



Environmental and Social Guidelines for

Health Care Facilities

This guideline contains the performance levels and measures that are normally acceptable to IFC and are generally considered to be achievable at reasonable costs by existing technology. While adherence to this guideline is strongly recommended, the application of these guidelines may be adjusted to each project or site, taking into account variables such as host country context, sponsor capacity and project factors. The environmental assessment process may recommend alternative (higher or lower) levels or measures, which, if accepted by IFC, become project- or site-specific standards or requirements. The environmental assessment document must provide a full and detailed justification or explanation for the levels or measures recommended for the particular project or site.

1 INTRODUCTION

The health care sector includes a diverse range of health care facilities and activities, ranging in size from large general and specialist hospitals to small medical and dental offices and clinics. Ancillary facilities in this sector include medical laboratories and research facilities, mortuary centers and blood banks and collection services. All of these facilities present common environmental and health and safety issues that need to be addressed at a scale appropriate to the size of the facility and its activities.

The health care sector involves close contact among patients, health care providers, and support staff; extensive use of sharps and instruments designed for diagnostic and curative (invasive and non-invasive) procedures; and, utilization of pharmaceutical, chemical, radiological and other agents for diagnosis, treatment, cleaning and disinfection.

Maintenance of sanitary conditions, use of appropriate disinfection and sterilization techniques, provision of potable water and clean air for all operations, and nosocomial infection control are the basic infrastructure requirements for health care facilities. These elements are mandatory to improve the health of patients, prevent transmission of infections among patients and staff, and reduce hazards for employees and the host community.

As part of day-to-day operations, health care facilities generate a variety of wastes including air emissions, wastewater effluents, health care waste (e.g. infectious, pathologic and chemical) and municipal solid waste. Approximately 75-90% of the total waste stream is general health care waste, generated by administrative, housekeeping and maintenance functions. The remaining 10-25% of waste includes infectious, pathologic and chemical wastes that are considered hazardous in nature and create a variety of serious health risks. These wastes pose numerous

hazards and must be appropriately managed to avoid damage to the environment and human health.

2 GUIDELINE

AREA OF APPLICABILITY

This guideline provides direction on IFC's specific requirements for environmental management for the health care sector. This guideline is intended to apply primarily to a range of larger health care facilities and activities including hospitals (general, specialist and teaching), medical and animal research facilities; laboratories (commercial, teaching or research); and ancillary services (blood banks, morgues). Small-scale health care facilities such as physicians' offices, dental clinics and rural health clinics may also be subject to specific emission requirements as determined during the environmental assessment (EA) process.

ADDITIONALLY APPLICABLE IFC GUIDELINES

Other IFC/World Bank Group guidelines may also be applicable to these facilities, and are referenced in the following discussion. These include:

- Small Combustion Plants;
- Life and Fire Safety (L&FS);
- Occupational Health and Safety; and
- Hazardous Materials Management.

GENERAL

Health care facilities shall be designed and constructed in a manner consistent with accumulated professional knowledge. Such information may be found, for example, in the AHA's *Guidelines for Design and Construction of Hospital and Health*

Care Facilities. This and/or other internationally recognized guidelines should be used as the reference for planning new or renovating existing health care facilities. Other professional organizations and government agencies use these guidelines as a reference code for review, approval and financing of health care operations. Additionally, they are employed for surveying, licensing, and accrediting completed facilities.

Health care facilities shall be operated in a manner consistent with accumulating and emerging professional knowledge. The foundations of JCAHO¹ certification, guidance provided by AHA², APIC³, WHO⁴'s project on hospital management, and many other internationally recognized programs provide informed guidance on hospital management and operations best practice. Internationally recognized disinfection and sterilization guidance is available from CDC⁵, APIC, SHEA⁶, and ISO.

MANAGEMENT SYSTEMS

All health care facilities financed by IFC are required to implement a comprehensive management system to ensure continuous operation of critical health care systems and functions. A properly designed management system will guide and direct health care design, construction and operations; eliminate to the extent feasible environmental and health hazards for patients, employees and the general public; communicate individual responsibilities in these efforts to all levels of supervision and employees; and facilitate rapid dissemination of health care management decisions and directives. An acceptable management system will fully integrate the following functions:

- Compliance with host country environmental, social and occupational health and safety laws and regulations and WBG environmental and social safeguard policies and guidelines;
- Occupational health and safety management program for all employees and ancillary staff;

- Specialized, ongoing training programs for health care facility cleaning staff;
- Health care waste management;
- Emergency response;
- Institutionalization of an internationally recognized disinfection and sterilization program;
- Procurement function oriented to waste minimization and informed management of expired pharmaceuticals and surplus instruments.

All health care facilities financed by IFC must establish, operate and maintain a Health Care Waste Management System (HWMS) adequate for the scale and type of activities and identified hazards. The system must be documented in writing and incorporated into the health care facility management system described above.

The HWMS should incorporate the following principles, as recommended by the 1992 United Nations Conference on the Environment and Development (UNCED):

- 1) Prevention and minimization of the production of waste (integrating systems and practices to avoid the creation of waste into facility design and management and equipment and consumables purchasing);
- 2) Reuse or recycling of wastes to the degree feasible, employing:
 - a) Source reduction measures such as purchasing restrictions to ensure the selection of methods or supplies that are less wasteful or generate less health care waste;
 - b) Recyclable products (use of materials that may be recycled either on- or off-site);
 - c) Good management practices rigorously applied to purchase and control of chemicals and pharmaceuticals, and
 - d) Segregation of wastes into different categories—for control of quantities and disposal methods.
- 3) Treatment of waste by environmentally sound methods;
- 4) Disposal of residues in permitted, controlled, and properly designed disposal sites;
- 5) Phase out the use of polyvinyl chloride (PVC) materials consistent with the availability of suitable replacement materials in the marketplace; and
- 6) Elimination of mercury (Hg) use.

¹ Joint Commission on Accreditation of Health Care Organizations.

² American Hospital Association

³ Association for Professionals in Infection Control and Epidemiology, Inc

⁴ World Health Organization

⁵ Centers for Disease Control and Prevention.

⁶ The Society for Healthcare Epidemiology of America, Inc.

The HWMS must define management-approved characterization and segregation procedures for health care wastes at the point of generation. Similarly, the HWMS must define management-approved waste collection locations and containers. Graphics and text should be employed adjacent to collection containers to emphasize waste management requirements, prohibitions and precautionary information.

PHYSICAL ELEMENTS

HEATING, VENTILATION AND AIR CONDITIONING (HVAC)

HVAC systems shall be designed and constructed and operated in a manner consistent with accumulated professional knowledge to prevent nosocomial illness and harm to employees and the host community. Available professional design and operation guidelines include Guidelines for Design and Construction of Hospital and Health Care Facilities, and JCAHO accreditation requirements

NOISE

The indoor noise level in hospitals wards should as an 8-hours average not exceed 30 dB(A). Peak values should not exceed 40 dB LA_{max}, fast. Inside treatment rooms the noise level shall be as low as possible⁷.

WATER SUPPLY

Potable water⁸ shall be supplied throughout the health care facility and shall be used for all operations including but not limited to human consumption, cleaning, laundry service, and food preparation. Potable water treatment and storage shall be designed to rectify shortcomings in local water supply, sized to compensate for local water supply outages; and, as applicable, further sized to provide the volume of water required for fire fighting.

WASTE STORAGE FACILITIES

Storage facilities for health care waste should be located in a separate building, and provide protection against unauthorized access. Waste shall be stored separately according to planned methods of disposal or treatment. Organic waste shall be stored for the

least time feasible in refrigerated storage (5-10° C). Storage rooms must be designed and built for the purpose, well illuminated and provide safe working conditions and, at a minimum, incorporate well-drained, impermeable flooring; water supply for cleaning purposes; wastewater connection to the sanitary sewer; and easy access for staff and waste collection vehicles.

WORKING ENVIRONMENT

Hospital employees assigned to cleaning, disinfection and waste management are at the highest risk of contracting nosocomial infections in the health care setting. Accordingly, the health care facility will institute and maintain a specialized training program for these and other employees deemed at high risk. Training programs will focus on specific job hazards, disease transmission, personal protective equipment and other elements required to minimize infections among and impact to health care employees.

EMISSIONS

AIR EMISSIONS

Energy and Steam Production. Emissions from energy and steam production at the facility must meet the limits specified in the IFC guideline on Small Combustion Plants.

Ventilation. Exhaust air potentially contaminated with biological agents, pathogens or other hazards (isolation wards, laboratories, waste storage and treatment facilities, etc.) shall be treated (e.g. conveyed to combustion air) to become non-toxic or contagious before discharge. Discharge shall be through a stack sufficiently tall to eliminate odor nuisances.

Waste treatment. If installed, pyrolytic incineration facilities for hazardous hospital waste shall meet the emission limits defined in Table 1. Flue gas must under the most unfavorable conditions have been subjected to a temperature of more than 850° C for at least two seconds.

⁷ Guidelines for Community Noise, WHO, Geneva

⁸ At a minimum complies with the chemical, physical, radiological and microbiological limits in World Health Organization (WHO) Guidelines for drinking-water quality, 2nd edition. Vol. 2 Health criteria and other supporting information, 1996 (pp. 940-949) and Addendum to Vol. 2, 1998 (pp. 281-283). Geneva, World Health Organization.

Table 1 Flue gas emission limits for hospital waste incineration facilities⁹

| Parameter | Averaging period | Unit | Maximum Value |
|---|------------------|--------------------|---------------|
| Total Particulate matter (PM) | 24 hours | mg/Nm ³ | 10 |
| Total gaseous and vaporous organic substances, as total organic carbon | 24 hours | mg/Nm ³ | 10 |
| Hydrogen Chloride (HCl) | 24 hours | mg/Nm ³ | 10 |
| Hydrogen Fluoride (HF) | 24 hours | mg/Nm ³ | 1 |
| Sulphur dioxide (SO ₂) | 24 hours | mg/Nm ³ | 50 |
| Carbon Monoxide (CO) | 24 hours | mg/Nm ³ | 50 |
| Nitrogen monoxide (NO) and nitrogen dioxide (NO ₂), expressed as nitrogen dioxide | 24 hours | mg/Nm ³ | 400 |
| Mercury (Hg) mg/Nm ³ | ½ - 8 hours | mg/Nm ³ | 0.05 |
| Cadmium + Thallium and their compounds, expressed as (Cd + Tl) | ½ - 8 hours | mg/Nm ³ | 0.05 |
| The sum of the following metals and their compounds: Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V | ½ - 8 hours | mg/Nm ³ | 0.5 |
| Dioxins/furans (CDD/CDF) | 6 - 8 hours | ng/Nm ³ | 0.1* |

* Average values shall be measured over a sample of period of a minimum of 6 hours and a maximum of 8 hours. The emission limit values refer to the total concentration of dioxin and furans where actual mass concentrations have been multiplied by isomer-specific toxicity equivalence factors.

Exhaust air from waste reception, storage, and other waste treatment processes shall be odorless and meet the emission limits provided in Table 1. Stack heights for all waste treatment facilities shall be determined in accordance with method B, Annex 1 of IFC's Small Combustion Plants guideline.

LIQUID EFFLUENTS

All liquid wastes must be adequately treated for safe, permitted discharge to public sewers or directly to surface waters. Treatment levels and point of discharge shall be established through the EA and locally granted wastewater discharge permits. Specific wastewater streams (e.g. film developer) shall be treated separately if combining waste flows

would result in dilution and increase the total emitted load of regulated pollutants. Pharmaceuticals should not be discharged to the sewer system but collected for separate treatment or return to the manufacturer.

Procedures and mechanisms shall be established to provide for separate collection of urine, feces, blood, vomitus, etc. from patients treated with genotoxic drugs. Such waste is hazardous and must be treated accordingly.¹⁰

Cleaning wastewater and storm water from storage rooms and loading docks where waste is handled between transportation modes is to be regarded as health care wastewater and managed as such.

Wastewater pre-treatment. Wastewater from laboratories must be neutralized, detoxified and undergo removal of heavy metals as appropriate. Wastewater from X-ray development shall be neutralized and treated for removal of silver. Kitchens must be equipped with grease traps and main laundry facilities shall have lint traps/fine screens. Wastewater from wet treatment of incineration flue gas shall be treated for neutralization and removal of heavy metals.

Discharge for off-site treatment. Wastewater from health care facilities may be discharged to off-site sewerage and the associated treatment system if the owner and operator approve such a discharge in writing. The accepting entity must confirm in writing that the systems (sewerage and treatment) have adequate capacity and provide quantitative documentation demonstrating permitted performance. The treatment works must be capable of ensuring continuous compliance with national liquid effluent standards.

Health care facilities discharging wastewater for off-site treatment must further ensure that external handling and treatment can be managed without compromising the health and safety of workers responsible for operating and maintaining the sewer system and treatment facility. Pre-discharge disinfection of health care facility wastewater and a separate sewer to the treatment plant may be required.

⁹ Adapted from: Directive 2000/76/EC of the European Parliament and of the Council of 4 December 2000 on the incineration of waste. Limits are for 11% oxygen content in the flue gas.

¹⁰ Certain Genotoxic pharmaceuticals may only be destroyed by incineration at a temperature of 1200° C.

Discharge to surface waters. Wastewater discharged directly to surface waters shall have undergone treatment and disinfection and complies with the limits in Table 2.

Table 2 Liquid effluent concentration limits for health care facilities

| Parameter | Units | Limit |
|---|-----------|-------|
| pH | units | 6-9 |
| Biochemical oxygen demand (BOD ₅) | mg/l | 50 |
| Chemical oxygen demand (COD) | mg/l | 250 |
| Oil and grease | mg/l | 10 |
| Total suspended solids (TSS) | mg/l | 20 |
| Cadmium (Cd) | mg/l | 0.1 |
| Chromium (Cr) | mg/l | 0.5 |
| Lead (Pb) | mg/l | 0.1 |
| Mercury (Hg) | mg/l | 0.01 |
| Chlorine, total residual ⁹ | mg/l | 0.2 |
| Phenols | mg/l | 0.5 |
| Fecal Coliform | MPN/100ml | 400 |
| Dioxins and furans ¹¹ | ng/l | 0.3 |

SOLID WASTE

Health care solid waste shall to the extent feasible be minimized in quantity and harmfulness through administrative and technical measures such as procurement of environmentally friendly and recyclable materials.

Health care facilities shall implement a system for segregation of waste into categories for separate handling consistent with its potential hazard.

General or non-hazardous wastes. General solid wastes should be subject to recycling (effected principally at the source) and residuals disposed of at a permitted sanitary landfill.

Hazardous health care wastes. Hazardous health care waste includes the categories in Table 3.

Table 3 Health Care Waste Categories

| Waste Category — Description | Examples |
|--|---|
| Infectious waste — <i>Waste with a potential content of pathogens or biological agents</i> ¹² | Laboratory cultures, waste from isolation wards, tissues, swabs, materials or equipment that have been in contact with infected patients, excreta |
| Pathological waste — <i>Human tissues or fluids</i> | Body parts, blood and other body fluids. |
| Sharp waste | Sharps include items that may cause cuts or puncture wounds, including needles, hypodermic needles, scalpels and other blades, knives, infusion sets, saws, broken glass, and nails. |
| Pharmaceutical waste | Pharmaceuticals that are expired or no longer used or needed, items contaminated by or containing pharmaceuticals (bottles, boxes) |
| Genotoxic waste — <i>Waste containing substances with genotoxic properties</i> | Waste with cytostatic properties (used in cancer therapy), genotoxic chemicals (carcinogenic, mutagenic, or teratogenic) |
| Chemical waste — <i>Waste containing chemical substances</i> | Laboratory reagents, film developer, disinfectants that have expired or are no longer needed, solvents |
| Heavy metals — <i>Wastes with high content of heavy metals</i> | Batteries, broken thermometers, blood pressure gauges, etc. |
| Pressurized containers | Gas cylinders, gas cartridges, aerosol cans |
| Radioactive waste — <i>Waste containing radioactive substances</i> | Unused liquids from radiotherapy or laboratory research, contaminated glassware, packages or absorbent paper, urine and excreta from patients treated with unsealed radionuclides, sealed sources |

The possibilities for returning hazardous materials to manufacturers (pharmaceuticals, waste chemicals, instruments etc.) and for delivery to an off-site hazardous waste treatment facility shall be pursued to the extent feasible. Tissue waste may be disposed of to a mortuary or crematorium. Off-site facilities shall be appropriately licensed by national authorities and perform according to a standard acceptable to IFC. Otherwise the health care service provider shall ensure that hazardous waste is rendered harmless before disposal in a sanitary landfill.

¹¹ Wastewater from treatment of flue gas from incinerators only.

¹² Bacteria, virus, microorganisms, cell cultures, human endoparasites, etc. which may be capable of inducing any infection, allergy or toxicity.

Incineration. Infectious and pathological waste, selected pharmaceuticals¹³ and chemicals, and sharps may be combusted in a pyrolytic incineration facility designed for combustion of such wastes. Waste segregation shall to the extent feasible eliminate PVC from such waste streams. Exhaust air from contaminated zones must be utilized for combustion air. The combustion unit must be designed to ensure complete incineration of organic matter. Flue gas shall, under the most unfavorable conditions, achieve a temperature of 850° C for a period of no less than two seconds. Plants shall be operated and maintained in accordance with the manufacturers specifications. Flue gas must be treated to meet the limits of this guideline. Ash and flue gas treatment residuals must be handled, transported and disposed of without dust generation. Genotoxic wastes, which require temperature levels up to 1200° C, should only be incinerated in equipment approved by the manufacturer of the pharmaceutical compound.

Microwave irradiation and autoclaving. Disinfection of infectious wastes and sharps through autoclaving with steam or microwave irradiation is also acceptable provided that microwave techniques include mechanical mutilation such as milling or crushing. Autoclaving should involve a contact time of 1-4 hours at a temperature of at least 121° C and a pressure of 200-500 kPa.¹⁴ Exhaust air from waste storage and handling areas shall be detoxified and rendered odorless. Steam discharges shall be treated to control odor. Condensate and blow-down liquids should be classified as health care wastewater and treated accordingly.

Small-scale health care facilities should be encouraged to participate in a regional waste management scheme, where available, with centralized treatment performed by a major health care provider or an independent contractor. In either case the treatment facility must be properly licensed and operated in accordance with the treatment criteria described previously. If a regional scheme is not feasible, innovative small-scale local waste management solutions involving encapsulation of sharps and other materials will be assessed for acceptability on a case-by-case basis.

Transport of health care waste to a central treatment facility shall be performed in correctly marked

containers and vehicles¹⁵. Storage facilities and collection frequency shall be appropriate for the particular category of waste. Organic wastes should be kept in cold storage and transported in a refrigerated vehicle. Wastewater from vehicle cleaning and disinfection is considered health care wastewater and shall be managed accordingly.

Radioactive waste shall be managed according to national requirements and current guidelines from the International Atomic Energy Agency¹⁶.

COMMUNITY INVOLVEMENT AND AWARENESS

The project sponsor is responsible for keeping the host community adequately informed, and to provide means for public feedback.

It is good practice for the potentially affected public to be:

- Given general information on the nature and extent of off-site environmental and human health effects arising out of routine and emergency operations at the health care facility;
- Supplied with specific information on appropriate behavior and safety measures in the event of an accident involving hazardous substances; and
- Afforded access to information needed to understand possible accidents and allowed to contribute to decisions concerning health care waste management and community preparedness plans.

MONITORING AND REPORTING

Frequent sampling may be required during start-up conditions. Once a record of consistent performance has been established, sampling for the parameters listed above should be carried out frequently in accordance with the requirements of the EA.

Monitoring data should be analyzed and reviewed at regular intervals and compared with the host country regulatory limits and IFC guideline limits so that any

¹³ Combustibility to be determined from the manufacturer's specifications.

¹⁴ Safe management of wastes from health care activities, WHO 1999.

¹⁵ IFC Hazardous Materials Management Guidelines.

¹⁶ Management of Waste from the Use of Radioactive Materials in Medicine, Industry and Research. IAEA Draft Safety Guide DS 160, 7 February 2003

necessary corrective actions can be taken. Records of monitoring results should be kept in an acceptable format.

Sampling, monitoring, and chemical and bacteriological analysis shall be performed according to internationally recognized methods and standards such as APHA, ASTM, WHO, USEPA, etc.¹⁷ or national methods of equal standing.

Project sponsors are required to submit annual environmental and social performance monitoring reports to IFC. These annual reports shall contain quantitative data illustrating compliance with host country regulatory and IFC guideline limits for emissions to the environment and occupational health and safety programs. The reports shall also contain discussions of the performance of facility management systems including the HWMS.

USEPA virtual hospital tour – focus on mercury reduction

<http://www.epa.gov/seahome/mercury/src/title.htm>

USEPA publication on Pollution Prevention for Selected Hospital Waste Streams

<http://200.10.250.47/eswww.fulltext/repind62/gpp/gpp.html>

Health Care Without Harm

<http://www.noharm.org/index.cfm>

Hospitals for a Healthy Environment

<http://www.h2e-online.org>

USEPA Reducing Mercury Use in Health Care – Promoting a Healthier Environment

3. REFERENCES

REFERENCES AND SUGGESTED INFORMATION SOURCES

McRae G, Shaner H (1996). Guidebook for Hospital Waste Reduction Planning and Program Implementation. Chicago, American Hospital Association.

Pruss, A., Giroult, E., Rushbrook, P., (EDS). 1999. Safe management of wastes from health care activities. Geneva. World Health Organization.

Reference Websites

The Nightingale Institute for Health and the Environment

<http://www.nihe.org>

The University of Massachusetts – Lowell's Sustainable Hospital Project

<http://www.uml.edu/centers/LCSP/hospitals/>

¹⁷ The list presents examples of acceptable standards and is not to be considered exhaustive or fully comprehensive: APHA, American Public Health Association; ASTM, American Society for Testing and Materials Standards; CEN, European Committee for Standardization; 40 CFR Part 60, United States, Codes of Federal Regulation; DIN, German Industrial Standards; ISO, International Organization for Standardization; WHO, World Health Organization; USEPA, United States, Environmental Protection Agency.