



International Finance Corporation

Environmental, Health and Safety Guidelines for

Rail Transit Systems

Right-Of-Way Alignment

The principal elements of World Bank policy regarding right-of-way alignment, land acquisition and creation of access are summarized below. The sponsors must provide information regarding rights-of-way, their lengths, general locations and the sponsors' policies regarding alignment of these rights-of-way in relation to the following guidelines:

- a) All new rights-of-way should be aligned taking environmental factors into consideration, in a manner which will minimize to the extent possible, the need for physical alteration and the impact on sensitive natural environments, cultural resources, agricultural lands, and residential and commercial areas.
- b) Land acquisition must be carried out in accordance with World Bank resettlement guidelines which require identification and quantification of any impacts on land-based livelihood, and compensation to landowners and people relying on the land for their residence and/or livelihood.
- c) Environmental impacts of proposed projects should be minimized through such measures as visual impact considerations in siting and design, restricting right-of-way use by non-authorized persons, erosion and sediment control during and after construction, and use of low-impact maintenance procedures.

Liquid Effluents - All Project Sites and Operations

<i>Parameter/Pollutant</i>	<i>Maximum Value</i>
pH	6 to 9
BOD ₅	50 mg/L
Heavy metals, total	10 mg/L
Oil and grease	10 mg/L
Total suspended solids	50 mg/L
Coliforms	Less than 400 MPN/100 mL (MPN - Most Probable Number)

Liquid effluent discharges to a public or private central wastewater treatment system may be subject to the pre-treatment requirements of the local authority. Sponsors should provide information, typically from the local authority, to confirm that the central wastewater treatment system has the capacity and ability to treat the project's liquid effluents.

Stack Emissions - Depot Operations

Concentrations of contaminants emitted from stacks, including boilers, furnaces, incinerators and electrical generating equipment should not be diluted nor exceed the following limits:

<i>Parameter/Pollutant</i>	<i>Maximum Value</i>
Particulate Matter (PM ₁₀)	
≥50 MWe	50 mg/Nm ³
<50 MWe	100 mg/Nm ³
Nitrogen Oxides, as NO ₂	
Coal fired	750 mg/Nm ³
Oil fired	460 mg/Nm ³
Gas fired	320 mg/Nm ³
Sulfur Dioxide	2,000 mg/Nm ³

Emissions of VOCs (volatile organic compounds) must be controlled in compliance with local laws and regulations.

Ambient Noise

- a) Ambient noise levels for rail and depot operations should not exceed local requirements.
- b) Track maintenance should employ the best available technology and work practices to minimize the occurrences of nuisance noise during sensitive periods.
- c) The fan rooms and ventilation ducting should be designed to meet a 60 dBA criteria, measured at the nearest noise-sensitive receptor (NSR).
- d) The noise level from the train air conditioners should not exceed 75 dBA within the passenger cars.

Solid and Liquid Wastes

- a) Project sponsors should recycle or reclaim materials where possible.
- b) If recycling or reclaim is not practical, wastes must be disposed of in an environmentally acceptable manner and in compliance with local laws and regulations.
- c) All hazardous materials, process residues, solvents, oils, and sludges from raw water, process wastewater and domestic sewage treatment systems must be disposed of in a manner to prevent the contamination of soil, groundwater and surface waters.

Other General Environmental Requirements

- a) Formulations containing chromates should be avoided in water treatment processes.
- b) Transformers or equipment containing polychlorinated biphenyls (PCBs) or PCB-contaminated oil should not be installed, and existing equipment involving PCBs or PCB-contaminated oil should be phased out and disposed of in a manner consistent with the requirements of the host country.

- c) Storage and liquid impoundment areas for fuels, raw and in-process materials, solvents, wastes and finished products should be designed with secondary containment (e.g. dikes, berms) to prevent spills and the contamination of soil, groundwater and surface waters.

Workplace Air Quality

- a) Periodic monitoring of workplace air quality should be conducted for air contaminants relevant to employee tasks and the plant's operations.
- b) Ventilation, air contaminant control equipment, protective respiratory equipment and air quality monitoring equipment should be well maintained.
- c) Maintenance and installation of asbestos containing materials (brake and clutch systems, etc.) must be controlled to prevent workplace exposure to asbestos from exceeding 0.5 fibers/cm³ in the breathing zone (fibers greater than 5 µm in length).
- d) Protective respiratory equipment must be used by employees when the exposure levels for welding fumes, solvents and other materials present in the workplace exceed local or internationally accepted standards, the asbestos fiber limit, or the following threshold limit values (TLVs):

<i>Parameter/Pollutant</i>	<i>Maximum Value</i>
Carbon Monoxide	29 mg/m ³
Nitrogen Dioxide	6 mg/m ³
Particulate (Inert or Nuisance Dusts)	10 mg/m ³
Sulfur Dioxide	5 mg/m ³

Workplace Noise

- a) Feasible administrative and engineering controls, including sound-insulated equipment and control rooms should be employed to reduce the average noise level in normal work areas.
- b) Plant equipment should be well maintained to minimize noise levels.

- c) Personnel must use hearing protection when exposed to noise levels above 85 dBA.

Work in Confined Spaces

- a) Prior to entry and occupancy, all confined spaces (e.g., tanks, sumps, vessels, sewers, excavations) must be tested for the presence of toxic, flammable and explosive gases or vapors, and for the lack of oxygen.
- b) Adequate ventilation must be provided before entry and during occupancy of these spaces.
- c) Personnel must use air-supplied respirators when working in confined spaces which may become contaminated or deficient in oxygen during the period of occupancy.
- d) Observers/assistants must be stationed outside of confined spaces to provide emergency assistance, if necessary, to personnel working inside these areas.

Hazardous Material Handling and Storage

- a) All hazardous (reactive, flammable, radioactive, corrosive and toxic) materials must be stored in clearly labeled containers or vessels.
- b) Storage and handling of hazardous materials must be in accordance with local regulations, and appropriate to their hazard characteristics.
- c) Fire prevention systems and secondary containment should be provided for storage facilities, where necessary or required by regulation, to prevent fires or the release of hazardous materials to the environment.

Health - General

- a) Sanitary facilities should be well equipped with supplies (e.g., protective creams) and employees should be encouraged to wash frequently, particularly those exposed to dust, chemicals or pathogens.
- b) Ventilation systems should be provided to control work area temperatures and humidity.

- c) Personnel required to work in areas of high temperature and/or high humidity should be allowed to take frequent breaks away from these areas.

- d) Pre-employment and periodic medical examinations should be conducted for all personnel, and specific surveillance programs instituted for personnel potentially exposed to toxic or radioactive substances.

Safety - General

- a) Shield guards or guard railings should be installed at all belts, pulleys, gears and other moving parts.
- b) Elevated platforms and walkways, and stairways and ramps should be equipped with handrails, toeboards and non-slip surfaces.
- c) Electrical equipment should be grounded, well insulated and conform with applicable codes.
- d) Personnel should use special footwear, masks and clothing for work in areas with high dust levels or contaminated with hazardous materials.
- e) Eye protection should be worn by personnel when in areas where there is a risk of flying chips or sparks, or where intense light is generated.
- f) Personnel should wear protective clothing and goggles when in areas where corrosive materials are stored or processed.
- g) Emergency eyewash and showers should be installed in areas containing corrosive materials.
- h) A safety program should be established for construction and maintenance work.
- i) A fire prevention and fire safety program should be implemented and include regular drills.
- j) A public disaster response program should be implemented and include regular drills.

Training

- a) Employees should be trained on the hazards, precautions and procedures for the safe storage,

handling and use of all potentially harmful materials relevant to each employee's task and work area.

- b) Training should incorporate information from the Material Safety Data Sheets (MSDSs) for potentially harmful materials.
- c) Personnel should be trained in environmental, health and safety matters including accident prevention, safe lifting practices, the use of MSDSs, safe chemical handling practices, and proper control and maintenance of equipment and facilities.
- d) Training also should include emergency response, including the location and proper use of emergency equipment, use of personal protective equipment, procedures for raising the alarm and notifying emergency response teams, and proper response actions for each foreseeable emergency situation.

Record Keeping and Reporting

- a) The sponsor should maintain records of significant environmental matters, including monitoring data, accidents and occupational illnesses, and spills, fires and other emergencies. This information should be reviewed and evaluated to improve the effectiveness of the environmental, health and safety program.
- b) Records should be maintained of public complaints and accidents involving passengers or the general public.
- c) An annual summary of the above information should be provided to IFC.