New Intermodal Concepts at the Port of Tacoma

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In 1985 the Port of Tacoma completed two new railroad intermodal facilities that embody a whole series of features that are unique in the port industry. Both facilities are located immediately adjacent to major container terminals, which makes possible dramatic savings in time and money required to move containers rapidly from ship to dedicated railroad trains of double-stack cars. The South Intermodal Yard was constructed by the port and is operated by a third-party contractor, and the North Intermodal Yard is owned by two main-line transcontinental railroads. The pavement of the yard is roller-compacted concrete (RCC) and is the first successful project of its kind in the country. Manning of the operation is by ILWU longshoremen under a new agreement that may set trends on the West Coast. Other interesting features are Sea-Land’s four new unit trains (double stack) that operate weekly out of the facility and a unique interchange yard that allows efficient switching to the intermodal yard itself. The North Intermodal Yard was completed by modifying existing rail yards in a construction time of 6 weeks. The use of RCC was a major contributor to fast completion. About 80 percent of all imported container traffic coming into Tacoma is destined for U.S. markets in the Midwest and on the East Coast. This makes the port’s intermodal rail connections a vital link in assuring that container cargo coming in through the port is moved rapidly to its final destination.

In 1985 the Port of Tacoma completed two new railroad intermodal facilities that embody a whole series of features that are unique in the port industry. These projects have attracted considerable attention nationwide because of their special features and they have been major factors in attracting new customers to the port. Both facilities are located immediately adjacent to major container terminals and have produced dramatic savings in time and money by making it possible to move containers rapidly from ship to dedicated railroad trains of double-stacked cars. The facilities are the product of several years of planning and negotiating and are the cornerstones of the rapid expansion that the port is experiencing.

The Port of Tacoma (Figure 1), located in Puget Sound in the state of Washington, is currently one of the fastest developing ports in the nation. The port is blessed with a combination of land still to be developed, good deep water, close proximity to Interstate 5, and a major north-south freeway and is served by two main-line railroads.

In 1981 the port developed its first port-operated intermodal yard. The yard had two tracks adjacent to the gate to the Terminal 4 facility that is a port-operated terminal serving various container lines. The two tracks had a total capacity of 21 standard 53’-long trailers (privately owned by Trailer Train) container-handling rail cars. The capability that this provided for fast transit of containers from shipboard to eastbound trains was dramatic and demonstrated the desirability of a well-run, efficient intermodal yard in close proximity to a container terminal. When, in 1983, Sea-Land, Inc., made the decision to relocate their northwest terminal from Seattle to Tacoma, the capability of providing a full intermodal yard immediately adjacent to their terminal area was one of the major factors in their site selection process. This began a series of events that led to construction in 1985 of the South and North Intermodal Yards.

**SOUTH INTERMODAL YARD**

The new South Intermodal Yard is located immediately adjacent to the new Sea-Land terminal, which is operated by their subsidiary operating company Tacoma Terminals, Inc. (TTI). Eventually the TTI terminal will be expanded further and will serve other shippers in addition to Sea-Land so the potential for growth in the volume of containers through the intermodal facility is both real and substantial. This intermodal facility will also handle an increasing volume of domestic (locally originated) trailer-on-flatcar (TOFC) and container-on-flatcar (COCF) traffic. The aerial photograph (Figure 2) looking out to Commencement Bay shows the close relationship of the South Intermodal Yard, the TTI cranes, and the marine yard.

This yard includes some notable "firsts":

- Constructed by the port and operated by a third-party contractor, it is served by and available to two main-line transcontinental railroads.
- The pavement of the yard is roller-compacted concrete; this was the first successful project of its kind in the United States.
- Manning of the operation is by International Longshoremen's and Warehousemen's Union (ILWU) longshoremen under a special agreement that could set trends on the West Coast.

Other interesting features of the South Yard are Sea-Land's four new unit trains (double stack) that operate weekly out of the facility and a unique interchange yard that allows efficient switching to the intermodal yard itself.

A commitment for the port to construct a port-operated intermodal yard adjacent to the new Sea-Land terminal was incorporated in the original agreement with that company. The construction of the new $30 million terminal for Sea-Land's subsidiary, Tacoma Terminals, Inc., was begun in mid-May with completion scheduled for May 1, 1985. Soon after that time, negotiations began on the final selection of the property on which to locate the yard, but a series
selecting a buildable site for this facility a long and sometimes tedious process.

One of the problems that has arisen is that parts of the Port of Tacoma land area are the subject of a claim by the Puyallup Indians to underlying rights to title. A substantial piece of property immediately adjacent to the gates to the Tacoma terminals facility was and is owned by Union Pacific Railroad and was an ideal site to build a facility. The Indian claims were the cause of some serious problems, however, in completing negotiations for that property. Ultimately, in mid-1984, it was determined that an agreement to develop on the Union Pacific property could not be consummated in time to meet the completion date of the Tacoma terminals project and the port then decided on a location on the east side of Milwaukee Avenue. This site is also in close proximity to the new terminal. A lease was signed with the City of Tacoma Municipal Belt Line for long-term rights to build and operate a facility on this 17-acre site.

To provide the site for the intermodal yard itself it was necessary to build replacement trackage for the Municipal Belt Line before removing any of the existing classification yard trackage that was located on this site. By the time the necessary agreements were in place and that work was done, it was the end of 1984. That meant that only 5 months, many of them winter months, remained to complete the actual development of the yard in time for the arrival of the first Sea-Land ship on the first day of May.

In late 1984 the port proceeded with requests for proposals from established intermodal yard operators from the private sector to submit proposals to operate the yard that was to be constructed by the port. This operator would be responsible for the total operation of the facility including furnishing the necessary lift equipment to load and unload the trains, which even at that time were foreseen to be
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FIGURE 2 South Intermodal Yard.

new double-stack trains as well as conventional TTX trains. The operator was also to provide for all interchange of scheduling and paper work between Sea-Land and other shipping lines and the two railroads. Payment is on a "per lift" basis. The two railroads serving the port are the Burlington Northern and the Union Pacific.

The port received proposals from seven operating firms and eventually selected the firm of Stevedoring Services of America, Inc., and Intermodal Management Services (SSA/IMS) to become operator under contract with the port.

Another interesting aspect of this development was that the 17 acres that were available for the construction of the site were not enough to provide for the necessary parking of chassis units, nor did they provide enough tracks to provide for good exchange trackage for the switching of trains. It was therefore necessary that additional acreage be provided nearby to provide for chassis parking not only for the Sea-Land operation but also for the future domestic traffic that is to be developed for this yard. Also, an intermediate interchange yard between the intermodal yard and the major main-line railroads
had to be constructed. An 11-acre site that existed upstream on the Union Pacific Railroad system was selected and made available through negotiations with the railroad. It was necessary in all these negotiations to provide that both of the main-line railroads could have access to the facility during the years to come. This was a critical point that caused problems during negotiations but had to be adhered to in order to allow total flexibility in the development of the port's intermodal rail services.

In the early stages of negotiations to determine the location of the rail facility for the South Intermodal Yard, the port realized that it was necessary to have the advantage of technical people who were familiar with the problems that were sure to be encountered in the development of a new rail yard. Five major U.S. consulting firms were interviewed in order to select a company that could provide good analyses and background information for use in the development of the concept through negotiations with the railroads and with the shipping companies. The firm of Sverdrup & Parcel and Associates, Inc., was retained to fill this role and Ron Zimmer of that company was selected as the lead consulting engineer for the project. Zimmer spent more than 2 months on site; a good part of this time was spent assisting the port in selecting the best combination of rail trackage and yard equipment for this facility. One of his most valuable contributions was in the analysis of not only the needs for the yard itself but of the total physical situation that included the existing yards of both the Burlington Northern and the Union Pacific railroads and how they interfaced with the port area. An understanding of the physical limitations and the problems faced by the railroads was extremely valuable in sizing and configuring the intermodal yard. This analysis identified the need for the interchange yard and its usefulness in interchanging with the railroads. The Union Pacific was also adamant that upstream switching track capacity was a necessity for a yard of this type, and the validity of that point is now well appreciated by the port and its customers.

During the design of the yard, a new type of pavement was considered: roller-compacted concrete (RCC). This type of paving had been used primarily in the construction of large sewer drains and embankments. The port realized that this type of pavement could be used in the yard. This was the first successful application of RCC as yard pavement in this country and it made possible to construct the yard in a short period of time during the late winter months that are often inclement in the Puget Sound area. The details of this type of construction are the subject of the paper by John L. Larson and will not be included here. It is interesting to note, however, that several different paving systems were bid and the savings realized by using RCC amounted to approximately $500,000 compared with conventional poured-in-place concrete paving.

The cost of the total South Intermodal Yard complex was approximately $6 million. This included the rebuilding of rail for the Municipal Belt Line; the construction of the main intermodal yard, which cost approximately $3 million; the construction of the new 8-acre chassis storage site with an administrative office facility; and the 11-acre interchange yard.

The South Intermodal Yard was put into service on May 12, 1985, with the arrival of the first Sea-Land ship and it has been operating successfully ever since (Figure 3). The operator has its own locomotive on site and has the capability of exchanging strings of rail cars back and forth to the interchange yard south of Lincoln Avenue. This gives a great deal of flexibility to the yard itself.

Sea-Land, at the inception of this service, purchased four new mile-long unit trains of double-stack cars to provide full service from Tacoma to the Midwest and the East Coast. There are two unit trains that proceed on a weekly cycle from Tacoma to Chicago and return. In addition, there are two other trains, one of which goes to New Jersey while the other is returning from the East Coast to Tacoma each week. The cars are of the bulkhead type of configuration.

The layout of the South Intermodal Yard consists of four parallel tracks approximately 2,700 ft long. There is a track along the outer edge of the yard on each side and two tracks at 14-ft centers down the middle of the yard (Figure 4). This allows a 174-ft clear space between the tracks, which was designed to permit side-lifted equipment to operate. The track equipment used by the yard operator includes two new 90,000-lb units and one unit with 82,000-lb capacity (Figure 5). It was thought during the layout of this yard that total flexibility must be provided so that, in the future, yard cranes could be operated over the center tracks to good advantage while maintaining the capability and the flexibility that the front-loading units provide.

**NORTH INTERMODAL YARD**

During the time the South Intermodal Yard was under construction interest in developing other container facilities at the port was rising. The port and one of its major tenants, International Transportation Services, Inc., or "Husky" as their operation in Tacoma is called, began serious negotiations with the Maersk line. Discussions began in earnest about the ability of the port to provide a second intermodal yard to be located adjacent to that facility in an extremely short time. This yard would be an extension of the existing 21-car yard and would be constructed in an area formerly occupied by a rail classification yard used primarily by a nearby grain elevator facility. It had also become apparent that the grain elevator was to be taken out of service in the near future and so plans went forward to enlarge this facility in time to meet the needs of Maersk. They were scheduled to arrive with their first ship on June 1, 1985. This decision was made at a time that allowed only 60 days for actual bidding and construction of that extended facility. Because the concept of RCC had already been developed, it was decided to go immediately with that paving system. This was done with excellent results. The construction was completed 1 day before the arrival of the first Maersk vessel (Figure 6). The yard was laid out to allow operation with various types of intermodal lifting equipment (Figure 7).

The North Intermodal Yard is unique in several ways. One of the most interesting facets of this yard is that it is immediately adjacent to the gate of two major container-handling terminals: Terminal 7D, which is the home of Husky Stevedoring and the Maersk operation, and Terminal 4, which has operated for 17 years as a major public container-handling terminal. The port has operated Terminal 4 with a system of straddle carriers that has proven to be efficient and flexible in a multiuser terminal. At the time that the original 21-car yard was developed the straddle carrier operation was extended into that yard, and straddle carriers have worked well in loading and unloading railroad cars. With the expansion to a full intermodal rail yard operation with unit trains the straddle carrier concept has been continued and is proving to be highly satisfactory. The use of straddle carriers as a viable equipment system for a major container terminal was the subject of a study recently completed by the Container Transport Technology consulting firm of New Jersey. The purpose of the study was to determine whether the port should continue its development of Terminal...
FIGURE 3  Sea-Land sails into Tacoma.

FIGURE 4  Schematic of the South Intermodal Yard.
4 using straddle carriers as well as whether this was an efficient means of operating a major intermodal yard. The conclusion is that, given the unique combination of proximity, layout, and skilled drivers, it is an excellent application.

The photograph in Figure 8 shows a straddle carrier at work in this increasingly busy yard. An expansion of the yard is already scheduled for 1986.

Ultimately, the North Intermodal Yard will serve three major container yards because the new Terminal 3 facility is already under development on the Blair Waterway. The gates of all these yards will open directly into the intermodal yard—a situation unparalleled anywhere else in the country at this time. Figure 9 shows the proximity of the intermodal gate to the Husky terminal.

It must be mentioned that one of the major reasons for Tacoma's ability to attract new shippers to its area is the excellent working relationship with the
longshore ILWU labor force in Tacoma. The willingness of Local 23 in Tacoma to work with the port in developing relationships with new tenants has been a major factor in attracting these shipping lines and cannot be overemphasized. The well-trained operators who are supplied by the local for the straddle carrier operation in the intermodal yard make a real contribution to the success of that operation.

The North Intermodal Yard encompasses 8.5 acres in its present configuration and has a capacity of 67 standard TTX cars or 23 double-stacked cars. At present the rail cars dedicated to the Maersk line train are furnished by the Union Pacific Railroad and are of the nonbulkhead configuration. Switching of rail cars to this facility is handled by the Municipal Belt Line.

CONCLUSION

Because of adequate available land adjacent to deep water terminals and service by two major railroads, the Port of Tacoma has been able to develop intermodal facilities at a location that allows the transfer of containers from ship to rail car to be a highly efficient operation. The long dray by truck is reduced to a transfer operation measured in hundreds of feet and one truck tractor unit or straddle carrier can make multiple cycles per hour. The benefits are high in the highly competitive arena of containerized transportation—a business for which time and cost are critical.