PREFERRED ALTERNATIVE REPORT

Detroit Intermodal Freight Terminal (DIFT) Wayne and Oakland Counties



Prepared by Michigan Department of Transportation

In Cooperation with

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION



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1.0 Executive Summary

Executive Summary

Introduction

1.0

This report outlines the engineering requirements for the creation of the Preferred Alternative selected for the proposed Detroit Intermodal Freight Terminal (DIFT) at the Livernois-Junction Yard. This work was undertaken by Benesch for The Corradino Group of Michigan, Inc. (Corradino) as part of the Environmental Impact Statement involving the evaluation of the type, size and location of intermodal facilities.

During the project, a number of alternatives were evaluated and assessed with input from the Michigan Department of Transportation (MDOT), public meetings, discussions with Corradino, and the railroads. There are four Class 1 railroads involved: CSX, Norfolk Southern (NS), Canadian National (CN), and Canadian Pacific Railway (CP). In addition, Conrail Joint Assets (jointly owned by CSX and NS) and Amtrak operate on the railroads around the DIFT project area.

The type of intermodal operations for each of these organizations revolves primarily around container movements. However, NS operates both intermodal container trains made up of container well cars and flats, and Triple Crown services, which are bimodal truck trailers. These trailers are designed to operate as a standard road trailer and a railroad freight car. These services utilize different equipment types and have different requirements for their facilities. Both CSX and CP now operate only container train well cars and flats.

Taking into consideration the factors above, and the routes that the railroads operate radiating from the Greater Detroit Area, engineering assessments to improve freight and transportation opportunities were determined.

Engineering Evaluation

During the project, a number of key issues were identified and evaluated to assess the requirements of a terminal for each of the railroad participants. These issues included:

- Current intermodal traffic and predicted growth;
- Current train operations and predicted growth, including passenger rail operations;
- Type of equipment being used;
- Train lengths and train routing;
- Ability to move trains into and out of a terminal and the surrounding railroad infrastructure;
- Access requirements for trucks from the Interstate system;
- Local roadway impacts;
- Gate and security requirements; and,
- Storage requirements.

Discussions on the requirements and conclusions of these evaluations are presented within the body of the report.

These evaluations led to a number of concepts and modifications thereof. Through the consultation process noted earlier, consolidation at Livernois-Junction Yard was selected as the Preferred Alternative.

Conclusions

The selected site of the Livernois-Junction Yard is owned by Conrail. Only the eastern end of the facility is currently utilized by railroad trains. The rest of the yard is mostly vacant. Conrail, NS and CSX utilize the eastern end for manifest train switching and container trains.

The Preferred Alternative presented within this report addresses the requirements of each of the railroads wishing to utilize the consolidated intermodal facility and the issues associated with getting trains and trucks to and from it.

Included in the consolidated intermodal facility at the Livernois-Junction Yard are terminals for: 1) NS Triple Crown trains; 2) NS, CP and CSX container trains; and, 3) Conrail manifest trains. In addition, improvements to the yard and the signalized junctions between rail corridors (interlockings) have been evaluated and improvements to remove and/or reduce conflicts are presented. These not only improve the operational flexibility of the Livernois-Junction Yard, but of Amtrak and CN trains which pass along the mainline tracks that border the Livernois-Junction Yard.



Livernois Junction Yard Looking East



Livernois Junction Yard Looking North



Livernois Junction Yard Looking West

1.0 Executive Summary

2.0 Introduction

Introduction

2.0

The Greater Detroit Area is one of the most dynamic intermodal markets in North America for a number of reasons, including:

- Because of the auto industry, Detroit leads the nation in its use of "RoadRailer" technology, i.e., a truck trailer becomes a rail car by placing rail wheels underneath.
- One-third of Detroit's intermodal traffic is trucked to and from other cities. This means it travels by rail to Chicago, Toledo, or Windsor for example, and then is trucked to Detroit. Better intermodal service could result in a diversion of some of this intermodal activity to Detroit because of reduced transportation costs. This would eliminate some trucks from Michigan's roads, which could reduce congestion and help ease the need for added capacity on the roadway network.
- The proposed improvement of the Detroit-Windsor rail tunnel and the construction of a new Port Huron-Sarnia rail tunnel enhance intermodal access to/from the Detroit area.

2.1 Project Description

There is a lack of sufficient intermodal capacity in the Greater Detroit Area. The Detroit Intermodal Freight Terminal Project (DIFT) looks to increase intermodal capacity by enhancing intermodal operations of the four Class I railroads operating in the State of Michigan. A Class I railroad does at least \$319 million (2007 dollars) of business annually. The four Class I railroads which operate in Michigan are CSX, Norfolk Southern, Canadian National, and Canadian Pacific.

Presently, there are five primary intermodal terminals located within the Greater Detroit Area:

- Canadian National Moterm Yard
- Canadian Pacific Oak Yard
- Livernois-Junction Yard (Both CSX & Norfolk Southern operate an intermodal facility at Livernois-Junction Yard)
- Norfolk Southern Delray Yard
- Norfolk Southern Oakwood Yard (Triple Crown)

The intermodal terminal area located behind the Michigan Central Depot and operated by Canadian Pacific is no longer in business.

Mazda has an intermodal terminal at Flat Rock in Wayne County, but it is dedicated exclusively to Mazda and not available for commercial use (Exhibit 2.1). The CN Moterm terminal in Ferndale and the private use facility operated by CN for Mazda in Flat Rock, MI. will remain.



Intermodal Train Transporting Single & Double Stack Containers



Exhibit 2.1 Railroad Terminal Location Map

2.2 Purpose of the Project

The purpose of the Detroit Intermodal Freight Terminal Project (DIFT) is to support the economic competitiveness of southeastern Michigan and the state by improving freight transportation opportunities and efficiencies for business and industry. The goal is that Southeast Michigan has a facility, or facilities, with sufficient capacity to provide for existing and future intermodal demand.

It is the role of government (in this case MDOT) to ensure that the businesses and industries involved in the freight transportation segment of the economy continue to have access to the market (i.e., customers, workers, shippers and the like). This, in turn, supports jobs and ensures maintenance of a high quality of life for the region's citizens. MDOT's role is served by engaging in the DIFT project to improve the connectivity between modes through provision of a better interface between the public road system and the private rail system; and, to facilitate the development of significant capacity at the region's intermodal facilities.

In addition, the purpose of the Detroit Intermodal Freight Terminal Project (DIFT) is to support America's national defense. National defense mobilization and deployment is increasingly reliant on intermodal connectors to project U.S. military power abroad to meet the challenges of regional conflicts. Detroit is one of the top intermodal markets in the nation. Even more intermodal traffic could flow through Detroit, if capacity were provided. And, the Detroit market has characteristics that could cause intermodal traffic to grow faster than the national average including its strategic position on the Canadian border.

It is also important to respect the quality of life of the residents in neighborhoods where terminals exist and may expand. To that end, the Michigan Department of Transportation (MDOT) studied the intermodal freight situation over a number of years. MDOT decided to address this issue through preparation of an Environmental Impact Statement (EIS) to evaluate alternatives to improve these intermodal freight movements and determine their related impacts on the residents of the State of Michigan, particularly Southwest Detroit and East Dearborn.

2.0 Introduction

3.0 Scope of Services

As previously discussed, the purpose of the project is to support the economic competitiveness of southeastern Michigan and support national defense by improving the freight transportation system. In order to make such an improvement, the scope of services for the study of rail alternatives for the DIFT project is divided into three parts:

- 1. Rail Improvements "Inside the Terminal Fence"
- 2. Rail Improvements "Outside the Terminal Fence"
- 3. Road Improvements "Outside the Terminal Fence"

Rail Improvements "Inside the Terminal Fence" 3.1

Rail improvements "Inside the Terminal Fence" are based on a field review and evaluation of the rail facilities and infrastructure at each of the existing terminal sites to determine the feasibility of meeting the projected 2030 intermodal traffic demand.

A conceptual layout of each terminal was developed, including the following items:

- Working Track
- Storage Track
- Parking
- Storage Areas
- Gate Locations
- Lighting
- Signals & Switches
- Grade Separation, as required
- Horizontal & Vertical Alignments for any New or Relocated Roadways
- Drainage Analysis and Recommendations for Terminal & Roadways
- **Cost Estimates**
- Improvements to any Existing Bridges affected by the ٠ Yard or Roadway Improvements

This work involved coordination with the participating railroads and MDOT to ensure all design criteria are met.

3.2 Rail Improvements "Outside the Terminal Fence"

Rail improvements "Outside the Terminal Fence" involve upgrading train operations for increased rail line capacity to support and expedite train movements in the future. These capacity improvements were developed with input from all the rail carriers.

All the interlockings in the Greater Detroit Area have been reviewed and modified based on the following criteria.

- Train Speeds All mainline switches along high movement routes are being proposed as either #15 or #20 switches. This will allow trains to operate at 25 mph and 40 mph, respectively. Mainline curvature will not exceed three degrees to permit higher speeds.
- Length of Trains Terminal tracks will be designed to accommodate 9,000-foot trains, where possible, to allow trains to clear the mainline track. In areas where this is not possible, switching track with segment lengths to allow 9,000-foot trains are proposed.
- Route Conflicts Route rationalization was addressed to minimize train conflicts.
- Signaling All signaling will be designed to allow a minimum of 25 mph. All junctions need to have simultaneous movements programmed to create maximum flexibility.
- Switching Operations At all locations where switching is being planned, the design will provide sufficient track so that the work can be completed without causing conflict to the mainline route.

3.3

Roadway improvements "Outside the Terminal Fence" involved analysis of horizontal and vertical alignments, grades, structure sizes and locations, structure approaches, roadway cross sections, vertical and horizontal clearances, and traffic maintenance options. Also included in the analysis of roadway improvements are relationships to utilities, right-of-way requirements, environmental impacts, and project phasing. Any engineering of I-94 improvements that may directly affect the project area will need to be coordinated with the DIFT project to ensure compatibility.

The resulting roadway improvements "Outside the Terminal Fence" include:

Road Improvements "Outside the Terminal Fence"

• A perimeter road extending from Wyoming Avenue to Livernois Avenue

• Grade separations from the rail yard at Central Avenue•

Closing of Lonyo Avenue

• I-94/Livernois Avenue Interchange improvements

• Improvements at the intersection of Dix Avenue and Central Avenue

• Modifications of the existing Livernois Avenue gate to require left-in and left-out movements only

4.1 **Detroit Area Railroad Operations**

As mentioned previously, the Greater Detroit Area is among the largest intermodal centers in the United States. Based on recent information gathered for the DIFT project, the four Class I Railroads which provide intermodal service to the Greater Detroit Area will face capacity deficiencies at the existing intermodal terminals currently in service.

The primary intermodal terminals in the Greater Detroit Area are (Exhibit 4.1):

- Canadian National Moterm Yard
- Canadian Pacific Expressway Yard (now closed) ٠
- Canadian Pacific Oak Yard ٠
- Livernois-Junction Yard (both CSX & Norfolk Southern operate an intermodal facility at Livernois-Junction Yard)
- Norfolk Southern Delray Yard
- Norfolk Southern Oakwood Yard

primary intermodal facilities. These yards include:

- Conrail Lincoln Yard
- Conrail North Yard
- Conrail River Rouge Yard
- CSX Rougemere Yard

RAILROAD INTERMODAL TERMINALS

- 1. Canadian National Moterm Yard
- 2. Canadian Pacific Expressway Yard (intermodal operations closed)
- 3. Canadian Pacific Oak Yard
- 4. Livernois-Junction Yard
- 5. Norfolk Southern Delray Yard
- 6. Norfolk Southern Oakwood Yard

RAILROAD SUPPORT YARDS

- 7. Conrail Lincoln Yard
- 8. Conrail North Yard
- 9. Conrail River Rouge Yard
- 10. CSX Rougemere Yard



Exhibit 4.1 Primary Intermodal Terminals & Support Yards

In addition, there are four additional yards which support the



Exhibit 4.2 Existing CN Moterm Yard

4.2 Existing Primary Intermodal Yards

4.2.1 Canadian National Moterm Yard

The Canadian National (CN) Moterm Yard is located in the City of Ferndale within Oakland County. The property has been zoned industrial since 1929 when the rail yard was developed by the Grand Trunk Western (GTW) Railroad. CN has utilized the Moterm Yard as an intermodal facility since its acquisition of the GTW in the 1990s.

The existing Moterm Terminal is approximately 29 acres. It is bordered on the south by 8-Mile Road, the north by 9-Mile Road, the east by an industrial/commercial area, and the west by a large residential area. The Michigan State Fairgrounds is directly south of the rail yard, on the south side of 8-Mile Road. Michigan has held its State Fair at this location since 1905.

The Moterm Yard has nearby access to I-75 and I-696. The primary access to I-75 that serves the terminal is at 8-Mile Road (M-102). The primary access to I-696 is at Woodward Avenue (M-1).

Truck access to the Moterm Terminal is controlled by one gate off Chesterfield Street in the southwest corner of the property. Trucks must access this gate by using Chesterfield Street from 8-Mile Road and make their way through a portion of the residential area using local streets.

Rail access to the yard is provided by CN's Detroit-Pontiac mainline tracks. Amtrak also uses the CN mainline tracks for passenger service between Detroit and Pontiac.



4.2.2 Canadian Pacific Expressway Yard

The Canadian Pacific (CP) Expressway Yard was in operation for four years, closing in 2004. It is located in the City of Detroit adjacent to the old Michigan Central Depot in the Corktown area. The yard is located just south of Michigan Avenue (M-12) between 20th and 15th Streets. The property footprint is approximately 18 acres, all of which CP leased from Amtrak and the Moroun Group. The properties immediately surrounding the yard are a mix of residential and commercial parcels.

CP operated its Detroit leg of its Expressway service from this facility. The Expressway service was different from conventional intermodal in that it was marketed to the trucker rather than the shipper. The concept for the Expressway service was

Exhibit 4.3 Existing Canadian Pacific Expressway Yard

that for long-haul truck movements, it is more efficient for the truckers to ship their trailers by train for the majority of the trip and pick them up at the other end, than it would be to drive the truck the entire distance. Detroit was the west end for the CP Expressway service which was operated between Toronto and Detroit. Again, that business model was not productive and the terminal was closed in 2004.

Truck access to and from the facility was restricted to 15th Street at the intersection of Marantette Street. An internal access road allowed traffic to get from 15th Street to the terminal gate located in the middle of the yard at approximately 17th Street. All paperwork and inspections necessary for vehicle check-in were performed prior to the trailer entering the facility. Once completed, the driver was instructed to park the trailer in a designated space where it would wait to be loaded on the train.

CP accessed the yard by rail via its own mainline tracks. The tunnel to Canada is approximately ¼ mile east of the yard and allowed CP to move trains between Windsor and Detroit. CP ownership of the mainline ends and Conrail ownership begins at Conrail milepost 2.02, which is at approximately 24th Street.



4.2.3 Canadian Pacific Oak Yard

The Canadian Pacific (CP) Oak Yard is located in the City of Detroit within the Grandmont area at the intersection of I-96 and M-39 (Southfield Freeway). Railroad operations have occupied the current location since 1871. The yard is owned by CSX but a portion of it is leased and operated by CP.

The CP Oak Yard is approximately 24 acres. CP leases 17.5 acres for the terminal facility itself plus an additional adjacent 6.5 acres for empty container storage. CP's contractor/operator also leases additional land north of the yard for container storage. The yard is bordered by I-96 on the west and south, M-39 on east, and a business complex and Glendale Street to the north.

Exhibit 4.4 Existing Canadian Pacific Oak Yard

Access to CP Oak Yard is accomplished by using the Southfield Freeway (M-39), which provides connections to both the Lodge Freeway (M-10) and I-96.

The entrance to the terminal is located off the southbound frontage road to the Southfield Freeway in the southeast corner of the terminal. The inbound gate and processing center is located in the southwest corner of the terminal. An internal roadway to the terminal gate allows trucks access to the yard. There are two exits from the terminal: one utilizing Artesian Avenue, and one through a private gate on the north side of the business complex onto the Southfield Freeway southbound frontage road. From Artesian Avenue, trucks have two routes they can take: either the Southfield Freeway, or I-96. The route from the private gate located on the north side of the business complex allows trucks to exit only to the Southfield Freeway.

CP trains access the facility via the CSX Detroit mainline. CP does not own any mainline track in Detroit except for a ½ mile segment at the end of the tunnel from Canada.



4.2.4 Livernois-Junction Yard

The Livernois-Junction Yard is located in Wayne County in both the City of Detroit and City of Dearborn. This is the largest of four yards owned and operated by Conrail in the Greater Detroit Area. The Livernois-Junction Yard can be accessed from I-94 on the north and I-75 on the south. The existing property footprint is approximately 300 acres and is bounded by John Kronk Street to the north, Dix Avenue to the south, Livernois Avenue to the east, and Wyoming Avenue to the west.

Exhibit 4.5 Existing Livernois-Junction Yard

Conrail presently occupies about a third of the total yard for its manifest operations. Besides their own train operations, Conrail also switches both the CSX and the NS intermodal terminals. Conrail's Detroit administrative offices and personnel are located in Conrail's offices on the site.

CSX and NS occupy the remaining two-thirds of Livernois-Junction Yard with their Detroit intermodal terminals. Livernois-Junction Yard is the only intermodal terminal CSX operates in Detroit. NS operates here as well as at the Delray Yard and the Oakwood Yard. All three carriers operating at the Livernois-Junction Yard have their own roadway access. Conrail and NS access is via Livernois Avenue. CSX access is via a gate at Dix Avenue. NS and CSX have, within the last few years, made improvements to their existing facilities to increase capacity.

Rail access to Livernois-Junction Yard can be accomplished in three ways: Conrail's east-west Michigan Line; Conrail's Detroit Line; and, via the NS mainline. Currently, Amtrak uses the Michigan Line for its passenger service between Chicago and Detroit.

4.3

Existing Support Yards

There are a number of other existing railroad yards in the Wayne County area (refer to Exhibit 4.1) being operated today. These provide various facilities and functions for shippers in the Greater Detroit Area, such as auto rack loading, RoadRailer services, manifest freight shipping and receiving, intermodal service, and unit train handling.

Due to the existing demand for services, some of these facilities are working over capacity. As a result, they provide no capacity for predicted 2030 traffic growth due to their physical constraints. A good example of this is the NS Triple Crown Yard in Oakwood Yard as described below.

Conrail Lincoln Yard 4.3.1

Conrail's Lincoln Yard is located west of I-75, just south of the Rouge River. Greenfield Road and Outer Drive make up the western and eastern limits of the yard, respectively. Roadway access to the facility is through a private driveway off Rialto Street. Rail access to the yard is via the Conrail Junction Yard Secondary mainline track.

The facility is presently being used for Conrail's Flexi-Flo operations. The existing layout of the facility contains eight tracks with none of the tracks exceeding 3,000 feet in length. This facility is severely restricted from any future expansion.



Conrail's River Rouge Yard is located within Wayne County just outside of the Detroit city limits in Dearborn. I-75 is directly north of the yard. The yard entrance is located off Visger Street. The yard contains approximately 23-yard tracks that range between 1,000 and 3,500 feet in length.

The River Rouge Yard is currently utilized by Conrail for manifest traffic serving Zug Island area industries.

4.3.3 **Conrail North Yard**

North Yard is Conrail's northernmost yard in Wayne County. Rail access to the yard is via the Sterling Secondary mainline track. The yard is located about a mile north of the interchange between I-94 and I-75 and is about 10 miles north of Livernois-Junction Yard.

4.3.4

CSX's Rougemere Yard is located within Wayne County within the City of Dearborn. Rougemere Yard is situated across from the Ford Motor Company's River Rouge Plant. I-94 is approximately one mile north of the yard and I-75 is approximately one mile south. Wyoming Avenue runs parallel to the tracks along the east side of the yard and provides roadway access to it.

Rougemere is the central yard for CSX train operations in the Greater Detroit Area. Rougemere is where all CSX trains are created or broken apart.

Currently the train building and passage of mainline trains has the yard operating at capacity. The new CP Lou connection currently relieves some CP mainline traffic from passing through the yard.



Exhibit 4.6 Existing Conrail Lincoln Yard - Looking West



Exhibit 4.7 Existing Conrail River Rouge Yard - Looking North



CSX Rougemere Yard



Exhibit 4.8 Existing CSX Rougemere Yard - Looking South



4.3.5 Norfolk Southern Oakwood Yard

Exhibit 4.9 Norfolk Southern Oakwood Yard

Norfolk Southern's Oakwood Yard is located immediately adjacent to the Conrail Lincoln Yard just west of I-75. NS provides both manifest freight and Norfolk Southern Triple Crown services at the Oakwood Yard.

Oakwood Yard is essentially three smaller, separate yards: NS Triple Crown Yard; NS eastbound yard; and, a manifest yard. Oakwood Yard serves as the hub for all NS train operations in the Greater Detroit Area. All NS trains in Detroit either originate at or arrive and are broken up at Oakwood Yard. The current Triple Crown operation is restricted in capacity with no land available for expansion. Site storage is so restricted that trailers are moved to and from off-site storage locations.



Exhibit 4.10 Existing Norfolk Southern Delray Yard

4.3.6 Norfolk Southern Delray Yard

Norfolk Southern's Delray Yard is located in Wayne County within the City of Detroit. Delray Yard is located just south of Fort Street in close proximity to the I-75/Dearborn Avenue interchange.

Road access to the yard is directly off Westend Street. I-75 is located adjacent to the facility, while I-94 is located just to the north.

Rail access to the facility is via the Old Union Belt Mainline, now operated by Conrail and NS.



4.4 Existing Interlockings

The mainlines of the major railroads serving the Greater Detroit Area are intertwined throughout the area. Where these railroads intersect at grade, a signaled interlocking is required. These are the equivalent of stoplights at a highway intersection. The function of these interlockings is to restrict speed of movement through an area due to trackwork, signal spacing and stopping distance requirements.

Existing Railroad Interlockings

The Southwest Detroit Area is a very congested area for train operations due to the number and nature of these interlockings and their close proximity to each other.

The existing interlockings within the Greater Detroit Area are illustrated on Exhibit 4-11. Improvements to some of these interlockings are proposed "Improvements Outside the Terminal Fence" and discussed later in this report.

RAILROAD INTERLOCKINGS

- 1. Bay City Jct.
- 2. Beaubien
- 3. CN Coolidge
- 4. CP Lou
- 5. CP Mill
- 6. CP YD
- 7. Delray
- 8. Dix & Waterman
- 9. Ecorse Jct. & NS Bridge



- 10 Milwaukee Jct.
- 11. Oakwood Jct.
- 12. P Company
- 13. Schaefer
- 14. Trenton
- 15. Victoria
- 16. Vinewood
- 17 Townline
- 18. West Detroit

5.0 Existing **Rail Traffic**

5.1 Introduction

Rail traffic in the Greater Detroit area is made up of three types of service:

- Intermodal
- Manifest
- Passenger ٠

Based on the results from the DIFT Commodity Flow Model, and several studies of future passenger service options, train movements have been developed as discussed below.

Intermodal Traffic 5.2

The railroads run 14 intermodal trains on an average day in and out of Detroit. These services are essentially one train in and one out of Detroit for each operation except NS Triple Crown, which operates to two destinations and, therefore, has two trains in and out daily. Below is a summary of the existing intermodal traffic:

Railroad	2002 Annual Lifts	Number of Trains
CSX	60,000	2
NS Intermodal	55,000	2
NS Triple Crown	83,000	4
CP Intermodal	77,000	2
CP Expressway	25,000	*2
CN	48,000	2
	348,000	14

Table 5.1 Current Intermodal Traffic

*CP Expressway service was suspended to Detroit in June 2004.

5.3 Manifest Traffic

Manifest trains are made up of a mixture of rail cars (box cars, tank cars, piggyback cars, etc.). Manifest trains operated by the railroads in the Greater Detroit Area are listed below. These train numbers include both the manifest train arrival and departure, and the associated manifest switching moves to distribute cars to receivers and originators of traffic.

Railroad	Number of Trains
CN	13
СР	18
CSX	23
NS	23
Conrail	15
	92

5.4



Exhibit 5.1 Existing Amtrak Route and Station Location

Passenger Traffic

Amtrak operates six trains daily, (the Lake Cities, the Twilight Limited, and the Wolverine), between Chicago, IL and Pontiac, MI. Exceptions have occurred when budget problems have caused train service to be temporarily reduced to two round trips. These trains pass through Detroit via the Conrail mainline that traverse the Milwaukee Junction, West Detroit, and Townline Interlockings and the existing Livernois-Junction Yard. The existing Amtrak train route and passenger station can be seen on Exhibit 5.1.

6.1 Introduction

The intermodal terminal must receive cargo from the carrier, identify the cargo's intended routing, plan the cargo's loading pattern on the railcars, plan the configuration of cars in a train, inspect railcars for suitability for the intended service, perform minor railcar repairs, load or unload the railcars, and prepare loaded railcars for departure.

The design of an intermodal terminal must provide functionality to both rail and trucking operations. The operations of one mode shouldn't interfere with the operations of the other. This requires a number of factors to be considered in the design of a terminal. The key items are discussed below.

Terminal Layout 6.2

Rail service to and within terminals is an area in which good planning and design can have a major impact on overall efficiency. Many facility designs seem to be limited to preparing a sufficient length of track to position the desired number of railcars and then connecting the tracks to an entry-area rail line.

Operations within these layouts are frequently difficult for the line haul railroad and switching railroad. The primary issues that must be dealt with when designing the rail-service aspects of an intermodal terminal are train arrival, internal switching, railcar servicing and repair, load blocking, pre-departure inspections, and train departure.

For railroads, the ideal intermodal terminal would consist of a series of tracks running parallel to the mainline tracks. Each track in the terminal would be long enough to hold one complete train. Additional track length would be provided so that the train could be broken into several segments to accommodate cross truck and equipment traffic. The arriving train would simply be switched from the mainline track onto one of the terminal tracks.

The track spacing of this ideal yard would be determined by the choice of loading equipment and the location of container and chassis parking, if it is provided. Because today's intermodal trains are often 9,000 feet in length, such an ideal terminal is difficult to construct in almost any urban area.

Because the ideal terminal is hard to achieve, thought must be given to each rail movement that will occur in and near the terminal throughout the process of train arrival, internal switching, and train departure. Failure to facilitate the convenient execution of any one of these steps will seriously reduce the terminal's efficiency in processing loads.

6.2.1 Gates

The gate of an intermodal facility has the potential to be the weak link in the chain of operations. Electronic transfer of data on cargo moving toward the intermodal terminal before its arrival permits the operator to plan the position of each load on the trains. Such data transfer facilitates the most favorable positioning of railcars ahead of time. Proper and consistent gate procedures must be controlled to manage inventory as well as damage control. Exhibit 6.1 shows a typical gate layout.

The most important element that should be considered when designing intermodal gates is providing expansion room for additional lanes and gate features as intermodal traffic increases to avoid containers entering the facility from queuing on city streets. In addition, queuing trucks leaving the facility can interrupt yard operations and create unsafe conditions.

Most intermodal yards require the transfer of bill-of-lading information, driver's identification, and inspection of the container and chassis for damages. Procedural changes that improve process times and reduce inbound and outbound queue lengths include the following:

- Inbound empty and bare chassis lanes;
- Bobtail (road tractor) lanes requiring only precheck;
- High, wide and heavy lanes that may bypass check-in area;
- Spots for trouble parking; and

- Minimized inspection procedures that statistically monitor damages by inspecting less than five percent of in-gate moves. The following technological improvements can reduce process times and reduce inbound and outbound queue lengths:
 - Video ID cameras;
 - Precheck area printers;
 - Speaker pedestals;
 - Swipe ID cards for drivers; ٠

The optimal gate process involves a driver pulling into a precheck lane and beginning the voiceless, paperless transaction of check-in by swiping a computerized ID card and having the chassis and container read by AEI antennae mounted in the lane. The EDI equipment records the arrival time of the driver and processes the necessary bill-of-lading information. The inventory is updated, and the driver is told to proceed to a specific row and spot on the yard to park. The driver is able to bypass the inspection lane because of randomized, statistically-balanced inspection procedures that keep accurate records of damages by inspecting fewer than five percent of all in-gate moves. The actual processing time of an inbound truck is less than one minute.



Exhibit 6.1 Typical Gate Layout

Automatic Equipment Identification (AEI); and Electronic data interchange (EDI).



6.0 Intermodal **Terminal** Design