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FOUR SHIP TYPES FOR THE AUSTRALIAN COASTAL TRADE

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INTRODUCTION.

The slow turn round of ships, and more particularly of ships carrying general cargo, is of concern to all the maritime countries, and much thought has been given to finding a solution to the various problems involved. Many ships of special design have been evolved to carry efficiently and economically most bulk cargoes, and general cargo if this is pre-assembled into unit loads. There are, however, limitations to the employment of certain of these special designs, e.g. bulk carriers are not entirely satisfactory when loaded with ore, ore carriers cannot carry a full deadweight of light cargoes such as coal, coke, etc. and roll-on/roll-off vessels are uneconomic where the distance between terminal ports exceeds about 300 miles.

Australia's interest in providing efficient and cheap sea transport by means of special ship types, is greater than that of most other countries for two main reasons.

(1) the turn round of ships is slower here than elsewhere - a general cargo ship spends approximately 4 days in port for every day spent at sea; and

(2) Australia's main centres of population and industry are on or near the sea, and in addition, are usually many hundred miles apart either by sea or by road.

Australia should - and did in the past - transport most of her raw materials and manufactured goods by sea, but except for bulk cargoes, at present finds it more economical to use the roads, and to a lesser extent, the railways.

It seems evident that, for general coastal trading, even the most efficient orthodox cargo ship is out of date, and that ships, designed for a specific purpose, and carrying cargo loaded and discharged in a predetermined fashion, are the only ones which have any chance of operating successfully. Some progress along these lines has already been made, - the Australian National Line operates 11 Bulk Carriers, and will soon have in service a Vehicular/Passenger Ferry and a Grain Carrier with automatic discharge gear - and all these ships have been designed by the Australian Shipbuilding Board. Four vessels of "Ore Carrier" class are also under construction.

Further special types are necessary to cater for Australia's dry cargo coastal requirements, and it is submitted these requirements can be fully met of means of four basic types of vessel. These are -

(1) Pallet ships of up about 500 tons deadweight of the open shelter deck type. These ships would be used for short runs, for special trades, and could also serve centres on the main coastal rivers away from the coast.

(2) Trailer and/or Container ships of up to 2,000 tons deadweight to enable goods to be delivered quickly over distances up to say 300 miles.

(3) Container ships up to about 4,000 tons deadweight, for service between the main capital cities. These ships would have long wide hatches, the containers being loaded within the hatch opening only, and the cubic capacity lost made up by carrying further containers as deck cargo.

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(4) Bulk Carriers generally similar to those already in service, but modified to carry all bulk cargoes, and to proceed in ballast, under entirely satisfactory conditions of stability, draft and trim. The design would be such that containers could be carried if required.

It should be mentioned that in the designs proposed, the carriage of all general cargo is based on a standard module of 46 " x 46" x 46". The pallet chosen, viz. 4' x 4' x 6', and the container chosen, viz. 16'6" x 8' x 8', are (1 x 1 x 1½) and (4 x 2 x 2) unit sizes respectively, with an allowance for the structure of the pallet or container itself. (1 x 1 x 1½) unit size = 84.5 c.ft. (actual payload); (4 x 2 x 2) unit size = 900 c.ft. (actual payload).

TYPE 1. PALLET SHIP.

The design proposed is very similar to that of pallet ships already operating successfully between the United Kingdom and Scandinavian ports, but the method of loading and discharging is different. The various alternatives have been examined, and it is felt that for Australian conditions, the gantry hoist method is preferable. Plan No. 1 shows the general design and particulars of the ship are given below:-

Dimensions	160'-9" x 30' x 10' (2nd Dk) x 17'-6" (U. Dk)
Type	Open Shelter Deck
Load Draft	9'-10¼" Block Coefficient (about) .71
Load Displacement	(about) 965 tons
Estimated Steel Weight	240 tons, Machinery 110 tons, Wood and Outfit 130 tons Stores 5 tons
Estimated Light Ship Weight	485 tons
Total Deadweight	480 tons including 30 tons of fuel and fresh water
Cargo Deadweight	450 tons, equivalent to $\frac{84.5 \times 282}{40}$ = 596 shipping tons
Diesel Machinery of about	500 B.H.P. for a service speed of 9½ knots.

The block coefficient of .71 is somewhat high, but a lower coefficient would mean an increase in length, which is not desired.

It is estimated that each pallet will have an all-up weight of about 1.6 tons, which, on a deadweight of 450 tons, gives a pallet capacity of 282. The hold and 'tween decks will accommodate 119 and 153 pallets respectively, a total of 272. The remaining deadweight can be made up, if desired, by carrying 10 pallets in an extension of the forecastle. Should the pallet weight be less than assumed - say 1.4 tons - the number carried would increase to about 320. ~~These~~ could be carried in a W.T. house on the shelter deck. The extra pallets

Construction.

The hull will be of double chine construction, with longitudinal framing, and a level freeboard deck. The hold and 'tween deck spaces will each be 100 feet in length, and transverses supported by centre line pillars will be spaced 12'-6" apart. This spacing of transverses will suit the size of pallet. Two cargo hatches 11' x 12'6" will be fitted in the upper deck as shown, while one flush hatch of similar size will be fitted in the freeboard deck.

Loading and Discharging.

These operations will be carried out by means of 4 - 3 ton travelling hoists supported by a gantry structure as shown. Two hoists will serve the 'tween decks, and two the lower hold. Six fork lift trucks, two in the hold, and four in the 'tween decks, will move the pallets into or out

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of their stowed position while four fork lift trucks will operate on the wharf. It is estimated that each hoist will move a minimum of 15 pallets per hour, so that a total loading (or discharging) rate of 60 pallets per hour should be attained, occupying just under 5 hours. If a correct sequence is observed and two hoists concentrate firstly, say on the forward end of the hold, while the remaining hoists concentrate similarly on the after end of the 'tween decks, it will be possible to discharge and load approx. half of the cargo simultaneously, and thus the turn round time should not exceed 8 hours.

When all but the last "bay" in each compartment has been loaded, all except one fork lift truck will have to be taken ashore, leaving this truck to load the last bay. Finally the last truck will be removed when six pallets remain to be loaded in the square of the hatch, and these will merely be lowered into position. The procedure will be reversed for discharging.

Each fork lift truck will weigh about 5 tons and two hoists in tandem will be used to move these.

The height of the gantry has been based on a permissible rise and fall of tide of 11 feet, at a wharf with a deck 2 feet above high tide.

It is considered that a gang of 22 men will discharge the cargo, and load a further 450 deadweight tons, or 596 shipping tons, in not more than 8 hours.

The ideal trade for the ship would be between ports just over 300 miles apart. The ship would make 1½ round voyages a week, and cargo would be worked during normal hours.

A somewhat larger Pallet ship might well be chosen for the Sydney-Hobart trade, and one with dimensions 210'-9" x 34' x 11'-3" x 19'-6", service speed of 12 knots, is suggested. Such a ship would carry 1 tier of pallets each in the hold and 'tween decks of (1 x 1 x 1.2/3) module size with a pay load capacity of 94 c.feet. The ship would carry about 500 pallets of 1,170 measurement tons, and could turn round in 8/9 hours.

TYPE 2. TRAILER AND/OR CONTAINER SHIP.

This ship, for which an order has recently been placed, is intended for service between Melbourne and Northern Tasmanian ports and the operating schedule calls for two return trips each week, one between Melbourne and Bell Bay on the Tamar, the other Melbourne, Devonport, Burnie, Melbourne.

A maximum speed of 15 knots is required to enable the ship to work cargo during normal hours, and this speed has a bearing on the length of the ship, particularly one which operates across the Bass Strait. The other dimensions are based on the quantity and type of cargo to be carried, and on the method of loading the cargo. After thorough and detailed investigation it was decided that a vessel which would carry loaded trailers and/or containers was necessary, and one which at the same time could deal with a fairly large tonnage of timber. Trade cars, i.e. new cars ex factory, will also be available in considerable numbers.

Particulars of the vessel are given below:-

Length B.P.	293'-9"	W.L.	306'-0"	
Breadths W.L.	55'-6"	Upper Deck	57'-0"	
Depths Lower Deck	15'-6"	Upper Deck	31'-3"	Boat Deck 46'-6"
Height of Tank Top	3'-6"			
Block Coefficient	.53			
Load Draft	14'-9"			
Load Displacement Estimated	3810 tons			

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Estimated Weights	Steel 1500, Machinery 175, Wood and Outfit 320, Stores 15 tons.
Total Deadweight	1810 tons
Areas available for Cargo	(Clear)
Hold 3,200 sq. ft.	Lower Deck 10,000 sq.ft. Upper Deck 11,300 sq.ft.

From Plan No. 2 it will be seen that the vessel will have two decks, one completely enclosed with access through a door in the stern, the other partly covered by the accommodation houses. Machinery is fitted aft leaving a long hold space with access through a wide hatch in the lower deck. The ship will be driven by twin screws, will have twin rudders, Denny-Brown stabilisers, and a Voith Schneider propeller at the fore end to assist in manoeuvring in confined waters. The 'tween decks and hold will be loaded and discharged over a ramp in way of the stern door, while the top deck is intended to be loaded and discharged by a stiff legged crane on the wharf.

The design has been based on a container size of 16'-6" x 8' x 8', trailers 8' wide and 12'-6" maximum height, and on timber packs in about 10 ton units.

Hold.

Trade cars or containers will be carried in the hold and the latter will be taken from the wharf on bogies about 21" in height, in "trains" of 2 or 3 containers pulled by a small prime mover. A hoist in way of the hatch will lift the containers from the bogies and lower them on to the tank top in their final athwartship position. Rollers, either loose or permanently attached to the four bottom corners of each container will allow the container to be moved to its stowed position. The empty "train" will go ashore for reloading and will finally be left behind. Refrigerated containers can be accommodated if required.

Vehicle Tween Decks.

The widths of the Upper Deck and of the Lower Deck amidships, has been arranged to allow six lanes of vehicles 8 feet wide and 12'-6" high to be accommodated, with a passageway on the centreline and 6" between each lane. It is proposed to carry a considerable tonnage of timber from Tasmania and this timber will be stowed in the 'tween decks. Timber in approximately 10 ton units will be taken on board through the stern door by means of straddle trucks and will then be positioned by fork lift trucks. The lower deck has, therefore, been designed to take an axle load of 34 tons. Timber will be loaded 2 tiers high. Trailers, containers or trade cars will make up the balance of the 'tween deck cargo.

Upper Deck.

Cargo on trailers, flats, or bogies, and in containers will be carried on the upper deck and these will be lifted on board into their athwartship position by the fixed wharf crane, to be moved forward into their stowed position on bogies or on rollers.

During discharge the procedures enumerated will be reversed.

General.

It will be noted that the after part of both decks has sheer and this is provided to reduce the length of ramp and at the same time maintain a ramp slope of 1 in 10 in association with a rise and fall of tide of about 11 feet.

Accommodation may be provided for 12 lorry drivers.

The desirability of providing twin rudders has meant that the maximum width of stern door possible is about 14 feet, but this is considered adequate.

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With the varied cargo to be carried, it will probably be necessary to carry water ballast on many voyages, in order to obtain satisfactory stability, draft and trim. Special tanks to cater for all likely conditions of loading will be incorporated in the structure. The ship, as designed, will float on an even keel when loaded homogeneously.

Machinery.

The machinery chosen will, no doubt, be the subject of much comment, but it should be pointed out that a decision was made only after thorough investigation and evaluation of the merits of the various types submitted. The main machinery will be twin Napier Deltic engines each developing 2000 B.H.P., driving variable pitch propellers through Allen Epi-cyclic reduction gearing. Three independent 150 KW diesel generators will be provided. For maintenance the complete Deltic engine will be removed ashore, and if necessary, replaced by a spare engine held in Melbourne for this purpose.

TYPE 3. CONTAINER SHIP.

This type is primarily intended for carrying cargo in containers, these containers to be stowed, loaded, and discharged, by the method so successfully adopted by the Pan-Atlantic S.S. Co. in their Sea-Land Shipping Service. During a recent visit to New York, the author watched s.s. "Gateway City" being discharged and loaded, and in this particular operation some 5,000 tons of cargo, in 224 containers 35 feet in length, were discharged, and a similar number loaded, in 15½ hours. This means that cargo was dealt with at a rate of nearly 700 tons per hour. It is considered the size of ship chosen will be suitable for Australian conditions, and it is purely coincidental that the two ships accommodate the same number of containers.

The general design is shown on Plan No. 3, and particulars of the vessel are given below:-

Dimensions		320' x 51' x 22.5"
Block Coefficient (about)		.72
Designed Displacement		5,700 tons Load Draft 17'-0" Maxm. Draft 19'-0"
Hatches	No. 1	84' x 33'
	No. 2	101' x 33'
Estimated Steel Weight		1,190 tons, Machinery 515 tons, Wood and Outfit (inc. 2 Gantries) 475 tons, Stores, etc. 15 tons.
Light Ship Weight		2,195 tons
Total Deadweight		3,505 tons
Allowance for O.F. and F.W.		145 tons
Cargo Deadweight		3,360 tons
Containers		16'-6" x 8' x 8' of 1,050 c.ft. with 900 c.ft. of actual cargo

It has been assumed that the "all up" weight of a container will not exceed 15 tons.

The 132 containers carried in the two holds will be loaded within the square of the hatch only, and will be stowed 3 tiers high. Vertical guide bars, of angle section at the corners, and of T bar section elsewhere, will prevent undue movement of containers when the ship is at sea, and with a clearance all round of not more than 6", no securing of containers below deck is necessary.

Steel hatch covers of the MacGregor type will be fitted, and for loading and discharging the holds, it will only be necessary to remove about 18 feet of cover. Other sections can be moved fore and aft as necessary.

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A total of 92 containers can be accommodated on and at the sides of the hatches, as shown on the plan. These containers - and obviously all containers used in connection with the ship - will have tubular holes located at the four bottom corners, and these holes will take pins suitably located on the hatch covers and on the structure supporting the outboard containers. These fittings will position the containers and each container will then be lashed in position by cross bracing wires set up with Warwick screws.

One, or possibly two, travelling gantry cranes, will be required to lift the containers from the wharf into their stowed position, and it is suggested the gantry cranes run on tracks on deck just inside the sheerstrake as shown in the detail given on Plan 3.

As on "Gateway City", all operations in connection with the movement of containers will be mechanical, and only a small number of waterside workers will be required for setting up the lashings.

Regarding permissible range of tide, and assuming the wharf deck to be 2 feet above high water, the ship as designed can work cargo at any state of tide, where the rise and fall does not exceed 16'-6". Where this range is exceeded, the top deck tier of containers could not be moved at low tide.

TYPE 4. BULK/ORE CARRIER.

(Suitable for carrying Containers if desired).

Bulk carriers can be divided into two categories:-

(a) those with cubic capacity to lift a max deadweight of cargoes such as coal, coke, limestone, sugar, etc., but with excessive ore and ballast stability, and poor ballast draft, and,

(b) ore carriers which are entirely satisfactory for ore cargoes and in ballast, but have poor cubic capacity for lighter bulk cargoes.

In several designs recently developed, it is claimed that most bulk cargoes, including ore, can be carried satisfactorily and that the ballast condition is also satisfactory. All these designs, however, have definite faults usually associated with discharging.

The design now proposed introduces a new patented type of hopper which, either alone, or with separate water ballast hoppers, results in a ship which will carry a max deadweight of all bulk cargoes under almost ideal conditions of stability, draft, and trim; and at the same time provide an entirely satisfactory ballast condition. Further, side and end shedders in the holds have been arranged so that there is very little "drag" outside the hatches.

Essentially the patent hopper, (see isometric sketch) which extends the full width of the ship under the deck, and between the hatch sides above the deck, has vertical sides, the lower part of which tapers downwards to a line. Fore and aft shedders are fitted in the lower, tapering part of the hopper, and the bulk caroges carried in the hopper are guided to sliding W.T. doors fitted in one of the sloping hopper sides, to fall by gravity into the hold below. Cargoes will be loaded through hatches in the top of the hopper, and because these hatches are used for loading only, they need only be small.

A ship with four holds provides a good arrangement, for the steel hatch covers can be stowed at the ends of the hold space, and between Nos. 1 and 3 hatches, allowing two patent hoppers to be fitted between Nos. 1 and 2 and between Nos. 3 and 4 hatches. A six hold ship is equally suitable.

Although water ballast can also be carried in the cargo hoppers to give a good ballast condition, the hopper being filled from the ballast main and discharged through dump valves on the shell, there may be objections to

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this procedure. In the design proposed, therefore, separate water ballast hoppers are fitted under the deck between Nos. 2 and 3 hatches, and at the sides of the cargo hoppers.

This arrangement has many advantages, for cargo and water are not carried in the same compartment, the cargo hopper bulkheads are smooth and have no pockets and there are no ledges to trap cargo. This means that the hoppers will be completely emptied when the doors are opened, and thus maintenance will be reduced to a minimum. Doors need not be of W.T. construction.

Little untrimmed cubic capacity is lost by the introduction of the ballast hopper between Nos. 2 and 3 hatches, and this loss is to a large extent made up by additional cubic in that part of the cargo hopper above the deck.

The bulk of the water in the ballast hoppers will be discharged through dump valves on the shell, and the remainder by the ballast pumps.

To illustrate the design, that of a series of existing orthodox bulk carriers has been modified, and a comparison made between the existing and modified types. These ships are mainly employed in the ore trade, but frequently carry coal or coke as back-loading.

Particulars of the ship are given below, and the modified version is shown on Plan No. 4.

Dimensions	440' x 57' x 34'
Block Coefficient	.765
Load Draft	25'-6¾"
Load Displacement	14,000 tons

Five Holds with Deep Tank between Nos. 2 and 3 holds.

A comparison between the orthodox and modified versions of the same ship is given in Table 1, and a study of this Table will show clearly that the modified design has the "edge" on its orthodox counterpart, and with an ore cargo the G.M. is actually halved. The increased weight of the structure reduces the deadweight by 33 tons, and this is the only disadvantage.

Turning now to the other alternative - the same ship built to "Ore Carrier" scantlings - the position is as follows. Tanker draft for this size of vessel would be about 26'-8½" compared with 25'-6¾", an increase of 13¾ inches. On a T.P.I. of about 51, this gives an increase in displacement of some 700 tons, but the increase in steel weight is about 225 tons, so the nett gain is only 475 tons. It seems doubtful if the building of "Ore Carriers" is worthwhile, for the relatively minor increase in deadweight is only possible at the expense of flexibility of operation.

As far as trim is concerned the position is:-

(a) with ore cargoes there is no problem in either type
(b) with coal cargoes the "Lake" type tends to trim slightly by the head, but as there is a margin in the deadweight, some ballast in the aft peak will correct this. The modified version does not require ballast.
(c) in full ballast condition, i.e. with fresh water and oil fuel tonnages much in excess of that normally carried, the "Lake" type has aft and forward drafts of 18'-6" & 13'-0" respectively, so that with normal fuel and water requirements, some ballast forward has to be sacrificed to obtain immersion of the propeller. This is not necessary in the proposed design.

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Although it is considered the ship under review is too big to be used for carrying containers, the hatch dimensions have been chosen with this end in view, and it may be of interest to know that the ship, as designed, could accommodate 180 containers in the holds, 116 containers on deck, a total of 296. An increase to 59 feet of the width of the deck, would allow 314 containers to be carried with a pay load of $\frac{314 \times 900}{40}$

= 7,065 measurement tons

COSTS.

It is felt that to put forward designs alone is not enough and that some assessment of operating costs should be attempted. It is realised that this is dangerous ground to tread, and it may be a case of "fools stepping in". The costs given are estimates only, but, it is hoped they are reasonably correct.

Assumption.

Road transport charge Sydney-Melbourne is £7.10.0 per ton with certain volume and weight limitations. It is assumed this is equivalent to sea pay load calculated at 80 c.ft. per ton.

Road delivery charges:- For 9 tons, 21/6 per hour plus 2/4¾d. per mile. On a basis of 2 hours and 7 miles, the cost per ton is just under 10/-.

Wharf charges assumed 10/- per ton.

It is considered the Pallet ship will require 1,000 pallets at about £20 each, and the Container ship 800 containers at about £1,000 each. Charges on the basis of depreciation over 16 years, capital charges and maintenance at 15%, have been included in each case.

F ork lift truck hiring charges at current rates have been included.

A reasonable operating profit has been added.

Pallet ship.

1½ return voyages per week, cargo carried 900 tons, cost per ton £4.18.0.

2 return voyages per week, cargo carried 1,200 tons, cost per ton £4.10.0.

On special trades where cargo is loaded at the factory and delivered to a central warehouse, above costs could be reduced by up to £1.0.0 per ton in each case.

This ship could be suitable for a weekly return service between Sydney and Hobart. The cost per ton of 40 c.ft. on this trade - no road competition - would be £4. 3. 0, including full wharf and delivery charges, and the latter might be reduced. For the larger pallet ship mentioned, the cost per ton would be under £4. 0. 0. Compared with the existing freight rate of £7.4.6. per ton, wharf to wharf, the pallet ship rate is under £3. 0. 0.

Container Ship.

Weekly return voyage Sydney-Melbourne.
Cargo carried $224 \times \frac{900}{80} \times 2 = 5,050$ tons.

Cost per ton £4.15. 0.

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Trailer and/or Container Ship.

As an order for this ship has been placed, no estimate of costs is given. It has, however, been publicly stated that a substantial reduction in the present rates will be possible.

In the estimate of costs in respect of the Pallet and Container Ships, it should be pointed out that any increase in the number of ships operating the service will substantially reduce the number, and therefore the cost, of pallets or containers needed.

It is suggested the four ship types discussed may well form the basis of an efficient and profitable coastal fleet, which will, at the same time, enable transport costs to be reduced.

In conclusion I wish to express my thanks to Messrs. J. G. Clark and A. Macaulay of the Australian Shipbuilding Board, for their assistance in the preparation of this paper.

The designs proposed and the views expressed in this paper are those of the author and do not necessarily represent the ideas of the Australian Shipbuilding Board.

1. Hopper
2. Shedder in hopper
3. Sliding W.T. doors
4. Door control motor
5. Door control motor shafting
6. Hatch to hopper
7. Main hold tank top
8. Side shedder
9. End shedder
10. Side shell
11. Upper deck
12. Topside ballast tank
13. Main hatch coaming
14. Stiffening on hopper sides

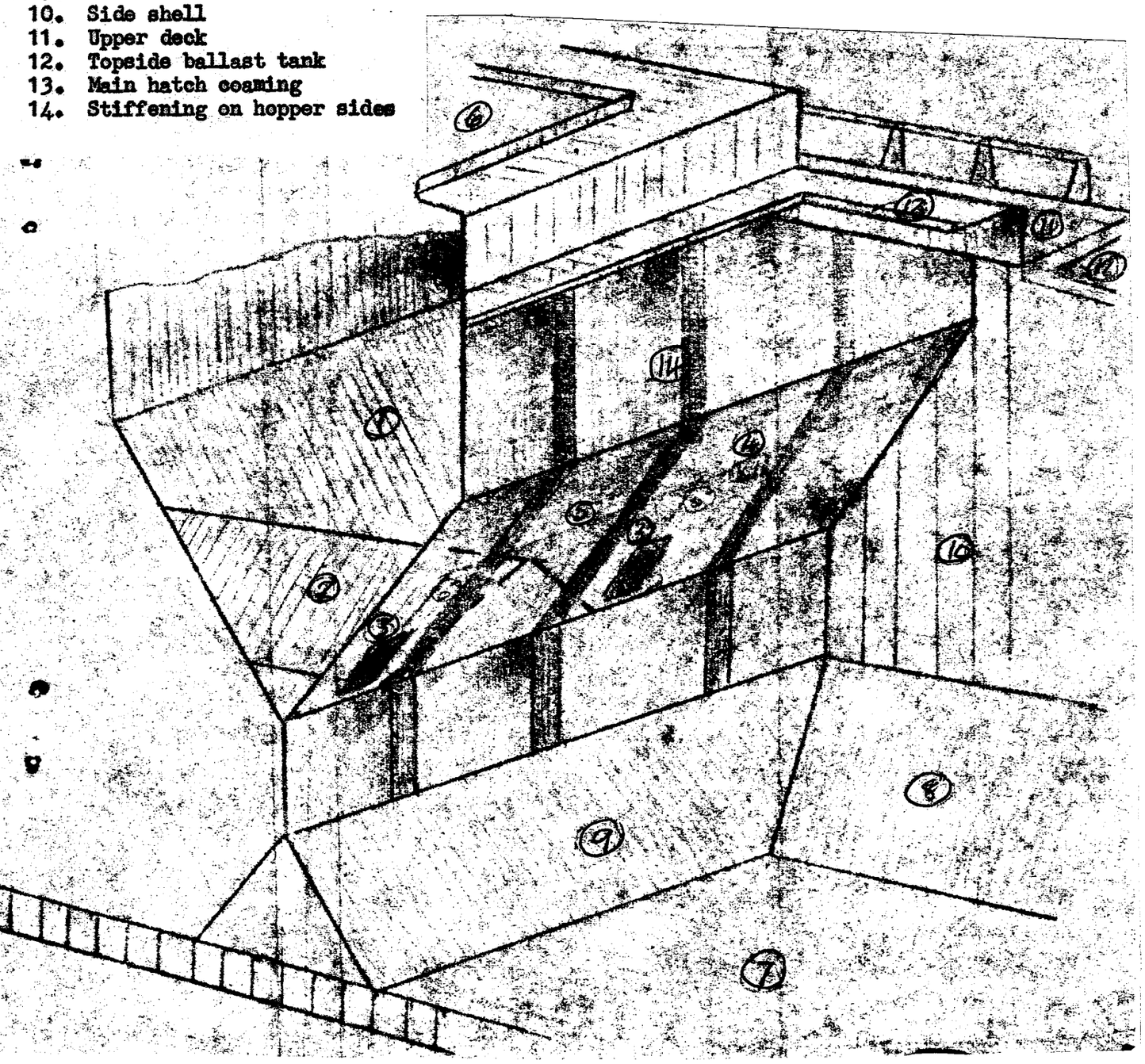
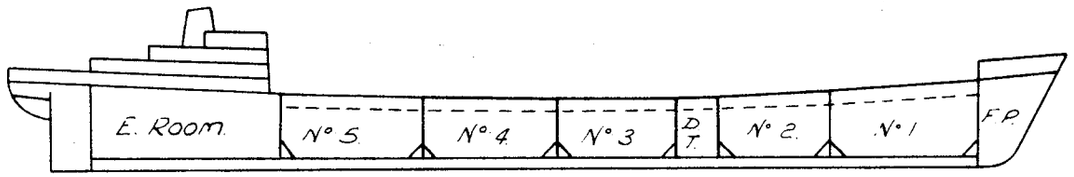
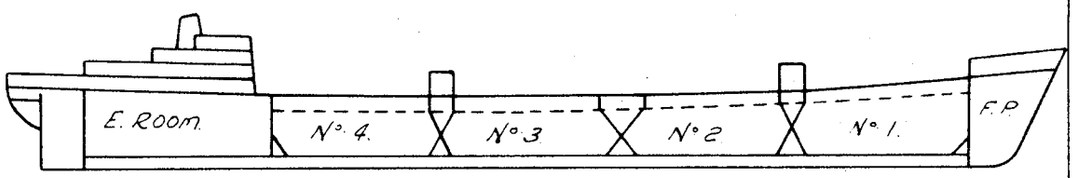


TABLE No. I.



"LAKE BOGA" TYPE.



NEW DESIGN.

	"LAKE BOGA"	NEW DESIGN.	GAIN OR LOSS.
FULL LOAD DISPLACEMENT TONS.	14000	14000	
× "EMPTY" SHIP INCLUDING 164 T F.W. 195 T O.F. TONS	4047	4080	
CARGO DEADWEIGHT TONS	9953	9920	LOSS
CAPACITY OF HOLDS C.FT.	436000	455400 INC. HOPPERS.	GAIN
STOWAGE FACTOR C.FT./TON	43.8	45.9	GAIN
FULL COAL CARGO 48 C.FT./TON (INCLUDING F.W. & O.F. AS ×)			
COAL CARRIED TONS	9070.	9470	GAIN
MEAN DRAFT FEET	24'-0½"	24'-9"	GAIN
G.M. FEET	2.67.	2.3	GAIN
FULL ORE CARGO 14 C.FT./TON (INCLUDING F.W. & O.F. AS ×)			
ORE CARRIED TONS.	9953.	9920.	LOSS.
G.M. FEET.	8.4	4.1	GAIN.
FULL BALLAST. - ALL TANKS FULL			
DISPLACEMENT TONS.	8155	8150	----
MEAN DRAFT FEET	15'-7¾"	15'-7½"	----
G.M. FEET.	6.28	5.5.	GAIN

LET SHIP

(2ND Dg) x 17'-6 (U DB)

4

PALLETS

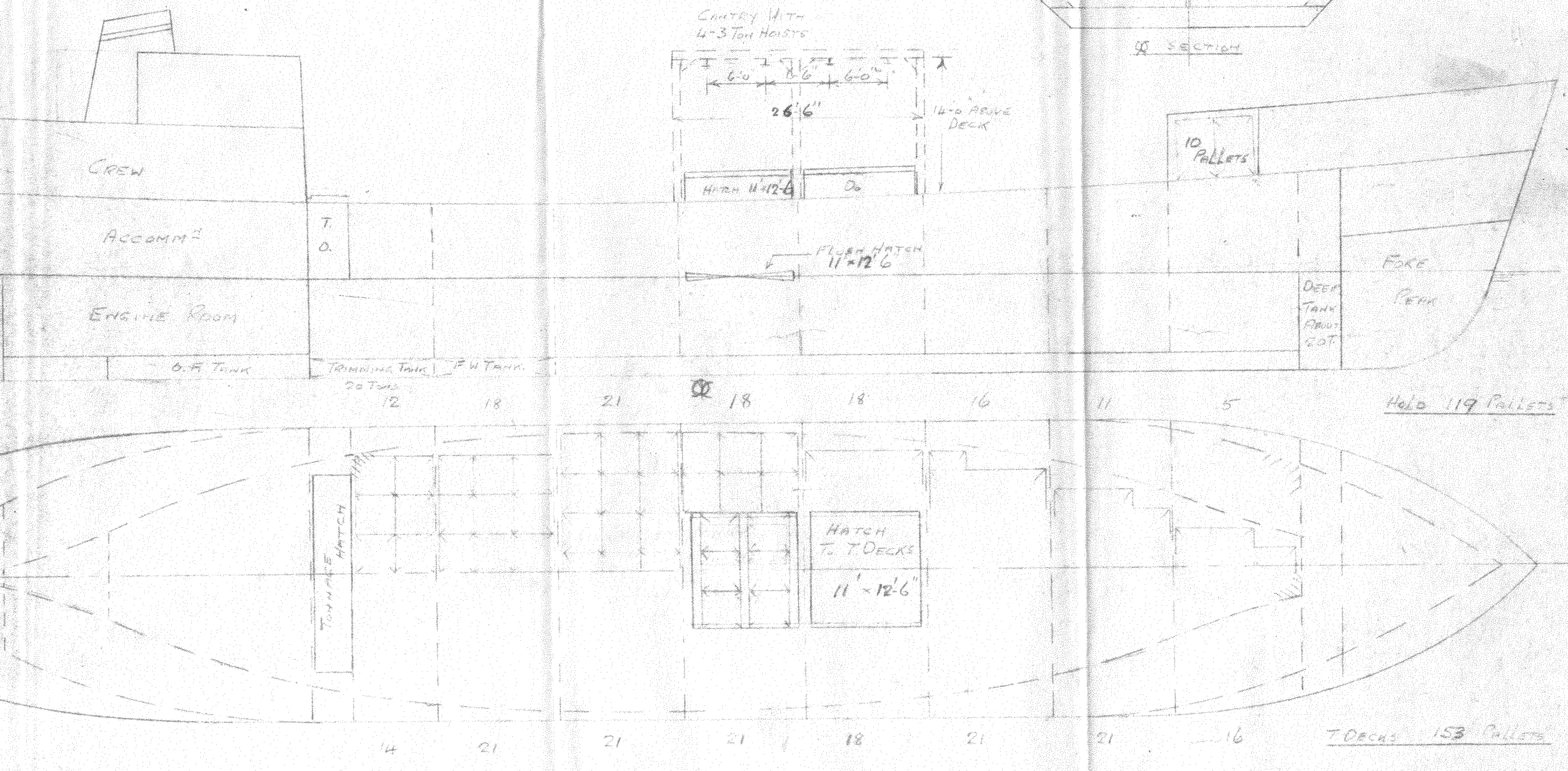
10 - 3'-10" x 5'-9" HIGH (54 S.C. 17)

SET

LENGTH OF HOLD = 100 FT

T. DECKS = 100 FT

TRANSVERSES SPACED 12'-6"



Hold 119 Pallets

T. Decks 153 Pallets

PROPOSED PALLET SHIP

160-9" × 30'-10" (2nd Dk) × 17'-6" (U.D.)

DRAFT 9'-10½"

CAPACITY 282 PALLETS

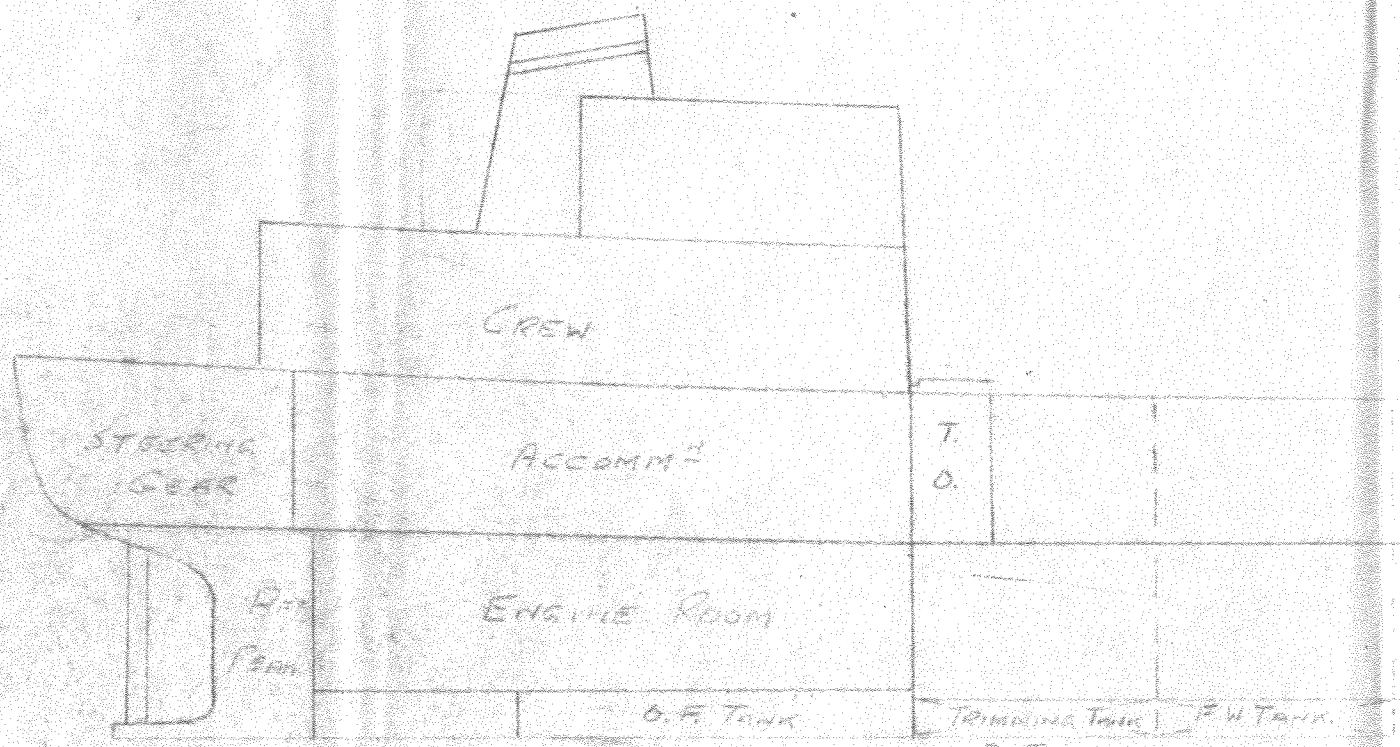
PALLET SIZE 3'-6" × 3'-10" × 5'-9" HIGH (84.5 C.FT)

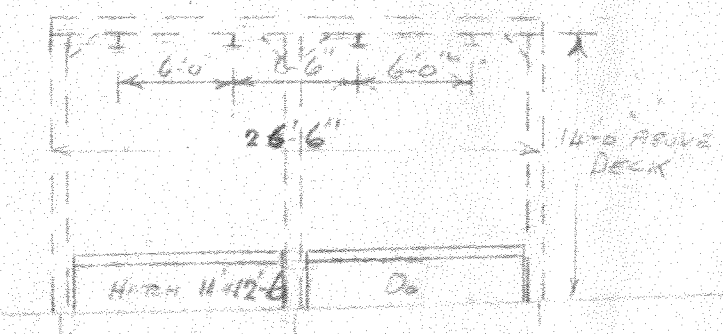
SCALE 1" = 10 FEET

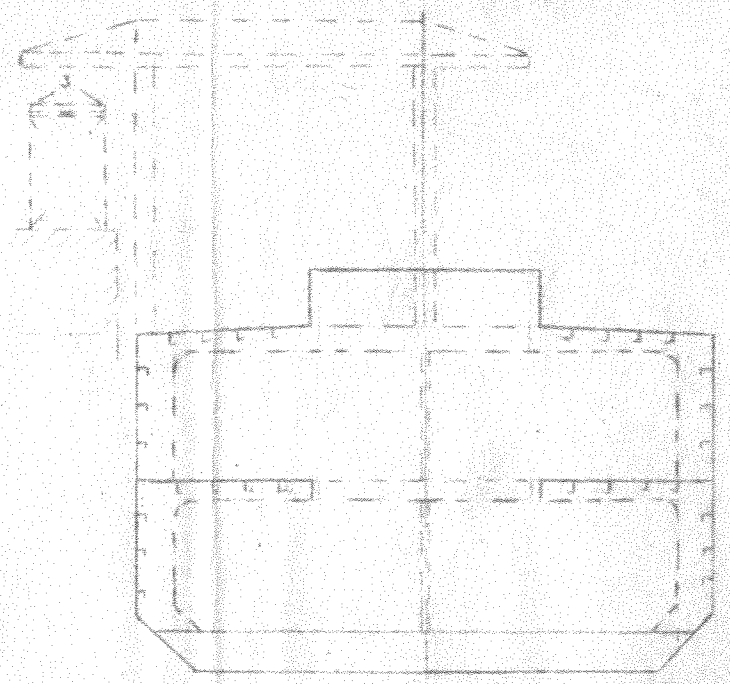
LENGTH OF HOLD = 100 FT

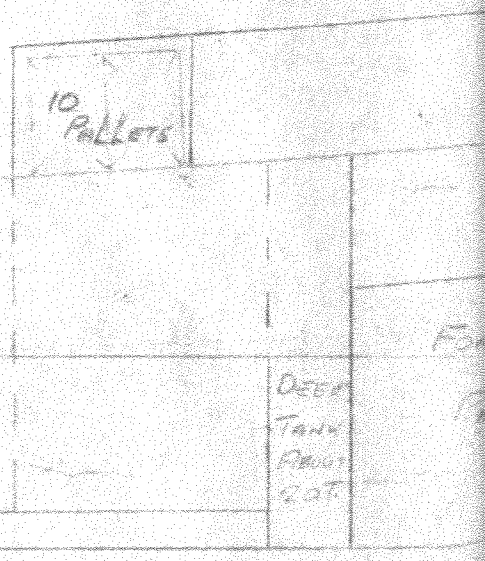
T. DECKS = 100 FT

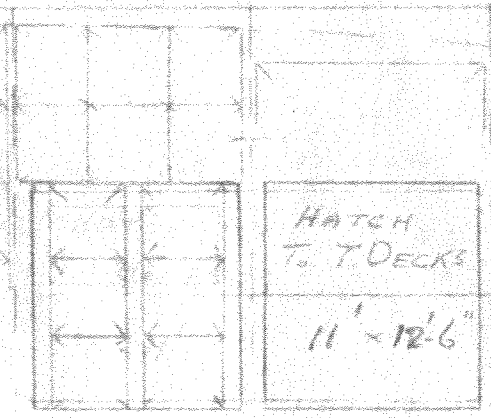
TRANSVERSES SPACED 12'-6"





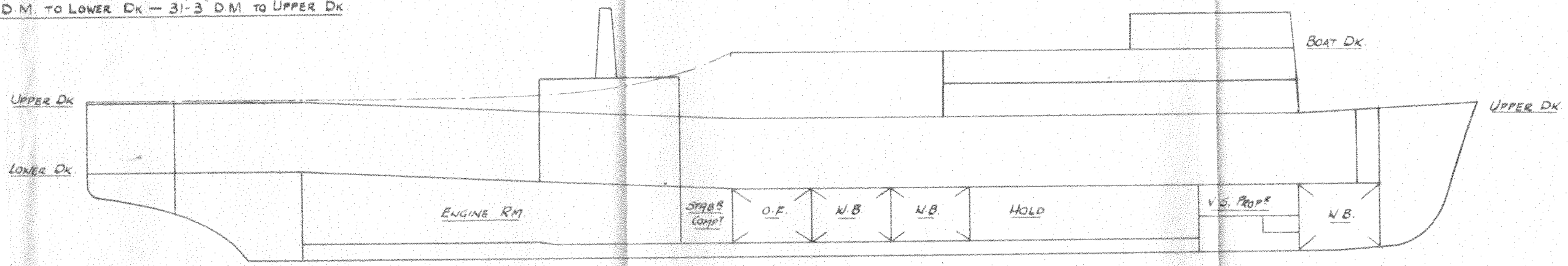


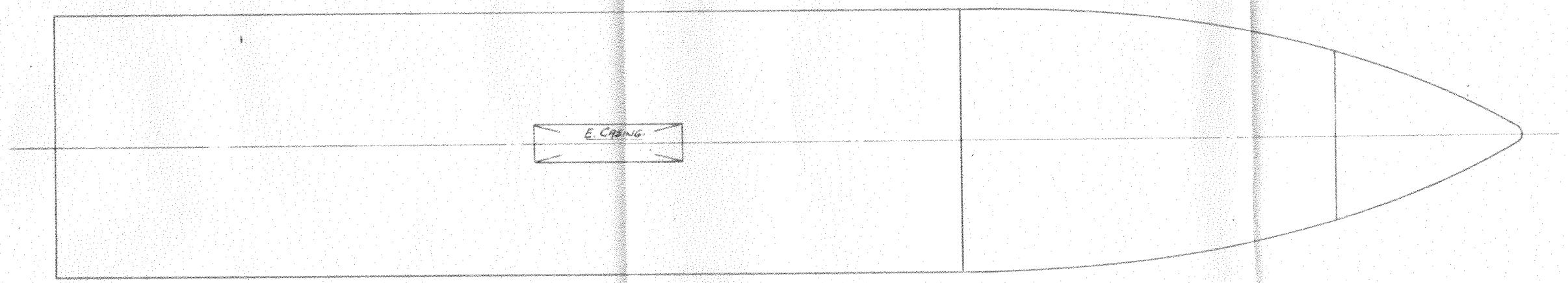




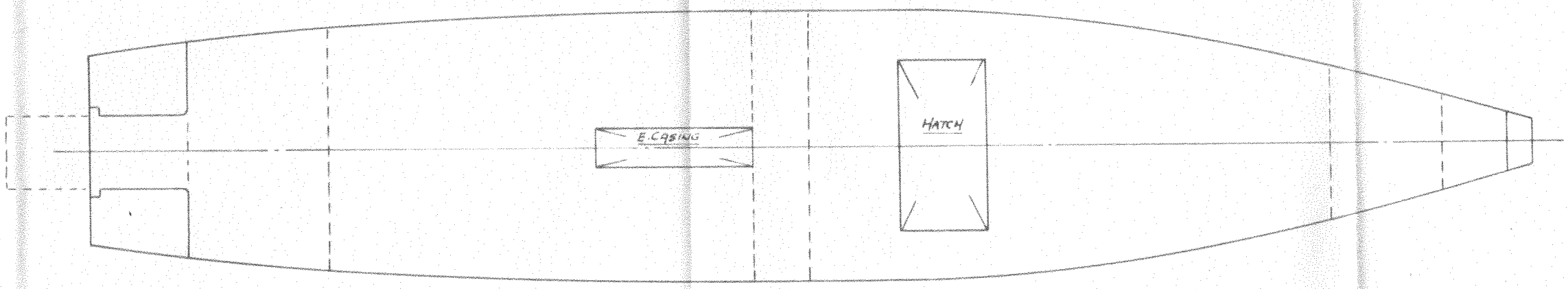
ICLE DECK CARGO VESSEL.
LINE ARRANGEMENT.

NSIONS:- 293'-9" B.P. (306'-0" ON L.W.L.)
57'-0" B.M. AT UPPER DK.
15'-6" D.M. TO LOWER DK — 31'-3" D.M. TO UPPER DK

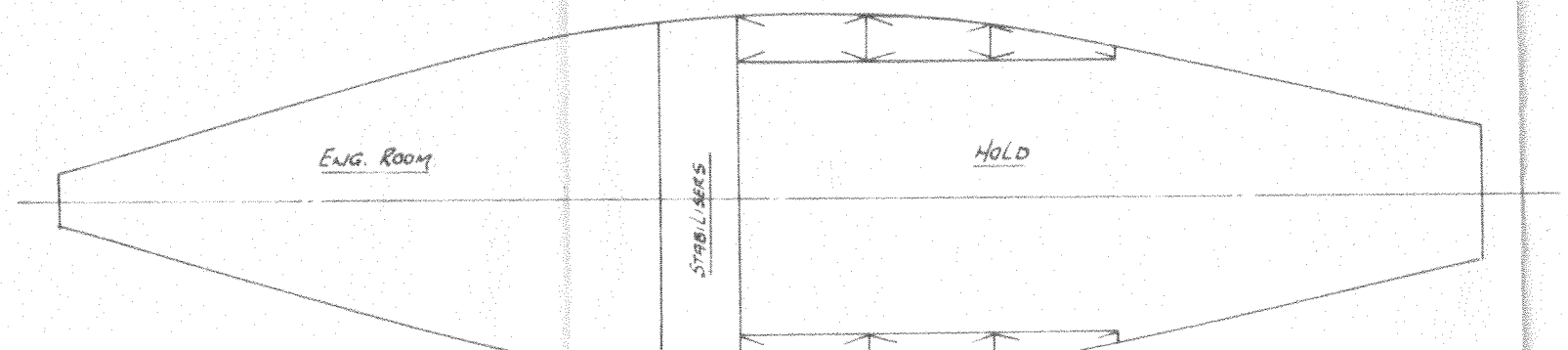


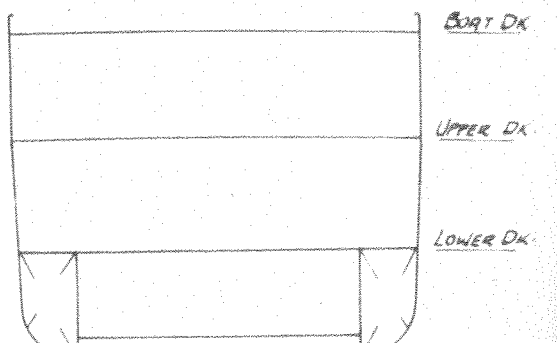


UPPER DECK



LOWER DECK





AINER SHIP

T ABOUT 19'

0 c.ft CAPACITY

S WEIGHT (AVERAGE)

ONS:- $\frac{1}{16}$" = 1 FT

AINER

SHOWING

TRACK

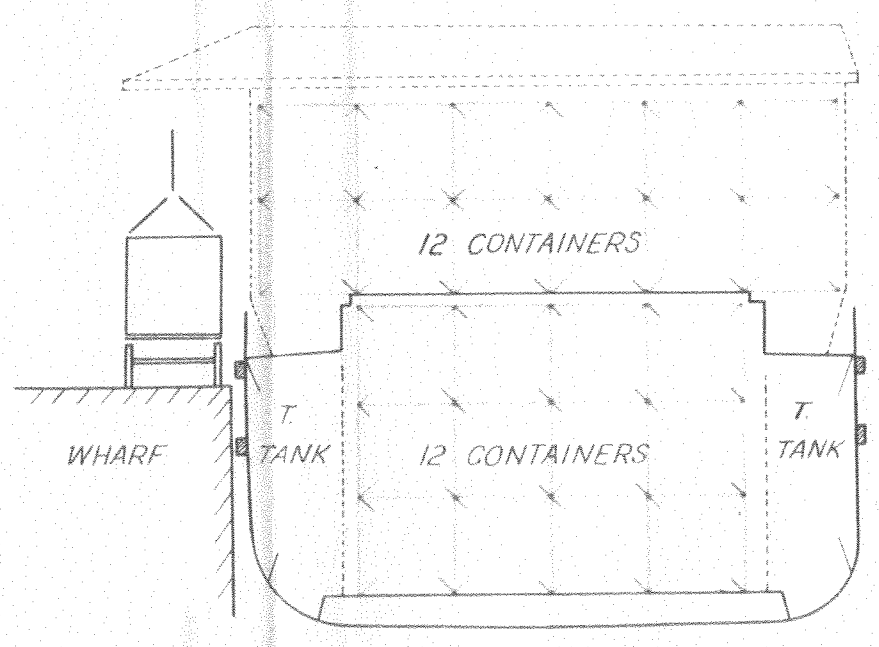
CONTAINERS

ON DECK-------92

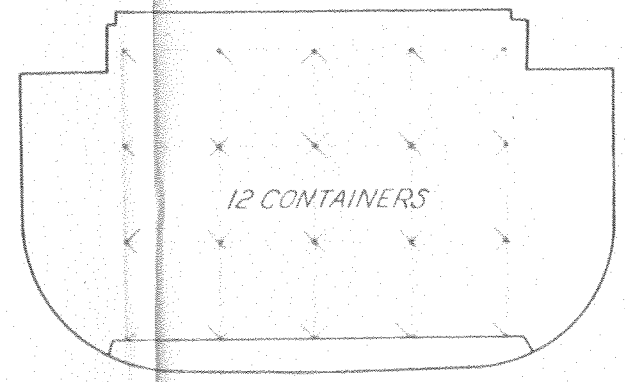
No. 1 HOLD------60

No. 2 HOLD------72

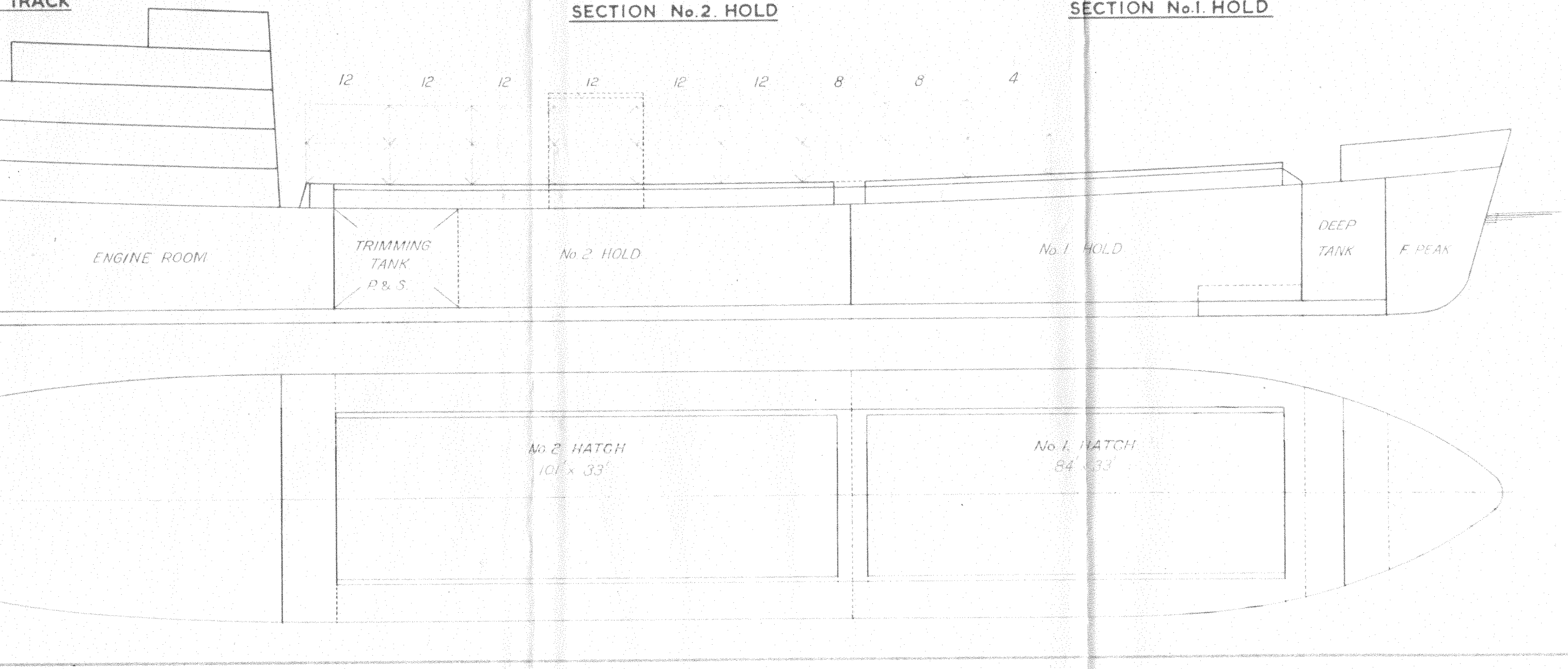
TOTAL 224



SECTION No. 2. HOLD



SECTION No. 1. HOLD



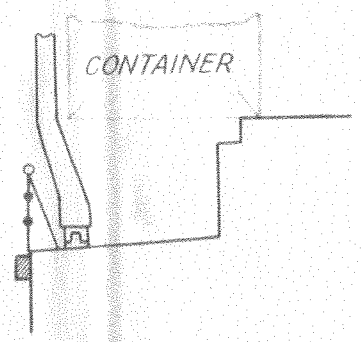
PROPOSED CONTAINER SHIP

320' x 51' x 22·5' DRAFT ABOUT 19'

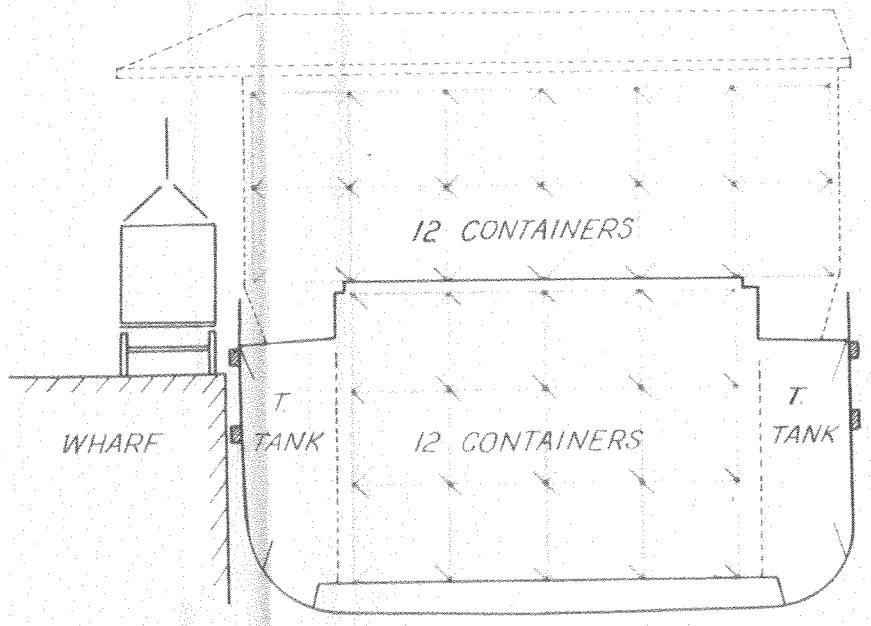
CONTAINERS 16'-6" x 8' x 8' 1050 c.ft CAPACITY

No. CARRIED 224 OF 2720 TONS WEIGHT (AVERAGE)

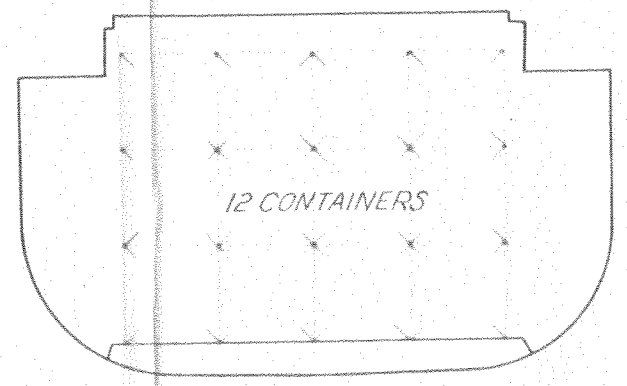
SCALE:- 1" = 20' SECTIONS:- 1/16" = 1 FT



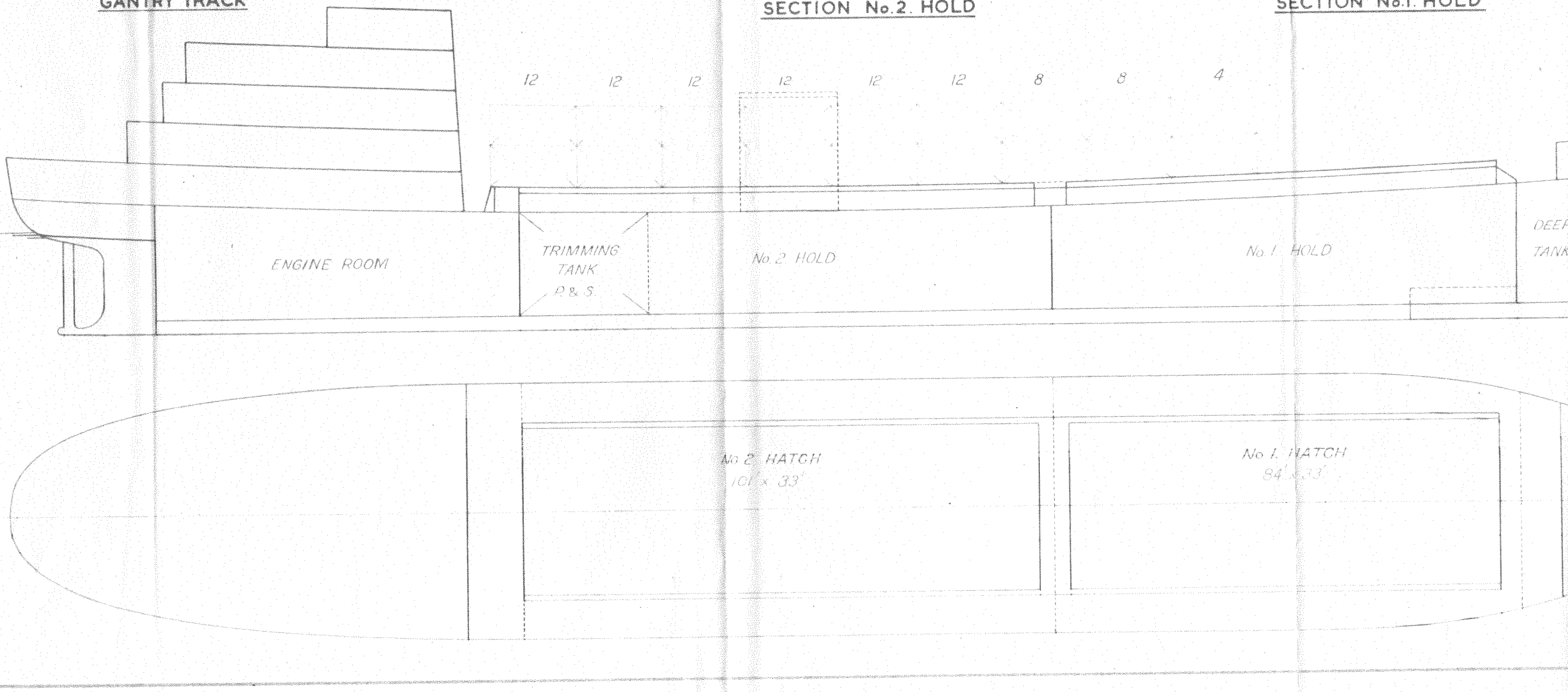
SECTION SHOWING GANTRY TRACK



SECTION No.2. HOLD



SECTION No.1. HOLD



PROPOSED BULK / ORE CARRIER

440' x 57' x 34 LOAD DRAFT 25' 6 3/4"

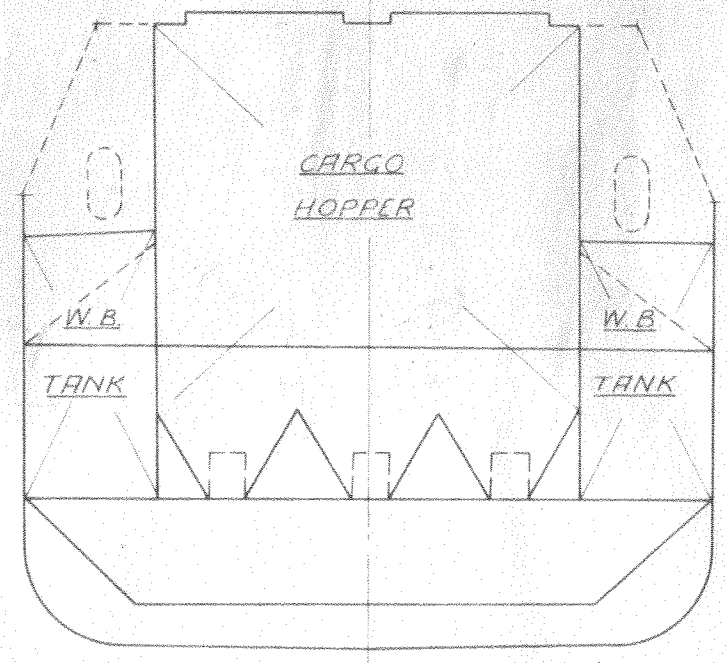
SCALE 1" = 30 FEET SECTION 1/16" = 1 FOOT

TOPSIDE TANKS & HATCH SIDE

COAMINGS CONTINUOUS

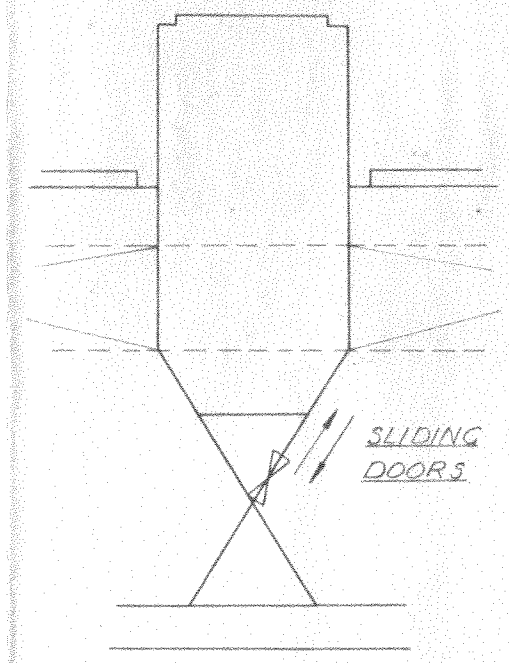
HOPPER CAPACITIES

Nos. 1 & 2 CARGO HOPPERS = 17900 c.ft. EACH
Nos. 1 & 2 SIDE HOPPER TANKS 2640 c.ft. EACH
TOTAL 4 x 2640 = 10560 c.ft.
W.B. HOPPER = 29,650 c.ft.



SECTION – No. 2 HOPPER

No 1 SIMILAR



ELEVATION
No. 2 HOPPER