2 INDUSTRIAL BUILDINGS

2.1 Introduction

Any building structure used by the industry to store raw materials or for manufacturing products of the industry is known as an industrial building. Industrial buildings may be categorized as Normal type industrial buildings and Special type industrial buildings. Normal types of industrial building are shed type buildings with simple roof structures on open frames. These buildings are used for workshop, warehouses etc. These building require large and clear areas unobstructed by the columns. The large floor area provides sufficient flexibility and facility for later change in the production layout without major building alterations. The industrial buildings are constructed with adequate headroom for the use of an overhead traveling crane. Special types of industrial buildings are steel mill buildings used for manufacture of heavy machines, production of power etc. The function of the industrial building dictates the degree of sophistication.

2.1.1 Building configuration

Typically the bays in industrial buildings have frames spanning the width direction. Several such frames are arranged at suitable spacing to get the required length (Fig. 2.1). Depending upon the requirement, several bays may be constructed adjoining each other. The choice of structural configuration depends upon the span between the rows of columns, the head room or clearance required the nature of roofing material and type of lighting. If span is less, portal frames such as steel bents (Fig. 2.2a) or gable frames (Fig. 2.2b) can be used but if span is large then buildings with trusses (Fig. 2.2 c & d) are used.

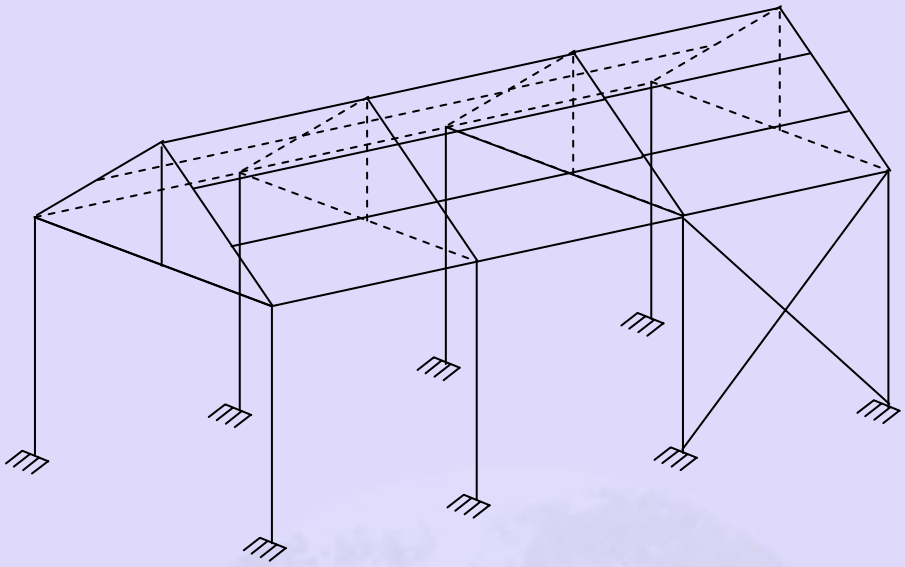
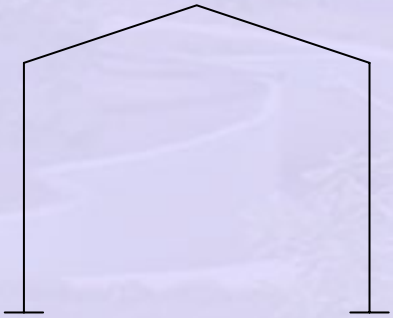


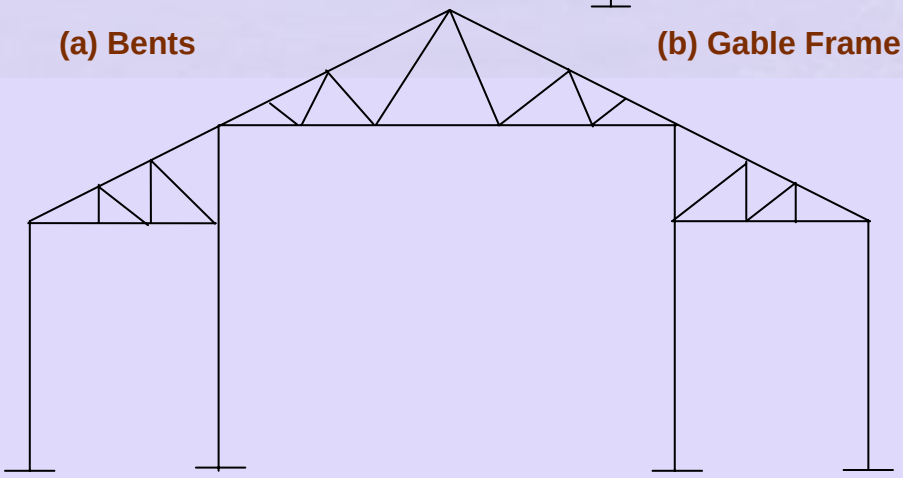
Fig. 2.1 Typical structural layout of an industrial

The horizontal and vertical bracings, employed in single and multi-storey buildings, are also trusses used primarily to resist wind and other lateral loads. These bracings minimize the differential deflection between the different frames due to crane surge in industrial buildings. They also provide lateral support to columns in small and tall buildings, thus increasing the buckling strength.

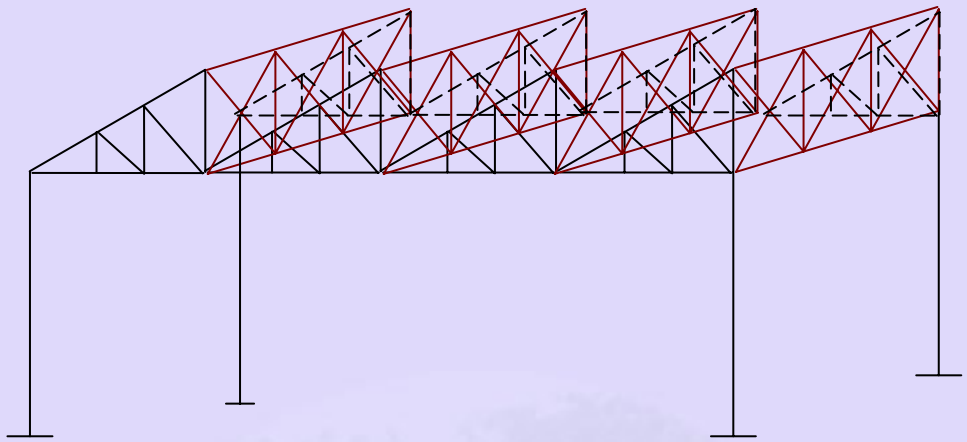
(a) Bents



(b) Gable Frame



(c) Industrial Building with Side Spans



(d) Industrial building with North light trusses

Fig. 2.2 Typical frame types used in industrial buildings

Floors

Different types of floor are required in any factory from their use consideration such as production, workshop, stores, amenities, and administration. The service condition will vary widely in these areas, so different floors types are required. Industrial floors shall have sufficient resistance to abrasion, impact, acid action and temperatures depending on the type of activity carried out. High strength and high performance concretes can satisfy most of these requirements economically and is the most common material used.

Foundation for vibrating machinery (such as reciprocating and high speed rotating machinery) should be placed upon rock or firm ground and it should be separated from adjacent floor to avoid vibrations.

Roof System

While planning a roof, designer should look for following quality lightness, strength, water proofness, insulation, fire resistance, cost, durability and low maintenance charges.

Sheeting, purlin and supporting roof trusses supported on column provide common structural roof system for industrial buildings. The type of roof covering, its insulating value, acoustical properties, the appearance from inner side, the weight and the maintenance are the various factors, which are given consideration while designing the roof system. Brittle sheeting such as asbestos, corrugated and trafford cement sheets or ductile sheeting such as galvanized iron corrugated or profiled sheets are used as the roof covering material. The deflection limits for purlins and truss depend on the type of sheeting. For brittle sheeting small deflection values are prescribed in the code.

Lighting

Industrial operations can be carried on most efficiently when adequate illumination is provided. The requirements of good lighting are its intensity and uniformity. Since natural light is free, it is economical and wise to use daylight most satisfactory for illumination in industrial plants whenever practicable.

Side windows are of much value in lighting the interiors of small buildings but they are not much effective in case of large buildings. In case of large buildings monitors are useful (Fig. 2.3).

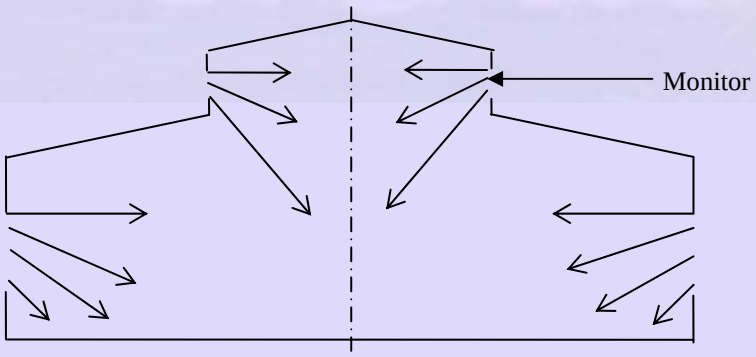


Fig. 2.3 Side windows and Monitors for natural light

Ventilation

Ventilation of industrial buildings is also important. Ventilation will be used for removal of heat, elimination of dust, used air and its replacement by clean fresh air. It can be done by means of natural forces such as aeration or by mechanical equipment such as fans. The large height of the roof may be used advantageously by providing low level inlets and high level outlets for air.