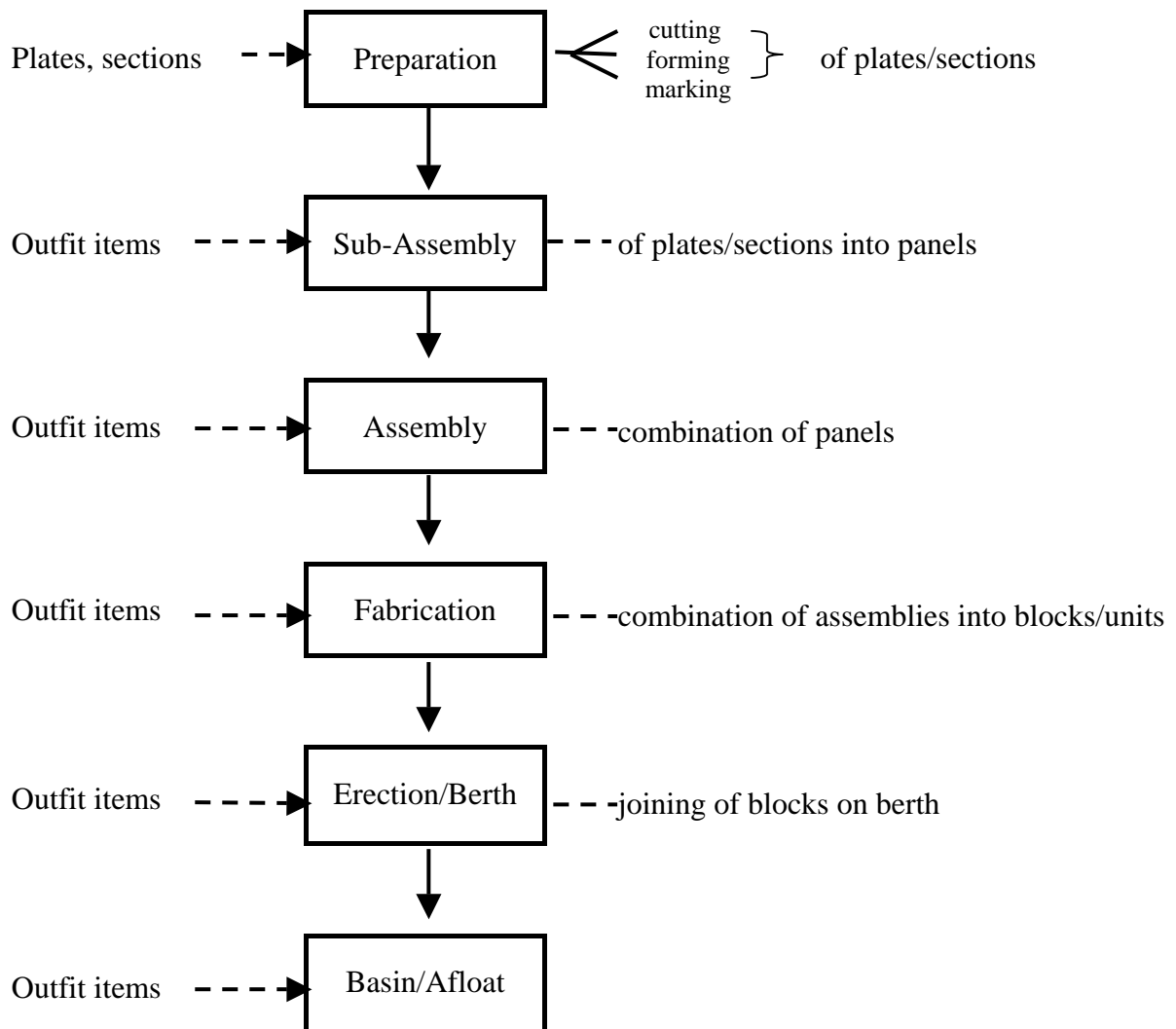


2. SHIPYARD LAYOUT

2.1 Stages in the Ship Production Process

Before looking at the details of shipyard layouts it is necessary, first of all, to understand the various stages in ship production process. Conceptually, this is explained by the following flow chart.



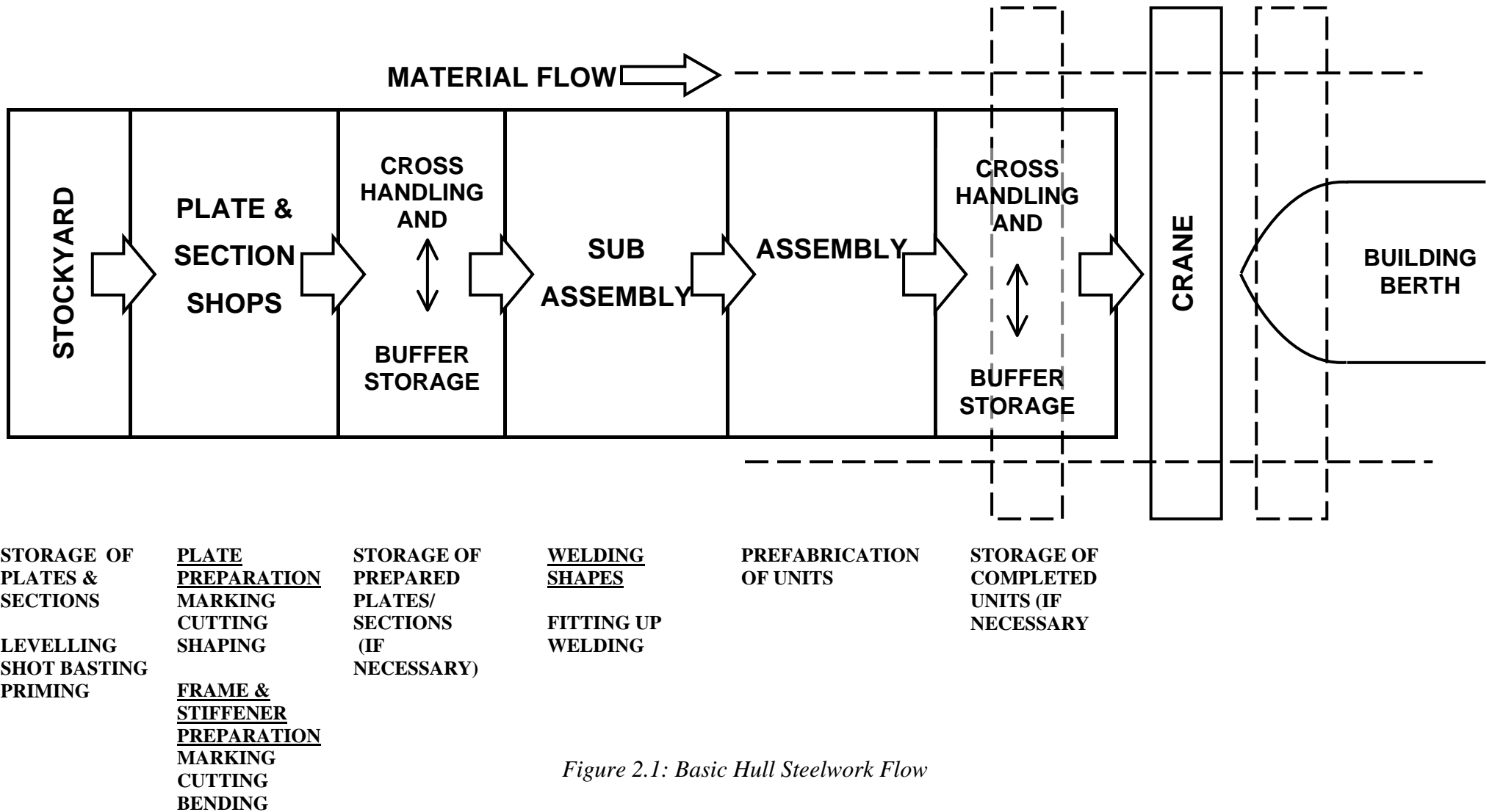
2.2 Examples of Yard Layouts

The hull of a ship is constructed (in a series of stages outlined above and) such that production is continuous. Many different layouts are possible, but the best layout is that in which the materials travel the shortest possible distance with minimum handling.

The simplest journey results from straight line travel and the ideal arrangement of the full construction yard is to provide unit-directional material flow – see Figure 2.1.

Such an ideal arrangement is very often not obtainable due to yard surroundings. Obvious alternatives are ‘L’ or ‘U’ shaped flows dependent on the physical environment and areas available and could be visualised as shown in Figure 2.2

Complete layouts of some shipyards are given in Figures 2.3 – 2.5.



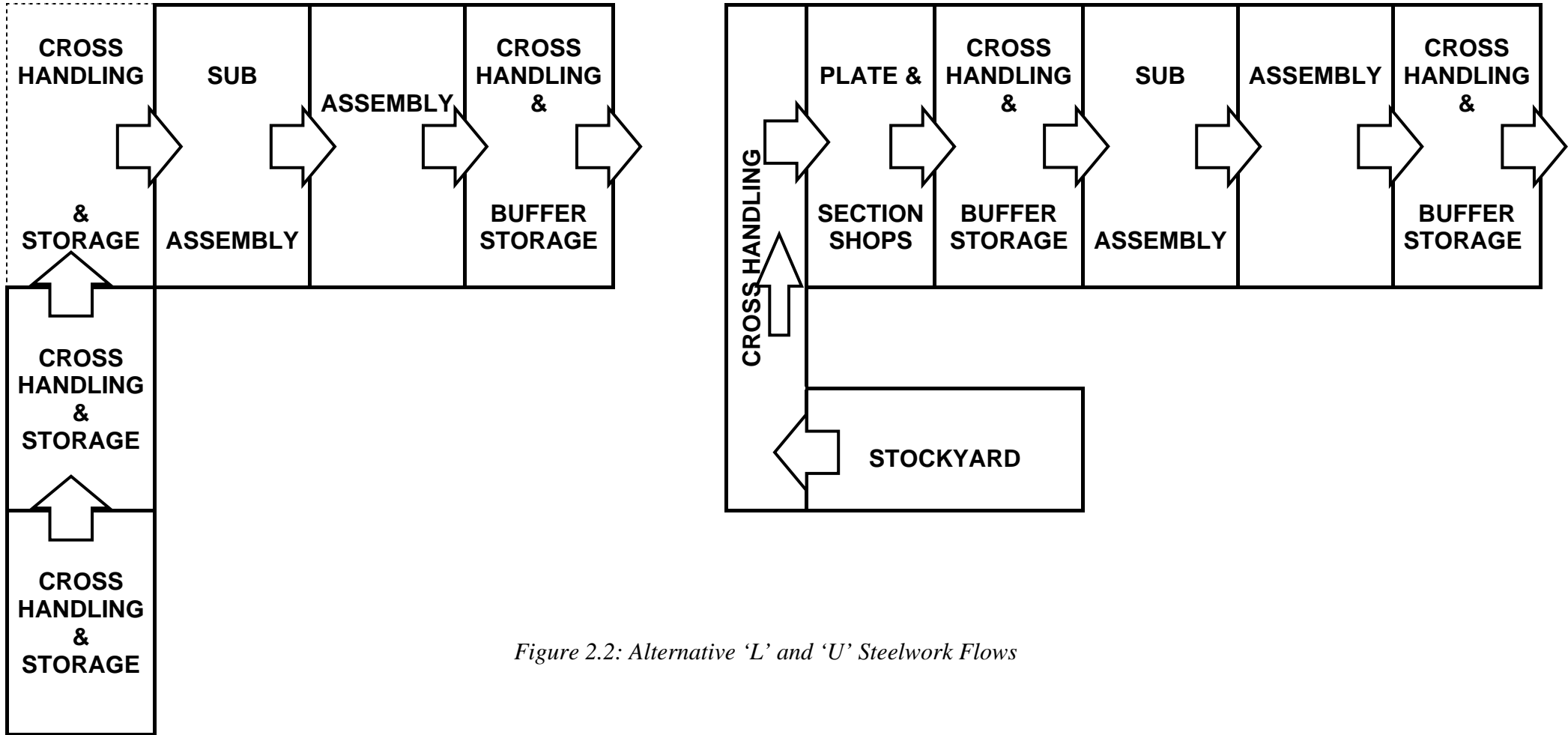


Figure 2.2: Alternative 'L' and 'U' Steelwork Flows

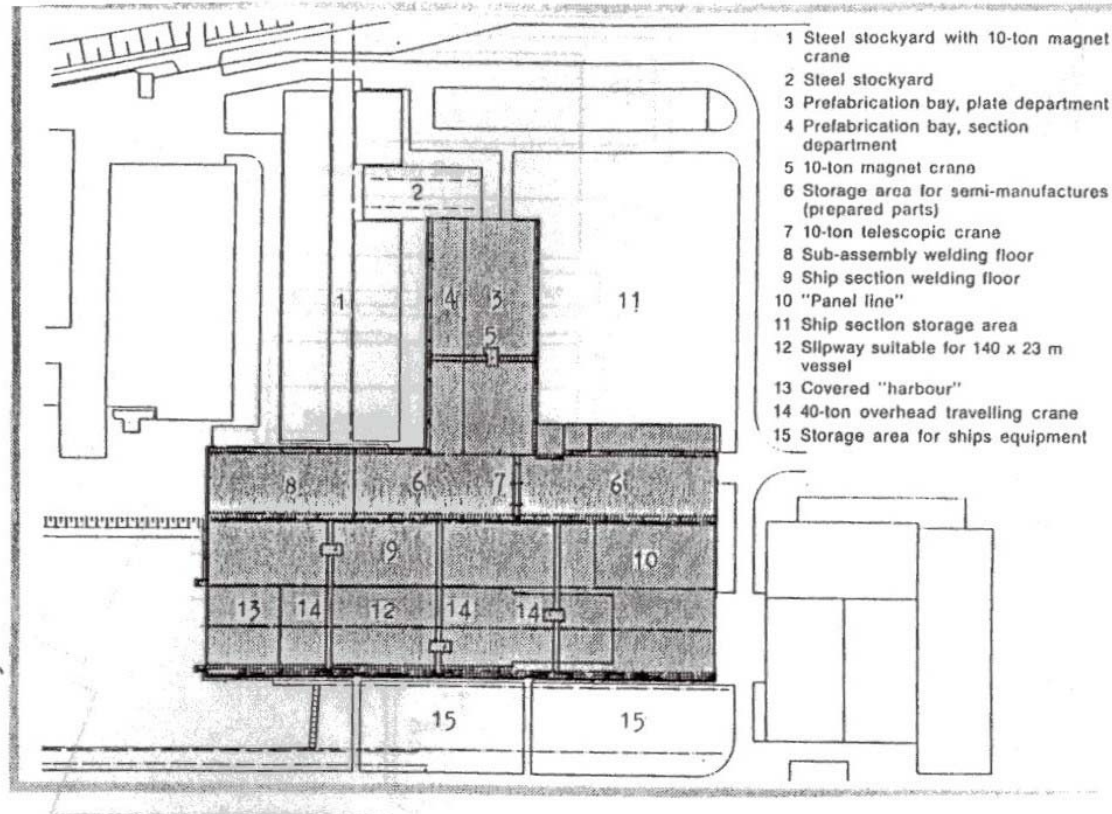


Figure 2.3: IHC Kinderdijk Yard

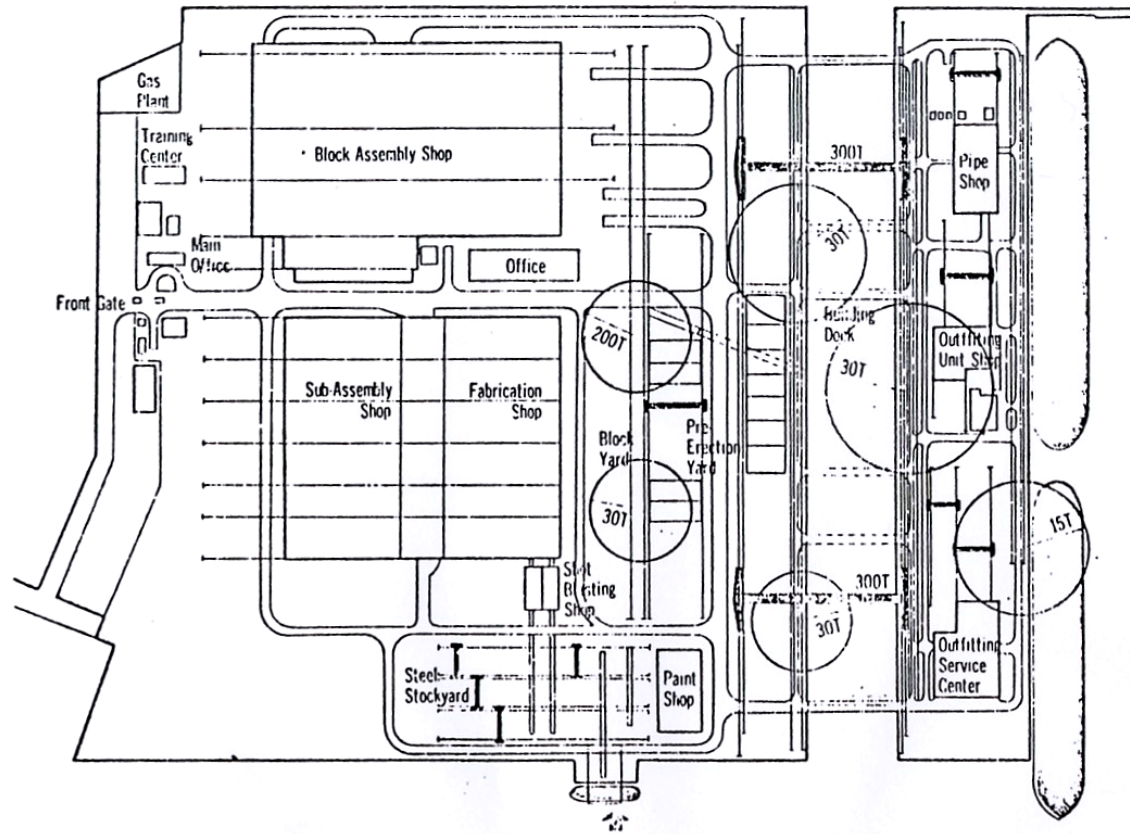


Figure 2.4: Simutomo Oppama Yard

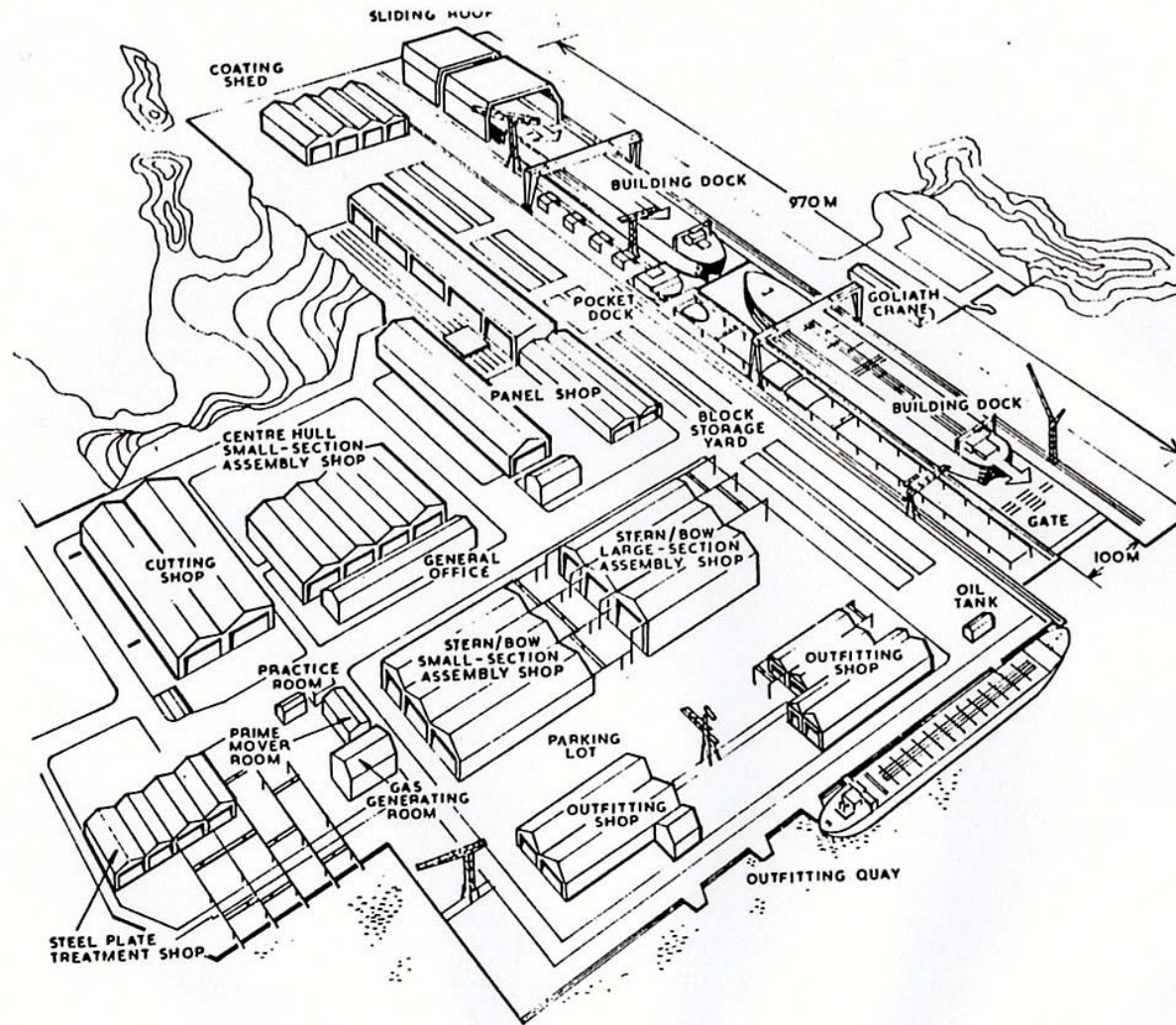


Figure 2.5 : Mitsubishi, Koyogi Yard

2.3 Factors Influencing Yard Layouts

The layout problem is common to every type of enterprise – from the small retailer to the largest manufacturing industries. The aim of each company is to obtain maximum benefit from their facilities. The adequacy of the layout directly affects the efficiency of the plant.

Principal factors which affect shipyard layouts are briefly discussed below.

(a) **Range of ship types to be built and number/year**

Ideally this should be one type, or two types of approximately similar type and size. In the case of one type, this can lead to a rationalisation or standardisation of design and production process, series production and a high efficiency of output.

Due to fluctuations in world demands for the various types, this ideal case is not often met in practice. Possible exceptions are yards producing vessels such as naval ships or trawlers/small steel craft.

In general, the type of vessels to be built will have considerable bearing upon the basic layout of the yard in respect of their size and various work contents, such as a large proportion of outfitting work in case of passenger and naval ships, or a large proportion of steelwork in case of tankers.

(b) **Space required**

The overall area is governed by the space required for the various stages of the building process. Such spaces should be of a size capable of accommodating the proposed flow of materials through them. The size of the various spaces should be such that there is a level workload through the production process. In practice the workload is not level and it is normal to incorporate buffer areas where materials may be stored before moving on to the next stage in the process.

The amount of space required for the various stages can be estimated by considering the building programme of the yard, ie. Number of ships per year, hence steel throughout.

(c) **Space available**

In practice, particularly in existing yard, it is often not possible to allocate the ideal size of spaces which have been mentioned above. In this case it is necessary (by careful production planning, possible re-allocation of some areas and changes in basic construction techniques) to improve the flow of material through the various shops.

(d) **Amount of mechanisation**

The actual amount of mechanisation and automation will depend on the capital expenditure available, the wage level of the area/country and the availability of labour; for example, if labour is cheap and plentiful it may be advantageous to carry out operations manually in preference to using high cost machinery. Alternatively, if there is a shortage of labour, or labour costs are high then it may be preferable to invest in machinery instead.

(e) **Materials handling**

The speed, direction and efficiency of material flow will depend on the type of transportation employed. Ideally, the handling of material should be kept to a minimum. For an efficient flow process it is necessary that the correct item is deposited in the correct place at the correct time using least effort and cost.

(f) **Construction methods employed**

Directly related to the foregoing items are the methods of construction employed. The design and construction method should be best suited to the production facilities and vice-versa. For example, the size and layout of the ships, materials handling, etc, will depend on factors such as the amount of pre-fabrication employed, whether flat panel shops

are used, the ambient weather which will indicate the amount of work to be carried out under cover, etc.

2.4 Re-development Strategy

Whenever a shipyard is to be modernised, or modified in light of changing demand, (or if a new shipbuilding facility is contemplated) then three, fundamental questions need to be answered:

- (a) What is the anticipated product mix?
- (b) What will be annual throughput for this product (mix)?
- (c) What are the present and projected levels of plant efficiency?

From these basic parameters the details of the work content, the necessary layout force, the layout of the facilities and the quantity and type of equipment must be evaluated within the bounds of any physical, financial and corporate guidelines. Of course the six features mentioned in the previous section will also need to be considered in the analysis.