# Work Health and Safety - Controlling Exposure to Surgical Plume

**Summary** The guideline provides information for NSW Health Organisations to manage the risks associated with surgical plume. It provides information for a risk management approach to minimise exposure of workers and patients to surgical plume and meet their duties and responsibilities under the Work Health and Safety legislation.

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**Distributed to** Public Health System, Divisions of General Practice, Government Medical Officers, NSW Ambulance Service, Environmental Health Officers of Local Councils, Private Hospitals and Day Procedure Centres, Health Associations Unions, Tertiary Education Institutes

**Audience** Senior Managers, Staff, Work Health and Safety Practitioners, Staff Health, Healthcare Workers;Infection Control and Operating Theatre Staff;Dental Clinical Staff

Secretary, NSW Health

NSW Health

GUIDELINE

# Work Health and Safety - Controlling Exposure to Surgical Plume

## GUIDELINE SUMMARY

This Guideline provides direction to NSW Health organisations to meet their duty of care under the *Work Health and Safety Act 2011* (NSW) and *Work Health and Safety Regulation* 2017 (NSW) in eliminating and minimising risk associated with surgical plume.

Each NSW Health organisation where surgical plume is created must have systems in place to identify hazards associated with surgical plume and to eliminate or minimise the risks through the implementation of appropriate controls.

## KEY PRINCIPLES

This Guideline applies to NSW Health organisations and all other bodies and organisations under the control and direction of the Minister for Health or the Secretary of NSW Health where facilities under their control create surgical plume, such as in operating theatres; surgical clinics and procedural rooms, dental clinics; morgues during autopsy; laboratories/ research and testing facilities.

Surgical plume is generated during operative or other invasive procedures by energy based surgical devices such as electrosurgical (diathermy), ultrasonic and laser units when cutting, vaporising or coagulating tissue. Surgical plume can contain a mixture of hazardous components including ultrafine particulates, noxious and toxic aerosols, cellular debris, bacteria, viruses, gases, fumes and vapours. Exposure to surgical plume needs to be assessed and controlled as it can cause potential hazards to workers and patients.

Hazard identification and risk assessment, in consultation with workers, must be undertaken to eliminate or minimise the risk of exposure for workers and patients. Surgical plume should be eliminated so far as reasonably practicable.

Plume evacuation systems are the most effective measure to remove plume at the point plume is created. Any plume that cannot be removed using a plume evacuation system should be minimised using additional controls based on the hierarchy of controls.

This risk assessment for worker/ patient exposure to surgical plume must include the physical layout of the area, equipment used for the surgery, surgical procedure being performed (length of surgery, type of tissue disrupted), ventilation of the area, specific risks for the patient and whether a plume evacuation system is installed.

Each NSW Health facility where surgical plume is created must:

- conduct risk assessments in consultation with workers
- implement controls identified through those risk assessments

- review controls at a frequency relative to the level of risk to ensure their ongoing effectiveness.

It is important to identify and procure the most appropriate plume evacuation system for the facility in consultation with workers. The plume evacuation system is to have an appropriate filtration system, alarm monitoring system, capacity to handle plume, and be easy to use without disrupting the surgical view.

The evacuation system must be maintained as per manufacturing guidelines which do not pose additional hazardous manual handling or infection control risks that cannot be controlled. Safe work procedures, checklists and training material must be developed to protect workers and patients based on the risks and controls identified in each facility.

Workers should be provided with information, instruction, training and supervision for the potential risks associated with surgical plume. This includes their role and responsibilities, safe systems of work and the use of equipment including personal protective equipment.

Control measures must be reviewed regularly, in consultation with workers who may be affected by surgical plume to ensure continuous improvement and ongoing effectiveness.

## REVISION HISTORY

| Version | Approved By | Amendment Notes |
|---|---|---|
| GL2023_018<br>July-2023 | Deputy Secretary, People, Culture and Governance | Updated guidelines to include Respiratory Protection Program requirements and changes with the legislation including an increased focus on worker consultation and risk assessment process. |
| January 2015<br>GL2015_002 | Deputy Secretary, Governance, Workforce and Corporate | New Guideline. |

# CONTENTS

# 1. BACKGROUND

Surgical plume generated during operative or other invasive procedures by heat generating devices such as electrosurgical, ultrasonic and laser units, is a hazard for workers and patients.

Hazard identification and risk assessment, in consultation with workers, must be undertaken to eliminate or minimise the risk of exposure to workers and patients. This risk assessment for worker/ patient exposure to surgical plume must include the work area design, type of energy-based surgical device used, the surgical procedure performed, ventilation of the area and whether a plume evacuation system is installed. Workers must be consulted when determining appropriate risk controls.

## 1.1. About this document

This Guideline provides guidance to NSW Health Agencies to meet their primary duty of care under the *Work Health and Safety Act 2011* (NSW) [WHS Act] and *Work Health and Safety Regulation 2017* (NSW) [WHS Regulation] in the management of risks associated with surgical plume.

This Guideline applies to any setting where energy-based surgical devices may generate a plume, such as operating theatres, surgical clinics and procedural rooms, dental clinics, morgues, laboratories and other research and testing facilities.

## 1.2. Key definitions

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| **Consultation** | Consultation is a two-way process with workers to talk, listen, seek and consider their views when making decisions that have health and safety consequences. It may involve additional stakeholders (including health and safety representatives) based on an organisation's consultation arrangements. How it occurs will vary but it needs to be consistent with legislative requirements. |
| **Energy-based surgical devices** | Heat-generating devices that are used in clinical procedures to disrupt tissue, as described under the definition of "plume". |
| **Hazard** | A situation or thing that has the potential to harm a person. |
| **NSW Health Organisations (Agency)** | Considered persons conducting a business or undertaking (PCBU) under the WHS Act and for the purpose of this Guideline means Local Health Districts, HealthShare NSW, NSW Ambulance, Sydney Children's Hospitals Network, Justice Health and Forensic Mental Health Network and NSW Health Pathology. |

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| **Person conducting a business or undertaking (PCBU)** | Under the WHS Act, NSW Health Agencies are PCBUs and are responsible for the primary duty of care for workplace health and safety, as far as is reasonably practicable. |
| **Plume** | Noxious airborne contaminants generated as by-products, particularly by procedures that rely on the ablation, cauterization, thermal desiccation, or mechanical manipulation of target tissue by devices such as lasers, electrosurgical generators, broadband light sources, ultrasonic instruments, and surgical instruments such as high-speed drills and bone saws. |
| **Plume evacuation system** | A portable, mobile, or fixed device designed to capture, filter, and remove surgical plume.<br>Note: Plume evacuation systems are also called plume scavenging systems, plume evacuators, laser plume evacuators, plume scavengers, and local exhaust ventilation (LEV). |
| **Risk** | The possibility that harm (death, injury or illness) might occur when exposed to a hazard. |
| **Risk control** | Actions taken to eliminate health and safety risks so far as is reasonably practicable, and if that is not possible, minimising the risks so far as is reasonably practicable. |
| **Surgical boom** | A device hung from the ceiling that contains and delivers medical gases, electricity, and other utilities to the boom end, which can also carry other devices such as electrosurgical units and monitors (sometimes referred to as pendants, or medical gas supply units). |
| **Ultra-low particulate air (ULPA) filter** | A filter that removes particles as small as 0.12 microns with a filtration efficiency of not less than 99.999%. |
| **Ventilation** | The movement or replacement of air, typically between an indoor space and the outside. The exchange is made to control temperature, replenish oxygen, or remove moisture, odours, smoke, heat, dust, airborne bacteria, and carbon dioxide. |

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| **Workers** | Anyone who carries out work for NSW Health is given the legal status of 'worker', workers include:<br>• Employees<br>• Contractors, including visiting practitioners<br>• Sub-contractors<br>• Sub-contractors and employees of contractors<br>• Employees of a labour hire company, such as agency staff<br>• Volunteers<br>• Apprentices, cadets or trainees<br>• Students on clinical, work experience or other placements. |

## 1.3. Legal and legislative framework

The *Work Health and Safety Act 2011* (NSW) [WHS Act] and *Work Health and Safety Regulation 2017* (NSW) [WHS Regulation] ensures the health and safety of everyone at the workplace.

Under Section 19 of the WHS Act, the NSW Health Agency (as a Person conducting a business or undertaking [PCBU]) has a primary duty, so far as is reasonably practicable, to ensure the health and safety of workers and other persons at the workplace, including patients. Deciding what is 'reasonably practicable' to protect people from harm requires weighing up all relevant factors, including:

- the likelihood of a hazard or risk occurring and the degree of harm that would result
- what the person concerned knows, or ought to reasonably know, about the hazard or the risk
- the availability and suitability of ways to eliminate or minimise the risk
- the cost associated with available ways of eliminating the risk and whether the cost is grossly disproportionate to the risk.

Under Section 47 and Section 48 of the WHS Act the NSW Health Agency must consult with workers to consider their views and enable them to contribute to decisions affecting their health and safety. Consultation is to be undertaken during the risk management process and, for surgical plumes, particularly when selecting equipment.

Under clause 34 of the WHS Regulation, the NSW Health Agency, in managing risks to health and safety, must identify reasonably foreseeable hazards that could give rise to risks to health and safety. In managing risks to health and safety as required under clause 35 of the WHS Regulation, the NSW Health Agency must:

a) eliminate risks to health and safety so far as is reasonably practicable, and

b) if it is not reasonably practicable to eliminate risks to health and safety –

minimise those risks so far as is reasonably practicable.

Clause 36 of the WHS Regulation requires that the hierarchy of controls be used to minimise the risks to health and safety where the risk cannot be eliminated. Clause 37 of the WHS Regulation requires that control measures that are implemented are also maintained to remain effective.

The Safe Work Australia Model Code of Practice *How to manage work health and safety risks* provides guidance on how to implement risk management principles in the workplace.

WorkSafe Victoria have published *Managing surgical plume exposure in healthcare*, for employers on controlling the risk of exposure to surgical plume in healthcare.

For further information in relation to the WHS Act and duties refer to the NSW Health Policy Directive *Work Health and Safety: Better Practice Procedures* (PD2018_013) or the SafeWork NSW website *Managing hazards and risks*.

AS 16571:2015 *Systems for evacuation of plume generated by medical devices* specifies requirements for evacuation of surgical plume generating systems in healthcare facilities.

# 2. OCCUPATIONAL EXPOSURE

## 2.1. What is surgical plume

Surgical plume is a byproduct from the use of devices when cutting, vaporizing or coagulating tissue during surgical, diagnostic and therapeutic procedures. The damage to tissues creates a potentially hazardous by product known as “plume”. This plume may or may not be visible and can have an unpleasant odour. The visible plume is often referred to as a ‘smoke’ plume.

Surgical plume can contain a mixture of hazardous components including ultrafine particulates, noxious and toxic aerosols, cellular debris, bacteria, viruses, gases, fumes and vapours. The human papillomavirus (HPV) and the human immunodeficiency virus (HIV) have been found in plume but it is not clear if the virus are viable[1][2].Regardless, surgical plume is a potential health hazard and can cause eye, throat, nose irritation and headaches and exposure needs to be controlled.

The composition and exposure hazards associated with surgical plume depend on a variety of factors such as the type of surgical procedure and device (such as laser, electrosurgical, ultrasonic), type and infectious nature of the tissue, extent of tissue ablation, the duration of surgery, and the workers proximity to the surgical field.

## 2.2. Energy sources

Emerging research tends to indicate that the hazards of surgical plume are the same, regardless of the energy source used to disrupt tissue. The number of particles present in plume can vary depending on the type of surgery and its duration and the type of tissue being disrupted.

[1] WorkSafe Victoria Guidance on managing surgical plume exposure in healthcare
[2] AORN Journal, Surgical Plume and its implications: a review of the risks and barriers to a safe workplace, Tan, E and Russell, K, January 2017

Electro surgery and laser plume is characterised by smaller particles. Ultrasonic scalpels produce a vapour. High speed electric devices such as saws and drills used in orthopaedic, ear nose and throat (ENT), neuro, cardiothoracic, dental and other types of surgery heat up and require irrigation to cool them. This emits aerosols into the operating room. Vapours and aerosols contain larger particles.

### 2.3. Settings where surgical plume is generated

Surgical plume can be found in public health facilities, such as:

- operating theatres
- surgical clinics and procedural rooms
- dental clinics
- morgues during autopsy
- laboratories – research and testing facilities.

## 3. RISK MANAGEMENT

A risk management approach to health and safety as required under the *Work Health and Safety Regulation 2017* (NSW) [WHS Regulation] must be undertaken to protect workers and patients from exposure to plume, which includes identifying hazards, assessing risks, controlling risks and monitoring and reviewing controls. Each of these steps needs to be in consultation with workers.

### 3.1. Hazard identification

Surgical plume is potentially hazardous to workers and patients that are exposed to it. Research indicates the plume contains toxic carcinogenic chemicals and may contain biological components in surgical smoke and aerosol particulates.

To identify hazards associated with plume, consideration needs to be given to the:

- physical work environment where the surgical plume is created
- nature of the ventilation system, including whether it is positive or negative pressure
- instruments and equipment being used
- nature of the procedure, work tasks and how they are performed
- length of surgery
- work design and management
- any specific risks associated with the patient (such as, type of tissue, infectious nature of the tissue, location of required surgery).

Workers are encouraged to submit incident reports if they are exposed to surgical plume and to report any suspected adverse health effects that may have arisen from exposure to surgical plume.

## 3.2. Risk assessment

A risk assessment involves considering the likelihood of exposure to surgical plume and the consequences of exposure (severity of the risk). A risk assessment can help determine:

- what workers are exposed to the risk
- what is the seriousness of the risk
- what action should be taken to control the risk
- whether any existing control measures exist and are they effective
- how urgently additional actions needs to be taken.

The risk assessment is to be carried out in consultation with workers who may be affected by exposure to surgical plume and should also include:

- clinicians
- work health and safety practitioners
- infection control practitioners, and
- technical experts who can assist in identifying the appropriate control measures.

The following must be taken into consideration when conducting a risk assessment at a facility[3][4]:

- Number and type of procedures that are to be performed
- The energy-based equipment being used and current plume evacuation systems in use
- Size and layout of the procedure room or treatment area
- Available ventilation in the procedure room/ treatment area including whether it is positive or negative pressure and the size of the area being ventilated
- Potential volume of plume related to the length of use of energy-based equipment and tissues
- Manufacturer's specifications, related to the effectiveness of the equipment and
- Compliance with standards and the status of use of the plume evacuation system
- Provision of suitable personal protective equipment (PPE) including respirators and eye protection

## 3.3. Control measure identification

Clause 35 of *the Work Health and Safety Regulation 2017* (NSW) requires that the

[3] Canadian Standards Association CSA Standard Z305.13-13 *Plume scavenging in surgical, diagnostic, therapeutic, and aesthetic settings December 2019, 4.5.2.*
[4] AS16571-2015*: Systems for evacuation of surgical plume generated by medical devices* (ISO 16571:2014, MOD).

highest levels of practicable control measures appropriate to the level of risk are used. Where a facility determines it is unable to eliminate plume, so far as reasonably practicable, then the risks must be minimised using the Hierarchy of Controls with a focus on higher level, controls to remove the plume.

These measures would include:

1. Adequate plume evacuation at the source, for example use plume evacuation systems
2. Effective room exhaust ventilation (air filtration systems). Please note that all devices and systems intended for plume filtration need to be 0.1 micron at 99.999% efficiency[5]
3. Safe work procedures, including standard precautions against exposure to blood-borne pathogens when entering or working in an area where infectious material from a plume could be present in the air or on surfaces
4. Maintenance of the plume evacuation system, such as replacing filters in accordance with the manufacturer's instructions
5. Waste disposal in accordance with NSW Health policy
6. Providing information to workers on the potential risks associated with surgical plume, their role and responsibilities and systems of work including the use of equipment and personal protective equipment (PPE)
7. Training, including refresher training, in the how to use plume evacuation equipment, how to use and store PPE and standard infection control procedures
8. Auditing for compliance by persons who have the knowledge, experience and training to competently identify whether the controls are effective and are being implemented. They must be able to identify if the controls have created other hazards and offer solutions to resolve any issues.

Where it is not reasonably practicable to eliminate smoke plumes, some options to consider, based on risk, are as follows.

### 3.3.1. Isolate the hazard/ reduce risk through engineering controls

Isolating a hazard or reducing risk through engineering controls is identified at Level 2 of the Hierarchy of Controls and is a higher level and more effective at controlling risk.

Plume evacuation systems are considered an engineering control to manage surgical plume. Refer to Resource 1 Plume Evacuation Systems for examples of the operation and effectiveness of different plume evacuation systems. The risk assessment may have identified a plume evacuation system is being used but it's important that it is fit for purpose.

Some points to consider including the general requirements of a plume evacuation system (see Section 3.3.2) are:

- Information regarding which types of plumes the system is designed to be used with

[5] IEC Standard TR60825-8 *Safety of laser products –Part 8: Guidelines for the safe use of laser beams on humans*

the types of procedures to be performed

- The size and layout of the procedure room or treatment room
- The type, number and duration of procedures to be performed
- The expected volume of plume generated
- Units effectiveness with continuous extraction at specified pressures and flows
- Ease of use of equipment-foot pedal versus automatic activation, size and flexibility in positioning, and noise levels
- Flammability risks of device and transfer tubing
- Storage, handling, maintenance and cleaning requirements including filter monitoring and cannister design
- Lifetime expectancy of system and components including single use versus reusable
- Warnings, risks and precautions for use
- Procedures for disposal of components and consumables
- Training and instruction of users
- Cost of equipment, installation and operating expenses.

### 3.3.2. General requirements of a plume evacuation system

The plume evacuation system should have the following operational requirements:

1. An intake that can be effectively positioned at or near the operative site and point of plume generation
2. A replaceable filtration system with a defined life that includes:
    - Pre-filtration media
    - An ultralow penetration air (ULPA) filter which provides filtration of 0.1-micron particles at 99.999% efficiency
    - An activated carbon bed for trapping gasses
    - Variable suction volume capacity to accommodate various levels of plume production
    - A monitoring system that alerts the need for a filter replacement
3. An exhaust system
4. Meets the requirements of regulations and standards for efficiency of plume removal, electrical safety and medical devices
5. Have sufficient capacity to handle the anticipated levels of plume for all procedures as part of its expected use
6. Be designed so that changing filters is easy to carry out and does not cause hazardous manual handling or additional unexpected infection control risks.

7. Be easy to use without interfering with the visibility of the surgical site.

Resource 2 Plume Evacuation Systems Checklist can be used to determine the qualities of a good plume evacuation system.

The use of wall suction units for plume evacuation in the perioperative environment are **considered unsuitable** as they do not effectively filter the plume and are difficult to maintain and can contaminate other systems. Plume evacuation systems should be used instead.

Rarely, wall suction maybe used only as an intermediary measure while phasing in a plume evacuation system. If using wall suction unit, you must:

- install a purpose built 0.1 micron in line filter and position it properly between the wall and floor canister (Note that filters reduce suction)
- ensure that the suction lines are cleared and cleaned or replaced
- change the filters regularly as directed by the manufacturer as they are time limited, and an overused filter provides minimal protection
- dispose of the filters properly as a biological hazard using standard precautions.

### 3.3.3. General room ventilation

General room ventilation is not sufficient on its own to capture contaminants generated at the source. A combination of general room ventilation and local exhaust ventilation (LEV) (a plume evacuation system) is required to remove/ reduce plume.

While air in the operating room is exchanged regularly over a period of an hour, it will not remove noxious surgical plume before it affects people in the room.

It is important to ensure that the filters for the general ventilation system are maintained and changed as recommended by the manufacturer of the system. Dirty air filters will impede room air exchanges.

### 3.3.4. Maintenance of equipment and disposal of biohazards

All plume evacuation equipment, including replaceable filters, absorbers, capture devices and hoses, must be maintained, monitored, and replaced on a regular basis in accordance with the manufacturer's recommendations.

All consumable associated equipment (such as masks, filters and tubing) and collection materials is to be considered biohazardous and must be handled and disposed of, using Standard Precautions (see AS/NZS 4187 *Reprocessing of reusable medical devices in health service organisations*) for blood-borne pathogens and in accordance with the Ministry of Health's policy *Clinical and Related Waste Management for Health Services* (PD2020_049).

A facility must establish and maintain a preventive maintenance schedule to ensure the continuing effectiveness of the plume evacuation system. This would include a periodic performance check and check of maintenance records.

### 3.3.5. Additional risk controls

To determine if a plume evacuation system introduces other risks, a risk assessment must have occurred in consultation with workers that are exposed. It is important that all efforts are made to trial different plume evacuation systems, to remove surgical plume that is generated.

Where surgical plume is generated and an assessment of the procedure has determined that plume evacuation system introduce significant other risks (such as visibility issues), alternative controls must be used to minimise plume to the lowest level practicable, for example:

- Use tools that generate less plume, use multiple tools, such as the initial use of bipolar diathermy with extraction and then use monothermy where greater visibility is required, and extraction may impede the line of sight
- Use low settings on diathermy tools to decrease the amount of plume
- Ensure the room has specialised ventilation with air exchange rates applicable to operating theatres.

The additional controls must be agreed and communicated to workers that are impacted by surgical plume.

### 3.3.6. Administrative and personal protective equipment controls

To supplement higher level controls (see Section 3.3.1) administration and personal protective equipment (PPE) controls are also used. These controls are not to be used in isolation, but instead to supplement higher level controls. Very rarely they may be used as an interim measure while implementing a more effective method to control the risk.

#### *Administrative controls*

Safe work procedures, checklists and training material must be developed to protect workers and patients based on the risks and controls identified in each facility. Safety procedures are to take into consideration that the identified controls may have an impact on other safety requirements within the facility.

In preparing safe work procedures and training material, consideration should be given, but not be limited to the following[6]:

1. The use of the plume evacuator nozzle, including set-up and positioning
2. Most appropriate plume evacuation system (see Resource 1 Plume Evacuation Systems)
3. Adequate plume removal during medical or surgical procedures performed in or near respiratory passages
4. Jet ventilation application during laser treatment in the upper respiratory tract

[6] AS16571-2015*: Systems for evacuation of surgical plume generated by medical devices* (ISO 16571:2014, MOD).

5. Appropriate removal of plume from surgical sites during enclosed procedures such as laparoscopy and endoscopy
6. Adequate room ventilation.

### *Awareness, training and competency*

The NSW Health Agency must ensure that all workers whose health and safety is likely to be affected by surgical plume receive information, instruction and training and supervision in a safe system of work which includes:

1. The potential risks associated with surgical plume
2. Specific roles and responsibilities in controlling the risk of surgical plume exposure (such as surgeon, theatre nurse, theatre technician, anaesthetic personnel etc.)
3. Understand and comply with safe systems of work for controlling the risk of surgical plume
4. When a plume evacuation system is a requirement of work, demonstrate competency in the use of plume evacuation devices and equipment according to manufacturer instructions and operating procedures. This includes complying with relevant safe work procedures, such as set-up and positioning of the intake device
5. Know how to use, maintain and store PPE required for the tasks according to instruction and training. If P2/ N95 respirator are identified to be used from a risk assessment, comply with the recommendations of the Respiratory Protection Program Manual (RPP)
6. Standard infection control procedures and precautions including disposal of contaminated supplies as per NSW Health policy.

The facility must conduct a training needs analysis to determine what training is required for each worker exposed to surgical plume based on their role.

The facility is to also maintain records of training and competency evaluation, in the set-up, use, storage and maintenance of the equipment used by the site for auditing and review.

Workers who are responsible for maintaining plume evacuation equipment must be trained in the proper maintenance and disposal of the equipment and its accessories.

### *Personal protective equipment*

PPE should never be used as the first line of protection against exposure to surgical plume. The following PPE should be utilised in conjunction with higher level controls identified, in accordance with Section 3.3.1 which include plume evacuation systems.

Respirators capable of 0.1 micron filtration should be used although it is recommended a N95/ P2 respirator is used when surgical plume is generated[7]. Surgical masks are not considered adequate protection for fine aerosols which are a component of surgical plume if working close to the patient.

[7] NIOSH Health and Safety Practices Survey of Health Care Workers, Centre for Disease control and Prevention, 2017

Please note that disposable respirators should be changed at a frequency determined by a risk assessment based on the type of operating procedure. Respirators, for example, would be changed more frequently where the operating procedure generates a lot of wet aerosols such as orthopaedic surgery.

When using N95 and P2 respirator, the worker needs to be assessed and fit tested as part of the Respiratory Protection Program to determine the most suitablerespirator. When donning a P2/ N95 respirator a worker needs to fit check each time.

Face shields and eye protection should be used.

Gowns and other standard surgical wear such as head, foot covers and gloves.

## 3.4. Review of control measures

Ongoing evaluation and review of surgical plume risk controls will identify areas for improvement, gaps in administration systems and causes of any system failures. Control measures must be reviewed, at an agreed frequency, in consultation with workers who may be affected by surgical plume.

When determining the frequency to monitor and review controls the following needs to be considered:

- The level of risk, high risk hazards need more frequent assessments
- The type of work practices, schedules or equipment involved
- Changes to the environment or when new tasks, equipment, process are introduced
- Data monitoring including review of incidents, near misses, injuries and other data, related to the minimising the risk of surgical plume.

The review could include questions listed below to assist in structuring the review:

- Are the control measures working effectively?
    - Worker health checks could assist in detecting ill-health effects at an early stage in plume exposed workers and will assist in identifying the effectiveness of the existing controls.
- Have the control measures introduced new problems?
- Has the evacuation system made the job safer?
- Are the safe work procedures appropriate and effective?
- Have all workers, who may be affected by surgical plume, been identified and provided with instruction and training?
- Is the instruction, training and training material that has been provided to staff appropriate and effective?
- Is there new legislation or standards that may impact on the risk control measures?
- Is the chosen evacuation system effective in removing surgical plume?
- Have any incidents, injuries, ill health or concerns been reported?

- Is supervision adequate to ensure that workers understand and comply with work practices and equipment use?
- Has any new information become available since the last review that may impact on equipment or work practices?

## 4. RESOURCES

1. Resource 1: Plume Evacuation Systems
2. Resource 2: Plume Evacuation Systems Checklist