6.0 WORKER HEALTH AND SAFETY

6.1 OCCUPATIONAL CONCERNS OF MEDICAL WASTE TREATMENT

Those with exposure to medical waste are subject to 29 CFR Part 1910.1030, Occupational Exposure to Bloodborne Pathogens; Final Rule, Occupational Safety and Health Administration, 1991.

6.1.1 Biological Hazards

Personnel involved in the treatment of medical waste may be exposed to infectious agents through several routes including skin penetration, skin contact, or by the aerogenic route. Exposure routes will vary with the type of treatment used. Medical waste may contain a variety of human pathogens including bacteria, fungi, viruses, and parasitic organisms as well as microbial toxins.

6.1.2 Physical and Chemical Hazards

Needle sticks, cuts, falls, strains, sprains, burns, and eye, back, electrical, mechanical, and chemical injuries are additional potential consequences of medical waste treatment. Additional hazards include radioactive, hazardous, and cytotoxic waste exposures.

6.1.3 Health Promotion and Protection

The promotion and protection of the health of medical waste treatment workers and the control of biological, physical, and chemical hazards to which they are exposed can be achieved through proper training, supervision, and health surveillance. Training employees in the proper operation of treatment equipment includes the use of any personal protective equipment needed. Health surveillance may also include proper immunization of employees who are potentially exposed to untreated medical waste

6.1.4 Onsite Medical Waste Treatment Technologies

6.1.4.1 Incineration

Incinerator operations can present other occupational hazards in addition to potential infection or burns. Toxic organic compounds or metals on respirable particles in ash may pose an inhalation risk. Additional hazards are also faced during maintenance and operation of air pollution control devices. Caustic burns can result from exposure to wet scrubber caustic liquid. Hypoventilation can be a risk during maintenance of fabric filters due to low oxygen in combustion gas. Injuries can also occur from contact with some incinerator components such as moving belts, hydraulic cylinders, ram feeders and ash conveyors.

Finally, heat stress is associated with incinerator inspection and repair because of the hot humid conditions and length of time required (EPA, 1989).

Potential infection from pathogens in medical waste and fires or explosions in the incinerator are the two greatest risks faced by incinerator operators. Exposure to infectious organisms is most likely to occur through handling of needles and other sharps prior to treatment. Fires could occur during charging of waste to the incinerator, especially if highly flammable materials are ignited by the incinerator burner.

6.1.4.2 Steam Autoclaving

All steam autoclaves require manual waste handling at some point in the loading process. The chambers of standard laboratory and hospital autoclaves, as well as commercial onsite steam autoclave treatment systems, are manually loaded with bags and containers of medical waste. In many instances the treatment operator will push the waste into the chamber with bare hands. This places the operator at risk of exposure through skin penetration from inappropriately shielded or contained sharps as well as possible exposure through aerosolization if the waste bags rupture. Waste may also contaminate the operator's hands, which may then transmit disease agents via contact with mucous membranes. Unprotected hands may also result in burns from contact with hot autoclave walls and doors.

6.1.4.3 Chemical/Mechanical Treatment

Individuals using chemical microbial inactivation or a small mechanical/chemical treatment device can place waste directly into the treatment system at the point of generation thus minimizing handling and exposure. Large onsite mechanical/chemical systems, however, require transport and loading of large quantities and varieties of medical waste items. The risk of exposure from skin penetration or contact with infectious agents is present. Aerogenic exposure may also occur from broken waste bags or from a contaminated conveyor belt or hopper that provides entry of the waste into the system. Workers risk exposure to treatment chemicals, either by contact or inhalation routes. It is imperative that such treatment systems be effectively decontaminated prior to disassembly for maintenance or repairs.

6.1.4.4 Microwave Irradiation

Although currently available microwave treatment does not require manual waste loading, potential worker exposure can occur through the aerogenic and dermal contact routes when access to the shredder is required during the treatment process. Access involves opening a small port in the side of the unit where the shredder is located and where the untreated waste is prepared for microwave exposure. Burns may occur as a treatment operator works with or near components associated with the steam injector, and microwave exposure may occur if leakage from the system is not monitored. It is imperative that such treatment systems be effectively decontaminated prior to disassembly for maintenance or repairs.

6.1.5 Offsite Medical Waste Treatment Technologies

6.1.5.1 Incineration

The hazards associated with the offsite treatment of medical waste by incineration are the same as have been described for onsite treatment.

6.1.5.2 Steam Autoclaving

Potential exposure by the aerogenic and dermal contact routes may occur as workers load up to 1,000 pounds of medical waste into treatment bins. The potential for injuries to occur from heat, falls, and mechanical equipment is also great.

6.1.5.3 Non-ionizing Irradiation

The loading of untreated and shredded medical waste into containers for radiofrequency treatment is manually controlled by a worker. The operator loading the shredded medical waste dons full protective clothing and appropriate respirator, thus minimizing aerogenic or contact exposure. Exposure to the radiofrequency waves may be precluded by adhering to operational precautions during treatment and heeding warning devices. The potential exists for injuries due to lifting, falling, and exposure to mechanical equipment.

6.2 WORKER TRAINING

6.2.1 Safety

Medical waste treatment operators should be provided with information and training on the process and mechanical operation of the treatment system they are using. They should have a full understanding of all operational controls and know what to do and/or whom to contact in response to a system failure or other emergency.

Appropriate safety training as required by Federal and State Occupational Safety and Health Administration (OSHA) regulations must be provided. Steam autoclaving, microwave and radiofrequency treatment system operators should be trained to prevent burns and eye and back injuries. Chemical treatment system operators should be provided with appropriate Material Safety Data Sheets (MSDS) and be trained to prevent chemical exposure, hearing loss, and mechanical and back injuries. Incinerator operators should be trained in appropriate waste feed handling, incinerator operation, and ash removal. All treatment technologies should provide a working environment designed to prevent slips and falls, and specific training on the use of personal protective equipment should be conducted.

6.2.2 Biohazards

Appropriate biohazard training should be provided as required by Federal and State OSHA regulations and/or recommended by specific health agencies such as the National Institutes of Health (NIH) and the Centers for Disease Control (CDC). It is recommended that biohazard training for medical waste treatment personnel be consistent with training outlined in the OSHA final rule on Occupational Exposure to Bloodborne Pathogens (OSHA, 1992).

Medical waste handlers, treatment operators, and supervisors should be trained in issues relevant to preventing biohazard exposure.

6.2.3 Incinerator Operator Safety Training

It is important that operators are aware of safe practices for incineration. Safety practices should be considered for waste feed handling, incinerator operation, and ash removal from the incinerator. For each of these activities, safety gear should be worn, including rubber soled shoes, rubber gloves and safety glasses. Respirators and hearing protection should also be used during maintenance of fabric filters.

Certain practices should be routine when handling waste feed. To minimize the chance of exposure to infectious agents, medical waste is placed in tear-resistant bags or other containers which meet applicable regulations. Sharps (needles, tools) should be placed in rigid containers. If tears or holes are noted, the bag should be placed in another bag or container. Waste handling should be minimized by use of carts for transport onsite. Disposable containers can be loaded into the incinerator either manually or automatically. Devices that could increase chances of bag rupture, including trash compactors, dumb-waiters, chutes or conveyors for transport, should not be used. To minimize fire and potential health hazards from vermin attracted to the waste, waste feed should be stored in a restricted-access area away from the incinerator and treated as soon as possible after generation.

During incinerator operation, fire safety should be paramount. Containers of flammable liquid or explosives should never be charged to the incinerator. The primary chamber burner should be off when waste is added. Manually loaded incinerators usually have an interlock system that automatically turns off the burner when the charging door is opened. Most automatic loaders will spray water on the hot ram face or reinitiate loading if waste is burning.

Standard procedures should also be followed when ash is removed from the incinerator. Ash should not be removed until after the cooldown period which may be as long as 8 hours. Entrainment of ash particles can be minimized by slowly opening the ash cleanout door and quenching the ash with water once it is removed from the incinerator. Ash

should always be handled cautiously because it may contain buried sharps, hot spots and may aerosolize easily.

6.3 SUPERVISION

Medical waste treatment operators should be under the supervision of an adequately trained professional who assumes and carries out responsibility for the operators' performance, health, and safety.

6.4 HEALTH SURVEILLANCE AND IMMUNIZATION

Health surveillance and immunization practices should be consistent with the OSHA final rule on Occupational Exposure to Bloodborne Pathogens. An employer should assure that all evaluations, procedures, immunizations, and post-exposure management are provided to the medical waste worker at a reasonable time and place, and according to standard recommendations for medical practice.

It is recommended that all medical waste treatment personnel be immunized against the hepatitis B virus (HBV). Other immunizations may also be appropriate if it is known that the medical waste to be treated routinely contains a pathological agent for which an approved vaccine is available.

6.5 PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment is recommended to significantly reduce worker exposure during the transport, handling, and processing of untreated medical waste regardless of treatment technology. This includes the use of appropriate puncture-proof gloves, safety glasses or faceshields, protective and non-slip footwear, fluid-resistant protective clothing, and respirators as required. Hearing protection may be indicated for operations that grind or shred waste prior to treatment. Blunt tools may be necessary to assist in the waste loading process, and are recommended to discourage hand-to-waste contact.