Part 12

Design Criteria for a Locomotive/Train Washing Facility

[1]— 2024 —

FOREWORD

A locomotive/train washing facility provides functions for the washing of locomotive and railcar exteriors for safety, inspection, appearance and FRA requirements. In addition, it may provide for the cleaning of cabs and engine compartments for line haul and local use.

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[1]References, Vol. 79, 1978, p. 281. Adopted 1979.

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SECTION 12.1 INTRODUCTION

12.1.1 SCOPE AND PURPOSE R(2015)

a. The purpose of these criteria is to provide design guidelines and considerations along with a layout and description for a typical washing facility and the necessary support functions. **Error! Reference source not found.** is shown as visual aid in depicting a "Typical" layout of work areas and a schematic of supporting utilities.

b. Environmental aspects of final wastewater treatment and discharge will be a necessary part of this project; however, it is not included in any detail in this report.

12.1.2 OPERATIONS R(2024)

a. Typical progression through a wash facility involves high-pressure pre-clean (pre-wet in certain climates), wash including chemical application (acid/alkaline), brushes and/or high-pressure wash, rinse, outbound drip (blow-dry in certain climates), and hand-wash and touch-up operations.

b. This straight-line process flow is supported by necessary mechanical functions utilizing chemical tanks, pumps, piping, clarifiers, brushes (if required), dryers, etc.

12.1.3 LOCATION (2024)

a. Generally, washing capability is desirable at maintenance and service areas; however, it is only at the major servicing complexes that large wash facilities are economically justified.

b. The washing facility should be located within proximity to the service platform and maintenance areas for minimum manpower usage; it may be located directly ahead or behind depending on the operation. An ideal layout would be a linear arrangement with service (fueling) area, washing facilities, and ready tracks.

c. Because of the desired linear configuration, available property may present a problem in obtaining a reasonable layout for the optimum number of consists in various stages of the flow line without doubling back. Length accommodating four to six locomotives is recommended.

d. The washing facilities should be located away from adjacent properties as there is the possibility of overspray if wind conditions are unfavorable. The facilities should be positioned or shielded so that vapors, chemicals, odors, etc., would not interfere with railroad personnel, equipment or any operation in its vicinity.

d. Washing facilities can also incorporate or be utilized for both cleaning of locomotives or a passenger train consist to include locomotives and passenger cars. The typical wash layout will be similar in design for use by both.

d. Use of spot washing of equipment may be considered for maintenance areas outside of the wash facility. Spot washing would typically consist of pre-treatment and rinsing of specific areas on the equipment for removal of oil and solids.

SECTION 12.2 WASHING FACILITY

12.2.1 TYPICAL FACILITY ARRANGEMENT (2024)

a. The facility, as indicated on **Error! Reference source not found.**, is comprised of four main functions or areas.

b. Area 1 is the inbound staging area. This is generally open but may have to be partially enclosed and heated if climate is severe. The length is determined by the number of locomotives to be moved into position for washing or accepting of an entire locomotive consist or train to prevent from needing to separate. The number of tracks required will depend on the ability for movement of equipment into the area as well as progression into the wash facility.. This area requires nothing special in the way of roadbed or utilities as it is only short-term storage with typically no maintenance work activities taking place. Locomotive cab services, like cleanings or toilet servicing, or other work to prepare the consists or train for the wash facility could also be planned. If maintenance work is planned for this area , some consideration may be given to an impervious surface for containing any spillage based on work to be performed.

c. Area 2 is the washing facility. It could be an open area or an enclosed open-ended building. The washing facilities typically are designed for either a freight type locomotive or passenger trains. Freight locomotive configurations make it difficult for use of mechanical type brushes for cleaning of locomotives. Typically, cleaning is performed via high pressure water positioned for cleaning of all areas of the locomotive. Typical passenger train arrangements tend to allow for brushes for cleaning of all sides of the locomotive and passenger cars. The wash facility can be designed for either a drive through type operation (typically the best option) or as a single unit spot where the locomotive remains in place as the facility washes the locomotive. The critical washing process is the acid application and allowing sufficient time for the acid to soak into the dirt and grime to allow for removal during the agitation step. Typically, the acid soak time should be a min of 30 seconds with a recommendation of 45 seconds which could have implications on the facility size depending upon equipment design speed.

d. Area 3 is the drip area for locomotives after the washing has been completed. This area is generally open but would have to be enclosed and heated depending upon the local climates. The drip area should be equipped with medium pressure hot water/soap or steam/soap hoses for manual spot cleaning of surfaces missed during the wash cycle or for areas of heavy collection of dirt and grime. Depending upon the wash facility, air blowers can be utilized for

removal of water if a drip area cannot be utilized or if the locomotives and trains will progress to the next servicing area after washing.

e. Area 4 is the support area, containing equipment, tanks, pumping equipment, controls and any effluent treatment. This area is specifically for the wash facility. If the overall maintenance facility is equipped with a treatment system, the wash effluent can be piped to the treatment plant. It should be noted that the discharge water may be out of pH specifications and pH adjustment may need to be accounted for in the treatment process. Consideration should be given to recycling the waste-water for re-use in the wash process.

12.2.2 WASH EQUIPMENT (2024)

Wash equipment can be designed for many types of applications based on client needs and equipment being utilized. The site and environment will be designing factors to ensure maximum cleaning capability for the equipment.

General equipment arrangement consists of:

a) Acid application zone which sprays acid on the entire equipment surface with focus in high grime areas of accumulation like truck assemblies and fuel tanks.

b) Soak Zone/Dwell Time will allow for the acid to penetrate the dirt and grime on the equipment surface before agitation and rinsing. The soak zone is the critical aspect to the wash cycle and should allow for maximum time as much as possible. Typical dwell times are at a minimum of 30 seconds.

c) Brush agitation and alkaline removes the dirt and grime that has been loosened during the acid application and neutralization of the chemical mixture prior to discharge from the wash area. Freight locomotives provide another challenge for a brush agitation if the locomotive or consist is in motion through the facility. Consideration could be given to automation for brush agitation with the locomotive in a stationary position.

d) High pressure rinse is utilized to remove any residual dirt and grime along with acid and alkaline solutions remaining on the equipment. The high-pressure wash is most affect with large amounts of water spraying in different angles to maximize removal from the equipment. Additional nozzles could be located in key areas to ensure dirt and grime is affectively removed. Spray should be minimized from entering exhaust stacks and intake louvres on the equipment.

e) Some wash systems could include a spot free rinse application with the use of RO (Reverse Osmosis) water. The rate of RO water not as high as the high-pressure rinse and is utilized to remove any residual salt and dirt left on the equipment prior to drying. RO rinse applications tend to be more with passenger equipment.

f) Air drying and drip zone is used to remove water with the use of high velocity air from the equipment. There is the possibility of water dripping from the equipment to contain small amounts of oil and grease and a containment pad or fabric should be considered for capture.

Design considerations should include:

a) Rate of movement of units through the washer is critical in relation to the spacing of the spray arches to achieve chemical manufacturer's recommended dwell time. The speed of the equipment could vary but on average would be around 3 mph depending on chemical combination used.

b) There are several acid/alkaline cleaning agent combinations on the market that are satisfactory. The type selected would depend on availability, frequency of washing and adaptability to be neutralized into an acceptable waste material for final treatment and disposal.

c) Various types of sensing devices or other controls are available to activate the numerous sprays during the washing cycle. These include track mounted switching devices, radio control, electric eyes, etc.

d) The wash equipment should be designed to allow for maintenance equipment to traverse the wash facility to allow for equipment replacement. This could be via hy-rail means, or a man type lift with wide based rubber tires.

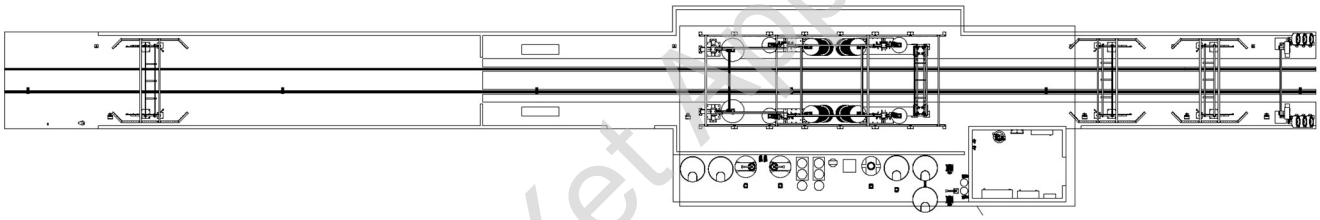

Figure 6-12-1 Typical Wash Facility Equipment Layout

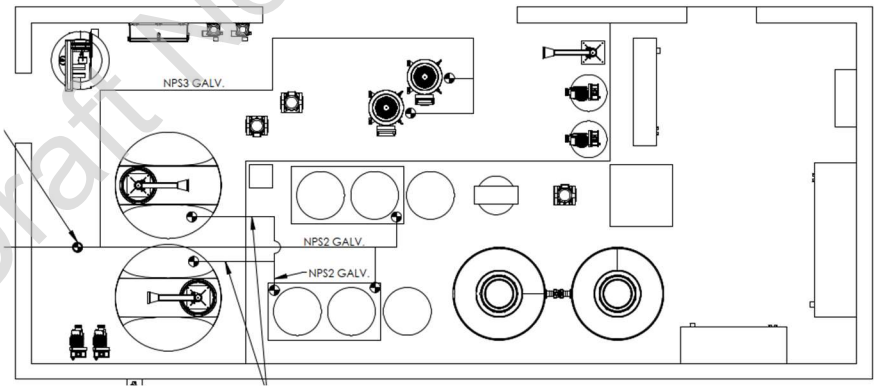

Figure 6-12-2 Typical Wash Facility Equipment Room Layout

12.2.3 WASH BUILDING (2024)

a. Concrete track slabs with acid-resistant treatment should be provided full length of the washing area with a minimum 30-foot treated approach slab. The rails should be sufficiently elevated to allow the various cleaning/rinse agents to freely pass under. All track fastenings should be corrosive resistant. The runoff collection area should be designed for acidic and basic chemicals as well as having ability for solids to be drained from the area. Means to clean and maintain the drainage structure should be considered. Consideration of the collection system extended beyond the limits of the wash equipment to capture any drippings from the equipment as it exits the wash area.

b. The entire floor should be properly sloped, curbed and drained to provide for proper waste collection and sufficient drainage area to handle run-off. Concrete surfaces should be coated with an acid/alkaline resisting material to preclude severe deterioration.

c. Consideration should be given to providing radiant heat in the floor slab in winter weather climates. Additional consideration should be given to using a waste oil furnace to heat hot water to melt snow and ice for the radiant heating system. Consideration for site environmental and ambient temperatures in selection of heating system.

d. The building structure may be pre-cast or poured acid/alkaline-resisting concrete, pole construction with plastic sheathing or standard steel prefabricated building provided the exterior panels are of a fiberglass plastic material or factory pre-coated with long life synthetic enamel. An acid-resisting coating shall be field applied to the structural frame and any other exposed steel. All fasteners shall be stainless steel. Building design should account for the chemicals to be used to protect from potential overspray. The building should be sized to allow for equipment installation, maintenance and change out if required. If building is design with a roof or enclosed, ventilation should be considered for both equipment exhaust and chemical outgassing.

e. Piping should be acid/alkaline resistant and supports designed for long spans and/or pressure requirements ~~pipe should be used and properly supported. Considerations should be taken into account for piping material…..~~

e) Lighting of a minimum of 30-foot candles at floor should be provided. This may be achieved by roof and/or side lights and interior illumination. Lighting should be designed to allow for both equipment operating through the facility as well as maintenance of the wash equipment when needed.

f) Sufficient roof type ventilators should be provided over the tracks to prevent buildup of fumes. If a portion of inbound storage and drip/clean-up area is enclosed for climatic conditions, a greater emphasis should be placed on ventilation, including make-up air.

h. Manual cleaning operations housed inside a building should include an exhaust hood to capture locomotive exhaust and sufficient tempered make-up air. The manual facility should also include access platforms on both sides of the locomotives at running board and top levels and the necessary fall protection to comply with OSHA requirements.

12.2.4 DRIP/CLEAN-UP AREA (2024)

a. Properly drained and treated concrete track slabs should be provided full length of drip area for ease of "touch up" cleaning of undercarriage. Cab and engine compartment cleaning may also be performed here.

b. Utilities required for finish washing are hot water with separate supply of detergent so that hot soapy water or clear water may be used at will. Pole-mounted hose reels should be installed to facilitate operation. Chemical formulations that work well with lower temperatures should be used where possible.

c. Overhead lighting of 20-foot candles should be satisfactory for night-time operations. Spaced poles between tracks would be satisfactory for both lighting and running overhead piping. Pipe trenches should be avoided in this wet area. All piping should be protected against freezing.

d. In severe climates, it may be necessary to enclose the drip/clean-up area. The diesel units would be cleaned and actually dried before moving outdoors. The enclosure would be well insulated and heated. Ventilation is important when units are standing at idle until dry.

12.2.5 SERVICE EQUIPMENT (SUPPORT AREA) (2024)

a. Provide building adjacent to washer building to house necessary chemical, preclean and rinse water tanks and pumps as well as heaters and electrical switch gear to provide power for equipment and lighting.

a. Fluid storage tank volumes should take into consideration recharge flowrates for filling tanks back up as well as volume of fluid used for each wash cycle. Volume storage should be considered to potentially allow for more than one wash cycle, in particular if there is a short duration between washings in certain instances. The wash system should verify tank volumes to alert the user that the wash system cannot be used due to low fluid levels. Depending upon how the raw chemicals are delivered, a tank volume to handle largest load to be delivered and minimize delivery schedules as much as possible.

b. If available water is of poor quality, consideration should be given to a water conditioning system so that the mixed chemical cleaning and rinse will be most effective. Soft water and RO water should be considered and utilized to maximize cleaning efficiency.

c. Recycling of collected water should be given consideration. The cost of a recycling plant with necessary filters and equipment should be evaluated against the type of chemical used, the availability of water and the availability of a waste disposal system. The final rinse can be recycled easily for pre-wash, but the acid/alkaline wash and chemical rinse would require more treatment depending on the final pH result.

d. Final liquid/solid waste disposal requires a holding sump with pipeline to acceptable treatment plant. The discharge water pH should be monitored and adjusted as needed to prevent corrosion concerns to the drainage infrastructure as well as creating treatment issues at the wastewater treatment plant.