Analysis of: Installation of an Existing Lift System for the Handicapped on Light Rail Vehicles

by

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INSTALLATION OF AN EXISTING LIFT SYSTEM FOR THE HANDICAPPED ON LIGHT RAIL VEHICLES

Project Purpose

This study was conducted by the Budd Company in 1983 under sponsorship of the Urban Mass Transportation Administration (UMTA). The San Francisco Municipal Railway (MUNI) conducted the field tests.

The objective of the study was to select and adopt an existing bus type wheelchair lift system to meet all the requirements of Light Rail Vehicle (LRV) operation. Five lifts were tested:

- Environmental Equipment Corporation (EEC)
- Lift-U, Incorporated
- Transportation Design and Technology, Incorporated (TDT)
- Transi Lift Equipment Corporation
- Vapor Corporation

While all the lifts tested could be adopted with relative minor changes to existing LRV's, the Transi Lift unit was determined to be the lift design concept which provided the best combination of lift characteristics for testing in a prototype LRV installation because it was the thinnest of the front door lift. A front door lift was chosen because the required modifications to both the lift and the LRV car body were minimal.

Test Summary

For this experiment, the Transi Lift was modified from 42" to 54" in length by adding a third horizontal tread to the lift at the top, which appears to be a part of the floor when in the step configuration and which is part of the platform in the lift configuration. While a short length is more easily accommodated in the vehicle and provides for easier boarding in island platform situations, a longer platform accommodates a much larger range of wheelchair sizes, allows for an accompanying person and generally provides for a faster boarding and alighting time due to easier positioning of the wheelchair on the ramp.

To minimize the disruptive effects of lift failures, the lift and its hydraulic power supply subsystems were developed to be modular units for easy removal and replacement. The lift module, called a "pod," was designed to contain a complete working lift assembly ready for operation. After the pod is installed in a vehicle, four hydraulic connections complete the installation. In the event a lift/pod unit was not immediately repairable and no replacement was available, it would be easy to substitute an inexpensive static step unit in the vehicle to allow the vehicle to continue in service.

Tests were conducted to determine how long it would take to remove the pod and install a step module. The entire process took 22 minutes. However, maintenance personnel were prepared and on-hand with a fork truck.

Remove Lift from Vehicle	14
Install Step Module in Vehicle	8
	22 minutes

Remove Step Module from Vehicle	7
Install Lift in Vehicle	15
	22 minutes

The lift was not tested in revenue service or when there would be a delay to the following car. Testing occurred over a 120 day period without evidence of damage to the lift. Testing was conducted during off-peak hours between 9 AM and 3 PM. A single LRV operator participated in all the testing sessions. Field tests were conducted on revenue tracks and non-revenue tracks using volunteers and without volunteers.

134 field tests
101 on revenue tracks
33 on non-revenue tracks
61 using volunteers
73 without volunteers

In addition, there were 120 daily maintenance cyclings plus over 100 additional cyclings in connection with installation and operator training.

During the tests, boarding wheelchair users were positioned within 5 feet of the lift and during deboarding, within 15 feet of the lift. As there were no standees, the wheelchair user could travel to the lift area while the door was being opened and the lift platform deployed. Boarding time was defined as that period of time a vehicle must remain stopped.

Boarding Time:
- Open door
- Deploy the lift
- Board or deboard the passenger
- Stow the lift
- Close the door prior to being ready to resume forward motion

The average amount of time it took to board and deboard the lift during the test are listed below.

	Board	Deboard
1 power chair	48 seconds	44 seconds
1 manual chair	45 seconds	52 seconds

However, in separate tests measuring ingress and egress time from the passengers viewpoint (e.g., excluding the time to stow the

lift, close the door, and prepare to resume forward motion) the average time it took a volunteer to exit a vehicle was 29 seconds, and to enter a vehicle was 30 seconds. It took 32 seconds to completely cycle the lift.

Problems which are sometimes encountered with bus lifts were absent.

- The lift never failed to fully cycle during testing.
- The outer safety barrier performed well in all tests.
- The lift platform lay flat on street or passenger island surfaces with no tendency to buckle.
- The platform of the lift maintained a safe angle parallel to the plane of the tracks and the LRV floor
- The lift controls were simple to operate.
- When deployed, the lift platform always stopped smoothly when it reached the street or passenger island surface, with no tendency to "jack" the vehicle.

Only two minor problems were encountered with the Lift during testing.

- The binding of the kickplate rubbed against a plastic guide when the load on the deployed lift platform is centered toward the forward edge of the platform and/or the platform is being raised under load with the LRV in a downhill position. This can be cured by increasing the clearance in a production design.
- When raised under load, the lift platform often stopped approximately 1/2 inch short of the LRV floor. While this never interfered with boarding by volunteers, the operator would have to correct this after the load was removed by lowering the platform a couple inches and raising it without load. This procedure took perhaps two seconds and invariably the lift would then be properly aligned with the LRV floor. This problem can be corrected by adjustments to the individual platform chain settings.

There was concern by operators that a possible failure of the lift would interfere with overall system operations. They felt that an acceptable failure rate, was one where the lift system did not fail more often than any other major subsystem on the vehicle. There was also concern that the lift may not be cycled on a regular schedule by the operators or maintenance personnel, thus leading to long term maintenance problems.

CONCLUSION

While the study attempted to test the lift system under true operating conditions, the fact that no testing occured in revenue

service casts doubt on the reliability of some of the test results. One thing that was borne out during this study is the need to cycle the lifts on an everyday basis. The fact that the lift utilized in the test was cycled daily probably accounts for the fact that the lift never failed during testing. Ironically, the District never tested the Transi Lift for use on our coaches and will probably not have the chance, as to our knowledge Transi Lift has gone out of business.