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Acronyms and abbreviations used in this guidance manual

- ASHRAE: American Society of Heating, Refrigeration, and Air-Conditioning Engineers
- ARI: Air-Conditioning and Refrigeration Institute
- NFPA: National Fire Protection Association
- SMACNA: Sheet Metal and Air Conditioning Contractors’ National Association
- Cibse Applications Manual Am10 Published by Chartered Institution of Building Services Engineers.
- ISO: International Organization for Standization
- OHSAS: Occupation Health and Safety Assessment Series for health and safety management system
- PME: Presidency of Meteorology and Environment (Saudi Arabia)
- SFDA: Saudi Food & Drug Authority
- LEED: Leadership in Energy and Environmental Design
- BREEAM: BRE - Environmental Assessment Method
Introduction

The Saudi Industrial Property Authority issued a guide of standards and requirements for the construction of factories and supporting services in industrial cities and decided to accompany the guide with this guidance manual which is a summary of the most important requirements and procedures to be followed with regard to the development of factories and supporting services in industrial cities.

It should be acknowledged that each of the owner (investor), designer, supervisor and contractor are committed to implement the provisions of the initial guide, not dispensed by the contents of this guidance manual.

The Saudi Industrial Property Authority
Executive summary

The purpose of the elaboration of this summary (investor’s summary) is to clarify the main steps and essential aspects of work in the industrial zones and cities as well as to provide the investor with the important information needed from the beginning, during the execution of the project and up until its completion. It also underlines the technical aspects of the standards and requirements for the construction of factories and the development of supporting services, the establishment of definitions and requirements for the creation of factories in the industrial cities, knowing that the summary does not go into the technical and specialized details for which it is needed to refer to the “Standards and requirements guide for the construction of factories and supporting services in industrial cities” to have the complete technical and detailed aspects required to implement the work.

- Part one: General requirements and procedures
- Part two: Building requirements
- Part three: Sustainability in the industrial buildings
- Part four: Phases, license procedures and follow-up
General requirements and procedures
Part one: General requirements and procedures

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1.1 Owner – Investor’s obligations

1. Commitment to the terms and requirements of this guide
2. Respecting the proprietary rights of those who have properties adjacent to the proposed project, whether these rights are moral or material
3. Coordination with the owners of existing adjacent projects and commitment to collaborate with them to restore any damages to their buildings resulting from the construction works of adjacent buildings
4. Preparation of layouts through a specialized Saudi consultancy firm qualified in factory planning, which are:
   a. to be signed and sealed with the seal of the consultancy firm
   b. accompanied with a valid copy of the firm license and submitted to the Saudi Industrial Property Authority
5. That the work procedures are met and obtaining the required approvals before proceeding with the construction works. No modification shall be done on any part of the accredited design after obtaining the permit, unless a modification of permit is applied for and approved. Any violation shall be disclosed by the Authority to undertake the relevant procedures.

Sudair Industrial City –
Model exhibited at the premises of the Authority in Riyadh
1.2 General requirements for the construction of factories

1. The factory must be licensed by the Ministry of Commerce and Industry or the General Investment Authority or the competent authorities.

2. Food, drugs and cosmetics factories must obtain a license from the competent authorities and refer to and coordinate with the Food and Drug General Authority to assure the production quality and its compliance with the general health standards and must know the health requirements for food factories and their staff and the requirements pertaining to drugs factories (www.sfda.gov.sa).

3. Factories with limited environmental impact must obtain a preliminary assessment form whereas an audit is performed by the Presidency of Meteorology and Environment for factories with important environmental impact, when submitting the preliminary environmental assessment form to obtain the license or ask for an environmental impact study as the Presidency deems appropriate.

4. The factories with hazardous environmental impact and potential environmental pollution must obtain an environmental permit from the Presidency of Meteorology and Environment or from the competent authorities further to an environmental impact study conducted by one of the consultancy firms or the research centers accredited by the Presidency of Meteorology and Environment (please refer to table 1).

5. The requested area for the factory must comply with the manufacturing and production requirements of the factory.

6. The minimum level of modern technology with regard to equipment, machinery and manufacturing methods must be provided in the factory.

7. The factory site must be carefully chosen considering its impact on the effectiveness and productivity of the factory, bearing in turn on the design and the construction terms of the factory.

8. Plots of appropriate area are allocated in the industrial city for each industrial project further to its review by the authority, taking into account the future expansions if sufficiently justified through a brief study of the production plan providing a preliminary idea of the current demand and of the

Procter and Gamble Plant
Industrial City, Jeddah - 2012
1.3 Application steps for the construction of a factory

Building licenses are requested through the procedures required and mentioned on the Authority’s Website after having reviewed the requirements described on the Website both in Arabic and English. For the Arabic language [http://www.modon.gov.sa/Arabic/Pages/default.aspx](http://www.modon.gov.sa/Arabic/Pages/default.aspx).

potential absorption markets.

9. Priority for the land lease in the industrial cities is given to the industries consistent with the desired development to enhance the industry in the kingdom in the framework of the quinquennal development plan.

10. The factories located outside the industrial cities are allocated plots inside the industrial cities in case relocating them is considered necessary to implement expansions to increase their capacity or to introduce new products according to their relevant granted licenses.

11. The investor benefits from the plot allocated for the construction of a factory in the industrial cities under a contract concluded with the Saudi Industrial Property Authority or with the private industrial city owner, according to the nature of the contract: leasing, selling or usufruct. The factory owner is committed to the factory construction in the industrial cities terms and requirements, concerning construction, operation and maintenance.
1.4 Checklist for the first part

Obtaining the necessary factory construction licenses from the competent authorities:

- Ministry of Commerce and Industry □ □
- General Investment Authority □ □
- Food, drugs and cosmetics factories must refer to and coordinate with the Food and Drug general Authority □ □ □
- Other bodies □ □

Audit by the Presidency for Meteorology and Environment and obtaining the necessary licenses:

- Review of the table with the classification of industries based on their environmental impact, Guidance manual, p.19 □ □
- Submission of preliminary assessment form for the factories with limited environmental impact □ □ □
- Submission of preliminary assessment form for the factories with important environmental impact and obtaining approval without conducting an environmental impact study for the factory □ □ □
- Preparation of an environmental impact study for the factories with hazardous impact □ □ □

Taking into account the factories construction general requirements

- The requested area for the factory complies with the manufacturing and production requirements of the factory □ □
- The minimum level of modern technology with regard to equipment, machinery and manufacturing methods is provided in the factory □ □
- Preparation of a brief study of the production plan to estimate the current demand and of the potential absorption markets in order to allocate appropriate areas for the factories and their future expansions □ □
## 1.5 Classification of buildings based on their environmental impact

<table>
<thead>
<tr>
<th>Classification of industrial buildings based on their environmental impact</th>
<th>Limited</th>
<th>Important</th>
<th>Hazardous</th>
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<tbody>
<tr>
<td><strong>Types of manufacture</strong></td>
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<tr>
<td>Manufacture of food products</td>
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<tr>
<td>Processing and preserving of meat</td>
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<tr>
<td>Processing and preserving of fish, crustaceans and molluscs</td>
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<tr>
<td>Processing and preserving of fruits and vegetables</td>
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<tr>
<td>Manufacture of oils and vegetal and animal fats</td>
<td></td>
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<td>✓</td>
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<tr>
<td>Manufacture of milk products</td>
<td>✓</td>
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<tr>
<td>Manufacture of grain mill products</td>
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<td>✓</td>
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<tr>
<td>Manufacture of starches and starch products</td>
<td>✓</td>
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<tr>
<td>Manufacture of bakery products</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Manufacture of sugar</td>
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<tr>
<td>Manufacture of cocoa, chocolate and sugar confectionery</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Manufacture of macaroni, noodles, couscous and similar farinaceous products</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Manufacture of prepared feeds for animals</td>
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<td>✓</td>
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<tr>
<td>Manufacture of beverages</td>
<td>✓</td>
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<tr>
<td>Manufacture of soft drinks; production of mineral waters and other bottled waters</td>
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<tr>
<td>Manufacture of textiles</td>
<td>✓</td>
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<tr>
<td>Preparation and spinning of textile fibres</td>
<td></td>
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<tr>
<td>Weaving of textiles</td>
<td>✓</td>
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<tr>
<td>Finishing of textiles</td>
<td>✓</td>
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<tr>
<td>Manufacture of knitted and crocheted fabrics</td>
<td>✓</td>
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<tr>
<td>Manufacture of made-up textile articles, except apparel</td>
<td>✓</td>
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<tr>
<td>Manufacture of carpets and rugs</td>
<td>✓</td>
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<tr>
<td>Manufacture of cordage, rope, twine and netting</td>
<td>✓</td>
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<tr>
<td>Manufacture of wearing apparel</td>
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<tr>
<td>Manufacture of clothes, other than fur clothes</td>
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<tr>
<td>Manufacture of articles of fur</td>
<td>✓</td>
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<tr>
<td>Manufacture of knitted and crocheted apparel</td>
<td>✓</td>
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<tr>
<td>Manufacture of leather and related products</td>
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<tr>
<td>Tanning and dressing of leather; dressing and dyeing of fur</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Manufacture of luggage, handbags and the like; saddler and harness</td>
<td>✓</td>
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<tr>
<td>Activity</td>
<td>Classification</td>
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<tr>
<td>Manufacture of footwear</td>
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<td>Manufacture of wood, products of wood and cork, except furniture,</td>
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<tr>
<td>manufacture of articles of straw and plaiting articles</td>
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<tr>
<td>Sawmilling and planing of wood</td>
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<tr>
<td>Manufacture of veneer sheets and wood-based panels</td>
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<tr>
<td>Manufacture of wooden containers</td>
<td>^=✓</td>
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<tr>
<td>Manufacture of builder's carpentry and joinery</td>
<td>^=✓</td>
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<tr>
<td>Manufacture of other products of wood, manufacture of articles of cork,</td>
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<tr>
<td>straw and plaiting materials</td>
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<td>Manufacture of paper and paper products</td>
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<tr>
<td>Manufacture of pulp, paper and paperboard</td>
<td>✓</td>
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<tr>
<td>Manufacture of corrugated paper and paperboard and of containers of</td>
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<tr>
<td>paper and paperboard</td>
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<tr>
<td>Manufacture of other articles of paper and paperboard</td>
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<td>Printing and reproduction of recorded media</td>
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<tr>
<td>Printing</td>
<td>✓</td>
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<tr>
<td>Printing and related services</td>
<td>✓</td>
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<tr>
<td>Reproduction of recorded media</td>
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<tr>
<td>Manufacture of coke and refined petroleum products</td>
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<tr>
<td>Manufacture of refined petroleum products</td>
<td>✓</td>
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<tr>
<td>Manufacture of coke oven products</td>
<td>✓</td>
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<tr>
<td>Manufacture of chemicals and chemical products</td>
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<tr>
<td>Manufacture of basic chemicals</td>
<td>✓</td>
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<tr>
<td>Manufacture of fertilizers and nitrogen compounds</td>
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<tr>
<td>Manufacture of pesticides and other agrochemical products</td>
<td>✓</td>
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<tr>
<td>Manufacture of paints, varnishes and similar coatings, printing ink</td>
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<tr>
<td>and mastics</td>
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<tr>
<td>Manufacture of soap and detergents, cleaning and polishing preparations,</td>
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<tr>
<td>perfumes and toilet preparations</td>
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<tr>
<td>Manufacture of other chemical products not classified elsewhere</td>
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<tr>
<td>Manufacture of synthetic fibres</td>
<td>✓</td>
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<tr>
<td>Manufacture of basic pharmaceutical products and pharmaceutical</td>
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<tr>
<td>preparations</td>
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<tr>
<td>Manufacture of pharmaceutical substances, chemical and herbal medicines</td>
<td>^=✓</td>
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<tr>
<td>Manufacture of rubber and plastic products</td>
<td>^=✓</td>
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<tr>
<td>Manufacture of rubber tyres and tubes and retreading and rebuilding of</td>
<td>✓</td>
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<tr>
<td>rubber tyres</td>
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<tr>
<td>Manufacture of other non-metallic mineral products</td>
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<tr>
<td>Manufacture of glass and glassware</td>
<td>✓</td>
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<tr>
<td>Manufacture of refractory products</td>
<td>✓</td>
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<td>Activity</td>
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<tr>
<td>Manufacture of other ceramic and porcelain products</td>
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<tr>
<td>Manufacture of cement and semi-ready mortars</td>
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<tr>
<td>Manufacture of articles of concrete, cement and plaster</td>
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<tr>
<td>Manufacture of basic metals</td>
<td></td>
<td>✓</td>
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<tr>
<td>Manufacture of basic iron and steel</td>
<td>* ✓</td>
<td>* ✓</td>
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<tr>
<td>Casting of iron and steel</td>
<td>* ✓</td>
<td>* ✓</td>
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<tr>
<td>Casting of non-ferrous metals</td>
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<tr>
<td>Precious and non-ferrous metals production</td>
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<tr>
<td>Manufacture of fabricated metal products, except machinery and equipment</td>
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<tr>
<td>Manufacture of metal structures</td>
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<td>* ✓</td>
</tr>
<tr>
<td>Manufacture of tanks, reservoirs and containers of metal</td>
<td></td>
<td>* ✓</td>
<td>* ✓</td>
</tr>
<tr>
<td>Manufacture of steam generators, except central heating hot water boilers</td>
<td></td>
<td>* ✓</td>
<td>* ✓</td>
</tr>
<tr>
<td>Forging, pressing, stamping and roll-forming of metal; powder metallurgy</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Treatment and coating of metals; machining</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Manufacture of cutlery, tools and general metal products</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Manufacture of other fabricated metal products not classified elsewhere</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Manufacture of computer, electronic and optical products</td>
<td>^ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacture of electronic components and boards</td>
<td></td>
<td></td>
<td>^ ✓</td>
</tr>
<tr>
<td>Manufacture of computers and peripheral equipment</td>
<td>✓</td>
<td></td>
<td>^ ✓</td>
</tr>
<tr>
<td>Manufacture of communication equipment</td>
<td></td>
<td>✓</td>
<td>^ ✓</td>
</tr>
<tr>
<td>Manufacture of consumer electronics</td>
<td></td>
<td>✓</td>
<td>^ ✓</td>
</tr>
<tr>
<td>Manufacture of watches and clocks and time measuring instruments</td>
<td></td>
<td>✓</td>
<td>^ ✓</td>
</tr>
<tr>
<td>Manufacture of irradiation, electromedical and electrotherapeutic equipment</td>
<td></td>
<td>✓</td>
<td>^ ✓</td>
</tr>
<tr>
<td>Manufacture of electrical equipment</td>
<td></td>
<td>✓</td>
<td>^ ✓</td>
</tr>
<tr>
<td>Manufacture of electric motors, generators and transformers, electricity distribution and control apparatus</td>
<td></td>
<td>✓</td>
<td>^ ✓</td>
</tr>
<tr>
<td>Manufacture of batteries and accumulators</td>
<td></td>
<td>&quot;✓</td>
<td>✓</td>
</tr>
<tr>
<td>Manufacture of other electronic and electric wires and cables</td>
<td></td>
<td>✓</td>
<td>^ ✓</td>
</tr>
<tr>
<td>Manufacture of electric domestic appliances</td>
<td></td>
<td>✓</td>
<td>^ ✓</td>
</tr>
<tr>
<td>Manufacture of other electrical equipment</td>
<td></td>
<td>✓</td>
<td>^ ✓</td>
</tr>
<tr>
<td>Manufacture of machinery and equipment not classified elsewhere</td>
<td></td>
<td>✓</td>
<td>^ ✓</td>
</tr>
<tr>
<td>Manufacture of engines and turbines, except aircraft, vehicle and cycle engines</td>
<td></td>
<td>✓</td>
<td>^ ✓</td>
</tr>
<tr>
<td>Manufacture of other pumps, compressors, taps and valves</td>
<td></td>
<td>✓</td>
<td>^ ✓</td>
</tr>
<tr>
<td>Manufacture of lifting and handling equipment</td>
<td></td>
<td>✓</td>
<td>^ ✓</td>
</tr>
<tr>
<td>Manufacture of office machinery and equipment (except computers and peripheral equipment)</td>
<td></td>
<td>✓</td>
<td>^ ✓</td>
</tr>
</tbody>
</table>
### General requirements and procedures

#### Classification of buildings based on their environmental impact

<table>
<thead>
<tr>
<th>Category</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacture of agricultural and forestry equipment</td>
<td>^ ✓</td>
</tr>
<tr>
<td>Manufacture of metal forming machinery and machine tools</td>
<td>^ ✓</td>
</tr>
<tr>
<td>Manufacture of machinery for mining, quarrying and construction</td>
<td>^ ✓</td>
</tr>
<tr>
<td>Manufacture of machinery for food, beverage and tobacco processing</td>
<td>^ ✓</td>
</tr>
<tr>
<td>Manufacture of machinery for textile, apparel and leather production</td>
<td>^ ✓</td>
</tr>
<tr>
<td>Manufacture of other special-purpose machinery</td>
<td>^ ✓</td>
</tr>
<tr>
<td>Manufacture of motor vehicles, trailers and semi-trailers</td>
<td></td>
</tr>
<tr>
<td>Manufacture of motor vehicles</td>
<td>✓</td>
</tr>
<tr>
<td>Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers</td>
<td>✓</td>
</tr>
<tr>
<td>Manufacture of parts and accessories for motor vehicles</td>
<td>✓</td>
</tr>
<tr>
<td>Manufacture of furniture</td>
<td>✓</td>
</tr>
<tr>
<td>Manufacture of furniture</td>
<td>✓</td>
</tr>
<tr>
<td>Other manufacturing</td>
<td></td>
</tr>
<tr>
<td>Manufacture of games and toys</td>
<td>^ ✓</td>
</tr>
<tr>
<td>Other manufacturing not classified elsewhere</td>
<td>^ ✓</td>
</tr>
</tbody>
</table>

* These manufactures are classified under two categories, depending on their production capacity and quantity

# For more than 1,000 Ton/Year

^ These manufactures are not classified by the Presidency of Meteorology and Environment. Please refer to USAID guide

^ These manufactures fall under the largest title for manufacturing types and are not detailed.
Siemens Electronics plant – Chengdu, China

Building requirements
Part two: Building requirements

2.1 General factory site elements and principles to determine their location and relation to each other

2.2 Land use administrative regulations and systems

2.3 Land occupation

2.4 Setbacks

2.5 Heights

2.6 Loading and Unloading areas

2.7 Parking areas

2.8 Open spaces

2.9 Facades

2.10 Factory administration buildings

2.11 Employees facilities

2.12 Fences

2.13 Advertising signs

2.14 Landscaping

2.15 Levels of inner roads

2.16 Entances and Gates

2.17 Pavements

2.18 Utilities

2.19 Environmental conditions and Industrial Safety conditions

2.20 Checklist for the second part
2.1 General factory site elements and principles to determine their location and relation to each other

The many elements of a factory can be gathered in one building or distributed in several buildings\(^1\) on the general factory site as long as their specific planning conditions are met. The general factory site includes three main elements which are the buildings, the circulation roads and the truck maneuver zones, in addition to the points of entrance, exit and control, parking areas and landscaping. The general factory site buildings include the manufacturing, production, warehousing, research and laboratories, worker facilities, administration and guards as well as the supporting engineering services building. The circulation roads and truck maneuver areas within the site have to take into account the loading of products and the unloading of raw materials, the maneuvers of trucks, the circulation of employees and workers cars, the movement of pedestrians and their relation to the entrances, exits and control points for the general factory site.

---

1. Please refer to the factory planning conditions in chapter three of the standards and requirements guide for the construction of factories and supporting services in industrial cities

---

Figure 1 - a: planning of production space

Figure 1 - b: planning of production space according to production flow
### 2.2 Land use administrative regulations and systems

- Commitment to use according to the zone specifications in the industrial city as appropriate to the manufacturing activity.
- Commitment to the terms and conditions of the selling or lease contract to make sure that the owner or the leaseholder preserves the building and the city attraction.
- Modifications shall not be made to existing buildings without specific permission of the Authority.
- The buildings use shall be restricted to the uses determined in the selling or lease contracts.
- Signs shall not be put on the building without prior permission of the Authority.
- The side setbacks or the factory roof shall not be used for storage purposes, especially waste.
- The side or rear setbacks shall not be used to place Chillers, even if the latter are surelevated.
- The buildings shall be preserved and maintained in good condition.
- The Authority is entitled to add other articles to support these provisions during the development of the industrial city, namely:
  - To impose fees on each leaseholder or owner to cover the maintenance of the city according to the systems proposed by the Authority
  - To impose fines and penalties on infringer factory beneficiaries and to enforce their application.
2.3 Land occupation

1. Building to plot area ratio varies around 50-60% as a maximum and not less than 45%.
2. Circulation routes, driveways, setbacks, parking areas, landscaped area and loading and unloading zone vary around 40-50% of the plot area.
3. Voids are to be distributed within the industrial building according to table 3.
4. Percentages may be modified according to the factory requirements in terms of units and warehouses so that the minimum level of industrial use is not less than 43% of the building area.
5. The floor area ratio (i.e. built area to plot area ratio) must not exceed 1.5.

### Table 2:

<table>
<thead>
<tr>
<th>Land occupation percentages</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building percentage</td>
<td>50%</td>
</tr>
<tr>
<td>Minimum building percentage</td>
<td>≥ 45%</td>
</tr>
<tr>
<td>Maximum building percentage (future expansion)</td>
<td>≤ 60%</td>
</tr>
</tbody>
</table>

**Sources:**

### Table 3:

<table>
<thead>
<tr>
<th>Industrial building elements</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>60-70% (decreases with the increase of factory size)</td>
</tr>
<tr>
<td>Warehouses</td>
<td>³ 20% (increases with the increase of factory size)</td>
</tr>
<tr>
<td>Administration</td>
<td>10-15 (increases with decrease of factory size)</td>
</tr>
<tr>
<td>Workers facilities</td>
<td>5-9% (increases with increase of factory size)</td>
</tr>
</tbody>
</table>

**Note:** these are percentages of the permissible built area and not of the overall plot area.
2.4 Setbacks

1. The front setback (from the street) shall not be less than 13.5m and from both sides and the rear, not less than 6m (or the setback allowing truck circulation, especially at turns, to avoid collisions with existing buildings).

2. No structures shall be located in the setback areas, save for the electricity room, the main switchgears and reserve generator room, the guard’s room and parking areas and the fuel and gas tanks to be placed in the front setback.

3. Should the access roads be 20m or 30m wide, a 3m chamber shall be made in the earth on each side at an angle of 45° degrees.

4. The front setback may be used as a private car or bus parking area (of a length not exceeding 6m perpendicularly to the fence) or open green areas.

5. It is possible to assure the car parkings and truck loading and unloading zones in the setbacks on the minimum area stated above. In case car parkings are to be located on both sides of the building, the distance shall not be less than 12m. In case a truck waiting and loading zone is to be located on the side of the building, the setback distance shall not be less than 29m so as to provide parking and maneuver space.

Figure 3: Setbacks and their use – plot on a single road

Figure 4: Setbacks and their use – plot on two perpendicular roads
2.5 Heights

6. The maximum permissible height of the production units in the factory is 20m, measured from the surrounding roads level up to the hall ceiling without including the factory chimney.

7. The minimum height of the production units is 6m, measured from the surrounding roads level up to the hall ceiling.

8. In special cases requiring an increase of this height, the prior approval of the Authority may be obtained, after justifying the request.

9. It is permitted to house the production area and the products and raw materials warehouses in multi-storey buildings up to a maximum not exceeding the regular height.

10. In case the production hall is two-storey, it shall be equipped with escape ladders at a maximum travel distance of 30m, according to the Saudi civil defense requirements, provided the use is symmetrical in the successive perpendicular spaces.

---

**Table 4:**

<table>
<thead>
<tr>
<th>Production type</th>
<th>Without overhead fixtures*</th>
<th>With overhead fixtures*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assembly area for small products with workbenches</td>
<td>3.6m</td>
<td>3.6m</td>
</tr>
<tr>
<td>Assembly area for large products at floor level</td>
<td>Maximum height of product + 75%</td>
<td>Maximum height of product + 125%</td>
</tr>
<tr>
<td>Small products forming area</td>
<td>Machine height + 100%</td>
<td>Machine height + 150%</td>
</tr>
<tr>
<td>Large products forming area</td>
<td>Machine height + 125%</td>
<td>Machine height + 125%</td>
</tr>
</tbody>
</table>

* Overhead lights and sprinklers + ventilation ducts, heating units, overhead conveyors, etc.

---

Figure 5: Minimum permissible height of the production halls

Figure 6: Permissible heights of production hall buildings
2.6 Loading and Unloading areas

1. A portion of the land surface shall be allocated to the loading and unloading activities according to the factory needs. The loading and unloading zones may be separated or combined in one area to unload raw materials and load end products.

2. The loading and unloading areas shall be determined on the master plan, taking into account the unhindered cars and trucks movements without interferences in the circulation paths and with sufficient manoeuvring space for large trucks (if necessary) according to the production type.

3. Loading bays shall be conveniently spaced according to their types.
2.7 Parking areas

1. At least 50% of the car parking shall be covered with light-colored roofs that increase solar reflectance. Photovoltaic solar panels may be placed on the car parking rooftop to achieve renewable energy production at the same time.
2. Each car parking space shall be no less than 2.6x5.5m. Between car rows, routes of no less than 6m shall be provided for perpendicular parking, of no less than 5.5m for 45° parking and of no less than 3.5m for route-parallel parking in one direction.
3. Front setback may be used as car parking area.
4. The factory shall provide sufficient parking areas for cars, trucks and buses within the factory site, to accommodate the number of employees and visitors and the raw materials and products circulation, according to the rates mentioned in table 5.
5. Loading bays spacing is closely related to vehicles turnaround, manoeuvring and their perpendicular or angled parking position as follows:
   ▫ Minimum spacing for the manoeuvring area depth of a 15m truck is no less than 13m (28m from bay face to turning boundary) and the minimum spacing between perpendicular loading bays no less than 6.5m. In such case the number of bays is limited (five loading bays for a 33m frontage building), figure 9
   ▫ Overnight truck parking between loading bays may be added as long as turnaround and manoeuvring area depth is no less than 20m (35m from bay face to boundary), figure 10
   ▫ Minimum bay spacing shall not be less than 3.8m as long as 5 meters are added to the turnaround and manoeuvring area depth to allow trucks to draw forward prior to turning and manoeuvring, figure 11
   ▫ Minimum spacing for the manoeuvring area depth of a 15m truck is no less than 9m (21.5m from bay face to turning boundary) and the minimum spacing between 45° angled bays no less than 3.8m, figure 12.

<table>
<thead>
<tr>
<th>Table 5: Car parking rates according to factory usages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate</td>
</tr>
<tr>
<td>One car per 160-200m²</td>
</tr>
<tr>
<td>One car per 120-160m²</td>
</tr>
<tr>
<td>One car per 40m²</td>
</tr>
<tr>
<td>Truck/vehicle</td>
</tr>
</tbody>
</table>

Source: studies approved by the Ministry of municipal and rural affairs and other studies

A list of information related to the specifications of a variety of trucks used in industrial activities has been elaborated. Please refer to the standards and requirements guide for factories building, p. 132 when planning the loading, unloading and manoeuvring areas in the industrial buildings sites.
Figure 9: Layout for turning and manoeuvring area depth for a 15m truck, perpendicular loading bays

Figure 10: Layout for turning and manoeuvring area depth for a 15m truck, perpendicular loading bays, intermediate space used for overnight parking

Figure 11: Minimum bay spacing for turning and manoeuvring of a 15m truck in perpendicular bays

Figure 12: Turning and manoeuvring area of a 15m truck in 45° angled bays
2.8 Open spaces

1. When designing the industrial buildings open spaces, two main specifics are to be taken into account:
   a. All open space design elements shall adequately match the scale, the height and the space blocks of the industrial buildings
   b. The treatment of open spaces shall contribute to the integration of the industrial building in its surrounding landscape.
2. The front court shall be used for landscaping and a minimum of 5% of the plot area shall be dedicated to open spaces.
3. Open spaces shall be landscaped and planted with evergreen trees/shrubs and green areas. Pedestrian walkways and uncovered car parking areas shall be designed to match the entrances, the circulation and the fences in terms of location and height.
4. 1m within the fence setback as well as 1m around the administration building shall be used for landscaping and tree planting so as to improve the overall factory sight.

Figure 13: Landscaping of open spaces around the office building and the building front facade
2.9 Facades

1. Attention to the design of the different facades, especially for the factories overlooking more than one road from the front or the rear.
2. No window in the production hall shall be less than 1m wide and 1m high.
3. Materials suitable to the hot climate environment shall be used for the factory facades external finishing.
4. Special care shall be taken in terms of painting colors, wall patterns, etc.
5. No air conditioning units shall appear on the external facades and building techniques shall be used to achieve a visually agreeable urban setting.

Figure 14: Design of external facades and attention to details

Figure 15: Attention to external facades design and avoidance of overuse of colors and finishing materials

Figure 16: Screening of devices and utilities placed on industrial buildings roofs

Some examples of possible shading systems
2.10 Factory administration buildings

1. In case administration buildings are separated from the production area, the space between the buildings shall be no less than 5m or adjacent to the production area.
2. It is forbidden to use the administration building to accommodate the workers.
3. The administration building shall be located in the front part of the factory facing the main road. No administration buildings shall be located in the rear or side parts without prior consent of the Authority or the existence of reasons related to the operation of the factory.
4. No basement shall be built on the factory site.
5. The administration and related services buildings that are separate from the manufacturing building may have a ground floor and three storeys with a maximum height of 16m, including the final coating. In such case, the buildings shall be equipped with escape ladders according to the civil defense requirements.
6. The administration building consists of the various departments staff offices, the manager’s and meeting rooms and the secretariat along with the necessary services such as water closets, buffet, depot, archive rooms and other service areas required for the staff working in the factory administration building.
7. The width of the administration building gate shall be no less than 2m.
8. The width of the main corridors in the administration buildings shall be no less than 2m and of the secondary corridors no less than 1.5m.

Figure 17: Administration and staff services building location

Figure 18: Facades of administration buildings
9. Distinctive architectural features shall denote the administration building facades.
10. An appropriate for the nature of the industrial city distinctive finishing type shall be used, such as stainless steel, glass, aluminum or any other materials to achieve the purpose of giving the building a good distinctive architectural facade.
11. The interior divisions in the factory administration buildings shall feature spacings and surface areas appropriate for the use and function of spaces. Gypsum boards are preferred as space partitions.
12. Natural lighting and ventilation as well as air conditioning shall be provided in the administration buildings.
13. Accessibility of the disabled to the administration building shall be ensured.
14. It is preferred to have a separation between the administration building and the employees’ facilities building as suitable for large factories.
### 2.11 Employees facilities

1. The minimum level of facilities to be provided for the workers in the production halls is: a praying room, a canteen, water closets, a buffet, a locker room, a first-aid room as long as the surface areas of these units suit the number of workers.
2. Separation between the facilities for female workers and the facilities for male workers.
3. Foresee 0.8m²/worker in the praying room and 1m²/worker in the canteen.
4. The first-aid room surface area shall be no less than 10m².
5. The following criteria shall be met with regard to the workers facilities: one washbasin/15 workers, one WC/15 workers.
6. Lockers and locker-room (one locker per worker)
7. When the number of workers in the factory reaches 250, a social service center shall be provided including a mosque within the factory building requirements and when the number of workers exceeds 300 persons, a resident physician shall be on site. Should the number of workers reach 500, an ambulance shall also be provided.
8. It is strictly forbidden to provide accommodation for the workers or the employees within the factory site boundaries save for the guard’s quarter.
9. The workers facilities shall not open directly to the production halls. Posters shall advise the staff to wash their hands with soap and antiseptics after using the water closets to avoid any pollution of the products and particularly in the food and pharmaceutical products manufactures.
### 2.12 Fences

Please refer to the fence specifications approved by the Authority and clarified in the Factory building standards and requirements (detailed) guide, shown in the following figure.

![Model of factory fence approved by the Authority](image)

**Figure 20**: Model of factory fence approved by the Authority

### 2.13 Advertising signs

The advertising sign shown in the following photo shall be made according to the specifications stated in the guide.

![Advertising signs approved by MO-DON](image)

### 2.14 Landscaping

1. Landscaping and planting shall achieve a buffer zone between the industrial use and the non industrial use. Open areas may be used to establish natural boundaries between the industrial and the non industrial uses.
2. Planters at least 1m wide shall be placed at the fence boundaries within the plot on the front, side and rear plot limits.
3. Landscaping and planting shall be assigned to a contractor qualified in this field.

### 2.15 Levels of inner roads

To facilitate entry to and exit from the factory, the final level of the inner roads shall not exceed the level of the road asphalt by more than 35 cm.

![Relation of the inner roads level to the front road level (not more than 35 cm)](image)

**Figure 21**: Relation of the inner roads level to the front road level (not more than 35 cm)
2.16 Entrances and Gates

1. Entrances shall be on the side roads only (20-30m). No entrances shall be located on roads wider than 30m.
2. Factory gates shall not open on main roads that are 40m wide and more, unless no other side road allows access to the factory.
3. Should the factory wish to open gates on a main road that is more than 40m wide, prior coordination shall take place with the Authority so as to adapt the entrances and exits to the models approved by the Authority.
4. Each factory shall have at least two gates.
5. Should the plot width not exceed 30m, the factory shall have at least two gates.
6. Each factory shall have a gate dedicated to workers and employees.
7. The factory external gates shall be as high as the fence (2.5m).

2.17 Pavements

Pavements no less than 60cm wide and 15cm high in relation to the surrounding road levels shall be made around the production halls.

2.18 Utilities
Building requirements

Utilities

Natural and artificial lighting

1. Natural lighting shall be provided in workplaces and employees facilities buildings for a better lighting quality in the work environment and a reduction of artificial lighting costs.

2. The factory undertakes the lighting of the fence and of the external driveways using weather resistant lighting units.

Natural ventilation

The administrative buildings, the services buildings and the workers buildings shall be naturally ventilated to prevent pollution whereas buildings openings shall take prevailing wind direction into account.

Natural ventilation means consisting of windows and openings in the ceilings shall vary according to the type of building (administrative, facilities, production hall) and to the use of the void.

Ensuring outdoor lighting

Air conditioning

1. The production halls and administration buildings air conditioning system shall be centralized with operation control programs.

2. Requirements specific to air conditioning and ventilation design and relevant calculations shall be met as well as the general and special considerations stated in the Saudi standard specifications and requirements of the civil defense or the other accredited standard specifications such as ASHRAE or ARI.

Electricity

- A room shall be provided to house the electric power transformers according to the requirements of the power supply company. The design and specifications of the room shall be approved by the company and any modifications related to the dimensions of the transformers and the special equipment requested by the company shall be made during the design phase and before the beginning of the works.

- A back-up electric power supply source shall be provided for large factories, in case of main electric power supply outage.

- The electric power usage rates indicated in table 6 are to be taken into account.

Communications

- Each plot shall be equipped with a telephone cable with at least 5 lines, installed by the telecommunications company according to the approved specifications.

- This shall be coordinated with the telecommunications operator in the industrial city.
### Table 6

<table>
<thead>
<tr>
<th>Industrial activity</th>
<th>Electric power use (kVA/50m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacture of food products</td>
<td>2/50m²</td>
</tr>
<tr>
<td>Manufacture of textile and wearing apparel</td>
<td>3/50m²</td>
</tr>
<tr>
<td>Manufacture of wood, wood products and furniture</td>
<td>2/50m²</td>
</tr>
<tr>
<td>Manufacture of paper, printing and publishing</td>
<td>2/60m²</td>
</tr>
<tr>
<td>Manufacture of chemicals and plastic products</td>
<td>2/60m²</td>
</tr>
<tr>
<td>Manufacture of building materials, porcelain and glass</td>
<td>4/100m²</td>
</tr>
<tr>
<td>Manufacture of basic metals</td>
<td>6/75m²</td>
</tr>
<tr>
<td>Manufacture of fabricated metal products, machinery and equipment</td>
<td>4/60m²</td>
</tr>
<tr>
<td>Cold storages and warehouses</td>
<td>3/30m²</td>
</tr>
</tbody>
</table>

Source: International specifications

---

### Potable water

- Potable water shall only be used for specific purposes in the production and not for the purpose of water packaging and sale or cooling and washing. Accordingly, the use of this water and the required quantities yearly shall be clarified.
- Water shall be pure, colorless and odourless, of palatable taste and fresh.
- Potable water shall not be used for industrial purposes.
- Ablution areas, bathrooms and kitchens shall be provided with hot water.
- The quantity of water required for factories uses varies between 25m³/ha/day for factories with reduced needs and 200m³/ha for factories with increased needs (table 7).
- Workers needs inside the factory amount to 30 lt/worker/day.
- Average irrigation water needs inside the factories are estimated to amount to 10 lt/day/m².

### Sanitary drainage

- The factory is committed to build an internal sanitary drainage network to be connected to the main network using external connections of at least 150mm diameter and to be implemented by the sanitary and industrial drainage operator in the industrial city.
- Water supply lines and drainage lines shall be separated as far as possible from each other.
- A system shall be used for industrial water treatment where necessary (such as in cement, chemicals, milk products manufactures), prior to its discharge into the network, implementing the environmental protection standards according to the document 1401/1402H issued by the Saudi Presidency of Meteorology and Environment or any of its supplements.
- Water resulting from the use in the factories shall be treated before its discharge into the sanitary network of the industrial city, should its specifications exceed the permissible limits for a direct discharge into the drainage network.
### Table 7

<table>
<thead>
<tr>
<th>Type of manufacture</th>
<th>Estimated number of workers per ha</th>
<th>Type of water required</th>
<th>Quantity of water required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food and beverage</td>
<td>50</td>
<td>Potable water 100%</td>
<td>100 m³/ha/day</td>
</tr>
<tr>
<td>Pharmaceuticals</td>
<td>50</td>
<td>Potable water 100%</td>
<td>75 m³/ha/day</td>
</tr>
<tr>
<td>Building materials</td>
<td>50</td>
<td>Potable water 100%</td>
<td>100 m³/ha/day</td>
</tr>
<tr>
<td>Cleaning products</td>
<td>50</td>
<td>Potable water 100%</td>
<td>50 m³/ha/day</td>
</tr>
<tr>
<td>Wood and metal</td>
<td>100</td>
<td>Potable water 30% Treated industrial wastewater 70%</td>
<td>100 m³/ha/day</td>
</tr>
<tr>
<td>Petrochemicals</td>
<td>50</td>
<td>Potable water 30% Treated industrial wastewater 70%</td>
<td>200 m³/ha/day</td>
</tr>
<tr>
<td>Plastic</td>
<td>50</td>
<td>Potable water 30% Treated industrial wastewater 70%</td>
<td>200 m³/ha/day</td>
</tr>
</tbody>
</table>

Source: Specifications established in the industrial cities in the Kingdom of Saudi Arabia

### Rainwater drainage
- Rainwater shall not be discharged into the sanitary drainage network

### Solid waste
- A location shall be assigned by the factory within the plot boundaries to collect (store) non-hazardous solid and industrial waste, provided that waste collection means have a secure and easy access to such location.
- The storage surface area shall be determined according to the solid waste quantities produced and to the necessary storage duration before waste collection by the competent parties. The ground of the storage room shall be made of concrete and shall extend at least one meter from all sides of the stored containers or bins.

Figure 27: Rainwater drainage in the factory

Figure 28: Ground plan showing sorted solid waste special containers
2.19 Environmental conditions and Industrial Safety conditions

1. Conditions and standards governing air quality, noise, smelly substances, toxic and harmful substances shall be applied as well as standards governing flash and flare, radiation and radioactive substances, smoke, dust, vapor and air polluting substances, vibrations, water pollution and other, according to the General Environmental Rules issued by the Presidency of Meteorology and Environment.

2. The firefighting standards and requirements issued by the civil defense and pertaining to firefighting in factories and industrial buildings shall be applied.

3. The Presidency of Meteorology and Environment is the competent authority for fighting pollution and protecting the environment. The Environmental protection standards stipulated in the requirements and rules for implementation of the PME require all parties to submit a demand as mentioned in the appendix of the environmental standards and procedures for industrial establishments and services in the industrial city issued by the Authority.

4. It is possible that an environmental impact study is requested from some parties according to the requirements of the PME. Please refer to chapter one of the detailed guide.

5. The standard specifications and the specifications of the Saudi Standards Metrology and Quality Organisation shall be applied to all building operations and where not available, the approved international specifications shall apply.

6. The factory shall seek to obtain an ISO certification for environmental management, so as to achieve more progress and improvement in the environmental
### Checklist for the second part

**Taking into consideration the environmental and natural factors surrounding the site**
- Taking into account the topography and geology of the site and the soil and land drainage particularities
- Benefiting from the advantages of the climate conditions and avoiding the disadvantages
- Ensuring an appropriate level of environmental control, natural and artificial lighting
- Considering noise abatement with regard to the other adjacent buildings

**Optimal distribution of voids within the general site**
- Taking maximum advantage of the site surface area and of the shape of the plot
- Integration of site planning and main circulation axes

**Choosing the optimal orientation for the building**
- Taking maximum advantage of the indirect sunlight
- Mutual shading between buildings (in case there are several buildings)
- Shading of pedestrian walkways
- Orientation of the building in the direction of prevailing winds

**Adapting the buildings shape to the shape of the site and to the type of manufacturing activities**
- Adapting the building shape to the type of manufacture and manufacturing processes
- Locating the facilities and related services in the proper locations
- Taking into account extension and future expansion

**Careful design of circulation flows, entrances and exits**
- Provision of sufficient areas for loading and unloading within the plot boundaries
- Provision of areas for circulation flows around end products warehouses
- Allocation of waiting areas for trucks and vehicles being loaded on the site
- Provision of safe, appropriate and specified pedestrian walkways between car parkings and pavements

**Taking into account landscaping and parking places**
- Securing car parking areas for agents and employees, as close as possible to the administration building
- Securing truck parking areas taking their time periods of movement
- Improving the truck parking areas setting by planting trees
Taking care of the factory facade in terms of design, embellishment and finishing

Taking into consideration floor area ratios within the plot according to the following rates:

- Total built-up area 50%
- Circulation space and road connections 35%
- Open areas for landscaping 5%
- Expansion 10%

Observance of following setbacks:

- Front setback no less than 13.5m
- Side and rear setbacks no less than 6m
- No structures to be located in the setback areas, save for the electricity room, the main switchgears and reserve generator room, the guard’s room and parking areas and the fuel and gas tanks

Observance of following heights:

- The maximum permissible height of the production units in the factory does not exceed 20m
- The height of the production units is not less than 6m

Observance of the following requirements in the loading and unloading areas:

- Determining loading and unloading areas on the master plan, securing unhindered cars and trucks movements
- Provision of sufficient manoeuvring space for large trucks
- Determining truck parking places and referring to the special information list concerning truck dimensions
- Taking into consideration minimum spacing between loading bays

Observance of open spaces requirements

- Dedicate a minimum of 5% of plot area to open spaces
- Dedicate 1m within the setback from the fence to landscaping and small tree planting
- Dedicate 1m around the administration building to landscaping

Observance of building requirements

- Creation of an integrated building and avoidance of top, side and rear additional parts
- Spaces between buildings no less than 5m
- Windows in the production hall no less than 1m wide and 1m high
§ Taking into consideration mutual shading between buildings

Paying attention to the design of the different facades
- Air conditioning units shall not be visible on the factory external facades
- The minimum width of the administration building gate is no less than 2m
- Construction of external walls with layers of cement blocks at least 2m high

Securing minimum facilities for employees in the production halls
- Provision of a praying room, a canteen, water closets, a buffet, a locker room and a first-aid room
- Provision of a separation between the facilities for female workers and the facilities for male workers
- Provision of a first-aid room of at least 10m$^2$ surface area
- Meeting the following criteria: one washbasin/15 workers, one WC/15 workers, one water cooler dispenser/60 workers, one ablution faucet/15 workers

Site requirements
- Fences from all sides shall be of square steel section according to the model approved by the Authority
- Entrances shall be on the side roads only (20-30m). No entrances shall be located on roads wider than 30m unless there are no side roads allowing the factory to open a gate on, according to the industrial city requirements
- Each factory shall have at least two gates
- Provision of a pavement around the production halls no less than 60cm wide and 15cm higher than the road level surrounding the productions halls
- Placing an advertising sign with the name of the factory according to the model approved by the Authority
PULS Power Supplies factory to which the prestigious LEED® gold sustainability certificate was awarded – China

Sustainability in industrial buildings
Sustainability in industrial buildings
Sustainability and preservation of resources are currently considered the most modern concepts. Their incorporation in the development requirements, the design and the management of facilities leads to savings in power consumption and natural resources and to achieving a better residential and work environment. Sustainable design of industrial buildings brings about the following benefits:

- Efficiency in facilities and buildings design and reduction of power consumption
- Rationalisation of potable water consumption which helps reducing waste water and consequently reducing the cost of water treatment or transportation
- Improvement of the environment inside the buildings, through a series of important elements such as the quality of the air, the appropriate indoor temperature, the management of glare, day light and other factors.
- Reduction of negative impacts on the external environment, including a lower emission of toxic gases, a reduction of water and air pollution and lower water consumption
- Achievement of profitability on the medium and long term through the reduction of the costs related to power and other resources, to operation and building maintenance and securing a better production environment in the factories through a better indoor environment for the worker.

MODON encourages the owners and investors to seriously consider sustainability, through working on the incorporation of the sustainability concepts into the development and design of industrial establishments, the observance of standards and recommended instructions. MODON also encourages the developers, the consultants and the contractors working in the industrial cities to secure the means and solutions to reduce waste production starting from the design of the factory and related installations and to secure dedicated areas for the collection and sorting of waste deriving from the operation of the factory, throughout the construction phase and finally during the operation of the factories.
In order to reduce the environmental impact resulting from the factories operations, it is recommended that factory owners or staffs dedicate places for recyclable waste. The surface area of such places depend on the surface of the factory and related buildings, the type of product and manufacturing method and can be carefully determined by specialists in waste management and recycling.

### Efficiency of resource materials

<table>
<thead>
<tr>
<th>Design</th>
<th>Construction</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
</tbody>
</table>

**Reduction of waste during design** through:
- Off-site manufacturing
- Use of standard components
- Provision of areas for recyclable materials

**Reduction of waste during the construction of factories and related facilities** through:
- Waste management plan
- Waste production reduction
- Waste sorting
- Waste recycling

**Reduction of waste during the operation of factories and related facilities** through:
- Collection and sorting of waste
- Recycling of waste

### Table 8: Example of recyclable materials

<table>
<thead>
<tr>
<th>Offices</th>
<th>Manufactures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper</td>
<td>Paper</td>
</tr>
<tr>
<td>Cardboard</td>
<td>Cardboard</td>
</tr>
<tr>
<td>Metallic containers of liquids</td>
<td>Plastic</td>
</tr>
<tr>
<td>Glass containers of liquids</td>
<td>Glass</td>
</tr>
<tr>
<td>Plastic</td>
<td>Wood</td>
</tr>
<tr>
<td>Metals</td>
<td></td>
</tr>
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Design phases of factories and related services buildings
Part 4: Design phases of factories and related services buildings

4.1 Phase one: Site soil studies and settlements ................................................................. 59
4.2 Phase two: Preliminary design of buildings ................................................................. 59
4.3 Phase three: Final design phase .................................................................................. 59
4.1 Phase one: Site soil studies and settlements

This phase includes:
- Execution of borings, identification of land topography and levels
- Industrial licensing
- Plot allocation notice
- General site sketch
- Site program preparation
- General site preliminary layout preparation
- Industrial layout showing the sequence of production operations of the project and required surface areas
- Surface areas and setbacks use program
- Factory needs in terms of electric power, required water and sanitary drainage quantities
- Required water standards limits and standards of sanitary water discharged from the factory.

4.2 Phase two: Preliminary design of buildings

Further to the approval of phase one, preliminary drawings of the architectural design of the buildings are prepared (ground plans of ground floor and repeated upper floors) and include: the guard’s room, the electric power control room, the fence and any other buildings within the general site.

4.3 Phase three: Final design phase

Further to the approval of the preliminary designs, final designs are prepared and include the following:
- Architectural work plans
- General site landscaping plans
- Structural works
- Site sanitary works
- Buildings sanitary works plans and documents
- Electric power works
- Telephone and telecommunication works plans
- Air conditioning and ventilation works plans
- Industrial safety plans
List of references

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