combustible materials on the other side to a safe distance
- If it is impractical to relocate the combustible material, the material will have to be *shielded*.
- Special precautions must be taken when work is being done on metal partitions or metal pipes to shield any material that is likely to ignite by conduction or radiation

➢ At least 1 fire extinguisher must be available in the immediate work area. The extinguisher must be in good working condition and fully charged.

➢ If hot work is done in proximity to a sprinkler head, the following precautions must be taken:

- A wet rag must be laid over the sprinkler head and then removed after the hot work has been completed
- During hot work operations, precautions must be taken to avoid accidental activation of the automatic fire suppression system

➢ The *operator* and nearby personnel must be suitably protected against dangers such as heat, sparks and slag

b. A safe work area must be established around the work site. The standard safe area is 50 feet (15 meters) from the work site. Within the work area:

➢ All combustible materials on the floor must be swept or removed, such materials includes but is not limited to wood shavings, paper clippings or textile materials.

➢ Combustible floors must be kept wet, covered in damp sand or *shielded*.

➢ All combustibles must be relocated outside the safe area. If it is impractical to relocate them, the combustibles must be *shielded*.

➢ All openings or cracks in walls, floors, ducts, open doorways or windows must be covered or sealed with non-combustible materials to prevent the passage of sparks to adjacent areas.

➢ The work area may be expanded or reduced at the sole discretion of the *PAI* based on the risks that are present.

5.3 Fire Prevention

a. In a building protected by a sprinkler system, the sprinkler system must remain operable throughout the hot work operations. If a sprinkler system must be impaired, the impairment protocol must be followed (See 5.7)
    a. During an emergency impairment of the sprinkler system due to unforeseen circumstances, all hot work permits are suspended until the impairment level can be determined and appropriate precautions put in place.

b. Prior to work starting, the *operator* must advise Safety & Security Services. The *operator* must provide the permit #, name, and location of the hot work to be done. Fire detection systems will be disarmed in accordance with the impairment protocol.

c. After the hot work is completed, the *operator* must contact Safety & Security services prior to leaving the area in order to remove all impairments of the fire detection or suppression systems.
d. At all times during hot work operations, the notice "Hot Work in Progress" must be clearly posted at the entrance of the work site to prevent anyone from accidentally entering the area.

5.4 Permit

a. A Hot Work permit is not required for the following activities :
    - Bunsen Burners in laboratories
    - Fixed grinding wheels
    - Electric Soldering Iron
    - Hot work being done in a designated hot work area
b. Before any hot work operations in non-designated areas begin, a written hot work permit must be issued by the *PAI*.
c. Permits are normally issued for a period of 24 hours. The *PAI* may authorize a longer period of time in special circumstances at its sole discretion.
d. Steps to obtaining a permit :
    - The *operator* must complete the Hot Work Permit Request form on the Safety & Security Services website at least 2 working days in advance.
        - Contractors cannot fill out a permit themselves. The project manager must complete the permit request on their behalf.
    - Once submitted, the *operator* must wait for approval from Safety & Security Services. It is the responsibility of the *operator* to ensure that the area and equipment is in conformity with the present protocol in order for the permit to be approved.
    - The permit will be approved or denied based on the specifics of the request and the risks involved.
e. Hot work can only be done once a permit is approved and the permit must be kept on site for the duration of the work
f. The *PAI* reserves the right to revoke a hot work permit at any time for any violation of the protocol or any applicable laws and regulations

5.5 Fire Watch

a. A fire watch is an individual who is knowledgeable about fire reporting procedures and emergency procedures. A fire watch is assigned to work with an *operator* to watch for fires resulting from hot work operations. They are normally assigned to areas not readily observed by the *operator*.
b. A fire watch is required for any hot work being done outside of a designated area.

c. A fire watch must be constantly maintained for at least 60 minutes after the completion of hot work operations. The *PAI* may decide, at its sole discretion, to extend the duration of the fire watch if it is determined the fire hazards warrant the extension.
d. Once the 60 minutes of fire watch is completed, monitoring can begin for a period of no less than 3 hours. Monitoring shall be defined as the periodic verification of the hot work area and the adjacent areas that are at risk. The different types of fire monitoring scenarios are detailed in annex II. The length and type of fire monitoring can differ from the recommended specifications in annex II at the sole discretion of the *PAI*.

5.6 Personal Protective Equipment (PPE)

a. Clothing must be selected to minimize the potential for ignition, burning, trapping hot sparks, and electric shock.
b. The *operator* must use the proper personal protective equipment while doing any hot work, this includes :
    - Welding helmet or hand shield. The helmet or hand shield must protect the face, forehead, neck and ears from direct radiant energy from the arc or direct weld spatter. During arc welding or cutting, the *operator* must also use filter lenses and cover lenses.
    - Gloves. The gloves must be flame resistant, be in good repair, dry and capable of providing protection from electric shock by the welding equipment
c. During overhead hot work operation, the *operator* must wear flame-resistant cape sleeves, shoulder covers or equivalent
d. During heavy work and when necessary, flame-resistant leggings may be used by the *operator*
e. During operations that create a hazard to the ear canals, the *operator* shall use flame-resistant ear plugs
f. When necessary, the *operator* may wear a cap made from flame resistant material under the helmet to prevent head burns
g. All persons in the immediate vicinity of hot work operations must be similarly protected

5.7 Impairment Protocol

a. The *PAI* has the authority to determine the level of impairment that is authorized for each permit issued and the precautions that have to be taken
b. A notice of impairment must be posted in the area of the hot work for any impairment that is of level 2 or higher.
c. Impairment requirements can only be lifted once all the affected systems are verified and confirmed to be back in service and fully operational.
d. The impairment classification is divided in 3 levels and an emergency impairment level :
    - **Level 1 impairment**: A component or room is found to be defective during routine maintenance and needs to be replaced or is deactivated to allow hot

work to be completed. Notification of Safety & Security Services is required, no other precautions or notifications are necessary.

- **Level 2 impairment**: A shutdown of a portion of the fire detection system that leaves multiple rooms without coverage due to hot work or defective equipment. Any shutdown of the fire suppression system is considered to be at least a level 2 impairment. A fire watch is required for any level 2 impairment. Notification of Safety & Security Services is required.
- **Level 3 impairment**: A shut down of an entire or major portion of a fire detection or fire suppression system, the interruption of the water supply to the fire suppression systems, a fire detection system disruption that affects a building, or there is a loss of connection of the fire alarm system with Safety & Security Services. Fire watch are mandatory for any level 3 impairment. Notification of Safety & Security Services is required. Non-critical hot work will be suspended.
- **Emergency Impairment**: A partial or complete shutdown of fire detection or suppression systems due to unforeseen consequences. All hot work operations are suspended until a proper assessment of the risk and of the extent of the impairment is determined.

5.8 Emergency repairs

a. It is possible that failure of the college's critical infrastructure would have immediate and catastrophic consequences to the college. In such cases repairs are required in the shortest delay. Under these conditions, an emergency hot work permit can be issued by the *PAI*.
b. Emergency permits are issued immediately without the required delays for verifications, all of the precautions and prevention measures are still required to be followed by the *operator*.
c. An emergency permit will only be issued if the following conditions are met:
    - The equipment is considered critical to college operations
    - Failure to repair the equipment immediately will adversely affect college operations
    - No alternative methods are found to maintain the equipment until a standard hot work permit can be issued (shutoff, alternative work methods, etc.)

Article 6

References

- National Fire Protection Association, *51B Standard for Fire Prevention During Welding, Cutting and Other Hot Work.*
- American National Standards Institute, *Z49.1:2012 Safety in Welding, Cutting and Allied Processes*
- Canadian Standards Association, *W117.2-12 Safety in Welding, Cutting and Allied Processes*
- National Fire Code of Canada 2010

Article 7

Annexes

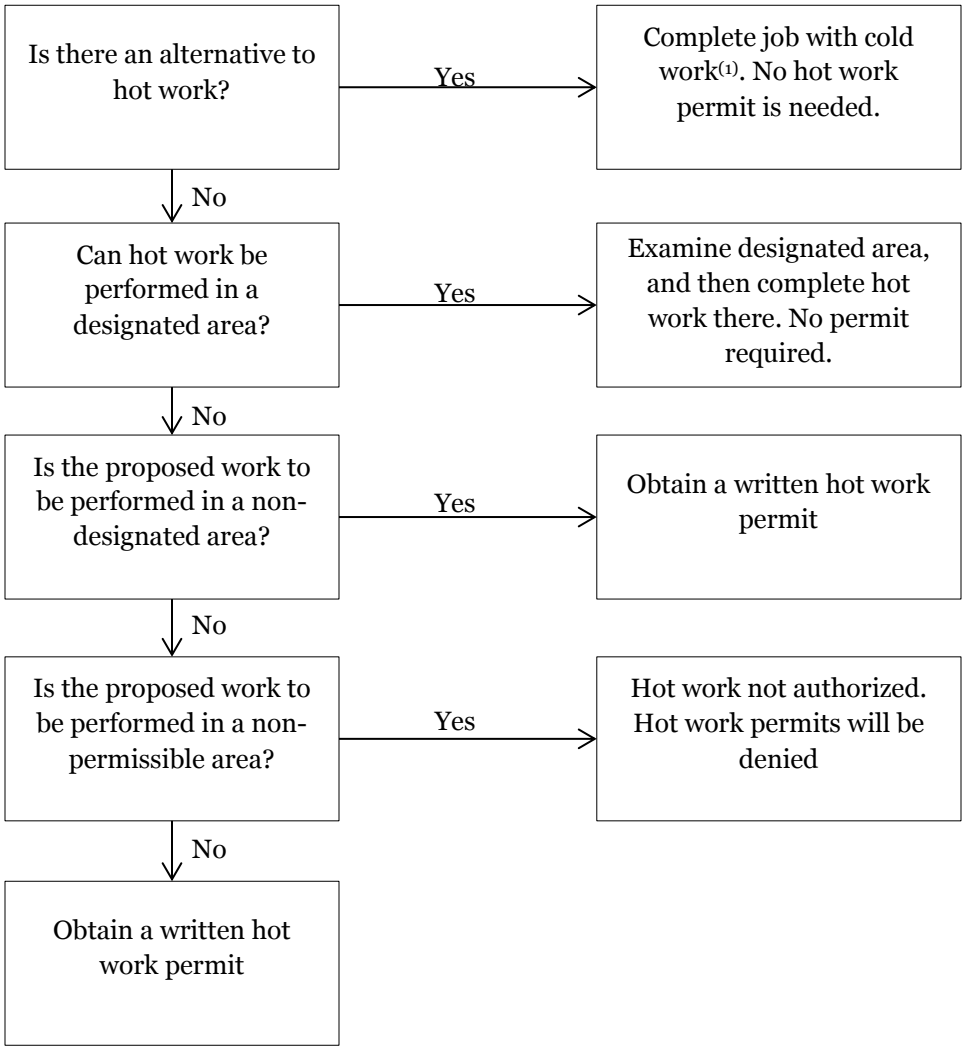
Annex I: Hot Work permit decision tree
Annex II: Fire monitoring
Annex III: Hot work accidents (Excerpts from NFPA 51B)
Annex IV: Hot Work Permit

Article 8

Update History

Version No.	Modifications	Issued
1.0	Initial publication of document	2013/10/08
1.1	Update due to National Fire code 2013 revision • Article 5.2 b) Safe area increased from 11m to 15m • Article 5.5 b) Changed 35ft to 50ft • Article 5.5 c) Fire watch must be in place increased to 60 minutes from 30 minutes Article 8: Update history added	2014/01/15
1.2	Update to fire watch requirements by the National Fire Code • Article 4.5 added • Article 5.5 modified to comply to Code requirements • Annex 2 modified to comply to Code requirements	2014/01/30
1.3	Updated document formatting following NFC standards	2014/05/20
1.4	Updated section 5.7 – Impairment protocol	2014/07/17

Annex I: Hot work permit decision tree



(1)**Alternatives to hot work can include ("Cold work")**	
Manual Hydraulic shears	Mechanical bolting
Screwed, flanged or clamped pipe	Reciprocating saw
Mechanical pipe cutter	Manual file
Mechanical removal and relocation of frozen piping to a heated area	
Approved self-drilling or compressed air-actuated fasteners	
Cold roofing methods, mechanically attached or fully adhered roof systems	

Annex II: Fire monitoring scenarios and their required actions

1) The hot work area and the adjacent areas are covered by a smoke detection system;

   At the end of the 60 minutes of surveillance, the fire watch does a last verification of the area and contacts Safety & Security services to re-arm the smoke detectors in the area before leaving the hot work site. The smoke detection system should be sufficient to monitor the area.

2) The hot work area and the adjacent areas are not covered by a smoke detection system but will be occupied continuously by staff members that have been informed of the risk;

   At the end of the 60 minutes of surveillance, the fire watch does a last verification of the area and informs all occupants to be vigilant for signs of smoke or fire in the next 3 hours and to activate the manual pull station at the fire sign of fire.

3) The hot work area and the adjacent areas are not going to be occupied for the next 3 hours and are not covered by a smoke detection system;

   At the end of the 60 minutes of surveillance, the fire watch will do a last verification of the area. Verification rounds must then be done at a maximum interval of 60 minutes between rounds for up to 3 hours, unless shorter intervals are determined to be necessary by the *PAI*.

4) The hot work area is on a roof and adjacent areas at risk may be on the roof, in the roof or the in the space below the roof;

   At the end of the 60 minutes of surveillance, the fire watch does a tour of the area and maintains a constant fire watch for the next 3 hours. During the fire watch, the monitor will have to do rounds of all the adjacent areas at intervals of no more than 60 minutes and then resume the fire watch on the roof until the end of the 3 hours.

5) The hot work area is in a vertical technical shaft and adjacent areas that have an opening in the shaft are considered at risk;

   Due to the high risk of travels of sparks in the shaft, the monitor must tour continuously all the areas that are considered at risk for the full 3 hours due to the high risk of these specifics circumstances.

The specifics of the fire monitoring are determined by the authority having jurisdiction during the planning stage with the assistance of the project manager to identify the specific risks associated with the hot work being done.

Annex III: Hot work accidents (Excerpts from NFPA 51B)

Austin, Texas : University library

Workers were using an acetylene torch to remove heating ducts between the 20th and 21st floor of the 27-story university library. Flying sparks fell through a vent and ignited papers stacked against the vent in storage room on the 20th floor. The fire burned for 20 to 30 minutes before discovery. The upper floors of the building had no fire suppressions systems. The fire department finally controlled the fire in 2 ½ hours, but damage extended to 4 stories. The contractors had not investigated the possibility of combustible materials being in contact with the old heating duct on which they were working.

Provo, Utah : Hardware Warehouse

An employee was welding a broken metal roof beam in the attic of a one story hardware building. A spark fell through a crack in the attic floor and ignited cardboard boxes in the shelving below. No precautions had been taken to guard against fire, and the welder did not realize that there was a fire until he felt the heat coming up from below. The total loss was $131,000.

Michigan : Restaurant

A plumber attempting to thaw some frozen water pipes in a newly constructed restaurant inadvertently started a fire with an open-flame torch. The torch ignited insulation material around the pipes, which were located in the kitchen ceiling. The plumber and several restaurant workers attempted to extinguish the fire with two 10 lb. extinguishers. When this attempt did not work, the local fire department was contacted as the fire moved quickly to the attic. The restaurant was determined to be a total loss, at a value of $525,000.

Kaukauna, Wisconsin : Warehouse

While an arc welder was being used on the 2nd floor, sparks dropped through an opening to cardboard boxes below and the boxes ignited. There was no fire watch on the first floor, and when the fire was discovered 15 minutes later, employees could not put it out. The fire department was too late to save the two-story building. The total loss was $1.6 million.