CHAPTER 22

DEVELOPMENT OF MODERN PORT FACILITIES IN THE PORT OF BOSTON

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INTRODUCTION

Boston is known throughout the world for its soul stirring part in the history of this great nation, its famed "Clipper Ships", its educational institutions, even its baked beans, and, last but not least, its port which has played such a strong role in world trade from the days of the country's first settlement.

Historically speaking, the Port of Boston was the first major port in these United States, and had its beginning early in the seventeenth century, shortly after the arrival of the Puritans. It was only logical that the city became a center of waterborne commerce. Its storm-sheltered harbor and deep waterways, with very little current, practically free of estuary sedimentary deposits; its closeness to the open ocean; and its excellent hinterland accessibility—all contributed to the development of the port. Boston Harbor comprises a tidewater area of about forty-seven square miles, with a shore line of more than one hundred miles. The maximum current velocity is less than one knot per hour. It is only seven miles from the open ocean to the center of the waterfront terminal area.

Originally all the commerce of Massachusetts Bay was with England. In 1641, when the Civil War there disrupted normal trade, Boston quickly sought other markets, and thus began its foreign trade, with salt fish as its principal export product. This port was the principal point of entry when the vast immigration commenced, with the arrival of fifteen hundred colonists in 1630. During the days of the Clipper Ships, the finest vessels were built in Boston's yards, and carried the name and trade of the city to every corner of the globe. Then came the days of steam transportation, and, with the arrival of the BRITANNIA in 1840, the establishment of regular passenger service by the Cunard Line between Great Britain and the United States. The Port of Boston prospered, and has continued to this day to maintain its strong place in world maritime trade. Boston had the first Naval shipyard in the country, where some of our early warships were constructed.

In the history of the Port, there has always been a strong influence of progressiveness, which has numerous times set the pace for the rest of the nation to follow. For example, in the early part of the twentieth century, the State of Massachusetts constructed the largest drydock in the world in Boston; it is still in excellent condition, and is in use by the Navy. The Commonwealth Pier No. 5, built in 1912, was

an ultra-modern pier far in advance of its day, for both general cargo and the handling of passengers. It was the forerunner of our present-day modern-design waterfront terminal, and is still considered to be one of the finest piers in the United States. At about this time also, the Boston Fish Pier was constructed by the State for the fishing industry, which had previously used the picturesque but inadequate small piers along the old Atlantic Avenue section of the waterfront. Boston's fishing industry set the pattern for the world in the efficient processing of fish on a large scale.

FORMULATION OF MASTER PLAN

In 1941 the Commonwealth of Massachusetts realized the necessity of embarking on a program of modernizing the terminal facilities for the handling of general cargo. Authorization and funds were provided for the construction of the first new pier at the site of the former Mystic Piers Nos. 46 and 47, but World War II caused a postponement of the commencement of construction until after the termination of hostilities. When conditions permitted the starting of the project in 1945, construction costs had risen so much that previous funds allocated were insufficient. Along with the need to re-estimate the project, it was also found that the functional layout did not ideally fit the post-war requirements of efficient interchange of cargo between land and water transportation. For this reason and because of changed conditions brought about by the war involving increased size and capacity of general cargo vessels, palletizing of goods, greater use of mechanized material handling equipment, increase in cargo movement by truck transportation, and anticipated large increase of trade, the Commonwealth decided that a comprehensive study of the entire port should be made and a broad plan for maintaining and improving our competitive position in the future formulated. In line with this thought, the Port of Boston Authority was empowered to embark on a Master Plan for providing adequate modern terminal facilities, for which purpose an initial capital outlay of $19,700,000. was approved by the Legislature. (Fig. 1).

The survey and study involved every aspect of the entire port with its correlating influence and relationship to all activities essential to waterways, land transportation, labor, industry, and the hinterland served by the port. Certain basic facts were derived from this study as follows:

(1) Sectional development priority for chronological sequence planning.

(2) Certain existing obsolete piers were strategically located for maximum efficiency in the interchange of waterborne cargo by rail and highway transportation, meeting the following fundamental essential requirements for port development: close to deep approach roadsteads and main highway arteries, easily accessible by waterfront labor, maximum construction economy, and minimum disruption of normal business activity of the area.

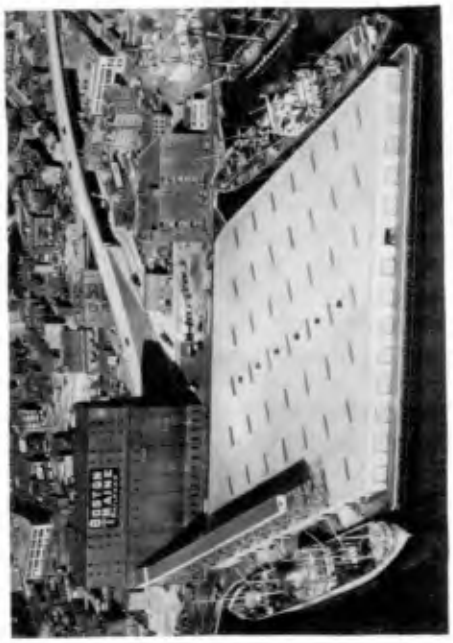

Fig. 2. Aerial photograph of Hoosac Pier No. 1 - the first step in the Master Plan. Completed in 1950.

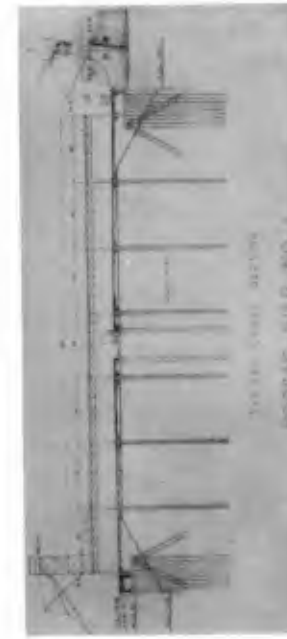

Fig. 3. Typical cross section of Hoosac Pier No. 1.

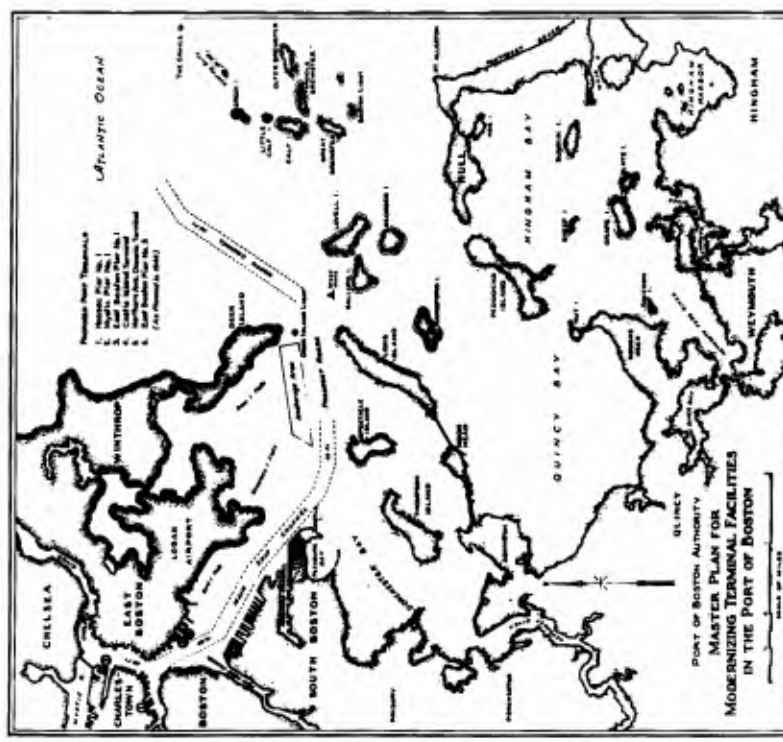

Fig. 1. Plan of Boston Harbor showing location of proposed port terminal facilities in the Master Plan.

Terminals constructed on new sites hitherto unused for such purposes not only were found to be more costly, but would not have a satisfactory operational layout of supporting facilities.

Further study indicated that the necessary additional margin of capacity to handle anticipated future expansion of waterborne commerce could be provided by a definite increase in the efficiency of the cargo handling process of the new terminal facilities without utilizing greater waterfront area.

To gain this efficiency in the cargo handling process, it was proposed that an improved functional layout would attain the objective. The functional layout considerations will be discussed later under design aspects.

In the formulation of the Master Plan it was decided to locate the projects strategically so as not to favor any one particular section of the port or any one railroad. In this manner the benefits to the city and waterfront would be more evenly divided, and traffic congestion on land and water minimized. From the port survey and study it appeared that the first two piers should be constructed in the Charlestown section of the city, the third in East Boston, and the fourth in South Boston.

Our plans for the various projects are coordinated in a long-range plan so that future development may not be prejudiced because of lack of vision, and may be accomplished with as little as possible disruption or displacement of waterfront business and establishments.

Because of existing commerce demands, it was not possible to proceed with the construction of more than one project at a time without jeopardizing the normal flow of business in the port. One pier at a time has been scheduled for construction, with the displaced business of that pier being absorbed by other terminals in the port. Each new pier being constructed will provide that necessary margin to handle the business of the pier being replaced while reconstruction is going on, as well as to take care of such new business as may be acquired after completion of each step in the overall development.

In establishing the modernization program for the Charlestown sectior of the port, the Hoosac Tunnel Docks were designated as the first project, to be called Hoosac Pier No. 1, as this facility was unusable. The second to be chosen was the site of Mystic Piers Nos. 46 and 47, to be called Mystic Pier No. 1, which would be commenced after the completion of the first step. Mystic Piers Nos. 46 and 47 were in use, and their business would be transferred to the new Hoosac Pier without creating a hardship. By the time the second step was completed there would always be a margin i business expansion. We have found our predictions more or less correct ir this regard (See Figures 2 and 3).

The third step was the location of two piers in East Boston, namely, Commonwealth Pier No. 1, which was very inefficient, and Grand Junction Pier No. 2, which was badly in need of major structural rehabilitation.

The fourth step is the revision of a military facility constructed early in World War II into a modern, efficient commercial terminal at Castle Island in South Boston.

Every year the needs of our waterborne commerce are re-studied with the object of reflecting current forecasts. In 1950 two additional projects were added to the Master Plan, the modernization of passenger facilities at East Boston Pier No. 3, and the Northern Avenue Oceanic Shipping Center in South Boston. The completion of the latter two was expected to maintain our competitive position until 1960. Because of increasing port commerce, consideration is presently being given to adding another step for materialization in 1959.

Another phase of port commerce which has been of much concern was the modernization of our 50-year-old export grain handling facilities. A study of this problem resulted in a decision that only 2 of the 3 grain terminals warranted modernization. From this decision Hoosac in the Charlestown District and Grand Junction in the East Boston District were selected for improvement at a cost consistent with the benefits to be derived on a competitive level with grain facilities of other North Atlantic ports. The third grain facility, the Mystic Elevator in Charlestown, was judged to be obsolete and scheduled for demolition.

DESIGN CONSIDERATIONS

In the planning of these piers, stress is placed on the economic aspect of functional layout, design and construction consistent with maximum efficiency of operation and low maintenance. Since the enabling legislation requires a 20-year lease with amortization of total construction costs at the rate of 3 per cent per year, every bit of Yankee thriftiness and ingenuity has to be used to meet the demands of lessees. There is nothing ornamental or monumental in the pier design - it is all purely functional with only such architectural treatment as may be given without increasing the cost. The appearance of our transit sheds is attractive, a result which has been attained by skillful use of simple lines, and the careful arrangement and use of low cost materials.

The first aspect of the basic layout to be studied for maximum efficiency of the cargo handling process was protection of labor and cargo against foul weather. It must be borne in mind that during the winter, we do have some snowstorms and cold rains. A working wharf apron width of 25' was selected as giving maximum protection against damage of walls of transit shed from cargo handling by ship's gear, minimum exposure of longshoremen to the elements, adequate clearances for rail tracks and highway vehicles for direct cargo interchange. A spacious transit shed to enclose the entire transfer operation once the cargo reaches the shed permitted a more expeditious and efficient movement of cargo. Such an arrangement not only has a better psychological effect on the worker, but involves no delays or slow-downs regardless of weather. When a snowstorm occurs it is only necessary to plow the snow into the sea and open a passage-way to a close-by main artery. All new transit sheds will

have a minimum of 100,000 square feet per main berth. This exceptionally large covered area permits maximum use of high equipment speeds in both assembly and dispatch of goods and also low stacking of cargo. In most cases the new project has the same or less berths than the terminal being replaced, but the increased efficiency of the layout plus larger covered storage area permits the accommodation of more ships with a shorter turn-around time.

Since most of the trucking companies in the port having business c the pier find it more advantageous for their vehicles to go into the shed to pick up or deliver goods at the point of assembly, our basic layout has a double ramp on each side of the trackwell for truck entrance into the shed. This arrangement permits complete circulation on either half or the whole pier. For those trucking companies which desire to load at platform height, truck docks are provided on the shore end of the shed. The wide column spacing and overhead clearance permit uninhibited freedom of movement of trucks and material handling equipment.

Because of wide variance in the percentage of cargo moving by rail and truck at the various piers throughout the port, a basic layout was decided upon which was equally advantageous to both modes of transportatic The wide finger pier with a minimum of two rail tracks down the center for flush deck loading and one on the work apron not only met this condition, but minimized interference with the other transportation. The traffic pattern in the layout was given considerable thought with the view of eliminating congestion and interference with the efficient movement of vehicles and cargo.

It was also believed that an increased efficiency would be attain by improving the working conditions of pier labor, namely, a light-colore interior to enhance good artificial and natural lighting, excellent wash-room facilities, and a special forming or shaping hall for use during in-clement weather.

In layout, all the new terminals follow the basic pattern of a finger pier with one-story transit sheds, except for the Castle Island Te minal, which is a marginal wharf about 4000 feet long. The piers have wo ing aprons twenty-five feet wide, with flush railroad tracks, ship water supply and fire-fighting hose connections for each berth, and adequate il mination with non-glare lights for night work and security. The terminals have one-story transit sheds of fire-resistant materials, with a twenty-foot overhead clearance which is adequate for maximum stacking of cargo; at least two railroad tracks in a depressed well in the center of the shed for flush loading of railroad cars; truck docks for platform-height loading of trucks; ramps for the entrance of trucks into the sheds good natural lighting for daylight operation and excellent artificial lighting for night work; the pre-action type of sprinkler system for fire protection, with an automatic and manual fire alarm system; power-operate trackwell bridges for flexible movement of cargo from one side of the she to the other; warm rooms for perishable cargo; and offices for steamship and terminal-operating interests. An added adjunct which is entirely new in ports is the supporting utility building adjacent to the pier, housing

a forming or shaping hall for longshoremen, and the repair shops for cargo-handling equipment. The plans provide for adequate open storage and parking areas, with good flood lighting. The entire terminals are enclosed with an eight-foot high chain link type of fence to provide maximum security at the least cost. These new piers each have large railroad classification yards adjacent to the piers, and are close to main arteries that serve the port's hinterland.

Incidentally, recently for the first time I received a complaint that we were doing our job too well - a longshoreman acquaintance reported workers are not happy about the new projects, pilfering is awful tough!

Some of the seemingly insignificant phases of waterfront terminal design are often neglected, although they greatly affect the operation and efficiency of the cargo handling processes. A small matter such as the proper location of Customs control would have a direct bearing on whether there is truck congestion on a pier, or whether there is fast movement of motor vehicles on to and off a pier.

Another item is the layout of the terminal to control pilfering. This aspect of pier design has been taken into consideration by us in our plans, and the effort has proven successful. It is estimated that pilfering on our new Mystic Pier has been practically eliminated. This is a very noteworthy accomplishment when one understands the problem of the shipping companies in large ports. In some places it has been assumed that nothing can be done to curb this illegal practice which has a direct bearing on the cost of handling goods at a port.

The 9½ foot mean tide differential and a considerable snow load in the winter have placed certain difficulties and restrictions on our terminal designs. The live load criteria set up for the design are as follows:

Snow 30 p.s.f.

Storage 600 p.s.f.

Wheel H 20-S16-44 + 30 per cent Impact

R. R. Tracks Cooper E60 + 20 per cent Impact

The cargo doors are of the rolling steel shutter type and have an alternate pattern. The doors are at least 16 feet high by 18 feet wide.

Our standard fire protection system for the new piers is a departure from the conventional criteria of the past. The entire shed area is uninhibited by firewalls and the uncertain value of stand pipes and hose racks. The fire protection consists of three more or less interconnected systems: (a) manually-operated fire alarm stations, strategically located throughout the pier and specially distinguished by lights and color to permit quick location in an emergency, are connected to the City Fire Department alarm system; (b) central supervisory fire alarm which is

Fig. 4. Interior of typical waterfront transit shed showing excellent natural lighting. Note hydraulic operated trackwell bridge.

Fig. 5. Brilliant apron lighting at Hoosac Pier No. 1 permits efficient cargo handling both night and day.

Fig. 6. Interior of transit shed at the new Hoosac Pier No. 1. Excellent lighting permits transfer of cargo between ship, rail, and highway carriers at night.

connected to the sprinkler system; (c) pre-action type of sprinkler system, with adequate draft curtains, covers every part of the transit cargo shed and offices. Also located around the pier are some hand extinguishers for ambient fires.

The alarm system, when actuated, sets off a large horn which not only alerts everyone on the pier as to a fire but also indicates the exact location. This eliminates any loss of time by the fire-fighting units in locating the fire upon their arrival on the pier. This heretofore new approach to the fire protection problem results from a study of pier fires consistent with a good functional layout and cargo operations. The primary move of the discovery of a fire is to actuate an alarm which will bring trained fire fighting units immediately to the scene, to supplement the protection of the sprinkler system.

The sprinkler system used is the pre-action dry pipe system actuated by rate of rise of ambient temperatures. Hose stations are costly to maintain, and without organized personnel they become of little use in fighting a fire. Because of the unsteady employment of longhsoremen and freight loaders, an organized fire-fighting unit would not be practical.

The lighting of the piers has been given special study with the view of providing the best illumination as a means of increasing the efficiency of the cargo handling process. There are skylights for daylight hours and incandescent electric lights for night work. The artificial lighting has been designed for low cost installation and operation consistent with the following requirements (See Figs. 4, 5, and 6):

1. maximum utilization and efficiency of lighting energy
2. low cost and ease of maintenance of the system
3. uniform distribution of illumination
4. minimum depreciation of light from dust and dirt accumulation on lighting units.

Since the interiors of the shed, including structural frame, will be painted with a semi-gloss protective coating, the appearance of the structure and the lighting efficiency are greatly enhanced. The lighting units used in the building are of the heavy duty industrial type, dust and weathertight, with wide symmetric distribution refractor lenses.

On the working aprons, adequate non-glare lighting is provided for the safe operation of ship's cargo-handling gear and cargo handling on the wharf. These lighting units are flush mounted on the wall to eliminate damage from, and any interference with, the swinging of cargo between ship and shore. Also, these heavy duty units have high stressed or tempered prismatic refractor lenses for proper light distribution and impact resistance.

The plan for modernizing the Hoosac and East Boston grain facilities consists of increasing the ship-loading capacity from 10,000 to 30,000 bushels per hour; provision for loading a minimum of four ship hatches simultaneously; installation of remote-control power-driven winches for operation of the shiploading spouts; an up to date communication and interlocking conveyor control system; and adequate power outlets for any arrangement of new grain-trimming machines. The modernization of the Grand Junction grain facilities in East Boston was completed by December, 1951, and the Hoosac Pier in Charlestown in April, 1951. The shiploading time of grain cargo has been reduced to less than one-half that required before.

DEVELOPMENT PROGRESS

1. Hoosac Cargo and Grain Terminal in the Charlestown District, the first step in the Master Plan, was completed on August 7, 1950, and immediately placed in operation. This large three-berth cargo terminal took almost three years to construct at a cost, including the acquisition of the site and grain handling facilities, of approximately five million dollars. The Hoosac Terminal becomes the first of the large comprehensive covered type of cargo piers in the world today. This terminal replaces the former Hoosac Piers known as Nos. 40, 41, 42, 43 and 44. Not only is the cargo handling capacity greater than the former facilities, but the pier has proven to be much more efficient, and with lower security, administration and maintenance costs (Figs. 2 and 3).

This terminal has a skew-type finger pier about 550 feet long by 515 feet wide, having a fireproof sub-structure, consisting of steel sheet pile bulkhead enclosure with a concrete relieving platform supported on timber piles, a fire-resistant shed, which covers an area of approximately four and one-half acres; a structural steel frame, bituminous concrete floor on earth fill, insulated flat galvanized steel roof deck with a built-up tar and gravel roof covering, and corrugated cement asbestos exterior walls; an adjacent battery-charging building; the supporting 1,000,000-bushel export grain elevator, and an automatic vehicle weighing scale at the entrance of the terminal for expeditious weighing of commodities passing over the pier.

Some of the distinguishing features peculiar to this pier are a vertical lift trackwell bridge, flat skylights, and ship water supply outlets in underground chambers on the wharf aprons. When the trackwell bridge is in use, a blinking red light both at the bridge and front of the building warns trainmen of the obstruction across the tracks within the building.

The grain handling facilities have been modernized by increasing the shiploading capacity to thirty thousand bushels per hour using two conveyor belts with five simultaneous points of tripping grain providing the latest portable equipment for the bagging of grain at the rate of about forty-five tons per hour in the transit shed, motorizing the movement of the ship loading spouts. A vacuum cleaning system was also installed to keep the elevator clean and free from dust, as a precaution

against explosion, and to insure better working conditions. The vacuum cleaning system has outlets on all floors of the elevator to which portable suction cleaning devices may be connected. The dust and dirt are collected on the outside of the building, and provision is made to load this refuse into freight cars for disposal. With the use of the new belt trimming machines, the trimming of grain in the ship hold has been increased from three thousand bushels to almost fifteen thousand per hour.

There is no congestion of trucks that are waiting to load or take on cargo, such as is usually found at other piers. Trucks can be loaded simultaneously at truck docks at the front of the building and in the transit shed, where a two-way traffic pattern can be attained.

The cost of the pier including transit shed, trackwork, outside paving, utility building, grain gallery, utilities, fire protection system and dredging and flood lighting, is about $12.30 per square foot of area.

2. Mystic Pier No. 1 Project, the second step in the Master Plan, was completed in July of this year at a cost of approximately $5,600,000., including the purchase of the site, and replaces Mystic Piers Nos. 46 and 47. It took approximately twenty-two months to complete from commencement of demolition of old structures. The general layout and features of the pier are similar to the Hoosac Pier. It is approximately 900 feet long by 468 feet wide with 25-foot working aprons on the side berths and a 20-foot apron on the outboard berth. The transit shed is a one-story building occupying a floor area of 246,000 square feet. This pier has a berthing capacity of three ships at one time, supported by a transit shed and one open berth for tie-up or bulk cargo operations. The characteristics and features which differ from Hoosac Pier are: the greater column spacing; three tracks in the depressed well in the center of the building; the hydraulically operated trackwell bridge which disappears into the track bed when not in use; two long canopied loading platforms connecting to the transit building, one on each side of the well tracks, and ship water supply outlets on the exterior walls of the building instead of in a chamber below the deck of the working apron. The roof deck is precast lightweight concrete slabs and the skylights are of the gable type. Part of the deck is bituminous concrete on fill and the rest reinforced concrete. (See Chapter 16).

The construction cost of the Mystic Pier is about $9.60 per square foot, which is considerably less than the Hoosac Pier. The decrease in unit cost results from maximum utilization of existing site conditions. The berths of the new pier have been dredged to thirty-five feet at mean low water on the two sides and forty feet at the outboard end.

The sub-structure, which is a wide reinforced concrete apron supported on long steel H bearing piles around three sides of an earth mole, is extremely interesting from both engineering and construction aspects. Because of the existing extremely thick underlying stratum of soft blue clay, the earth mole of the old pier was found to be too sensitive to support the much greater loads required to be imposed by the new struc-

Fig. 7. Aerial photograph of site of the Third Step in the Master Plan - proposed East Boston Pier No. 1.

Fig. 8. Sketch showing proposed East Boston Pier No. 1.

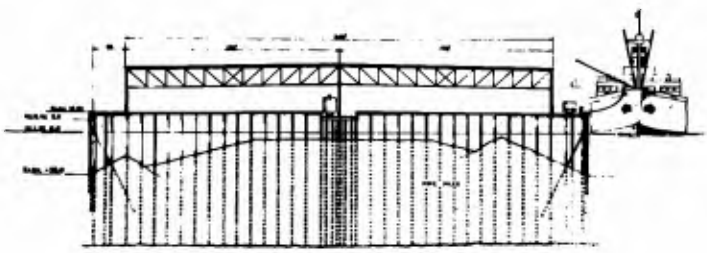

Fig. 9. Typical cross section of East Boston Pier No. 1.

ture. In order to eliminate the effect of differential settlement on the wharf building and create a greater margin of stability of the banks of the earth mole, it was found advisable to drive the piles to rock, a length of about 160 feet. In addition, 15,000 cubic yards of local low-cost lightweight aggregate were placed in raising the floor of the mole area about three feet. This expedient minimized the effect on the foundation soil from the additional depth of fill. In a period of eight months, about 70 miles of timber and steel piles have been driven, indicating the magnitude of the project and speed with which the work was accomplished.

3. Proposed East Boston Pier No. 1 in the East Boston District is the third step in the Master Plan. Besides a new pier facility involving a cost of nine million dollars, the project includes the modernization of the ship-loading grain facilities on Pier No. 4 at a cost of about one-half million dollars (Figs. 7, 8, and 9).

The plans for the project were completed in 1950, at which time contract bids for its construction were taken. However, waterborne commerce requirements at that time would not permit the withdrawal of the two existing piers, No. 1 and No. 2, from port operations. Therefore, because of this condition and the Korean crisis, construction of the pier was postponed until after completion of Step 2, but the grain facilities modernization proceeded without further delay and was completed in December, 1951.

The proposed pier has not been changed in basic layout. It is, briefly, 600 feet long and 390 feet wide, with 25-foot working aprons on the side berths and 20-foot aprons on the outboard end; a transit shed with 20-foot overhead clearance, covering an area of approximately 196,000 square feet; four sets of tracks, one flush with the deck on each side apron, and two depressed in a well at the center of the shed; the side berths to have a piping arrangement for the transfer of bulk liquid cargo from ship to tank cars; ramps for vehicular access into the shed; offices, warm rooms, and truck docks will be provided at the inshore end of the building; more parking and open storage area will be provided; a separate two-story utility building will be built which will house pier cargo-handling equipment, repair shops, a gasoline station, and a large hall for the shaping of longshoremen for the work on the pier. A chain link type of fence will be constructed around the entire property to provide the necessary security for cargo and terminal facilities. The cargo working area of the transit shed will be entirely devoid of interior columns, making it the ultimate in modern and efficient operating layouts. The pier will be entirely supported on steel pipe piles which will have a length exceeding 100 feet.

A contract for dredging, demolition and filling has been awarded. It is expected work will commence by October 31, 1952. The remaining contracts will be awarded within three months. The project is scheduled for completion in 1955.

4. The Castle Island Terminal was constructed by the United States

Army as a port of embarkation during World War II. It comprises an area of approximately 101 acres, and has potentialities for development into an ideal commercial port terminal. It has a marginal wharf which is 4200 feet long, with a controlling depth of 35 feet at mean low water at the berths. There are two existing transit sheds, each 840 feet long, by 180 feet wide, one of which is a more or less permanent structure, but too far removed from the caplog for maximum efficiency and flexibility of operation. The other is a temporary wood structure having a close column spacing which prohibits efficient cargo handling and stowage. There are also many small temporary buildings which constitute a fire hazard and will be removed in the first-stage development of the terminal. The roads of the terminal are practically non-existent, as they were originally of a temporary nature. The tremendous classification yard has a total capacity of approximately 650 rail cars. The entire terminal is lighted for night operations by banks of flood lights in structural steel towers located strategically throughout the terminal.

The first-stage development plan to convert this terminal into a modern, efficient commercial facility consists of the following improvements and alterations which will involve an expenditure of $1,200,000.00:

(1) Replacement of about 1000 untreated timber piles in the wharf which are undergoing a severe marine borer attack.

(2) The demolition of Transit Shed No. 2 and the construction of a new one-story transit shed of fire-resistant materials, approximately 500 feet long by 200 feet wide.

(3) Transit Shed No. 1 will be extended toward the caplog, a distance of about 60 feet, and increased in length about 180 feet toward Shed No. 2, in order to provide a better working apron and adequate covered transit storage area for the handling of two ships at one time. Offices will be constructed at each outboard corner of the building for steamship companies and Customs.

(4) The removal of all unnecessary trackage and the revision of the existing layout for efficient movement in classification of rail cars consistent with low maintenance. The existing holding yard capacity of approximately 650 cars will be cut down to about 80 cars. The shipside tracks along Transit Shed No. 1 will have to be moved closer to the caplog, in order that ship's gear can handle cargo directly from cars to the hold of the ship.

(5) Replacement of the entire underground water supply system, which has been found to be in very bad condition due to electrolytic and chemical action. This work is necessary to provide an adequate source of water supply for fire protection of the terminal, and for servicing the requirements of ships while at the docks.

(6) The existing temporary roads are in very poor condition and require reconstruction on a permanent basis. The entire existing layout of roads will be revised to permit a more desirable traffic pattern, security, and maximum use of the area comprising the terminal.

(7) A single-story storage building will be constructed in the rear of Transit Shed No. 1 for use as a supporting storage facility in connection with waterborne commerce. This shed will be of one story, approximately 120 feet wide by 300 feet long, with ramps for truck entrance into the sheds, and tracks in a depressed area in the rear of the building to permit floor-level loading of freight cars.

After completion of the first-stage development, consideration will have to be given to further development after complete study is made of the commerce requirements and the economic benefits to be derived from the proposed improvements.

The contract plans have been completed and the work is scheduled for commencement about March of 1953.

5. The Proposed Northern Avenue Oceanic Shipping Center is the fifth step in our Master Plan for the modernization of terminal facilities in Boston Harbor. Until World War II, the so-called New York, New Haven & Hartford Railroad Piers Nos. 1 to 4, inclusive, were used for intracoastal trade. During the war and since, these facilities have been abandoned and allowed to deteriorate to such an extent that rehabilitation is impractical. This location is ideal for development as a combined passenger and cargo terminal, since it is situated on the main ship channel with a depth of 40 feet at mean low water; it is sheltered against rough water; the area encompassed would allow an extensive open storage and parking area for cars and trucks; close by is a large railroad classification yard, near the main arteries leading to and from the city and close to the business district of the city and to rail, air, and bus transportation. The development of the area would not disrupt any strongly-rooted businesses or require the taking of sound, usable structures. The existing structures are dilapidated and present a very unsightly appearance.

The project would consist of one combined passenger and general cargo terminal having a two-story building approximately 200 feet wide by 500 feet long; one general cargo terminal having a transit shed 200 feet wide by 500 feet long; another general cargo terminal having a transit shed 200 feet wide by 600 feet long; a three-story industrial center building approximately 200 feet wide by 600 feet long; a vehicular ramp to the second floor of the passenger terminal; roads, open storage, and a parking area.

The industrial center would be a three-story fireproof building having ramps, truck and rail loading platforms, elevators, and such other appurtenances and features as would be necessary for efficient and flexible use of the building for commercial, industrial, and warehousing operations relative to the maritime trade. An international trade center is

planned to be located on the top floor.

The first part of this project which is scheduled for commencement about 1955 is the passenger and general cargo terminal. The passenger service would be exclusively on the upper deck, while the lower deck would be used primarily for the handling of general cargo. The second deck would also include the general offices of the Port of Boston Authority; offices for Customs and steamship lines; a restaurant; waiting rooms; and other conveniences and services pertinent to the passenger trade. There would be a freight elevator for transferring baggage and cargo between the first and second decks. Special attention would be given in the layout to the elimination of the confusion that exists in most passenger terminals because of the intermingling of passengers and visitors and the processing operations of disembarkation and embarkation. The motor vehicular and pedestrian ramp to the passenger terminal, which is to be on the second deck of the proposed new structure, would enable passenger and other operations of the second floor to be carried on independently without interference from the first floor general cargo activities. The large parking area that would be available would permit visitors and passengers to arrive in their private cars. This is an aspect that is sadly lacking at most piers throughout the country.

The economic study made, indicates that the revenue derived from the rental of the actual passenger terminal, the offices, and concessions, the parking, and the general cargo function would be more than adequate to amortize the cost of the project.

In order to permit expansion of the passenger service facilities when future conditions warrant, the foundations of the transit shed adjacent to the passenger terminal have been designed to carry an 80-foot wide passenger gallery with an observation mezzanine on the roof. The gallery would be connected to the main terminal by a 100-foot long second-floor bridge. The maximum length of the passenger terminal with gallery would be 1100 feet, permitting the accommodation of the largest passenger ships.

The plans have been completed for the sub-structure of the project. It is estimated that the total cost of this first step in the overall development will be about 15 million dollars.

The proposed ultimate development will involve an additional 12 million dollars.

6. Modernization of Pier No. 3 in East Boston--The passenger facilities on the second deck of Pier No. 3 of the so-called Grand Junction Docks in East Boston, now owned by the Commonwealth, should be modernized and placed in service again.

This area, since Colonial times, has been one of the principal locations in the Port for the handling of waterborne cargo and passengers. Near the turn of the nineteenth century, the existing Pier No. 3 was con-