

Liverpool Refrig. Co's Specification of
I N S U L A T I O N .

The holds and 'tween decks where shown on the plan are to be insulated for the carriage of fruit. The nett fruit capacity to be 214,000 cubic feet after deducting insulation, trunks, bins, etc.

GENERAL. The Insulation to be carried out in the finest quality granulated cork retained in position with two linings of $\frac{3}{4}$ " nominal P.T. & G. boards, the boarding being fastened against white pine grounds which are bolted to the ship's structure.

All grounds inside insulation to be treated by the B.M. process. All nails, screws and ironwork used in the fitting of the insulation to be galvanized.

All exposed woodwork to receive two coats of best quality insulation varnish and wherever double linings are used to form air ducts or cooler house divisions, two thicknesses of best quality waterproof paper is to be fitted between the linings.

The Refrigerating Machinery Contractor's requirements regarding air duct arrangements and cooler house designs to be complied with and all work to be carried out to the satisfaction of the Owners and where the words "as necessary" or "to approval" are mentioned in this specification they are to be read as to the approval or requirements of the Owners.

SHIP'S SIDES. Suitable white pine grounds to be bolted to the ship's side frames with bolts of at least $\frac{3}{8}$ " diameter and two in the height of the deck, with chocks fitted behind each bolt. Double linings of $\frac{3}{4}$ " nominal P.T. & G. boarding to be nailed to the grounds and the space behind properly packed with best quality granulated cork to a minimum thickness of 8". Stopper boards to be fitted at intermediate decks to prevent settling of cork.

BULKHEADS. Suitable white pine grounds to be bolted to the bulk-head stiffeners or where no stiffeners are available to angle lugs with bolts at least $\frac{3}{8}$ " in diameter and two in height, chocks being fitted behind each bolt. Double linings of $\frac{3}{4}$ " nominal P.T. & G. boarding to be nailed to the grounds, the space behind properly packed with best quality granulated cork to a minimum



thickness, in the case of external bulkheads of 8" and in the case of divisional bulkheads to a thickness of 1" more than the depth of the stiffener at one side and at least 4" on the other.

OVERHEADING OF UPPER TWEEN DECKS. Suitable white pine grounds to be bolted to the overhead beams in like manner to the ship's sides and bulkheads, faced with a double lining of nominal $\frac{3}{4}$ " P.T. & G. boarding and the space behind packed properly with best quality granulated cork to a minimum thickness of 2", care being taken that the bulbs of the beams are well protected. *8" See Letter 16/10/33.*

BEAM KNEES AT INTERMEDIATE DECKS. The beam knees at the intermediate decks to be grounded with white wood grounds and properly cased in with double boarding in like manner to the ship's sides, packed with granulated cork and this insulation to be carried inwards from the ship's sides at least 3' 0" thus forming a ribband on the underside of the intermediate decks.

ENGINE ROOM BULKHEADS. Suitable white pine grounds to be bolted to bulkhead stiffeners of the engine room and boiler room bulkheads, faced with double linings of $\frac{3}{4}$ " P.T. & G. boards and the space behind packed to a thickness of 12" with best quality Silicate Cotton. Asbestos washers to be used between the white wood grounds and the stiffeners to avoid direct contact.

TANK TOP. The tank top to be covered with bitumen by Shipbuilders (minimum $\frac{1}{2}$ " thick) to be grounded out with white pine grounds 7" deep, and the space between the grounds properly packed with granulated cork to a minimum thickness of 7", the whole finished off with two linings of nominal P.T. & G. boarding of 1" and $1\frac{1}{4}$ " thick respectively. Elm doubling 2" thick to be fitted in the wake of the hatch openings extending 2' 0" either way.

TOP OF AFTER ORLOP DECKS. The top of the after orlop decks to be treated in a manner similar to the forward tank tops being grounded out with white pine grounds 6" deep and the space between the grounds properly packed with granulated cork to a minimum thickness of 6", the whole finished off with two linings of nominal P.T. & G. boarding of 1" and $1\frac{1}{4}$ " thick respectively. Elm doubling at least 2" thick to be fitted in the wake of the hatch openings.

LIMBERS AND BILGES. The limbers to be insulated in like manner to the tank top and to be fitted with bilge plugs framed up in best quality pitch pine and built in handy sections for inspection purposes, to Owner's requirements.

INSULATION ON UPPER DECK. At Aft. and No. 2 Upper Tween,



insulation to be similar to top of Orlop Deck with 6" granulated cork and two linings of white pine P.T. & G. one lining 1" thick and the other $1\frac{1}{2}$ " thick. The necessary plugs to be fitted and framed in pitch pine, set in pitch pine coamings to be fitted over the manhole and filling openings to oil spaces and cofferdam.

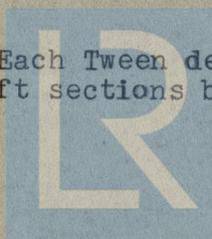
HATCHWAYS. The upper tween deck hatchways to be fitted in the usual manner with heavy pitch pine coamings bedded on to tarred felt and bolted to the hatch ends, sides and bridles, the pitch pine coamings being faced with $3/16$ " galvanized steel plates. The outfit of bevelled insulated plugs framed up in best quality pitch pine and double sheated top and bottom with $\frac{3}{4}$ " nominal P.T. & G. boarding, to be carefully made to fit the coamings so as to be airtight as practicable. Each plug to be fitted cape and corner with two heavy galvanized steel ring bolts fastened through the grounds of the plug and each corner of the plug protected with galvanized corner pieces made of $\frac{1}{8}$ " steel plate. The bevelled edges of the plugs to be channelled and fitted with Fearnought felt to approval.

DECK RIBBANDS. Ribbands 2" thick of best quality pitch pine to be properly fitted and bedded in white lead on top of the intermediate decks in way of the ship's sides and the exposed bulkheads. The ribbands to be brought out at least 3' 0" from the skin of the ship and to be properly caulked, payed and scraped to approval. Suitable battens to be fitted on top of ribbands so as to bring these to the same height as the deck gratings.

SHIP'S SIDE DOORS. In way of the fruit cargo doors in ship's sides, insulated plugs to be arranged. The plugs to be framed in pitch pine and fitted in pitch pine coamings. The whole arranged to clear ship side door furniture. The plugs to be fitted with galvanized fittings for fixing in place.

GRATINGS. A complete outfit of white pine gratings to be supplied for the floors of all chambers made of $2\frac{1}{2}$ " and $1\frac{1}{2}$ " white wood battens placed on edge so as to form a $2\frac{1}{2}$ " air space under the gratings, these battens being placed fore and aft as bearers for the athwartships battens of $2\frac{1}{2}$ " x $1\frac{1}{2}$ " white pine nailed on the flat and spaced not more than $1\frac{1}{4}$ " apart, the bearers being spaced approximately 16" apart and the gratings so formed being made in readily portable sections to permit of vertical stowage and to be numbered by burning irons in figures and letters 6" long.

ROTARY AIR CIRCULATION SYSTEM. Each Tween deck and hold space to be divided into three fore and aft sections by two double sheated



divisional bulkheads strongly constructed to withstand the weight of the cargo and provided with bin boards on both sides to provide an air passage around the outside of the fruit. Each divisional bulkhead to be made portable in way of the hatch by a full height sliding portion, strongly framed and mounted on steel rollers and galvanized flat runner rails and provided with suitable galvanized iron fasteners. Care to be taken that the sliding doors are shielded from the weight of the fruit on either side, in either closed or open position. All ship's side insulation to be suitably grounded and fitted with horizontal bin boards to provide an air passage between cargo and insulation. The ship's side cargo doors to be railed off and a passageway made through the fruit bins from each cargo door to its corresponding hatchway.

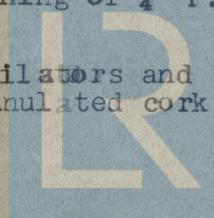
The three divisions of each chamber are to be treated as though they are large air ducts, the two outside portions being deliveries and the centre portion a return duct.

The Port and Starboard divisions in each chamber to be provided at one end with an air distribution screen communicating with the delivery duct from the cooler house above. The centre portion of each chamber to be provided with collecting screens, one at one end to collect the air from each side division and one at the other to collect the air from the centre portion into the suction duct leading to the cooler house above. The suction screens to be of the vertical slatted form, strongly constructed and the delivery screens to be close sheeted and provided with suitable openings for equal distribution of the air.

The two delivery and one suction ducts to be lead up to the cooler house from each chamber and provided at the point of entry in the cooler house with adjustable regulating shutters to provide proper control of the air supply to each side of each chamber. Each chamber to be provided with three thermometers suspended from the overheading on cords in such a manner that they can be drawn along the overheading to one end and passing through suitable ports made in the delivery and suction screens, can be read inside same. Also one hanging thermometer to be fitted in suitable position in each delivery and suction screen and two Kew tested thermometers to be provided as standards.

MASTS, STANCHIONS & LADDERS. All obstructions such as stanchions and ladders or masts to be properly roped or otherwise protected so as to prevent the contact of any fruit with the metal work and also to be insulated where necessary, masts being insulated with a thickness of 4" best quality granulated cork faced with narrow vertical boards forming a double lining of $\frac{3}{4}$ " P. T. & G. white pine.

VENTS & TUNNEL ESCAPE. All ventilators and tunnel escapes properly insulated with best quality granulated cork 4" and 6" respectively.



and the ventilators fitted with insulated plugs hung on galvanized furniture and made properly air tight to approval.

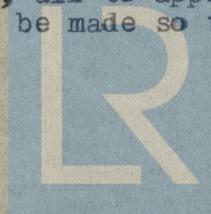
BANANA BINS. One full outfit of banana bins comprising pitch pine posts, heavy galvanized iron sockets for the deck heads, galvanized steel sockets for the foot of the posts, portable batten boards, galvanized cleats, etc., Bin posts to be of 6" x 6" first quality pitch pine with machined notches so that horizontal battens can be readily portable. The horizontal battens 6" x 2" and the posts all to be clearly marked to correspond to their positions. All corners of bin posts and battens to be well rounded off and all woodwork varnished two coats special insulation varnish to approval.

AIR COOLER HOUSES. The insulation of the air cooler houses to be carried out on similar lines to the cargo chambers in best quality granulated cork and double linings of $\frac{3}{4}$ " P.T. & G. boarding and to be complete with all access doors framed up in best quality pitch pine and hung on galvanized iron door furniture of the "Taylor" pattern, the fasteners to be of the double handle type so that they may be operated from both sides of the door. Doors to be fitted with heavy hasps and galvanized padlocks.

The internal woodwork of the cooler houses to be carried out with one lining of $1\frac{1}{4}$ " P.T. & G. and one lining of $\frac{3}{4}$ " plywood, with two layers of waterproof paper between and to be complete with all doors, regulators, cooler baffles, shutters, etc., to suit the refrigerating machinery contractor's requirements including all plugs and fittings for fresh and foul air openings and continuous fresh air inlets.

Boundary bulkheads of the cooler houses will be built of steel, forming part of the structure of the ship, by the Shipbuilders, all remaining internal divisions, air ducts, wooden inspection ladders and floor gratings together with all necessary doors arranged for opening in both directions and fitted with spring hinges and wedge fasteners top and bottom to be provided by the Insulators, together with the necessary air ducts between the cooler houses and the various cargo spaces, including hinged wooden regulating shutters, galvanized air cooler sheathings and galvanized steel protection gratings over air duct openings, as required by owners.

NO.2. TWEEN DECK. A space to be partitioned off at the after end of No.2. Tween Deck to form a store for outward cargo. The divisional bulkhead to be built of wood, and to include three heavy double doors with suitable locks, all to approval of Owner's representative. Arrangements to be made so that this space can



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be used for the carriage of bananas on homeward voyage.

EVAPORATOR ROOM. The insulation of the evaporator room to be carried out in best quality granulated cork faced with double linings of $\frac{3}{4}$ " P.T. & G. boarding in a similar manner to the cargo chambers and to include the supply of one heavy insulated door framed up in best quality pitch pine and hung on adjustable hinges of the "Taylor" pattern fitted with screw fastener, arranged for operation from either side; hasps, padlock, staple, backhook, and having the sill protected with $\frac{1}{8}$ " galvanized steel plate. Portable plugs to be fitted in the bulkheads of the evaporator room as required by the Refrigerating Machinery Contractors for the withdrawal of the evaporator coils.

The underside of the evaporator room deck to be insulated in like manner to the cargo chambers with not less than 9" best quality granulated cork and the top side of the deck to be covered with $1\frac{1}{2}$ " of Limmer and Trinidad asphalt.

FEED & RETURNS . The insulation of all feed and return brine piping between the evaporator room and the various cooler houses to be carried out in best quality granulated cork sheathed with double linings of $\frac{3}{4}$ " P.T. & G. boarding and protected where passing through bunkers with $\frac{1}{8}$ " galvanized steel plates, the thickness of the insulation to be not less than $7\frac{1}{2}$ " clear of the outside dimension of the pipes.

INSULATION OF SHIP'S PROVISION CHAMBERS. The insulation of the ship's provision chambers carried out in best quality silicate of cotton and boards, the lining in all cases to be double and of $\frac{3}{4}$ " P.T. & G. on lines similar to the cargo chambers, but the thickness of this insulation to be 12". We include all necessary insulated doors framed up in best quality pitch pine and hung on heavy galvanized door furniture of the "Taylor" pattern with fasteners arranged for operation from either side.

Vegetable Room to be fitted with the necessary wood sparred shelving and the Fish Room fitted with galvanized steel shelving to approval. The Meat Room to be fitted with hanging rails and hooks and these three chambers and the Handing Room to be fitted with wood sparred gratings on the decks.

Approximate capacity of the chambers is as follows: -

One Meat Chamber say	980	cubic feet.
One Fish Chamber say	290	" "
One Vegetable Room "	590	" "
Handing Room say	400	" "

The decks to be covered inside chambers with 2" thick slab cork laid with bitumen and covered with 1" layer of rock asphalt.



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SHIP'S CARGO CHAMBERS. Two ship's cargo chambers to be insulated similarly to the Provision Chambers, also including thermometer tubes, brass deck sockets mounted in teak pads and the necessary thermometers, and having 2" slab cork laid in bitumen on deck and covered with 1" of rock asphalt. Sparred wood "Turtle" shelves, half height, to be fitted.

The approximate capacity of these chambers is as follows: -

Forward Chambers -	1530	cubic feet.
Aft Chambers -	1460	" "

Two motor driven, propeller type fans, to be fitted in vertical steel ventilators, complete with starters fitted in most suitable position. The side grids to be sheathed where necessary, with suitable air openings in the sheathing to provide an air circulation of these chambers for the carriage of citrus fruits. The steel vents to be supplied by shipbuilders.

COLD PIPES ON REFRIGERATING MACHINERY. The suction and expansion pipes between the Refrigerating Machinery and Evaporator Room to be properly insulated with best quality sectional compressed cork properly fitted to the pipes with bends made to suit the radii of the pipes and boxes for fitting around the valves. Cork sections to be fitted together with hot bitumastic, wired and skewered, bound with double canvas and painted two coats of paint to approval.

REFRIGERATING MACHINERY ROOM. The overheading of the machinery space to be insulated in way of the Smoke-room above with Silicate of Cotton to the depth of the beams, sheathed with P.T. & G. boarding.

SUNDRIES. Special insulated plugs in way of W.C. Bath or other soil discharges and where necessary in way of electric fittings

Insulation over double bottom or deep tank oil fuel spaces to be Lloyd's requirements, with air space where necessary.

A Cold Cupboard to be fitted in pantry, complete with shelves, overall size of cupboard 4' 2" high x 3' 0" x 3' 9". Insulation of cupboard 4" slab cork all over, lined inside and out with $\frac{3}{4}$ " P.T. & G. white pine boards, cupboard lead lined at bottom and fitted with drain.

CLASSIFICATION. The Insulation to be carried out under the supervision of Lloyd's registry of Shipping and to comply with their requirements.



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EXCLUSIONS. The foregoing specification does not include any of the usual Shipbuilder's work such as drilling or cutting of the ship's structure, the provision of angle iron lugs or deck angles, any painting of the steel work to receive the insulation, any black hatch covers for weather or intermediate decks, nor the bitumastic work on tank tops, asphalt work in cooler houses, nor machinery.

Shipbuilders to lift bulk materials on board and into the spaces required and provide any lighting of the spaces and power required during the carrying out of the work.

WEIGHT. The weight of the foregoing Insulation is estimated at 472 Tons.

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