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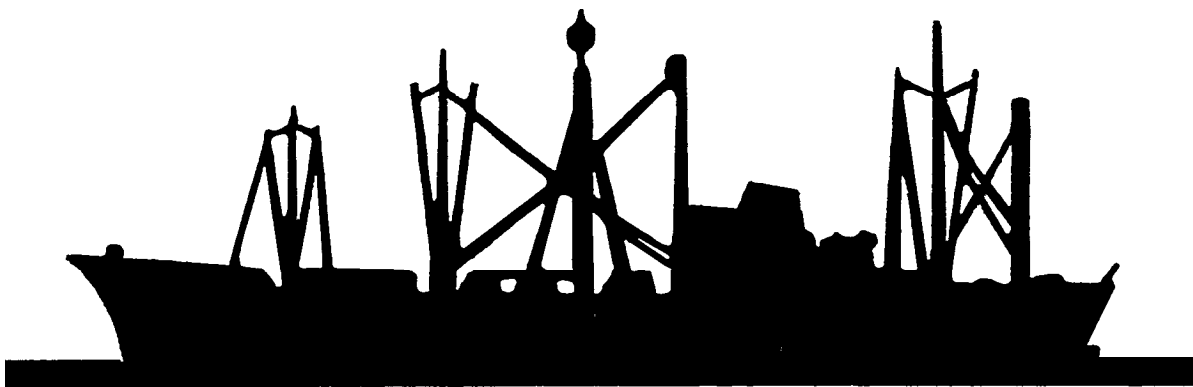
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INSTITUTE FOR RESEARCH AND ENGINEERING FOR AUTOMATION AND PRODUCTIVITY IN SHIPBUILDING

IREAPS

PRODUCIBILITY FROM CONCEPTUAL DESIGN TO SHIP CONSTRUCTION

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ABSTRACT

Producibility concepts may be applied in a variety of ways. Three main classifications are identified:

1. At the conceptual design stage
2. At the design development stage
3. As a method of reducing operational costs by removing work content, shortening the construction time and rationalizing material requirements of existing designs.

This paper reviews the effectiveness and likely benefits to be gained from these three approaches and examines design engineering, production engineering, facilities engineering and personnel engineering as applied at these three levels.

Figure 1

COST CONTROL POTENTIAL

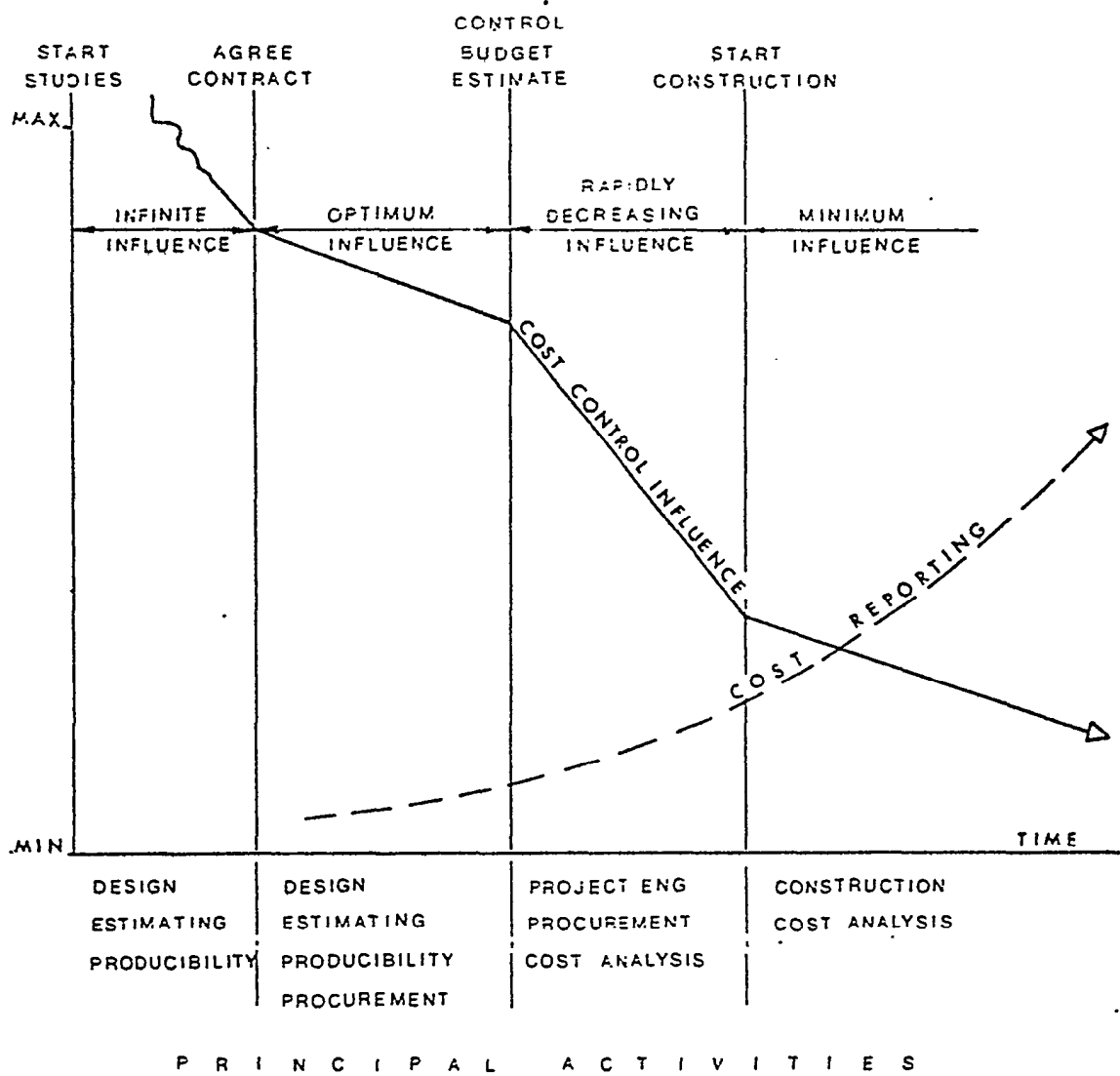
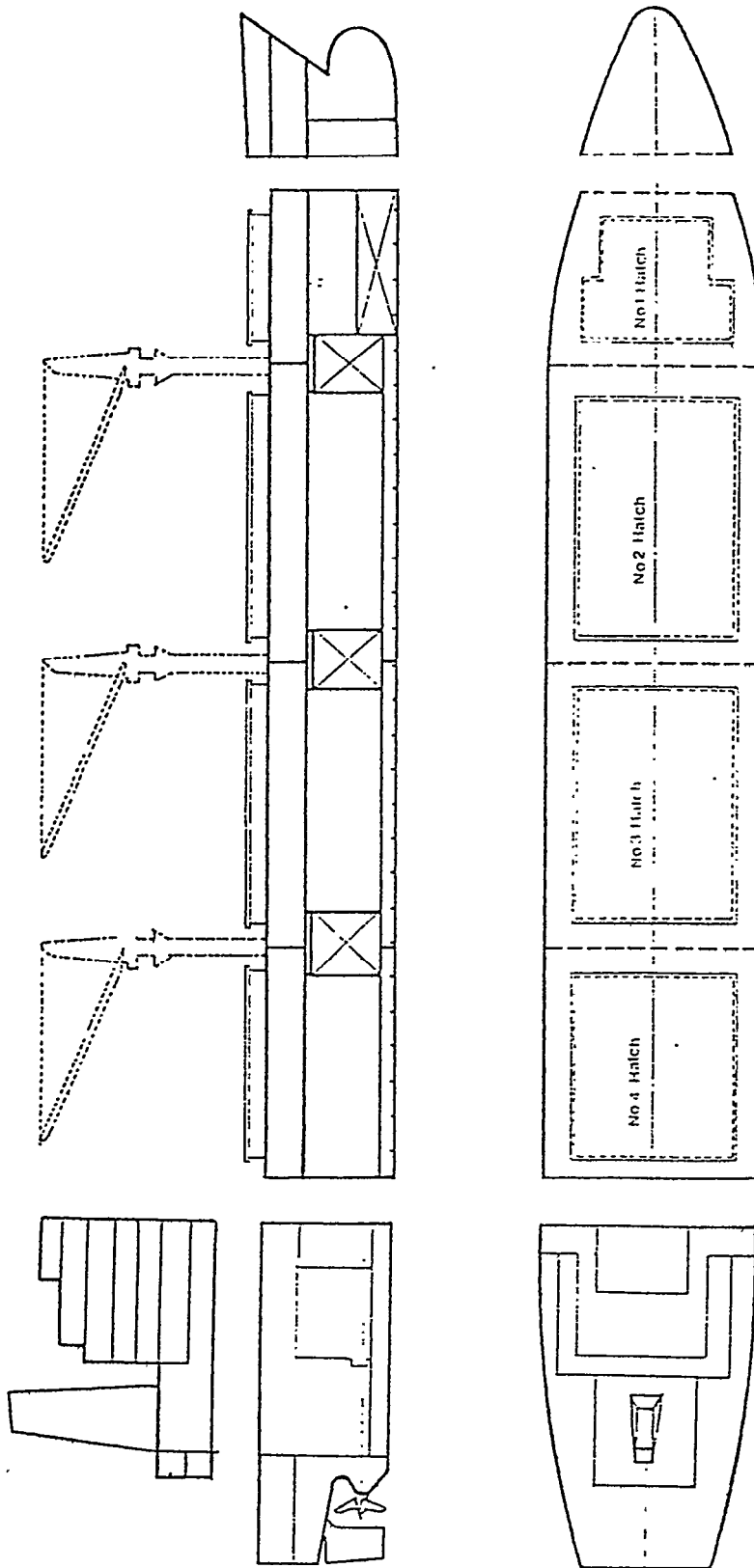


Figure 2



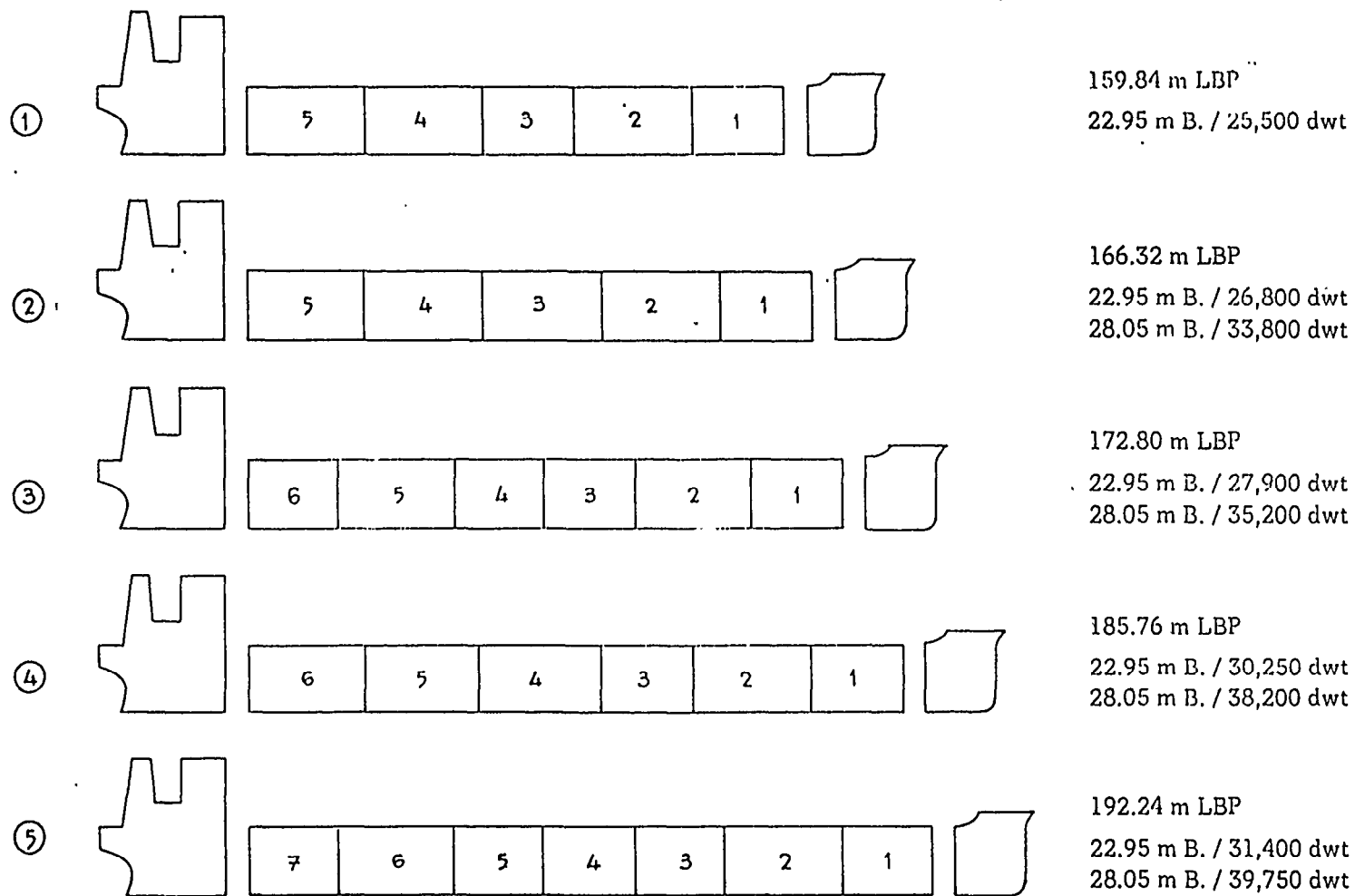
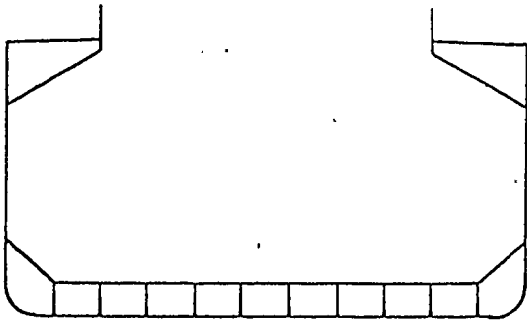


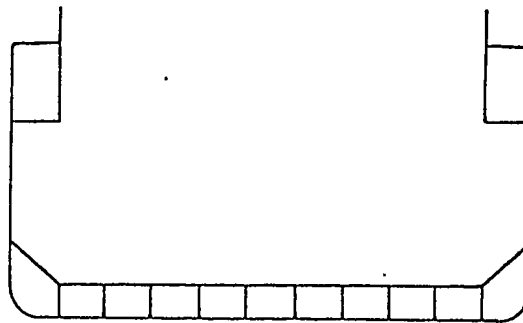
Figure 3

Length-Dead weight Options

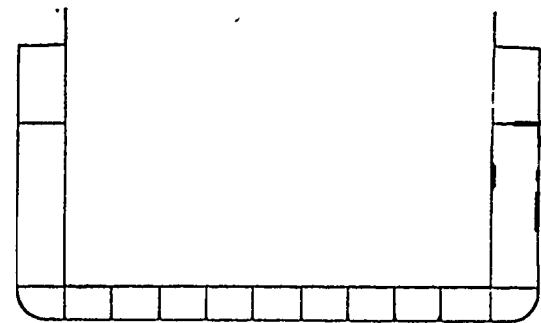
28.05 m B.Mld.



CONVENTIONAL

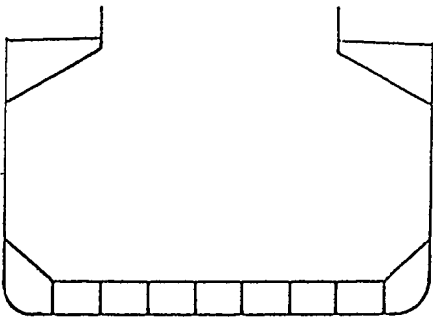


WIDE HATCH

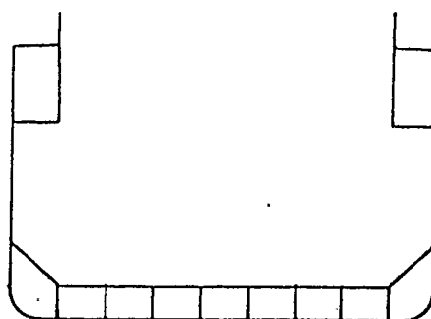


FOREST PRODUCTS

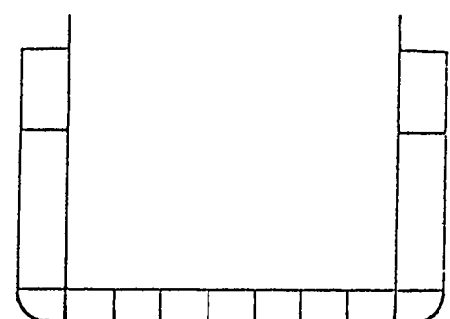
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CONVENTIONAL



WIDE HATCH

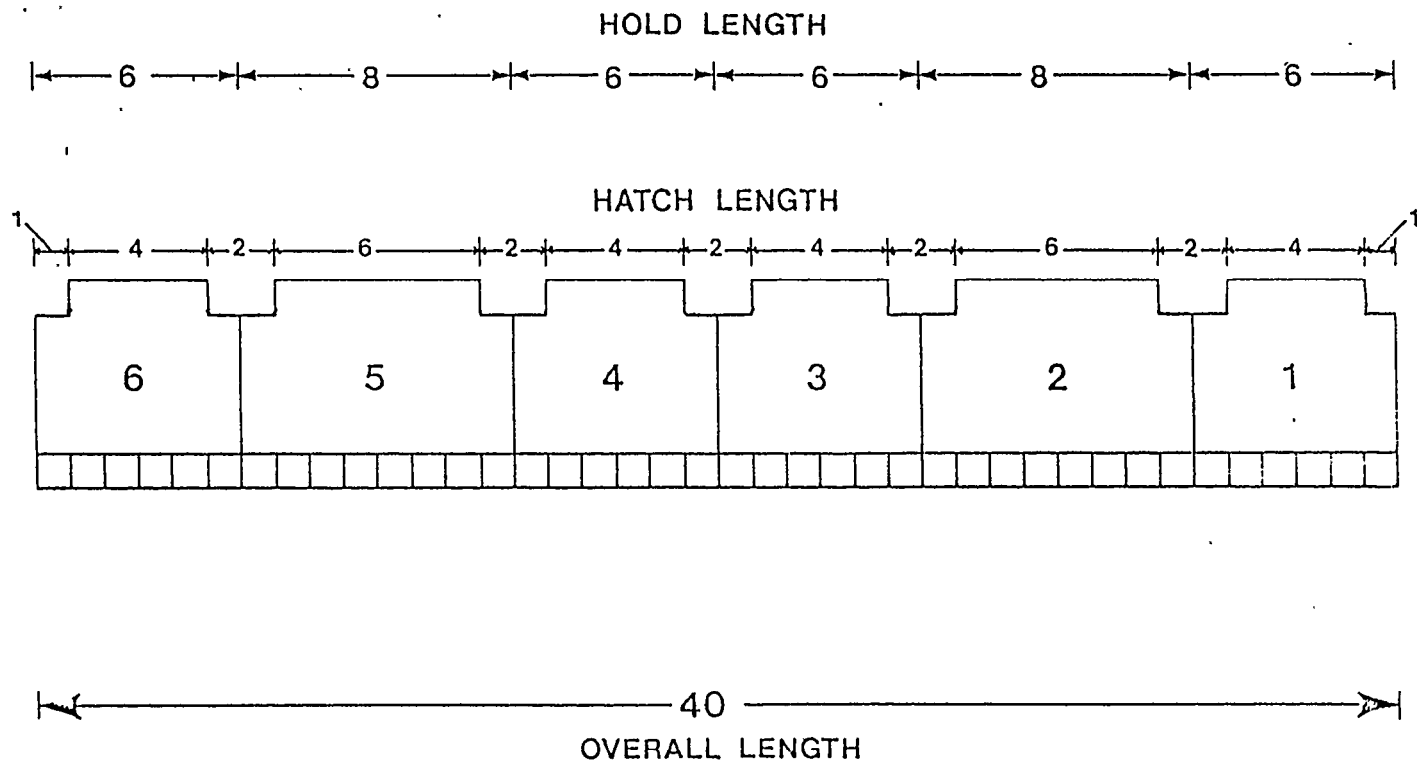


FOREST PRODUCTS

Beam & Type Options

Figure 4

Multiples of longitudinal
modular dimensions in:



172·80m LBP VESSEL - CARGO HOLD SECTION PROFILE

Figure 5

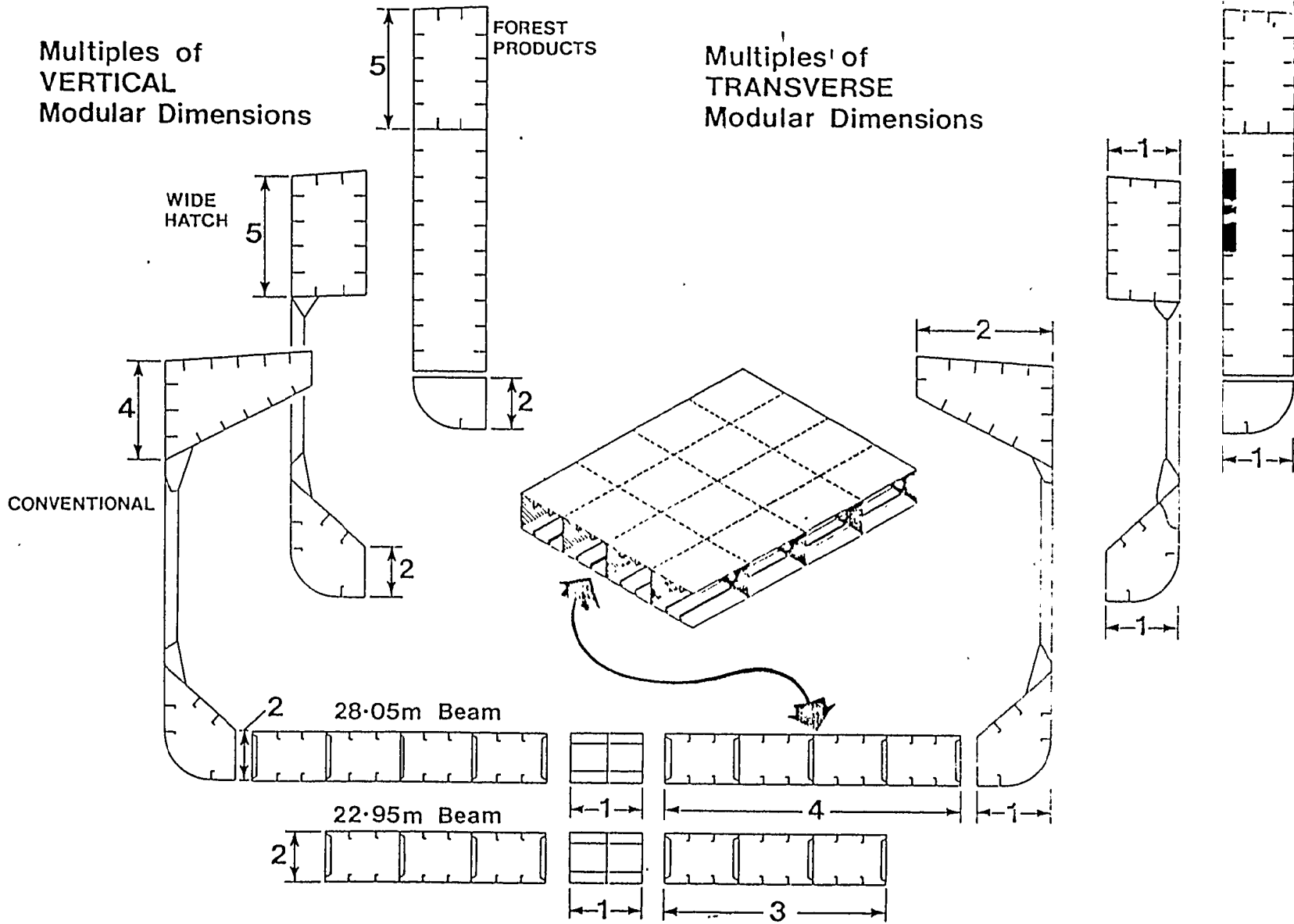


Figure 6

ALTERNATIVE MIDSHIP SECTIONS

Figure 7 .

BLOCK WEIGHTS:-
 E = 4 wt.
 C = 75 T.
 K = 125 T.
 D = 80 T.

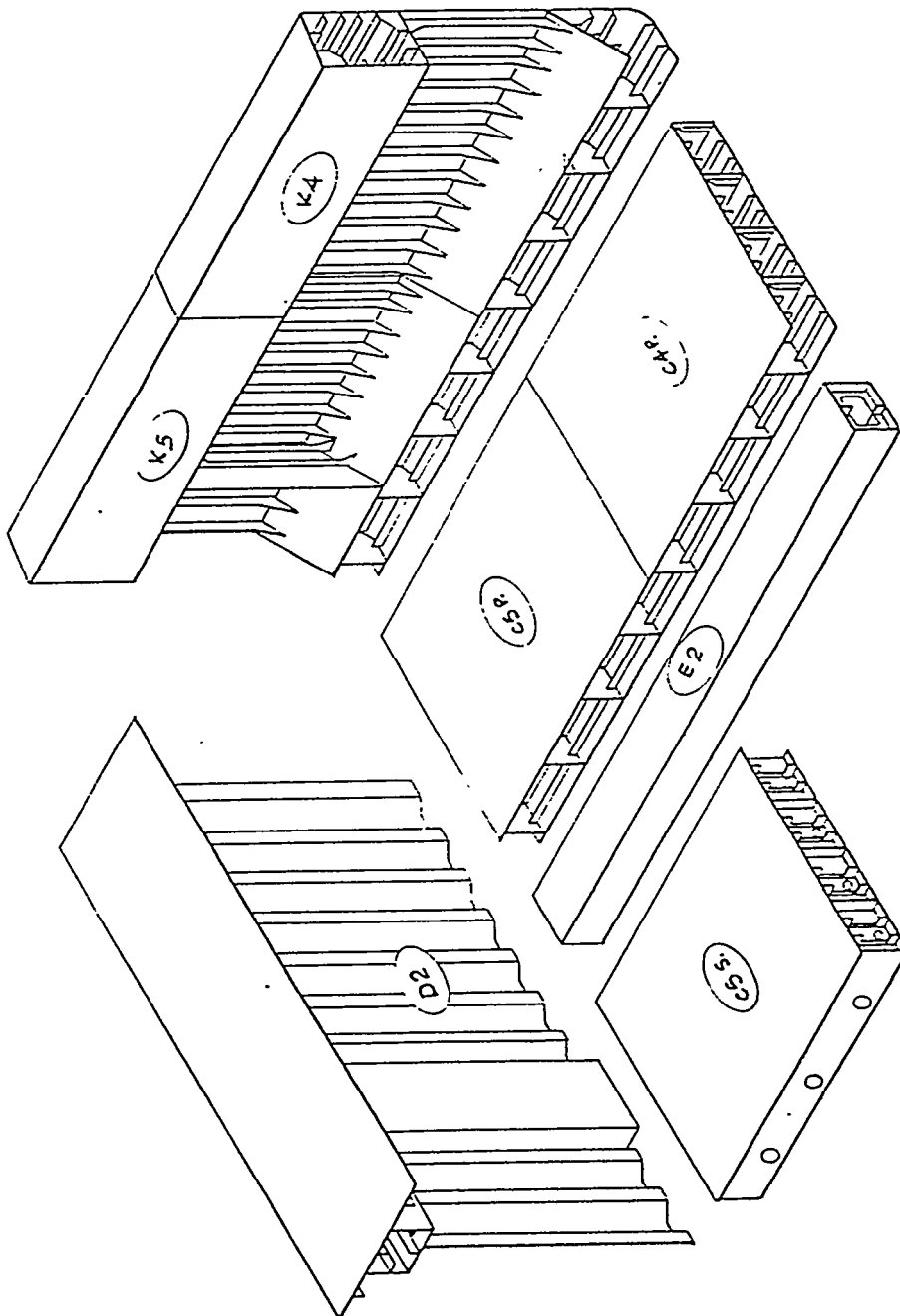
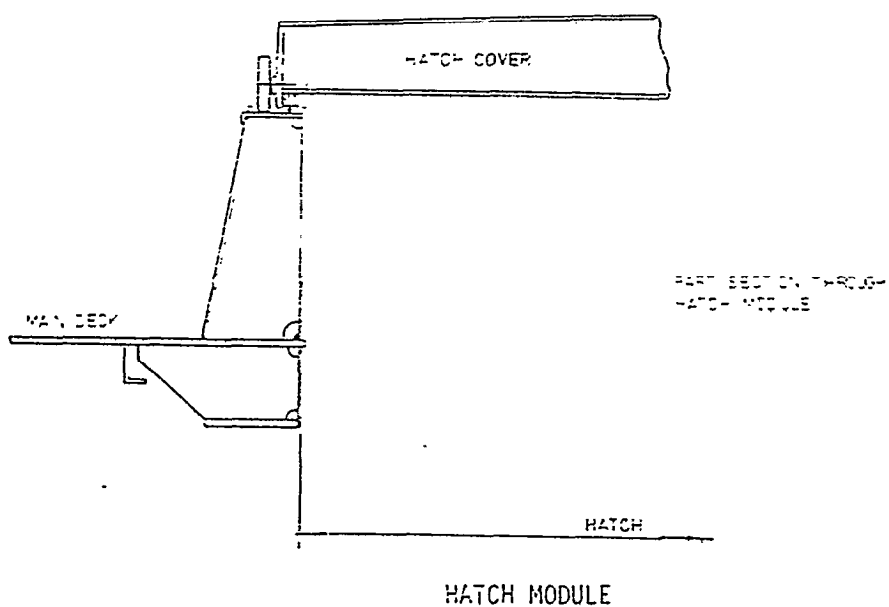
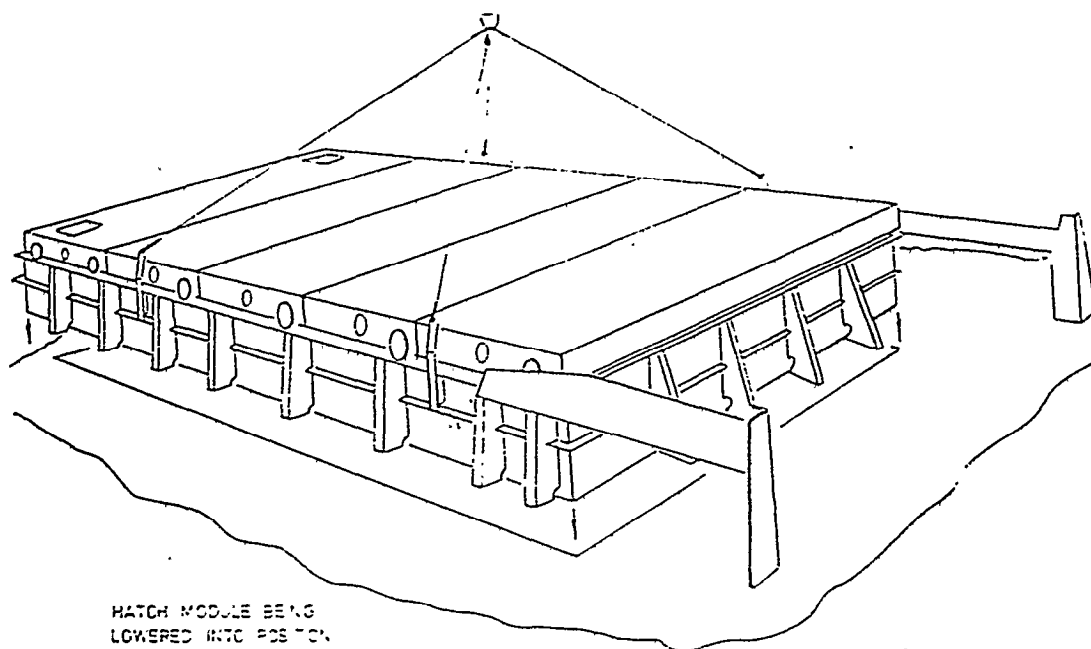


Figure 8



Hatch covers and coamings are assembled and tested 'off site' and delivered to the ship under construction.

Final Welding of the coamings is completed and module welded in position

Figure 9

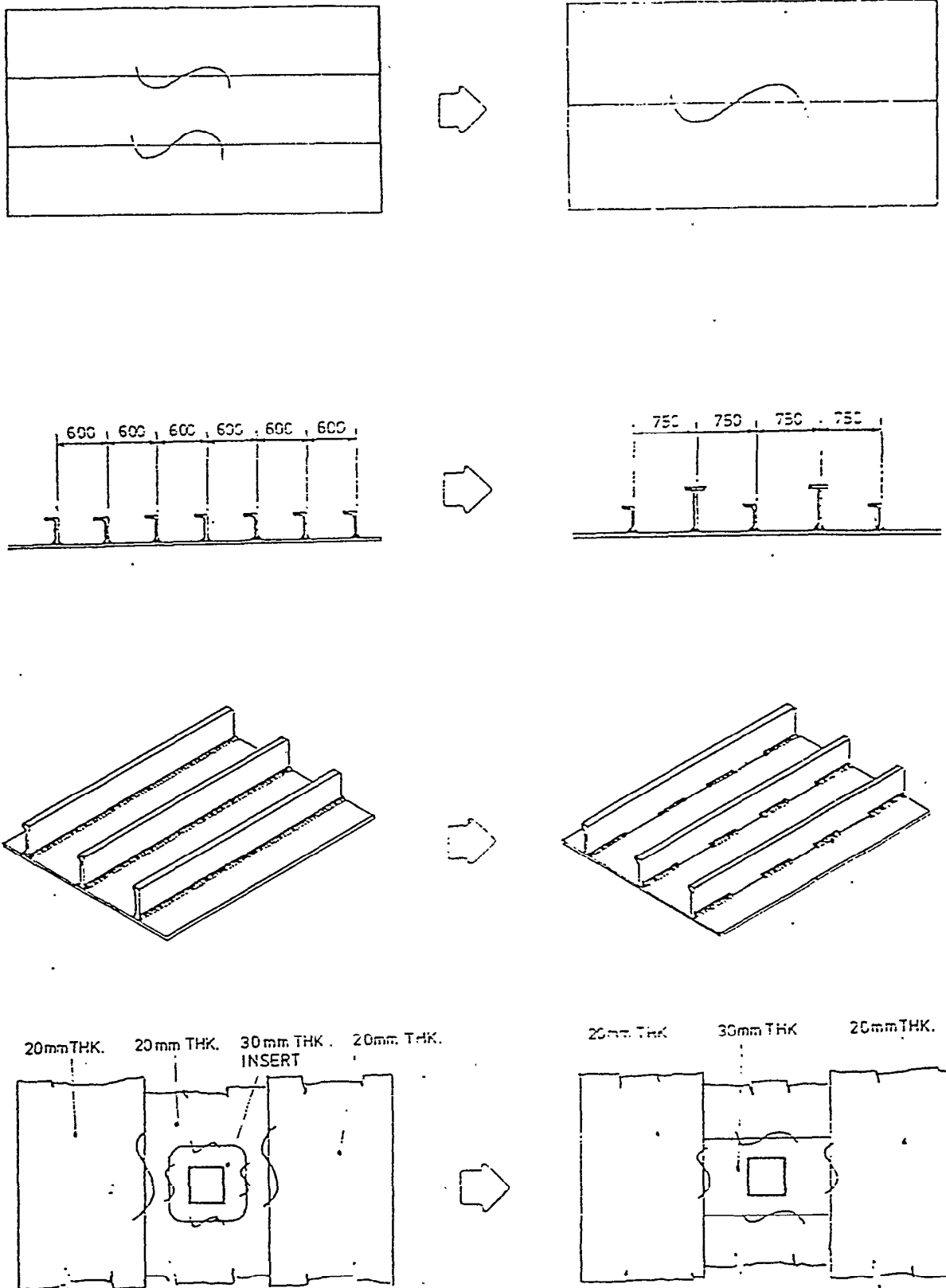


Figure 10

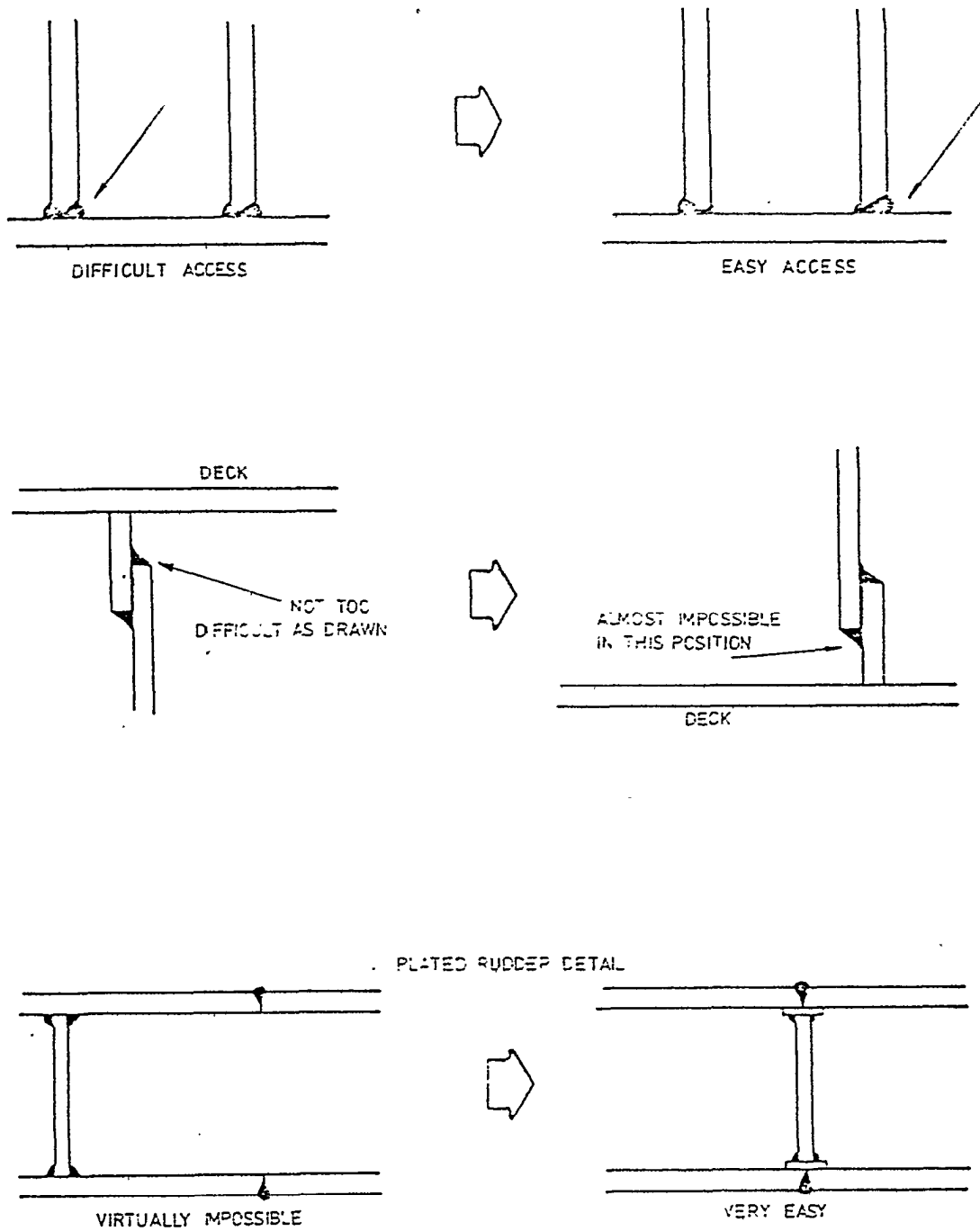


Figure 11

OPERATIONAL CHARACTERISTICS OF
SHIPBUILDING

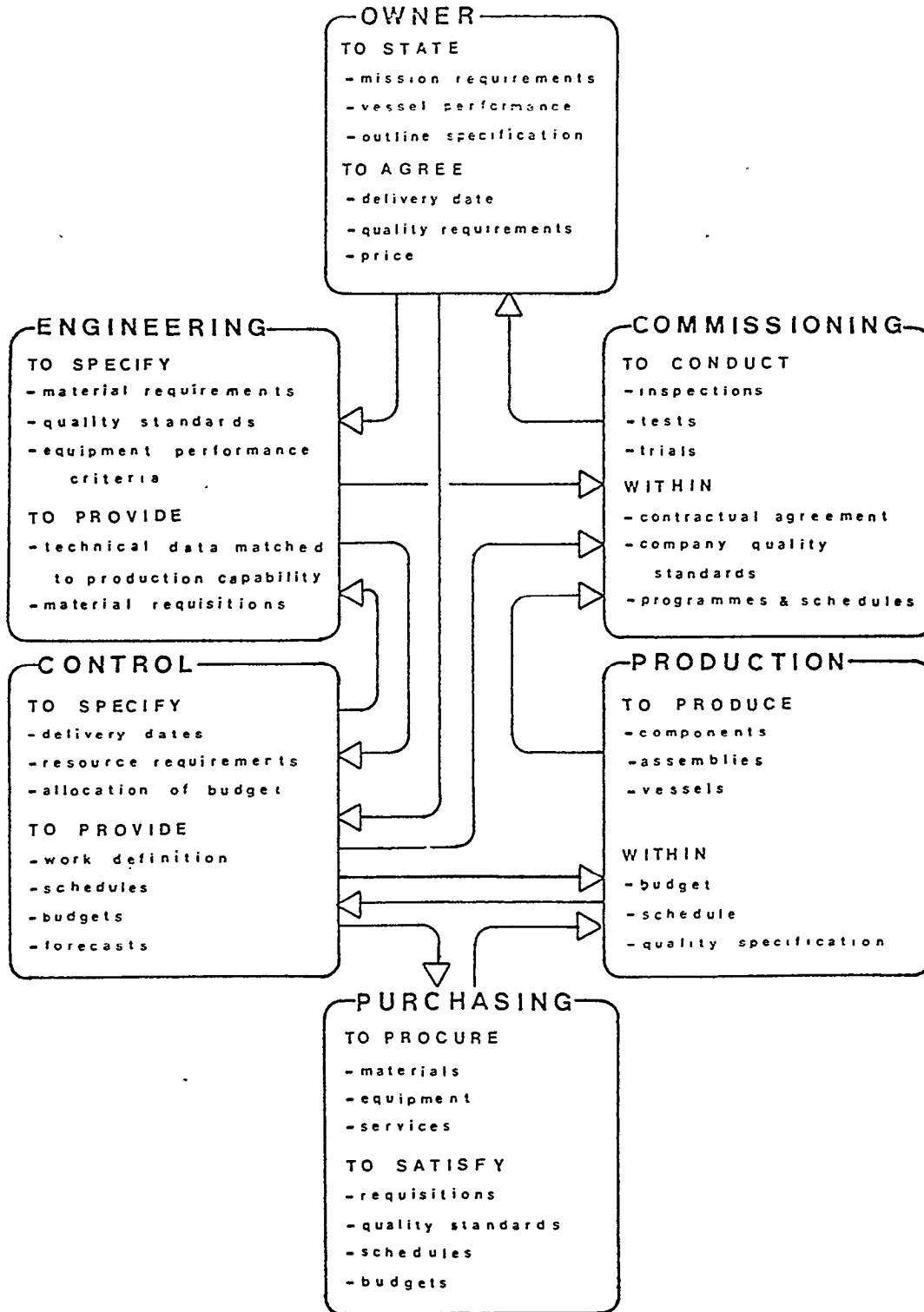
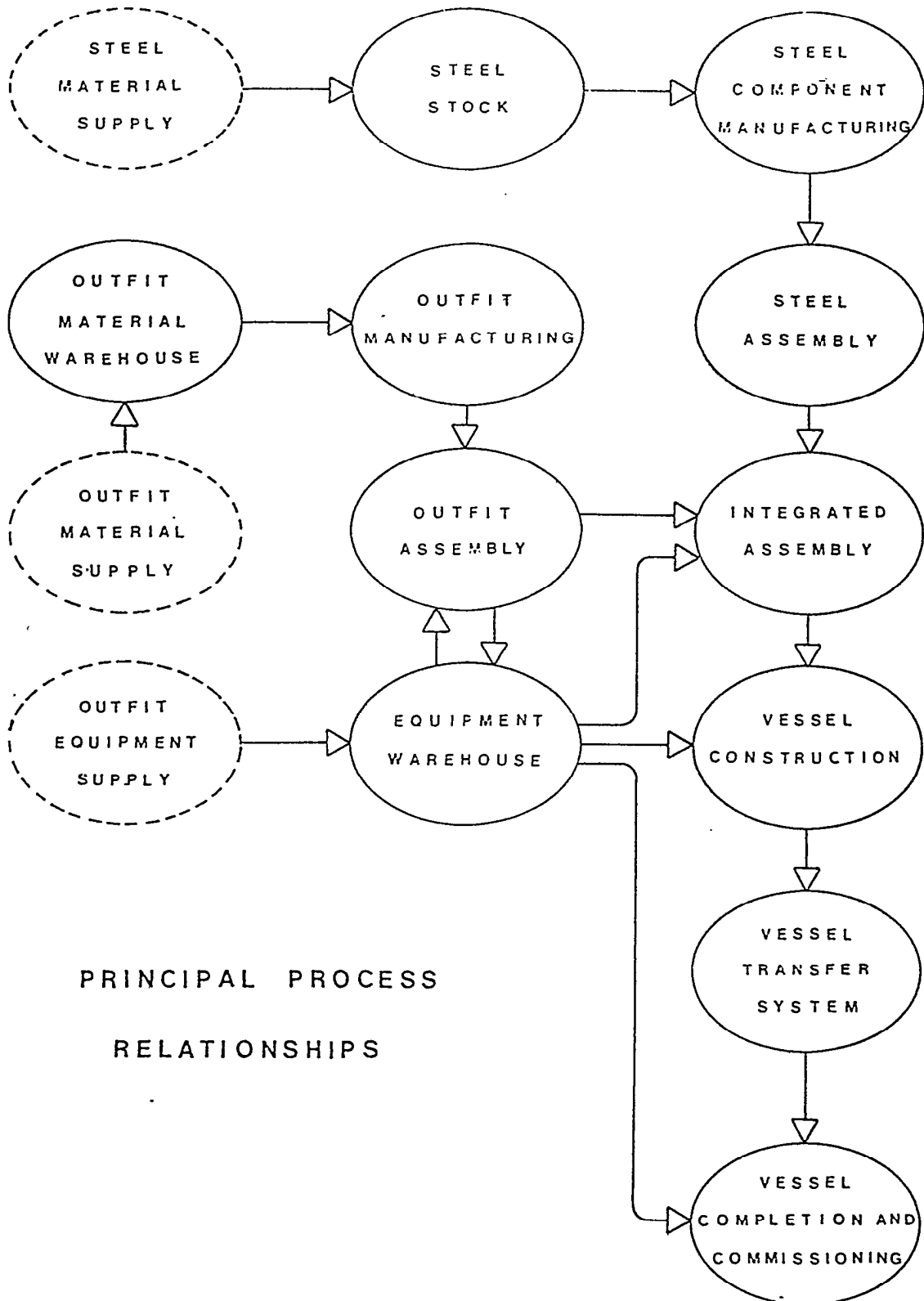


Figure 12



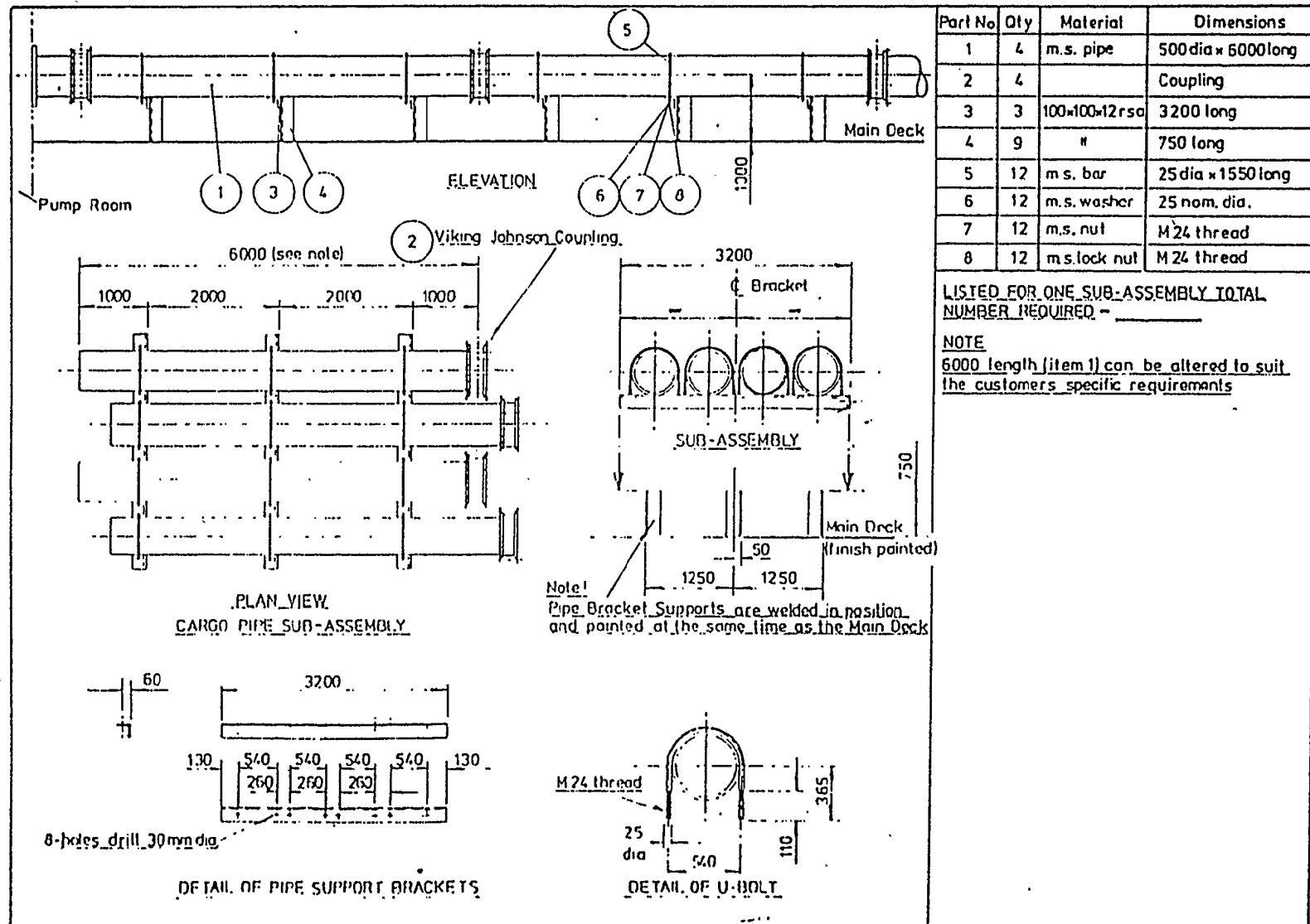


Figure 13

Figure 14

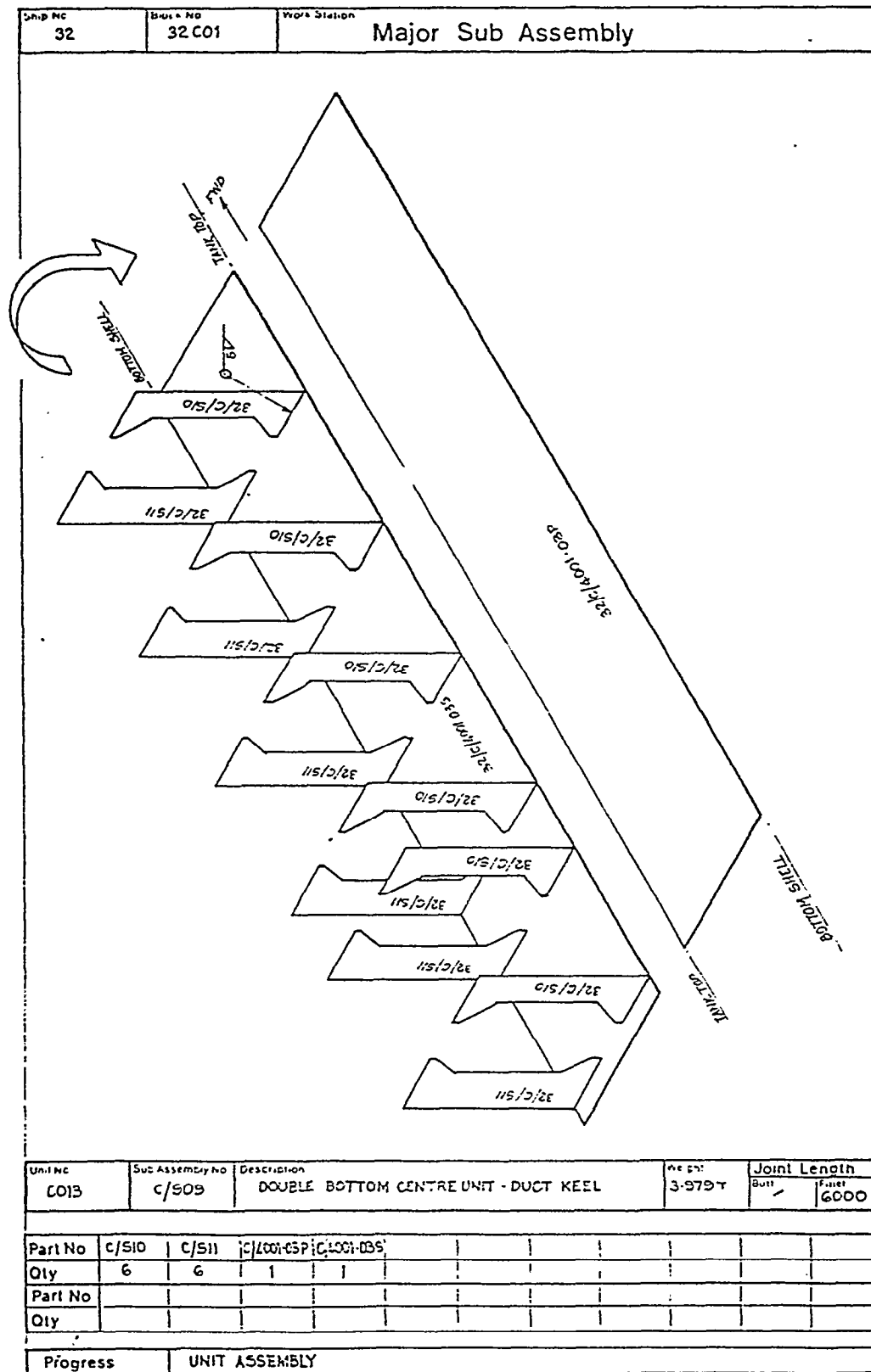


TABLE 1
DESIGN CONSIDERATIONS

- a) Operational requirements study.
- b) Principal dimensions selection.
- c) Body plan.
- d) Form variation.
- e) Hydrostatic calculations.
- f) Main dimensional analysis.
- s) Freeboard.
- h) Subdivision.
- i) Propulsion system.
- j) Capacity calculations.
- k) Preliminary selection of equipment.
- l) Machinery component selection.
- m) Electrical component selection.
- n) Weight and C.G. calculation.
- 0) Trim and stability calculation.
- p) Damaged stability calculation.
- q) Strength calculations.
- r) Speed prediction.
- s) General arrangements.
- t) Machinery systems balance calculations.
- u) General arrangement of engine room.
- v) Pipe systems.
- w) Electrical systems.
- x) Technical specification.

TABLE 2
PRODUCIBILITY CONSIDERATIONS

a) Principal Dimensional Check

- Launch/float out.
- Navigation.
- Crane cover and clearance.
- Ground/dock loading.

b) Vessel Characteristics

- General arrangements.
- New/unknown type.
- Construction philosophy.
- Zone configuration.
- Special technological requirements.
- Structural configuration.
- Hull form.
- Supplier/subcontract content,
- Technical interdependence.
- Modularity and standards.
- Balance of work content.

c) Facility Characteristics

- Berth/dock dimensions.
- Tidal influence.
- Accessibility.
- Levels of technology employed.
- Human skills.
- Working practices.
- Resource balance.
- Manufactured products.

Table 2 cont'd

- Material storage.
- Crane capacities.
- Internal transport.
- Material dimensions.
- Standards.
- Production capacity.

d) Assembly Philosophy

- Steel.
- Outfit.
- Pipework.
- Engineering.
- Electrical.
- Subcontract content.
- Painting.
- Zone outfitting.
- Block breakdown.

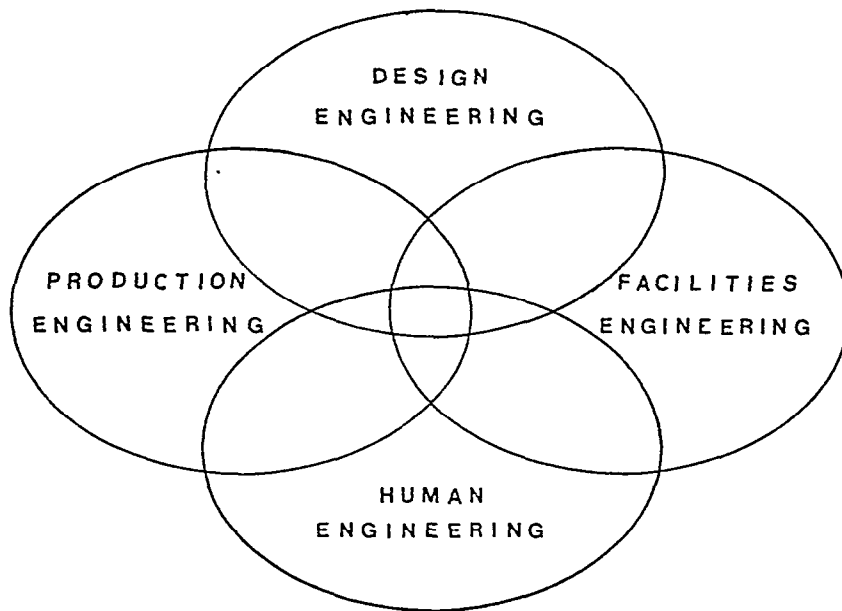
e) Manufacturing Philosophy

- Standards.
- Range of products.
- Modularity.
- Material definition.
- Jigs and tooling.
- Technical information.
- Balance of manufacturing resources.
- Subcontract content.

f) Planning and Control

- Programme and cost.
- Sequence of work.
- Work content analysis.
- Productivity.
- Sensitivity.

Figure 15



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