

EXECUTIVE SUMMARY

STUDY OBJECTIVES

The Connecticut Department of Transportation (“ConnDOT”), Bureau of Public Transportation plans to purchase new railcars for its Metro-North rail operations within the next several years. Surveys of passengers continually identify user dissatisfaction, as well as operational and maintenance issues, with railcar lavatory facilities and systems. The acquisition of new railcars provides an opportunity to address current lavatory issues and concerns.

The objective of this study is to explore and identify lavatory design and operational issues to be considered by ConnDOT to assure improvement in lavatory cleanliness and customer satisfaction.

SUMMARY OF FINDINGS

The cleanliness of railcar lavatories is an issue of critical concern that should be addressed to assure that the quality of service achieves acceptable standards that will meet the expectation of passengers and ConnDOT for both existing and new railcars.

Passengers regularly cite foul odor and cleanliness as areas of dissatisfaction, as documented in recent Metro-North customer satisfaction surveys. The lavatories are old and are not well designed for servicing. Re-circulating waste management systems installed in many lavatories will cause odor problems if not serviced frequently. Ventilation systems in older cars are not designed to effectively exhaust air from the lavatory or prevent foul odors from entering the interior of the railcar. Additionally, the very poor condition of many lavatories in existing railcars makes it difficult to achieve an acceptable level of cleanliness. Consequently, the unacceptably low cleanliness baseline makes it difficult for personnel to accomplish servicing tasks that they can be proud of. It is suggested that servicing practices and procedures be reviewed to determine if it is possible to improve the quality of cleanliness in existing railcars, until such time as these railcars can be replaced. This may result in creating an environment where employees believe that it is possible to produce quality outcomes from their efforts. It is believed that when clean facilities exist, both the public and employees take more pride in keeping them clean.

An Amtrak passenger focus group study that was conducted to help guide the design of lavatories for the Acela Express revealed that passengers expect, for all forms of transportation, routinely clean lavatories. Most passengers were reported to believe that they have a responsibility to help keep facilities clean, and the state of cleanliness appeared to have an impact on passenger behavior.

Areas for consideration by ConnDOT in the design of new railcar lavatories and systems include the engineering and design process, waste management system technology, ventilation, and materials. Additionally, ConnDOT should consider the development and implementation of servicing procedures and operations to assure that lavatories and the interior of the railcars

are clean at the start of a trip. No matter how well the systems are designed and how advanced the technology, service and maintenance must be performed regularly.

Engineering and Design: Railcar lavatory design should be integrated into the design of the railcar interior and systems, and determined at the front-end of the design process. Engineering/design companies that specialize in lavatory and interior railcar design may be helpful in assuring that the latest innovations, improvements, and materials are incorporated into the design specification.

Lavatories constructed of a molded fiberglass, or similar material, can be fitted with all necessary equipment and systems and installed in the railcar during its construction. A molded module also provides an opportunity to minimize seams where dirt and bacteria can collect, allowing for more effective cleaning. Major lavatory sub-assemblies should be designed for easy removal and replacement. Material selection for surfaces and components of the module can help make it easier to keep clean and perhaps extend its life cycle. Some suggestions include the following:

- Coat fiberglass module surfaces with a gel coat or polyvinyl fluoride over-laminating film (PVF) material similar to Tedlar®;
- Use anti-slip flooring materials without seams to help prevent dirt and bacteria from collecting in difficult to clean areas;
- Construct sink counters of acrylic resins and fire-retardant fillers similar to Gibraltar®. This material is stain resistant, can be repaired, and has seams that are smooth and rounded to prevent dirt build-up. Also, it is suggested that the counter be constructed with a lip on the edge to keep sink water from running onto the floor.
- Configure the sink faucet so that it is easy to operate and protected in order to ensure that water cannot be left running.
- Employ a disposable soap dispenser that is screwed into position on the sink.
- Use manually operated flush controls. The flush control should be very visible, easily recognizable and operable by users.
- Size trash container appropriately and make it easy to use with minimum user contact; and
- Select warm and pleasing colors for materials and surfaces in the lavatory.

The module design also may provide an effective way to retrofit the entire lavatory as needed at half-life or other designated overhaul period, since removal and replacement can be accomplished relatively quickly as compared to other lavatory designs.

Waste management systems commonly in use today in rail operations, as well as on Metro-North railcars, include:

- An on-board bacteriological sewage treatment system that eliminates the need to pump retention tanks. New Jersey Transit has been using this type of system for over 15 years and has approximately 300 systems in use today.
- Several different types of technologies are paired with retention tanks that require the periodic pumping of waste material, including chemical re-circulating, clean water

pressurized, macerator, and vacuum systems. The re-circulating system re-circulates a chemical blue water charge and waste material until the system is emptied and recharged. In rail operations, re-circulating type systems will generally cause odor problems keyed to the frequency that the system is re-charged. This type of system has been more acceptable in airline operations than rail operations, since in many cases the system is pumped and recharged with clean water after each flight. All other systems, each with their own set of advantages and disadvantages, should be considered as acceptable alternatives.

Consideration should be given to selecting a waste management system technology similar to those that have performed well and are in operation on other railcars in Metro-North's fleet or those consistent with Metro-North's plans for the future. System standardization will increase staff familiarity and efficiency in dealing with maintenance and servicing requirements.

- Vacuum systems offer advantages of very low water consumption, which translates into either the possibility of using a smaller retention/holding tank or decreasing the frequency of pumping if a larger tank is used. The vacuum system also helps to evacuate odor from the lavatory. Vacuum systems are reported to have a higher initial cost.
- It might be valuable to undertake a pre-qualification process for the waste management system through a prototype test period, similar to the process utilized by Long Island Railroad (LIRR). This process would provide an opportunity to judge equipment proposed for installation based on a variety of factors including reliability, service, manufacturer support and ease of maintenance, and would assure that the equipment meets required design specifications. Experience gained by Metro-North from operation of the vacuum type system installed in Test Car 8447 as part of the Metro-North M2 rehabilitation project will also be helpful.

Ventilation of the lavatory proved to be one of the most important and significant concerns reviewed by the Study Committee. The lavatory ventilation system should quickly and effectively remove foul odors from the lavatory and prevent them from entering the interior of the railcar. It should be independent of the cabin's HVAC system to prevent recirculation of lavatory air into the cabin. The design should include exhaust vents located behind and at the level of the toilet as well as to the rear and above the toilet. The lavatory door should be designed to provide for sufficient air circulation into the lavatory even with the door closed. The exhaust fan should operate continuously so as to create negative pressure in the lavatory; this will result in clean cabin air being drawn into the lavatory from around the lavatory door without the need for door louvers. This will also help prevent lavatory air/odors from entering the cabin.

Servicing: The purchase of new railcars with state of the art systems and materials will not completely solve the on-going day-to-day cleanliness and odor operational issues. Regular, consistent and thorough cleaning, servicing and scheduled maintenance are necessary to achieve the standard of service expected by passengers. Installation of a hose in the lavatory would provide a source of clean water to assist and facilitate lavatory servicing. Consideration should be given to establishing operational procedures and staffing to assure that all lavatories

are inspected, provisioned, and cleaned at a minimum prior to the beginning of any trip (New Haven – New York or New York – New Haven) to an acceptable cleanliness standard. **It is important to note that unless the lavatory is effectively serviced regularly, the issues of cleanliness and odor will re-appear.**

A new technology for use in railcar environments that processes waste material through a controlled thermal decomposition process into inert ash, water, and clean exhaust is currently under development and will be initially tested in China. This may be an alternative for future consideration. Additionally, automatic cleaning public restrooms are installed in cities in the United States and other areas of the world. Although automatic cleaning systems do not appear to be in use in rail operations, if adapted for rail operations, they would offer the potential to improve lavatory cleanliness.

In conclusion, acquisition of new railcars provides the opportunity to select reliable systems and materials for the lavatories. **However, servicing and maintenance procedures should be reviewed, modified, and established to assure that the condition of the new railcars and lavatories are operated to standards that maintain cleanliness on an on-going basis for day-to-day operations.**

A summary of the Study Committee’s findings is presented in Appendix A: Overview of Options.