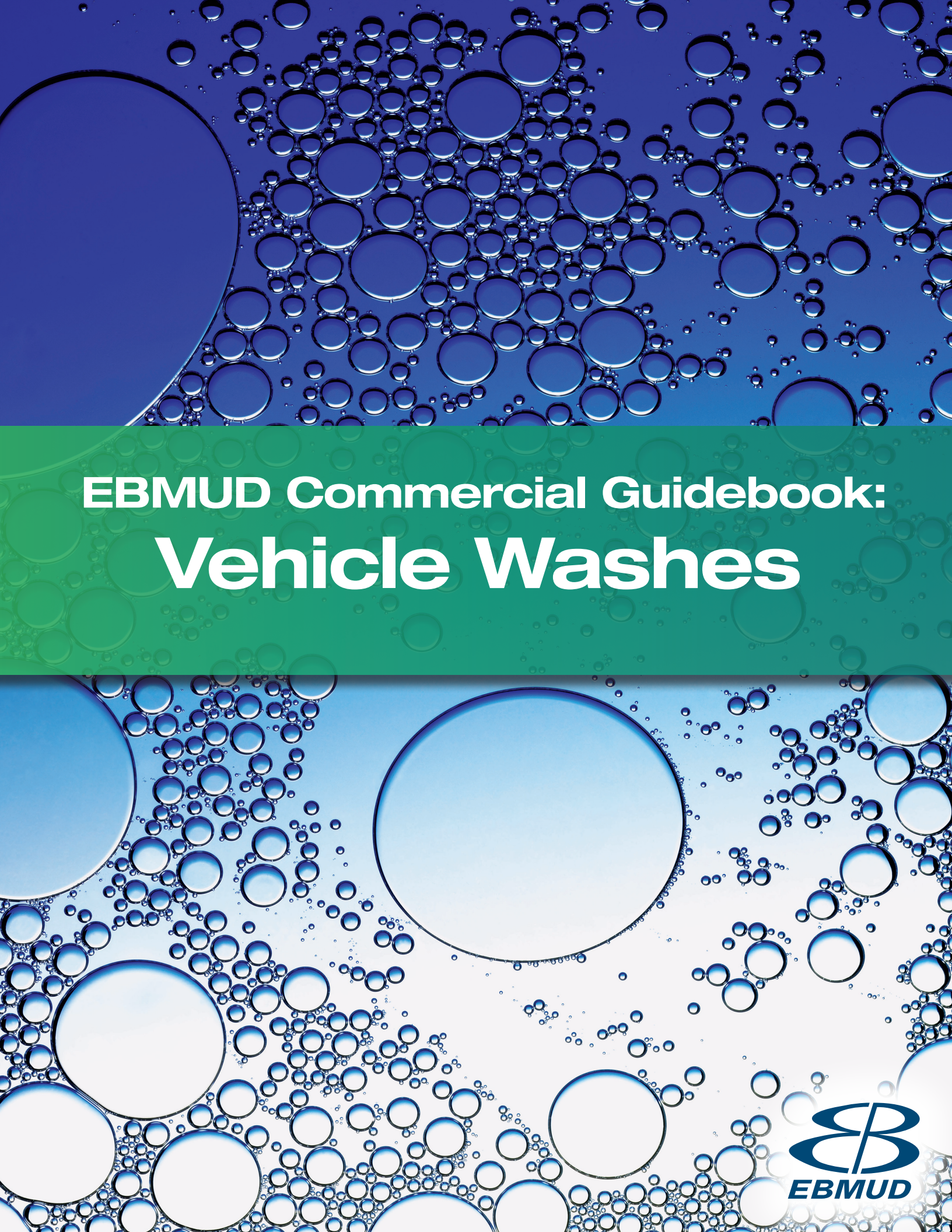




EBMUD Commercial Guidebook: Vehicle Washes



VEHICLE WASHES

Water efficiency in commercial vehicle washes derives from both proper equipment and operational measures. Car wash systems are primarily a variation of:

- Conveyorized tunnel
 - Brushless/touchless
 - Touchless
 - Exterior wash only
- In-bay touchless automatic
- In-bay friction automatic (brushes)
- Self-service
- Full-service
- Stand-alone arches or spray wands

These systems can be found at vehicle washes that are available for public use at stand-alone facilities, as well as those alongside convenience stores, lube shops, and fuel stations. They also can be found on private property as part of businesses that own, operate, or service a fleet of vehicles. These can include vehicle dealerships, fleet vehicle operators, car rental agencies, bus and transit companies, quarries, warehousing operations, and other industrial operations involving transportation.

Example of a Conveyorized Vehicle Wash

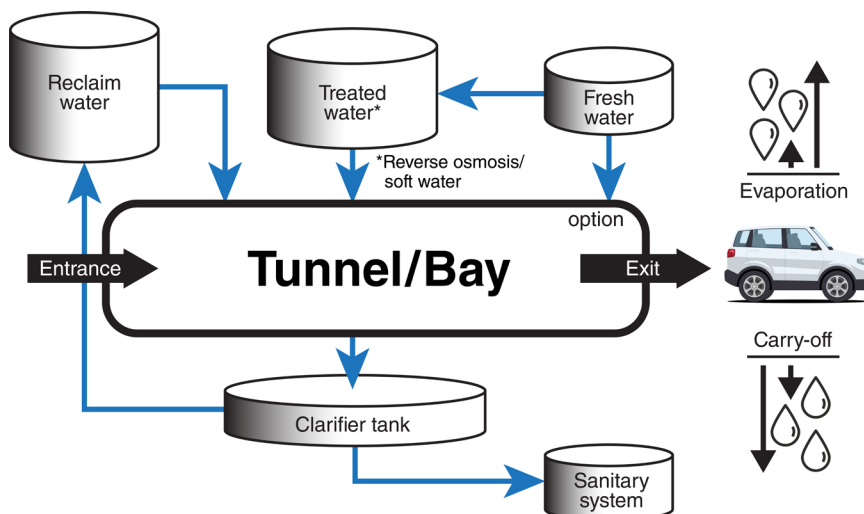


Image source: Lee Norton, Mark VII Equipment, Inc

Carwash Water Reclamation

In addition to proper equipment and operational measures, water reclamation technology and evolving regulations for commercial car washes are changing the industry and further increasing water efficiency. California Water Code Section 10951 requires in-bay and conveyor car washes permitted and constructed after January 1, 2014, to install, use, and maintain a water recycling system that reuses at least 60 percent of the wash and rinse water. Alternatively, these types of facilities may use recycled water provided by a water supplier for at least 60 percent of their wash and rinse water.¹ Moreover, stormwater and wastewater discharge regulatory requirements have placed an additional emphasis on water reclamation.

Water Uses in Professional Car Washes



¹ <https://casetext.com/statute/california-codes/california-water-code/division-6-conservation-development-and-utilization-of-state-water-resources/part-212-recycled-water-usage-by-car-washes/section-10951-requirements-of-in-bay-car-wash-or-conveyor-car-wash>

Conveyor, in-bay, self-service, and stand-alone/spray wand vehicle washes are described below, along with the water-savings opportunities related to use of water reclamation systems and equipment choices which improve efficiency.

Conveyorized Tunnel Systems

The conveyor vehicle wash, usually installed in a tunnel, includes a series of cloth brushes or curtains and arches from which water is sprayed while the car is pulled through the tunnel on a conveyor chain. In some “touch-free” vehicle washes, only spray nozzles are found. In full-service conveyor vehicle washes, hand drying usually follows the conveyor processes, and often hand-held wands like those found at self-service vehicle washes are used for the pre-soak.

Pre-soak sprays should be limited to 3 gallons per minute or less.

In a 2017 study for the industry by the International Car Wash Association, the facilities evaluated with conveyor systems used on average 30 gallons per vehicle and used an average amount of reclaimed water ranging from 1.9 to 4.9 gallons of reclaim per gallon of freshwater.²

Most in-bay car washes will use an average of 45 gallons per vehicle.



In friction vehicle washes, the wash and/or pre-soak cycle is accomplished with brushes or soft cloth curtains known as mitters. Mitters is a generic term for car wash portals that are equipped with long textile strips that dry cars by rubbing. The mechanical action of the mitters on the car surface replace the use of high-pressure water spray that can be found on touchless equipment.

Mitters are available in different variants; side-to-side, front-to-back or as a carousel.

Conveyors with friction components use less water because the brushes or curtains pick up water and detergent from earlier vehicles and do not need to be rewetted throughout the day.³

Mitters can often be installed as curtains in the pre-soak area of the conveyor, and rotating brushes are often found in the wash cycle (although this is not universal).

Mitters in Action During a Pre-Wash Cycle in a Conveyorized System



Image source: Lee Norton, Mark VII Equipment, Inc

Timing is a critical component in vehicle wash-water efficiency.

In properly calibrated conveyors, nozzles are timed to turn on as the vehicle passes under an arch and to shut off as it exits each arch. Each arch is on for a matter of seconds since conveyors can process ninety or more cars

Mitters at Work During a Wash Cycle



Image source: Lee Norton, Mark VII Equipment, Inc

2, 3 <https://8374610.fs1.hubspotusercontent-na1.net/hubfs/8374610/Pulse%20and%20Research/Water+Use%2c+Evaporation+and+Carryout+in+Professional+Car+Washes.pdf>

an hour. Efficiency is also maintained by proper nozzle configuration, alignment, and water pressure. A number of nozzle types can be found in conveyor vehicle washes. Nozzle tips which emit water in a fine, fan-shaped spray appear to use the least water. Nozzles referred to as “guns” or “gatling guns,” however, provide high-flow volumes and should be used only with reclaimed water.

Blowers at the ends of tunnels should be oriented to push water back into the tunnel. Conveyors should have a longer stretch of tunnel after the final-rinse arch, so water that otherwise would be carried out of the tunnel can flow back into the sump and be reclaimed and reused in the vehicle-wash system.

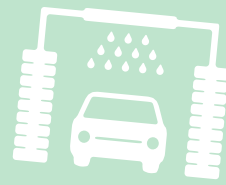
Conveyor Wash Blowers in Action at Cycle's End



Image source: Lee Norton, Mark VII Equipment, Inc

Towel drying is one of the services offered in a full-service conveyor or vehicle-detailing business. In many older car washes, towel-washing sinks were designed to have a constant flow-through of water. A float-ball valve that halts the water flow when it reaches an optimum level is one efficiency measure for such sinks.

New vehicle washes should not use flow-through sinks or top-loading washing machines and should install high-efficiency clothes washers from the Consortium for Energy Efficiency's Tier 3 or 4.



Self-service vehicle washes use the least water on average per vehicle. A self-serve foaming brush car wash uses an average of 1 to 2 gallons per minute per vehicle and self-service high-pressure wand car washes use an average of 15 gallons per vehicle per three-minute cycle.

A conveyor wash, referred to by the industry as “exterior-only,” does not offer drying or detailing services. A visual inspection is recommended to confirm whether a vehicle-wash system is a full-service or exterior-only conveyor.

In addition to the savings already mentioned for conveyor washes, a full-reclaim system can be installed. It is cost-effective to build conveyor and in-bay automatic carwashes with water-reclaim systems, which can reduce potable water use by as much as 90 percent, although average savings found in studies are more likely to fall in the range of 50 percent. These systems can provide additional filtration for rinse water. They can also be designed so the pit extends outside the edge of the tunnel, and the driveway and roof gutters direct rainwater into the pit, thus providing rainwater as an alternative water supply. These types of conveyors can be built in commercial settings, but safety considerations typically preclude their use except on private property. Because the pit would extend outside the area of the tunnel, safety should be improved by placing a steel grate above the pit to prevent workers from accidentally falling in.

In-Bay Automatic Vehicle Washes

With in-bay automatics, the customer stays in the car, while the car remains stationary within the carwash bay during the process. The carwash equipment is mounted on a gantry, which moves over or around the car. In-bay automatics can use either spray nozzles or brushes or a combination to wash the vehicle. In-bay automatics also have the greatest variety in basic design, with some machines comprising an entire movable arch and others having vertical and horizontal arms suspended from the gantry. Other designs include spinning arms that are attached to the gantry. In-bay automatics that use brushes typically have spinning bars with brush material attached that roll over and alongside the vehicle.

For in-bay touchless car washes, there is no physical touch applied to the vehicle (friction) and instead a

Example of an In-Bay Automatic Wash



combination of high-pressure wash and chemicals are used to clean the vehicle.

The number, size, and alignment of nozzles, the water pressure, and the speed of the machinery all affect the water use of in-bay automatics. The number, size, and alignment of nozzles can be specified in design guidelines. Water pressure and speed are operational considerations. Most in-bay car washes will use an average of 45 gallons per vehicle.⁴

As with conveyor vehicle-washes, in-bay automatics that use foam brushes or cloth material that use less water than frictionless or “touch-free” washes. Some in-bay automatics also reduce water use by employing photo eye sensors⁵ to precisely measure the length of the vehicle being washed, limiting the gantry movement and timing of the wash based upon the sensor signals.

In an in-bay automatic system, all water flows to one pit, and all chemicals mix together. Therefore, water reclaim systems can be more costly and a bigger challenge to maintain than in conveyor carwashes.

Self-Service Vehicle Washes

Self-service vehicle washes are typically credit card and/or coin-operated and have spray wands and brushes operated by the customer. This same equipment is often found in truck washes, and some dealerships or fleet operations also use spray-wand and brush technology. A typical commercial self-service facility with four-to-six wash bays will have an equipment room where water is mixed with cleaning chemicals and where pumps and treatment equipment are housed. The customer controls whether and for how long low-pressure or high-pressure settings are used. Thus, the vehicle wash owner/operator does not have direct control over water use at the facility. The owner/operator can, however, help reduce water waste by installing the most efficient nozzles. In addition to water used in the pre-soak and wash cycles, many self-service operations also offer a spot-free rinse using reverse osmosis (RO), deionized, or softened water. Reject water from a Reverse Osmosis (RO) unit can be used in landscape watering, where landscape exists. Ideally, deionization equipment should be used rather than water-softening or RO systems.

Self-service vehicle washes use the least water on average per vehicle. A self-serve foaming brush car wash uses an average of 1 to 2 gallons per minute per vehicle and self-service high-pressure wand car washes use an average of 15 gallons per vehicle per three-minute cycle.

This can be attributed to the direct relationship between water use and price in the self-service vehicle wash: the

Spray Wand in Action



⁴ <https://8374610.fs1.hubspotusercontent-na1.net/hubfs/8374610/Pulse%20and%20Research/Water+Use%2c+Evaporation+and+Carryout+in+Professional+Car+Washes.pdf>

⁵ <http://automation-and-controls.blogspot.com/2009/05/how-to-install-and-maintain-photoeye.html>

longer the customer runs the wash, the more expensive the service, since they are charged by the minute.

Self-service operators sometimes find evidence of oil dumping or larger debris, like yard waste, in the wash pits. This can occur because customers wash their own cars unattended. Due to the relatively low potential water savings and the potential for organic materials and debris to foul the filters, water-reclaim systems are seldom cost-effective in a self-service vehicle wash. Where zero discharge is required by regulations, self-service operators have installed reclaim systems, but have also hired on-site staff to monitor and clean the wash bays, thereby increasing the cost of doing business.

Stand Alone Arches and Spray Wands

Some outdoor vehicle washes in industrial or commercial settings restrict public contact and use a single arch to rinse off the vehicle prior to returning it to the public right-of-way. These washes, built on private property, can use aerobic biotreatment in open pits which capture both the wash runoff and the rain that falls on the pit, the pad, and the paved area around the pad. Such “total” reclaim systems can also be designed or used for tire-washing, which reduces dust on vehicles leaving quarries and other industrial facilities. A bus wash water reclamation system in Seattle was able to achieve more than 80 percent efficiency and save more than 200 gallons per vehicle.⁶

Recommendations

All:

- Complete periodic visual inspections for leaks.
- Perform monthly meter checks.
 - Shut down all equipment & record meter readings at shutdown and prior to startup.
- Clean spray nozzles every couple of months.
- Replace spray nozzles every 6 to 12 months depending on the volume of cars going through the system.
- When present, towel washers should be front-loaded, high-efficiency machines with a Consortium for Clean Energy rating of Tier 3 or 4.
- If a planned commercial building project includes on-site vehicle washes, follow all local regulations for water efficiency and reclamation requirements.

Conveyorized tunnel:

- Use friction components, such as mitters or foam brushes, in every conveyor vehicle wash for pre-soak and/or wash cycles.
- Spray nozzles on arches should produce a fan-shaped spray, oriented parallel to the arch.
- Limit gun-type undercarriage nozzles to use of reclamation water.

Table 13-1: Average Water Usage by Vehicle Wash Type

Type	Water Usage
Conveyor	30-40 gal/vehicle
In-bay	45 gal/vehicle
Self-service: foaming brush	1-2 gpm
Self-service: high pressure wand	15 gal/vehicle/3 min cycle

⁶ <https://calwep.org/wp-content/uploads/2021/03/Vehicle-Wash-Systems-PBMP-2006.pdf>

In-bay touchless:

- In-bay automatics which include a spot-free rinse option should use deionization equipment, rather than water-softening or RO systems.

Self-service/Stand-alone:

- Optimum operating pressure nozzle flow rate should be three gallons per minute or less (based upon pump design).
- Use a low-pressure pass for pre-soak.
- Use stainless steel or hard ceramic nozzles to reduce corrosion, especially in areas with hard water.

Reclamation:

- Design wash pads, parking and staging areas, and tire-rinse systems at industrial sites to capture rainfall and wash water for reuse.
- Where RO is used, reject water should be sent to the recycling system (or otherwise reused in the washing process).
- At minimum, vehicle-wash-water reclaim systems should provide water to the pre-soak, undercarriage, and initial wash cycles.
- Equip vehicle washes for buses and other commercial vehicles with filtration systems sufficient to allow all wash and rinse cycles except the final rinse to use reclaimed water.

Resources

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