

## **INTRODUCTION**

The "General Guidelines for Factory Buildings" have been prepared to assist the Investors, Architects and Engineers who are entrusted the task of designing /constructing the factories and other ancillary building of BOI projects.

All factory buildings constructed in Sri Lanka should confirm to the Factories Ordinance. This "Guidelines" booklet does not in anyway replace the Ordinance. Basically it aims at highlighting the areas to which special attention should be given by the Engineer/Architect in the design of the factory. It also drawn the attention of the designer to certain area which as our past experience shows, have been often overlooked or have not received adequate attention, either due to lack of knowledge of requirements or inadequate briefing by those engaging the designers, Subsequent modification to the building, cost ,time and money may also cause much inconvenience to the investor as well as the constructing agency.

In certain areas where guidance from the ordinance is inadequate, or norms stipulated appear to be outdated, suggested norms have been indicated in this booklet. For example, under "lighting" (section B (2.4) page 7 intensities of illumination for certain categories of operations have been laid down.

Requirements indicated in the booklet are" minimum requirements" . It is desirable to have higher provisions in all important areas. Such provisions, apart from giving the factory a higher standard, would also help the investor during enhanced production periods when extra hands may have to be recruited.

Inquiries of clarification regarding any matter dealt with in this booklet may be directed to the Director (Eng Approval) Tel 346627

## **GENERAL GUIDELINES FOR FACTORY BUILDINGS**

The general guidelines given below are to be followed by all BOI Enterprises in the planning, designing and construction of factory buildings. The Architect/Engineer designing the factory complex shall also take into consideration inter-alia, the location, site conditions, services, required, number of workers, processes involved, raw materials used, factory effluents and solid waste to be disposed of ect., before finalizing the building plans for submission to the BOI for approval.

### **SECTION A- SITE REQUIREMENTS**

#### **Selection of Site**

In selecting a site for the factory building of the proposed project, among other things, the following aspects should be taken in to consideration;

- a. The covered area of factory building and other ancillary structures such as warehouses and workshops.
- b. Internal roads, packing areas, footpaths, loading and unloading space, and garden area
- c. Fire gap and fire escape routes.
- d. Space and locations within the site for installation such as gas cylinders, transformers, water tanks, under ground water sumps, treatment plants, storm water drains ect..

If the factory is to be located outside an EPZ or an industrial park, among other matters, transportation, availability of eating establishments, adequacy of infrastructure facilities such as power, telecommunication and means of discharging effluents if any, disposal of solid waste and storm water etc.. also be taken note of.

In addition , prevailing by -laws/regulations in force in the area of the Local Authority, particularly those pertaining to road reservations, streetlines, construction of building and waste disposal which affect the siting of buildings and operations of the factory should be give due consideration.

## **SECTION B – BUILDING REQUIREMENTS**

### **(1) GENERAL**

#### **1.1 Factory Building and Services**

All building and services shall be design and accordance with accepted Codes of practice and in conformity with the current Factory Ordinance.

#### **1.2 Architectural Appearance and Quality**

The building and other structures shall be aesthetically pleasing and of a high standard acceptable to the BOI. Major building components, type of finishes, (such as external finishes of walls), electrical fans, extractors, blowers, doors, windows, louvers, lighting point, air conditioners (if any) shall be clearly indicated in the building plans.

#### **1.3 Final Ground and Floor Levels**

Final ground and floor levels of the factory must be fixed in relation to the surrounding lay of the land, adjoining road levels, invert levels and location of the nearest manhole in order to ensure proper surface water drainage and sewage disposal.

#### **1.4 Floor Space**

No factory shall be over crowded so as to cause risk or injury to the workers, The space requirement should be decide upon taking into consideration the numbers and size of machinery that would be installed, tables/work benches, bins and other equipment that need to be accommodated in the production areas, pathways, emergency exits and temporary storage requirements. The total covered area should taken into account the production area required, stores space, office, canteen, toilets, service areas, first aid room, fire escape route, maintenance space, too room/(s), workshops, boiler room, treatment plants, etc.

#### **1.5 Storeyed Buildings**

In storeyed factory buildings, in addition to the main stairway leading to the working area there shall be provide an additional stairway which would serve as an escape route in case of fire. All stairways should be provided with railings and the top railing should not be less than 90 cm high. The completed structure consisting of anchor post and railings should be of solid construction and should be capable of withstanding a point load of at least 90 kgs applied in any direction at any point on the top rail.

**1.6 Guarding of wall openings, open-side floors, platforms and catwalks.**

All wall openings, open-side floors, platforms and catwalks should be suitably guarded by means of railing or fencing. Where there is a hazard of material falling from open-side floors, platforms etc., suitable protective measures should be adopted by the provision of toe-boards or screens of solid construction.

**1.7 Boundary Walls**

The boundary walls along the perimeter of the site and the gate shall be 6 ft. high. Prior approval should be obtained for the location of the gate.

**1.8 Landscaping**

The premises and road frontage should be well landscaped. As many of the existing trees as possible should be preserved and only those which need to be removed for buildings should be felled.

**1.9 Parking Area and Access**

Adequate parking areas and suitable access roads should be provided within the site, so as to avoid parking of vehicles on the highway.

**1.10 Security Lights**

The factory compound shall be provided with adequate security lights.

**1.11 Exit Doors**

Minimum of two exit doors in every floor or every big room should be provided.

**1.12 Electrical Installations**

All electrical installations shall be carried out to the satisfaction of the Ceylon Electricity Board.

**1.13 Miscellaneous**

During the planning stages due consideration should be given to the expansion programmes of the project so that at later stages when the layouts are modified or the work force increases changes required and the provision of amenities to the work force do not become problematic.

**(2) SANITATION & HEALTH REQUIREMENTS**

**2.2 Ventilation and Thermal Comfort**

Effective and suitable provision shall be made for securing and maintaining adequate ventilation in each work room by the

circulation of fresh air. The minimum fresh air required in a work room where there are no contaminants to be removed from air shall be such to effect at least three air changes per hour.

Where natural ventilation through windows and other openings is found to be inadequate, mechanical ventilation either by exhaust of air or by positive ventilation or a combination of these two shall be provided.

In the case of industrial buildings wider than 70 ventilation may be augmented by floor ventilation.

Where the desired temperatures and humidities cannot be obtained by mere ventilation, air conditioning should be resorted to.

Air movement and distribution may be achieved by re-circulation of the inside and. or outside air by installing an adequate number of fans .blowers. The rate of air movement in the vicinity of workers shall be such as to give reasonable comfort without objectionable draughts.

Effective provision shall also be made for maintaining a reasonable temperature in each work room. The following method are recommended for controlling temperature.

(a) Isolation

Locate heat producing equipment such as furnaces so as to expose only a small number of workers to the hot environment. Where possible, enclose the work areas and supply conditioned air to enclosures.

(b) Insulation

Insulation of the roof and providing ceiling would be very effective in controlling heat. Good result could also be achieved by painting roof sheets with heat reflective shades.

## **2.2 Sanitary Conveniences :**

Adequate and separate sanitary conveniences shall be made available for workers of either sex with water accessible on tap. Where persons of both sexes are employed, sanitary conveniences for each sex shall be so screened so as to provide adequate privacy.

The minimum requirement is one sanitary convenience for every twenty five workers (male or female). However, in the case of

any premises where the number of males employed exceeds 100, sufficient urinal accommodation should also be provided on the basis of urinal for every 50 males.

Sanitary conveniences should have adequate ventilation and lighting. Large windows and/or exhaust fans should be provided in passages and in open areas. Narrow, dark, ill-ventilated passages should be avoided.

## **2.3 Water Supply**

### **a Water Storage**

In every factory a suitable sump and an overhead water tank should be constructed taking into consideration the total daily requirement of water for domestic use as well as processes, if any. The total capacity of the sump and the overhead tank should not be less than one day's requirement.

The sumps shall be located so that water could be drawn from it for fire fighting if required. It shall be designed in such a way as to facilitate cleaning and inspection. If located on the fire gap the design of the sump should cater for passage of heavy vehicles over it.

### **b Washing Facilities**

Separate washing facilities shall be provided for male and female workers. The minimum requirement is one wash basin for every 20 persons. Where troughs are provided they shall be tiled and shall be at least 2 ft. of straight trough for 20 persons.

Washing areas provided for female workers should be enclosed or screened so that the interior is not visible from any place where persons of the other sex work.

In addition to the above, taking into consideration the nature of operation in the factory, there shall be provided a sufficient number of showers for the use of employees. Showers for the use of female workers shall be enclosed.

## **2.4 Lighting**

Provision shall be made for securing and maintaining adequate lighting whether natural or artificial in every part of the factory where persons are working

In areas where persons are regularly employed the intensity of illumination shall not be less than 4000 lux (40ft candles) at the height of 3 ft. from the floor. In other parts of the factory over which persons employed pass, the intensity shall not be less than 50 lux (5ft candles).

The above are the minimum requirements. For operations that need sustained attention, higher illumination should be provided.

The following table gives the recommended illumination levels for certain operations :-

Workshop - 400 lux  
Sewing - 600 lux  
Stores - 50 lux

Lighting should be provided in such a manner as to avoid glare.

## **(3) FACILITIES TO WORKERS**

### **3.1 Meal Room**

The meal room shall be adequately provided with sufficient tables and chairs to accommodate at least 30% of the workers at a time. The floor area of the meal room excluding the area occupied by equipment, fittings and furniture other than tables and chairs or benches shall not be less than 10 sq. ft. per person.

Suitable washing facilities shall be provided within the meal room, together with provision for draining off excess water.

### **3.2 First Aid Room**

Every factory should have a well equipped first aid room, sited so as to be easily accessible from all parts of the working place. The door for the first aid room should be large enough to allow the passage of a stretcher. The floor and wall should be covered with smooth washable material easy to clean and adequate lighting and ventilation must be provided.

A footbath with running water together with a sink or a wash basin also shall be made available.

In factories where male and female workers are employed the first aid room should be capable of accommodating a minimum of two beds with suitable screening facility between beds.

For equipment the first aid room, a separate leaflet from the Senior Manager (Engineering Services) could be had on request.

3.3 changing Rooms and Lockers

Adequate lockers for personal belongings and suitable accommodation for changing clothes shall be provided in the factory premises.

3.4 Facilities for Resting

There shall be provided and maintained for the use of all female workers whose work is done standing, suitable facilities for resting, sufficient to enable them to take advantage of any opportunities for resting which may occur in the course of their employment.

(4) **POLLUTION CONTROL**

**4.1 General**

Suitable action shall be taken to eliminate any pollution created as a result of the factory process, use of boilers, discharge of wastes, effluents ect..

Suitable action shall be taken to submit a flow sheet showing the various steps of the production processes in board outline indicating the points of origin of liquid and solid wastes.

**4.2 Effluents**

Effluents shall conform to the suggested tolerance limits for effluents discharged into the common sewer, a copy of which may be obtained from the Environment Department of the Board. Intended in-house treatment facilities to treat the effluents to conform to the above standards shall be outlined and detailed drawings of these shall be submitted to the Board.

Effluents shall be located into a leakproof storage tank the capacity of which would be adequate to hold at least one half day's effluent from the production process before discharging to the common sewer.

**4.3 Noise**

Due consideration shall be given to install noise generating machinery on resilient foundations to reduce the vibration and

noise generated by them. In addition they may be enclosed using suitable material to isolate the machinery so as to reduce the spread of noise to adjoining area.

**4.4 Smoke Emission**

Details of civil engineering aspects, location/s, intended heights of location/s, intended heights of chimney/ stacks for the boiler/s furnaces using fossil fuels and the quantities of fuel to be used shall be forwarded to the board.

**4.5 Solid Waste Disposal**

Suitable bin shall be constructed or provided for the collection of Solid waste until such time they are removed to the BOI dump yard periodically.

**4.6 Dust, Fumes & Vapour**

Provision should be made for local exhaust ventilation system for the removal of any dust, fumes or vapour produced during any process in the factory.

**4.7 Miscellaneous**

In premises where there is oil spillage, such areas should be cemented and provided with drains and oil traps.

**(5) FIRE PRECAUTIONS**

**5.1 General**

Adequate precautions should be taken to minimize the risk of fire within and outside the factory buildings.

**5.2 Fire Gap**

No building or other structure including any projection shall be built within a distance of 20 ft. from any of the boundary walls except with the prior approval of the Board. This passage shall be motorable right round.

**5.3 Fire Extinguishers**

Within the factory building, an adequate number of fire extinguishers and other fire fighting equipment shall be made available. In this regard, the Chief Fire Officer of the Fire Department of the Colombo Municipal Council or any other specialist agency may be consulted.

**5.4 Fire Escape**

The factory building should have an adequate fire escape/exist. All doors of the factory building should open outwards.

**5.5 Handling & Storing of Explosives**

Where explosives and inflammable dust, gas or vapour substances are involved, adequate precautions should be taken, under expert advice, regarding their storage and handling

## **SECTION C**

### **Approval procedure**

#### **(1) Certified Drawings**

The overall design and the preparation of plans should be carried out under the supervision of a qualified Consultant. Civil engineering drawings should be signed by a Chartered / Civil/ Structural Engineer or Chartered Architect. Electrical and Mechanical drawings should be signed by a chartered Electrical Engineer/Chartered Mechanical Engineer. The name, address and qualification of the Engineer/ Architect should be indicated in the plan.

- 1.1 **Layout Plan** – to be submitted in 5 copies.  
This plan should indicate the areas allocated for production activities, stores, canteen and the areas earmarked for services such as cleaning, washing etc..
- 1.2 **Service Plan** - to be submitted 5 copies  
This plan should indicate the position of sewers, water lines, surface drains sump and overhead tank, water taps, location of the fire hydrants and fire extinguishers, parking areas, and the location of boilers, if any, Structure required for effluent treatment may also be included in this plan.  
**Note** ; Surface water drains should not be connected to the sewer system.
- 1.3 **Structural Drawings** – Single Copy
- 1.4 **Electrical Drawings** – to be submitted in 3 copies  
This should indicate the proposed wiring of the building, electrical circuits, location of switch gear and their ratings, conduits, cables, sizes of conductors etc.
- 1.5 **Mechanical Drawings** – to be submitted in 3 copies  
3 sets of mechanical layout drawings indicating the locations of the machines, their names and horse power rating, the location of the boilers/ high pressure vessels, position of the safety valves etc. Should be submitted.
- 1.6 **Other Drawings** – if any may be submitted in 3 copies

**(2) Commencement of work**

No work should be commenced at the site without the approval of the Director (Eng. Appr)

**(3) Construction of Buildings**

All buildings shall be constructed according to the plans approved by the BOI Prior approval of the Director (Eng. Appr) shall be obtained if any construction activity other than what is indicated in the approved plan is to be carried out. For this purpose a set of plans (Three copies) indicating the modifications to be effected shall be forwarded to the Director (Eng. Appr.)

During the construction phase the Enterprise shall make necessary arrangement in consultation with the Investor Services Department of the BOI to obtain the ancillary services such as electricity, telephone, telex, water supply etc.,

When construction activities are nearing completion it must be brought to the notice of the Director (Eng. Appr.) requesting an inspection indicating the expected date of completion of the construction activities.

**(4) Certificate of Conformity**

Upon request by the Enterprises, the Director (Eng.Appr.) will make arrangement for officers from the BOI to inspect the building to check whether the constructions have been carried out in conformity with the approved plans; fans, extractor fans have been completed lockers for the workers provided and certificates for pressure vessels, if any, obtained. If satisfied, the Certificate of Conformity which will be needed for obtaining the letter of Authority for allowing commercial exports would be issued.