

# **Appendix B**

## **Terminal Design Standards**

### **Introduction**

Under ESHB 2358, the Washington State Department of Transportation (WSDOT) Ferries Division was directed to develop terminal design standards that achieve the most efficient balance between capital and operating investments, and that adhere to operational strategies and vehicle level of service standards.

The terminal design standards were developed by the Terminal Engineering Department of the Ferries Division, in collaboration with other departments within the agency. In keeping with the intent of ESHB 2358, the standards provide comprehensive guidelines for the design of ferry terminal facilities that optimize the capital and operating investments, while continuing to support the overall mission of the agency to provide safe, secure, efficient, reliable, and environmentally sound marine transportation for people and goods throughout Puget Sound.

A brief description of the functional make-up of a ferry terminal and how it operates is first provided in order to provide context to the presentation of the terminal design standards.

# **Functional Elements of a Ferry Terminal**

A typical ferry terminal is composed of a number of key elements, each with, distinct function.

## **Terminal Buildings**

The terminal buildings accommodate passenger and staff areas. The passenger terminal typically includes the waiting rooms (indoor and outdoor), the ticketing area, restrooms, and other amenities. Some terminals also include an overhead loading (OHL) structure. The staff areas include various office spaces and equipment rooms.

## **Vehicle Holding and Support Areas**

The vehicle holding area is where ticketed vehicles are staged while waiting to board the ferry. It also includes circulation and traffic lanes. Depending on the location, the holding can either be on-shore, off-shore, or a combination of the two. The vehicle holding support areas include the toll plaza, restrooms, and other amenities.

## **Terminal Outbuildings**

The terminal outbuildings are climate-controlled structures that house electrical, IT and security equipment, as well as supply and vendor storage.

## **General Terminal Areas**

The general terminal areas include electrical and mechanical equipment such as stand-by generators, transformers, sewer lift stations, and waste management equipment.

## **Terminal Enclosures**

The terminal enclosures are unheated spaces used for storage of equipment, such as oil booms, oil spill kits, and hazardous material kits.

## **Parking**

Parking spaces are provided for the Vessel and Terminal Security (VATS) team, and depending on the terminal, employees and vendors.

## **Customer Signage/Way Finding**

This includes all signage elements, such as sign bridges, variable message signs, entrance/exit and directional signs, and Highway Advisory Radio (HAR).

## Operational Criteria

The operation of a ferry terminal is complex, and, influenced by many factors, each with a varying degree of predictability. The design of a successful and efficient facility will result in an optimal balance between capital investments and operational costs. One of the parameters used in measuring a terminal's ability to operate efficiently is the *dwell time*.

Dwell time can be described as the time during which the vessel is positioned at the ferry dock. A typical sequence of events that occurs during the dwell time can be summarized as follows:

- Vessel landing is made.
- Vessel is secured (*2 minutes is provided for this*).
- Traffic arm is raised.
- Passengers are directed to disembark to shore side passenger exit way (*if OHL is provided the passenger disembarkation occurs simultaneously with the sequence described below*).
- Bicycles are directed to disembark with separation\*.
- Motorcycles are directed to disembark with separation\*.
- Vehicles are directed to disembark in same order as they were staged, with oversized vehicles disembarking in a single lane. An "oversized vehicle" is longer than 20' or taller than 7'6", or both
- At completion of offload the traffic gate is lowered and vessel crews conduct security sweeps of all decks and spaces.
- At completion of security sweep the vessel crew mans stations in preparation for loading.
- Vessel crew communicates to terminal staff to begin loading.
- Passengers are directed to embark onto the vessel via the vehicle deck (*if OHL is provided the passenger embarkation occurs simultaneously with the sequence described below*).
- Bicycles are directed to board with separation\*.
- Motorcycles are directed to board with separation\*.
- Vehicles are directed to board based on a first come first served basis with oversized vehicles embarking in a single lane.
- Prior to completing loading for a "full boat" direction is given for single lane loading the last few vehicles as the last available deck space is used.
- Upon completion of loading vehicles:
  - Remaining bicycles are directed to board with separation\*.
  - Remaining motorcycles are directed to board with separation\*.
  - Remaining passengers are directed to board onto the vessel via the vehicle deck.
- Upon completion of loading procedures the traffic gate is lowered and crew is directed to make ready to depart (*2 minutes is provided for this*).
- Vessel departs.

\*Separation: to ensure safe operation, each mode is handled separately. The next mode is not released until the previous mode has cleared the area, which varies with each terminal.

While the dwell time is in part governed by the vessel size and capacity, the design of the terminal can have a significant impact. Lack of vehicle holding space, remote or distant holding of ferry traffic, single lane load/unload, toll booth configuration, and efficiency of transit connections are all factors that can increase the dwell time. The area surrounding a terminal can also significantly impact the dwell time because of the presence of railroad crossings, traffic lights and intersections, pedestrian street crossings, curves on adjacent roadways, and reduced sight distance.

WSF does not have a specific standard for dwell time. The implicit standard currently in use is that dwell time shouldn't be allowed to increase to the degree that it delays a sailing and disrupts the schedule. With growing ridership, terminal improvements are needed to keep dwell time at or below current levels. The proposed reservation system represents a large step towards this goal.

## Terminal Design Standards

Terminal design standards were developed to optimize the balance between capital and operating investments, and to support adopted operational strategies and vehicle level of service (LOS) standards.

The development of the design standards required an in-depth evaluation of internal engineering practices, a detailed analysis of the operational requirements that guide the design of terminal facilities, and a comparison with other ferry agencies' design standards.

### Terminal Building

Separate terminal building standards were developed for the passenger and staff areas.

#### Passenger areas

The sizing of passenger waiting areas for walk-on customers and drive-on customers wishing to leave their vehicles is based on three parameters: pedestrian level of service, type of ridership, and target date.

Pedestrian (LOS): The passenger waiting areas are designed to Level of Service B, as defined in the *Transit Capacity and Quality of Service Manual - TCRP Report 100*, published by the Federal Transit Administration. At Level of Service B, “standing and partially restricted circulation to avoid disturbing others within the queue is possible.” It provides 10 to 13 square feet per person.

*“Levels of service for queuing areas are based on available standing space, perceived comfort and safety, and the ability to maneuver from one location to another. Since pedestrian LOS is based on the amount of pedestrian space available, the LOS thresholds can be used to specify desirable design features such as platform size, number and width of stairs, corridor width, and so forth” (TCRP 100).*

Type of Ridership: While each ferry route has its unique characteristics, it is possible for the purpose of standardization to divide the routes in three categories: commuter routes, recreational routes, and mixed routes (combinations of the two). Tailoring the design of the passenger areas to each type of ridership is critical to achieving the most efficient balance between capital and operating investments.

#### *Commuter Route*

The Bainbridge Island to Seattle route is a good example of a route considered to be a “commuter route”. These routes are generally busy year-round and exhibit minimal increases in traffic flow during the summer months. Commuters have a

very different way of accessing the ferry terminal compared to recreational users. For example, the majority of commuters at Bainbridge Island, over 55%, tend to arrive within the last 10 minutes before a boat's scheduled departure.

### *Recreational Route*

At the other end of the spectrum is the recreational route, such as the Anacortes-San Juan Islands route. At Anacortes, less than 13% of walk-on riders arrive within the last 10 minutes. Because of the less frequent service to these remote islands (boats tend to depart every 2 to 3 hours) riders tend to arrive 1 to 3 hours prior to departure in the summer months.

### *Mixed Route*

The other routes serve a broader mix of customers. The design of a mixed use terminal requires an approach that combines commuter and recreational terminal elements.

Once a route has been categorized, the design of the passenger areas will follow the following criteria:

#### **Walk-on Passengers**

100% of passengers arriving 0-10 minutes prior to departure would not be provided inside standing/waiting space. They would simply pass right through and board the vessel.

100% of passengers arriving 10-20 minutes prior to departure would be provided inside waiting space, as these customers would be queuing to board the vessel; approximately 80% standing, 10% sitting, and 10% sitting at tables.

50% of passengers arriving 20-30 minutes prior to departure would be provided inside waiting space; approximately 45% standing, 45% sitting, and 10% sitting at tables. What's happening to the other 50%?

50% of passengers arriving 30-45 minutes prior to departure would be provided inside waiting space; approximately 55% standing, 25% sitting, and 20% sitting at tables. Same question

50% of passengers arriving 45 minutes or more prior to departure would be provided inside waiting space; approximately 10% standing, 60% sitting, and 30% sitting at tables. Same question

#### **Drive-on Passengers**

All drive-on passengers for Anacortes must arrive 60 minutes prior to departure. Of those drive-on customers, 50% would be provided space

inside the terminal and be able to use the facility; approximately 20% standing, 20% sitting, and 60% sitting at tables.

The remaining 50% would not be provided terminal building space.

For terminals with significant numbers of recreational users, such as Anacortes, the passenger areas will be divided as follows: 55% heated/air-conditioned space, 25% covered space (non-heated) and 20% open space (non-covered). For terminals with significant numbers of commuters, such as Bainbridge Island, the passenger areas will be divided as follows: 88% heated/air-conditioned space, 6% covered space (non-heated) and 6% open space (non-covered). Why these numbers

Target date: the standard design of passenger areas will be based on the “85<sup>th</sup> percentile” method. The benefit of this method is that facilities are not oversized for the great majority of the year. In the case of the “85<sup>th</sup> percentile” the facility will be adequately designed for 85%, or 310 days of the year. The the facility would be expected to be over capacity according to the design for 55 days of the year.

### **Staff areas**

The development of design standards for staff areas required that operational office space requirements for each terminal be quantified and compared to *WSDOT Maintenance and Operations, Facilities Office Master Planning Template, Appendix B*. The template was created by Washington State General Administration (GA) and has been used by WSDOT to determine uniform office space requirements throughout the organization. The template is based on an employee’s position or level within the organization.

While the GA template includes most of the positions within the Ferries Division Headquarters, its guidelines do not easily translate to the terminal staff areas such as auto toll booths, seller safe rooms and supervisor office space. As a result, the design standards for staff areas are based on the GA guidelines whenever possible, but also include revised office sizes for unique ferry terminal positions.

### **Vehicle Holding**

The design standard for the sizing of vehicle holding areas is based on the assumption that a reservation system will be implemented. Under this assumption, the terminal will need to hold the full capacity of the largest vessel assigned to the route. Depending on the terminal, space also needs to be provided to accommodate HOV, van and car pool programs, bicycles, motorcycles, and oversized vehicles. A system-wide detailed evaluation of the minimal vehicle holding requirements is included at the end of this document.

Another component of the vehicle holding is the toll plaza. The standard number of toll booths at a terminal is based on the vessel dwell time and sale transaction processing rate. With the implementation of a reservation system, the use of transponder technology will become standard at terminals on commuter routes. One transponder lane per terminal will decrease transaction/processing time and customer convenience.

### **Customer Information**

The successful implementation of a reservation system relies on improved real-time customer information. The terminal design standards include the use of technology to inform the public of vessel capacity status and propose alternate routes. Examples of technology to be implemented include Variable Message Signs (VMS) and Highway Advisory Radios (HAR) (WSDOT Design Manual Chapter 860). HARs are messages available to a traveler by tuning in to a specified radio frequency. Usually these are available before a travel decision point is reached, so that the traveler can choose another ferry route or choose to drive around rather than take the ferry. For example, an advisory might say that standby facilities are now full for the next three boats, and give the estimated wait time. VMSs are also used to inform motorists about conditions at the terminal, for example “service is currently delayed by 15 minutes.”