Oregon Department of Transportation

Public Transit Division

Capital Vehicle Preventive Maintenance Program Handbook

Oregon Department of Transportation

Public Transit Division

PART I: VEHICLE PREVENTIVE MAINTENANCE PROGRAM

Per Federal Transit Administration (FTA) requirements for managing federally-funded assets, agencies will have a documented Vehicle Maintenance Program approved and in place. Specifically, all vehicles funded by ODOT Public Transit Division (PTD) must be included in the program which will include a comprehensive written Vehicle Maintenance Plan. Regardless of how your vehicle fleet is funded, it is important for all agencies providing public transportation to have a strong vehicle maintenance program since well-maintained vehicles are essential to providing a safe and secure ride for your customers. Preventive maintenance is required to ensure vehicles remain in a state of good repair based on manufacturer recommendations. Preventive maintenance also helps avoid breakdowns that may jeopardize passenger safety; helps ensure that all equipment, such as wheelchair lifts, is functioning properly; and conserves agency vehicle maintenance budgets by reducing avoidable unplanned major repairs.

PURPOSE AND COMPONENTS OF A VEHICLE MAINTENANCE PROGRAM

The purpose of a grant recipient vehicle maintenance program is to:

1. Ensure that the fleet is in a state of good repair
2. Ensure that a sufficient number of agency vehicles are available to meet daily service demands
3. Ensure that agency vehicles are safe, serviced regularly, and clean
4. Ensure that good vehicle maintenance is provided at a reasonable cost

Significant components of an effective vehicle maintenance program include:

1. A comprehensive Vehicle Maintenance Plan
2. An established vehicle service preventive maintenance schedule, based on manufacturer’s recommendations and warranty requirements
3. A thorough and documented inspection program including daily driver pre-trip vehicle inspections and post-trip inspections. Documentation should include reporting all problems and any corrective actions taken
4. Mileage or time-period based periodic mechanical vehicle service and inspections and corrective actions as required
5. Required annual vehicle safety inspection schedule for each vehicle, to be performed by a certified mechanic
6. A regular vehicle exterior and interior cleaning program
7. A cost-effective vehicle repair function for unplanned break-downs, which may include both in-house and out-sourced repair services

8. A policy and facility for safe and secure off-hour vehicle storage
9. A vehicle management information system (either automated or manual) to schedule and track vehicle maintenance activities, as well as vehicle labor and parts costs, by vehicle
10. Maintenance records of all service and repairs (invoices, or in-house reports if agencies perform services) for each vehicle. These records must be kept throughout the life of the vehicle being used in transportation service, and for three years following the end of the useful life of the vehicle.

CAPITALIZED VEHICLE PREVENTIVE MAINTENANCE

Some federal grant programs such as FTA 5310 and 5311 allow preventive maintenance projects to be reimbursed at the capital match rate in the grant program. Capitalized preventive maintenance allowable costs include:

1. Scheduled or routine maintenance, such as changing belts, hoses, and distributor parts
2. Oil changes and tune-ups
3. Tire purchases and tire maintenance
4. Wheelchair lift servicing and repairs
5. Annual safety inspections performed by a certified mechanic
6. Associated maintenance labor, parts, and supplies

Preventive maintenance in a capital grant is limited to one major component rebuild or replacement per vehicle included in the grant.

Some expenses are specifically disallowed as capitalized maintenance. These disallowed costs include:

1. Vehicle fuel
2. Vehicle oil, lubrication, or engine fluids purchased for inventory*
3. Vehicle parts and other expendables purchased for inventory*
4. Shop supplies
5. Repairs resulting from accidents covered by insurance
6. Insurance policy deductibles, or other costs covered by insurance
7. Repairs that should be charged to warranties or service agreements

* The cost of lubrication, oil, engine fluids, and parts which are expended in the course of a specific vehicle service are allowable as capitalized preventive maintenance, as a portion of the total vehicle servicing cost.

Vehicle “re-builds,” such as full engine replacements, or transmission/drive train replacements, are not considered preventive maintenance, and are generally not accepted by PTD as allowable capital grant expenses. Agencies considering a major vehicle re-build, should complete a brief cost-benefit analysis to determine if the additional vehicle life secured by a re-build justifies the re-build cost, and whether the same funds applied towards a new vehicle would provide the agency greater value. This documentation should be submitted with the agency’s grant application and will be considered on a case-by-case basis.

VEHICLE MAINTENANCE PLAN

Publicly owned transportation vehicle assets represent a significant investment of public funds. It is the goal of the FTA to ensure that all public transit assets, including vehicles, are preserved and maintained cost-effectively, in a state of good repair, and that they remain in safe condition. PTD’s responsibility is to see that this goal is met.

All PTD vehicle grant recipients must complete a *Vehicle Maintenance Plan*. The Vehicle Maintenance Plan is an agency policy document that should address or include:

1. Goals and objectives of the agency’s maintenance program, and how these were established;
2. An inventory of the agency’s vehicle assets, and a schedule and process for periodically updating the inventory;
3. A description of maintenance responsibilities within the agency, encompassing management, supervision, drivers, and maintenance staff;
4. A preventive maintenance plan with the following components: :
   - ✓ A preventive maintenance servicing schedule for each vehicle in the agency fleet, based on manufacturers’ recommendations for the size, type and components or equipment contained on that specific vehicle;
   - ✓ A process for managing and monitoring vehicle warranties and, if applicable, service agreements, to ensure all service requirements are met;
   - ✓ A vehicle daily servicing plan designed to prepare the vehicle for daily revenue service (typically includes interior cleaning and key fluids checks) ;
   - ✓ A vehicle inspection procedure which should include both driver’s daily pre-trip inspections and post-trip inspections, reports;
   - ✓ Mechanic’s mileage-based service and inspections;

- ✓ A procedure for follow-up for repairs arising from pre-trip and post-trip inspections, and documentation regarding any vehicle being pulled from service until required repairs are made;
- ✓ A schedule for periodic exterior vehicle cleaning and more thorough interior cleaning, that takes into account seasonal and environmental conditions;
- ✓ An annual vehicle safety inspection by a certified mechanic. This inspection must include all safety components and is not complete unless it includes inspection of ADA-related equipment such as lifts, tie-downs, handrails, etc.
- ✓ New driver vehicle orientations, to ensure proper and safe use of the vehicle and any installed equipment;

5. A consumables re-stocking procedure assigning responsibility and date intervals for restocking fuel, oil, parts, and supplies. Note: These items are **not** eligible for reimbursement in a capitalized preventive maintenance grant agreement—these items are only eligible as operating expenses, in ODOT PTD grant programs which fund operating expenses;
6. A vehicle repair policy for unplanned mechanical breakdowns, whether repairs are performed in-house or are contracted out;
7. A vehicle storage procedure for safe and secure vehicle storage off-hours;
8. The agency's vehicle management information system (VMIS) established to document vehicle inspections, maintenance and repair activities. The system should track actual dates, services performed, parts used, costs incurred, and when the next service/inspection is due (miles and/or date).

INDIVIDUAL VEHICLE PREVENTIVE MAINTENANCE SCHEDULE AND RECORDS

All grant recipient agencies are required to prepare a preventive maintenance schedule for every grant-funded vehicle the agency is awarded. Vehicle preventive maintenance schedules should be based on manufacturer's recommendations for the specific vehicle size, type and model, and must meet or exceed manufacturers' maintenance recommendations for that vehicle.

Vehicle Condition Definitions: PTD has established vehicle condition definitions that comply with FTA guidelines, and are useful to agencies for assessing and documenting the status of their vehicle fleet. These definitions can be found in the Asset Management section.

Forms and Checklists: For agencies that do not have their own forms and checklists, and/or desire to look at examples from other agencies, sample forms and checklists, including inspection checklists, are provided in Appendix One to this Handbook.

Records Retention Requirement: Individual vehicle records, including procurement, maintenance and repair records must be retained as long as the vehicle remains in public transportation service, plus three years beyond disposition of the vehicle.

Scheduled Service Intervals: The preventive maintenance schedule should include expected service triggers for maintenance services to be performed. These may be either time periods (example: every three months), or miles elapsed (example: every 3,000 miles),. Service intervals for different types of maintenance should be established as multiples of a common denominator, whether mileage-based or time-based. This minimizes the frequency of preventive maintenance servicing, and optimizes vehicle in-service operation.

For example, if oil is changed every 3,000 miles, schedule tire rotations every 6,000 miles and transmission fluid changes every 24,000 miles (as long as these intervals meet or exceed manufacturers' recommendations). For a time-based service interval program, this example could equate to every three months, six months, and twelve months.

The scheduled service should address every component included in the manufacturer's warranty requirements schedule, including all safety equipment and ADA-accessibility equipment such as wheelchair lifts.

Service intervals should also take into consideration seasonal and environmental factors, such as winter conditions, salted or sanded roads, rough road conditions, city-versus-rural driving, coastal fog and sea salt conditions, regular hill or mountain driving, etc.

Wheelchair Lift Maintenance: A survey of major wheelchair lift dealers in Oregon indicates that because of widely varying lift usage rates, manufacturers recommend that preventive maintenance for powered lifts is scheduled based on lift cycles, rather than on time-based intervals. For instance, if a dial-a-ride bus is deploying the lift 30 times a day, it would require more frequent service than a limited-route van requiring 8 deployments in a day. Cycle counters have been installed on vehicle lifts in Oregon since April 2005. PTD is advised that retrofitting older lifts with cycle counters is possible with certain units, and in limited circumstances. Check with the vendor who sold the component for information.

Agencies should include a vehicle lift preventive maintenance section in the Vehicle Maintenance Plan. The lift preventive maintenance section should address the following:

1. A preventive maintenance schedule based on lift cycles, according to manufacturers' recommendations
2. Regularly scheduled visual lift inspections by drivers, and by mechanics during in-shop maintenance
3. New staff orientation and training on operation of the lift and of the cycle counter (for drivers and shop technicians)

Vehicle Maintenance Schedule Chart: A tracking chart should be maintained in the vehicle file documenting both the maintenance service schedule and the next service due for each vehicle component. This chart should be maintained for as long as the vehicle is used to provide public transportation. See sample forms in Appendix One.

Each vehicle maintenance chart should include:

1. Vehicle manufacturer, year, make, model, size, and type;
2. Vehicle chassis VIN number, license plate number, and internal agency inventory tag or vehicle number;
3. A checklist of major vehicle components requiring scheduled maintenance or service—component list must include ADA equipment;
4. Annual safety inspections—either as a separate line item or identified in a line item with an interval that meets the requirement of annual inspection (the safety components inspected should be identified in the checklist);
5. Scheduled maintenance activities to be performed, identified by either date (time period), odometer reading (elapsed mileage), or number of lift cycles;
6. Dates the scheduled maintenance or service was actually completed, including any repairs made, depending on software used;
7. Vehicle odometer mileage at time of each maintenance or service;
8. Warranty maintenance service performed, whether noted as part of the regular scheduled maintenance, or performed separately;
9. Name, initials or unique employee identifier (e.g., ID Badge number) of person who performed the maintenance, if agency has in-house maintenance shop;
10. Initial of agency staff member responsible for vehicle maintenance (per Vehicle Maintenance Plan), if service is contracted to another facility;
11. For contracted work, vendor invoices and associated documents in the vehicle file confirming that work was done on date noted in chart.

Vehicle Preventive Maintenance Records: Vehicle maintenance records, including the Vehicle Maintenance Chart described above, must be maintained for each vehicle, to show whether or not maintenance has in fact been performed according to vehicle manufacturers' established preventive maintenance schedule. The maintenance records will also show that recommended repairs are made on a timely basis.

Vehicle maintenance and repair documentation is an FTA requirement for all federally-funded assets. All vehicle maintenance records must be made available when requested by PTD staff or its representatives.

Vehicle maintenance records for each vehicle should be kept in separate files, and should include:

1. Vehicle Maintenance Schedule for each vehicle (see above);
2. Documentation of annual safety inspections, including ADA components, performed by a certified mechanic with manufacturer-certified training for the vehicle and for specialized, on-board ADA components;

3. Completed daily pre-trip and post-trip driver checklists documenting that all safety features are functioning. The driver's pre-trip checklist must include deploying any wheelchair lift equipment and interlock features. The post-trip checklist must include indications of service or repairs required, action taken to do the work, and whether or not the vehicle must be taken out of service until repair or service is done, based on agency maintenance policies and safe operation standards;
4. Chart of periodic maintenance performed according to maintenance schedule (see below);
5. Copies of all parts or services invoices, or internal repair orders, documenting that the maintenance and repairs were performed.

VEHICLE REPAIRS AS PART OF PREVENTIVE MAINTENANCE

Vehicle repairs include planned major parts replacements (one instance per vehicle per biennium may be reimbursed in a capital preventive maintenance grant); repairs arising out of pre-trip, post-trip, or mileage/time-based inspections (including annual safety inspections); and wear and tear repairs or replacements (e.g., nicks and minor windshield chips, cracked light covers, individual seat tears, tires, planned brake jobs, lift repairs, bus washing and detailing, etc.)

Although defined as maintenance repairs, warranty/recall servicing, warranty/recall parts replacement, and repairs resulting from accidents, are not eligible expenses in PTD capitalized preventive maintenance grants. Warranty work should be performed in a timely manner, and agencies should access the manufacturer's warranty via the vendor if assistance is needed to determine what is covered. Any warranty work not covered that must be paid for by the agency should be reimbursed as an operating expense, not in the capitalized preventive maintenance grant. Accident repairs should be covered by insurance. Any deductibles or charges resulting from an accident that the agency must pay are also considered operating expenses that cannot be reimbursed from a capital preventive maintenance grant.

Agencies should use some form of Vehicle Repair Work Order form or sheet to record the repair activities. It should include, at a minimum, the start and end date of repairs; the reason for the repair (for example, bus wouldn't start, check engine light came on, inspection finding, or accident); what repairs were made; labor hours; parts used; and who did the work. A Work Order should be used whenever the agency performs the repair service in-house. If work is done by a vendor, agencies should require work orders or invoices from the company performing the maintenance or repair that, at a minimum, state the issue, parts installed and separate labor charges.

Once the work is completed, the repairs should be documented on the Vehicle Maintenance Chart (see above) and the Work Order should be kept in the individual vehicle maintenance file, where it becomes part of the historical record for that vehicle. These documents are also provided either as required reimbursement documents, or as the basis for completing the

vehicle Preventive Maintenance Reimbursement Request attachment form (the Excel spreadsheet developed for use in lieu of providing copies of vendor receipts).

VEHICLE CLEANING

It is important that vehicles are regularly cleaned inside and out. Agency preventive maintenance plans should address the issues of regular vehicle cleaning.

Regular vehicle cleaning helps prevent premature vehicle aging, protects exterior paint, extends the life of protective coatings, and helps prevent rust. It also increases passenger comfort and maintains a positive agency image. Smaller vehicles may be washed at a car wash or with a portable vehicle washing unit; larger buses may require use of a washing facility (wash rack) or a trip to the nearest truck wash facility. Washing should include periodic washing or steam-cleaning the vehicle engine and undercarriage, and application of a protective coating to the painted surfaces, if recommended, and as specified by the manufacturer.

An interior and exterior cleaning schedule should be developed, which specifies cleaning activities to be performed at specified intervals. At minimum, the cleaning standards should include the activities noted below (information provided by Basin Transit Service).

Bus Clean-up – Daily

Run vehicle through bus washer (automatic machine)
Pressure wash wheels
Squeegee window exteriors, dry off mirrors
Clean spots off windows, interior
Clean driver area (dash, consoles, seat, fare box, windshield)
Sweep and mop floors
Replace trash bag

Bus Clean-up – Weekly

Same as daily, plus:
- Clean all interior windows
- Vacuum seats, wipe down stanchions & railings
- Clean seats with disinfectant (fabric or vinyl cleaner)

Perform at Service Interval (4-6 weeks)

Same as daily and weekly plus:
- Clean all interior bulkhead and ceiling surfaces
- Scrub floors
- Apply dressing to dash, console and driver area (such as a product that cleans, shines and protects surfaces)
- Paint rims

Clean water spots off mirrors (soft scrub)
Apply exterior protectant (per manufacturers' specifications)

VEHICLE STORAGE AND SAFETY

Every transit agency is responsible for protecting its vehicle fleet through good storage and safety practices. Safe and secure vehicle storage encompasses several aspects:

1. ***A secured vehicle parking area***. This may be a parking lot with adequate lighting and security, such as security fencing, perimeter motion-detector lighting, or door/window alarms, or a covered bus parking shelter, or a bus barn, also with adequate security,.
2. ***Security surveillance***. In areas more prone to crime, vandalism, or gang-related activity such as graffiti tagging, some form of additional surveillance may be desirable. This can take the form of electronic surveillance (monitored security cameras), or a routine private patrol service, or both. Security camera monitoring during hours the agency is closed can often be contracted to a commercial security company.
3. ***Safety procedures***. Proper storage also incorporates safety procedures such as no-exception brake setting and transmission-in-park requirements of drivers; and setting up the parking area to maximize forward driving and avoid operating vehicles in reverse. Backing up is a frequent accident-generating activity. Entering and exiting safely at the storage facility is also important. Requiring procedures such as 10 MPH maximum driving speeds, and stop signs or markings at intersection points, will help to minimize unnecessary vehicle damage or collisions.
4. ***Key Control***. Keys are a vulnerability point for all vehicles. A policy and procedure for locking vehicles, and assigned responsibilities for vehicle keys at shift-end should be established.
5. ***Suspicious Package Checks***. The FTA, in conjunction with the Office of Homeland Security, strongly encourage transit providers to adopt safety guidelines related to bomb threats and suspicious circumstances. Agencies should have a procedure for employees to appropriately and safely respond to the discovery of a suspicious package or device, which may include incidents at a vehicle storage facility.
6. ***Rural Transit System Considerations***. For more remote rural systems involving longer distance driving, storing vehicles off-site, such as near a driver's home for a closer route start, may be necessary. Agencies in these circumstances should ensure that vehicles are regularly inspected by a supervisor to ensure parking locations are safe; cleanliness standards are being met; and pre-trip and post-trip inspections are being performed.

PART II: VEHICLE FLEET MANAGEMENT - BEST PRACTICES

The information below has been compiled from a wide variety of sources including FTA, Community Transportation Association of America (CTAA), Small Urban & Rural Transit Center (SURTC), and other state transit agencies. It represents current best practices in several aspects of vehicle fleet management, including Vehicle Information Management Systems (VMIS), fleet analysis and spare vehicle ratios, maintenance employee training, and contracting for vehicle maintenance. These are not mandatory topics and may not be of interest to smaller agencies, but are presented here in the interests of supporting transit best practices for mid-size and larger agencies.

VEHICLE MANAGEMENT INFORMATION SYSTEM (VMIS)

The VMIS is the key to successful and cost-effective vehicle maintenance. A VMIS may consist of a combination of automated tracking systems, paper checklists and forms, written procedures, and supervisory oversight responsibilities. Agencies that do not already employ a VMIS are encouraged to develop one. Automated VMIS software applications are available commercially, or may be obtained from other transit agencies.

There are three basic components of an effective VMIS: 1) vehicle data-gathering; 2) vehicle data tracking and analysis; and 3) management oversight and maintenance decision-making support. Effective use of VMIS information by agency management allows for informed decision making regarding vehicles and maintenance functions, which in turn improves overall agency efficiency. The table below provides an overview of the data elements, outcomes, and functions in each of these areas.

VEHICLE DATA GATHERING ELEMENTS	VEHICLE DATA TRACKING AND ANALYSIS OUTCOMES	MANAGEMENT OVERSIGHT AND MAINTENANCE DECISION SUPPORT
✓ Vehicle PM schedule ✓ Daily/monthly vehicle mileage log ✓ Daily/monthly vehicle in-service hours log ✓ Vehicle maintenance file ✓ Vehicle maintenance chart ✓ Pre-trip inspection reports ✓ Post-trip inspection reports ✓ Mileage or time-based inspection reports ✓ Repair work orders ✓ Accident reports ✓ Parts inventory/use report	✓ Annual and monthly maintenance cost per vehicle ✓ Annual and monthly average maintenance cost per vehicle type/category ✓ “Fully loaded” maintenance labor cost per hour ✓ Maintenance cost per vehicle mile, by vehicle ✓ Average maintenance cost per vehicle mile, by vehicle type/category ✓ Maintenance cost per vehicle in-service hour, by vehicle ✓ Average maintenance cost per vehicle in-service hour, by	✓ Effectiveness of PM program in reducing breakdowns ✓ Adjusting interval schedule for PM (increase or decrease) ✓ Adequacy and appropriate skills mix of vehicle maintenance staffing ✓ Trends in consumable usage for budget adjustment (parts, fuel, oil, tires) ✓ Effectiveness of vehicle repair program (time between incidents; re-repair rate) ✓ Loss control evaluation and prevention (pilferage) ✓ Average productivity of mechanics and maintenance

✓ Consumables purchase records (fuel/oil/fluids/tires/etc.) ✓ Agency vehicle maintenance budget ✓ Agency vehicle maintenance actual costs by month ✓ Maintenance payroll and labor cost allocation records ✓ Maintenance vendor invoices ✓ Staff training costs/invoices ✓ Vehicle and equipment purchase orders ✓ Shop equipment purchases and maintenance records ✓ Contract invoices and reports (if maintenance is contracted out)	vehicle type/category ✓ Parts inventory trend analysis ✓ Parts usage by month/staff-person/vehicle ✓ Fuel use per vehicle/mile ✓ Average repair costs per vehicle/per vehicle type/category ✓ Comparative maintenance costs and trends by vehicle year ✓ Average vehicle down-time for maintenance and repairs ✓ Maintenance shop productivity (vehicles maintained per month, vehicle repairs per month, etc.) ✓ If contract, contract trends and cost averages per vehicle/month	staff ✓ Determine threshold for adding fleet vehicles with existing staff ✓ Determine need for additional (or less) maintenance staff ✓ Risk management: accident rates by vehicle and/or driver ✓ Comparative maintenance data to support vehicle purchase decisions (best make/model; most appropriate vehicle categories; etc.) ✓ Fuel efficiency of present fleet ✓ Useful life threshold to replace vehicles (high maintenance costs) ✓ Review of driver and maintenance staff training needs

* Source: ODOT Public Transit Division, 2010

VEHICLE FLEET REVIEW

Using VMIS data, as well as other ridership information, route information, passenger surveys, and driver and maintenance staff input, agencies should periodically review their existing vehicle fleet. Among the questions to consider are:

1. Is the fleet size adequate for the current agency mission? Does the agency need more vehicles, or possibly fewer vehicles?
2. Is the agency using the appropriate type/category of vehicle for its present fixed route and/or demand response activities? Is the present fleet sized properly for ridership levels, route lengths/traffic, and vehicle wear-and-tear?
3. Is vehicle downtime for service within acceptable limits, and not causing service disruptions? Should spare/back-up vehicle capacity be expanded? (see below)

SPARE VEHICLE / BACK-UP CAPACITY

In order to maintain scheduled routes and services without disruption when regularly assigned vehicles are down for maintenance servicing or repair, agencies need to maintain an appropriate number of back-up/spare vehicles. One published rule-of-thumb suggests that 85% of an agency's total fleet should be available for active revenue service (passengers on

board), with 15% assigned as back-up vehicles for maintenance service and accident down-time.[1]

More specific guidelines have been published for assisting agencies to determine the appropriate ratio of back-up vehicles for their fleet. Agencies should note these are general guidelines, not hard-and-fast rules. Some other factors the agency should consider in determining appropriate back-up vehicle capacity include geography, type of terrain traveled, road conditions, harsh weather conditions, length of routes, and condition of the current fleet.

SIZE OF AGENCY'S REGULAR SCHEDULED FLEET	MINIMUM NO. OF BACK-UP VEHICLES REQUIRED
1 – 7 vehicles	1
8 – 13 vehicles	2
14 – 20 vehicles	3
21 – 29 vehicles	4
30 – 39 vehicles	5

VEHICLE MAINTENANCE EMPLOYEE TRAINING

Maintaining vehicles in good working condition requires well-trained and well-supervised maintenance staff. Maintenance training for vehicle mechanics and vehicle service technicians should include, at a minimum[2]:

1. Shop and overall facility familiarization, including training on all equipment for which they have responsibility;

2. Facility safety training including hazard identification, location of fire and life safety equipment, shop power emergency disconnect location, safety exits, and emergency incident procedures;

3. Vehicle maintenance program scope and objectives training;

4. Transit agency's policy training, including safety and maintenance policies;

5. Applicable vehicle maintenance standards and regulations training, and instruction on how they are enforced;

[1] Source: Principles of Transit Management, Chapter 7: Vehicle and Facility Maintenance. SURTC, 2010.

[2] Source: "Maintenance Management and Safety Guide", Texas Department of Transportation, Public Transportation Division

6. Training on forms and procedures used in the agency's Vehicle Management Information System, including all inspection checklists;

7. Instruction on the safe operation and maintenance of all bus on-board safety equipment, and ADA equipment;

8. Specialized certification training as may be required by state, federal, or municipal regulations, and/or as a condition of employment (example ASE Certification)

Maintenance training should cover all vehicles and equipment operated by the transit agency. Training manuals, maintenance manuals, and all updates/revisions should be provided in a central shop location, for each type of vehicle and equipment being used by the transit agency.

Vehicle manufacturers or component companies that manufacture the engine, transmission, or heating and air conditioning for the vehicle often offer specialized maintenance training. This might take place at their facility, or they may offer to travel to your location for training sessions. Manufacturers should always provide training when new equipment is delivered or when a vehicle is retrofitted with their equipment. In addition to training, manufacturers commonly provide regularly updated manuals and bulletins to keep mechanics informed of the latest recommendations and guidelines.

All drivers should be given a complete familiarization of the vehicle, including engine compartment, driver controls and passenger safety devices. Drivers should be trained to recognize unusual noises and to communicate basic mechanical problems to the maintenance department.

Beyond this initial orientation and training, mechanics and all vehicle service personnel should be continuously trained to ensure that their skills are kept up-to-date. All training should be documented, and the effectiveness of the training program evaluated periodically.

Supervisory training for shop supervisors is equally important, and should include not only technical training and updates, but also, at minimum, training in basic and advanced supervision; employee communication and effective listening; and problem-resolution skills.

IN-HOUSE VERSUS CONTRACTED VEHICLE MAINTENANCE

PTD will accept both in-house and out-sourced (contracted) preventive maintenance programs that meet state and federal requirements. The same eligibility for capital reimbursements in grant programs apply to in-house and contracted or vendor-performed maintenance. The grant recipient agency also has the same responsibility to monitor and manage its vehicle maintenance program, whether the maintenance is performed at the agency's facilities, is out-sourced to a single contractor, or is performed by local vendors.

For smaller agencies, contracting out vehicle maintenance can be cost-effective. Larger agencies with in-house maintenance staff performing vehicle maintenance, may still find it cost- and time-effective to contract out some work, such as lengthy major vehicle repairs, or repair of highly specialized equipment.

Vehicle maintenance is one of the most significant expenses for a transit provider, whether small or large. Your agency should consider conducting a thorough evaluation of vehicle maintenance alternatives if you are:

1. Significantly expanding, or considering a significant expansion of, your transportation services or vehicle fleet;
2. Experiencing significant and/or sustained cost increases in your maintenance function which are out-pacing growth in your agency's financial resources;
3. Experiencing significant and/or sustained quality-control problems with vehicle maintenance, resulting in regular route delays, vehicle breakdowns, and/or service cancellations;
4. Regularly having difficulty recruiting and retaining qualified mechanics, due to pay differentials or geographic location;
5. A new transit provider.

Evaluation factors to consider:

1. Agency financial resources and available maintenance budget;
2. Size and condition of the vehicle fleet;
3. Cost and availability of vehicle maintenance facilities and equipment;
4. Ability to hire, train, pay, and retain qualified mechanics and maintenance staff;
5. Ability to effectively supervise an in-house vehicle maintenance operation;
6. Proximity and ability of qualified vehicle maintenance facilities/vendors to service your fleet in a timely and cost-effective manner

An agency's VMIS can provide valuable data to perform an analysis of maintenance costs and alternatives. General guidelines have also been published indicating the average number of vehicles that one full-time mechanic can keep maintained, by category of vehicle:

VEHICLE DESCRIPTION	ODOT – PTD VEHICLE CATEGORY	NO. OF VEHICLES MAINTAINED BY ONE FULL-TIME MECHANIC
Passenger Sedan	E5, E6, E7	20 - 30
Van or Modified Van	E1, E2, E3, E4	15-30
Light-to-Medium-Duty Bus or Chassis Cutaway	C, D	5 - 20
Larger Transit Buses	A, B	3 - 10

* Source: Management Toolkit for Small Urban and Rural Transit Operators, TCRP Report No. 54, U.S. Transportation Research Board, Washington DC

If considering contracting for maintenance service, grant recipients must follow their agency's established procurement policies and procedures, which may include seeking competitive bids or proposals. A written contract should be carefully negotiated to clearly define a schedule of charges for specific maintenance activities and should be reviewed by ODOT PTD staff prior to awarding if PTD grants fund the activity. The contract and/or bid should include a preventive maintenance schedule to be followed; vehicle turnaround timelines; quality control standards; and a process to mutually resolve problems or issues.

RESOURCES

Federal Publications

Code of Federal Regulations (CFR) 49

• Part 37, Transportation Services for Individuals with Disabilities (ADA) 49CFR37

• Part 38, ADA Accessibility Specifications for Transportation Vehicles 49CFR38

• Part 393, Parts and Accessories Necessary for Safe Operation 49CFR393

• Part 396, Inspection, Repair, and Maintenance 49CFR396

• Part 571, Federal Motor Vehicle Safety Standards (FMVSS) 49CFR571

Other Useful National Organization Publications

• Federal Transit Agency – Bus Safety and Security Program – Resource Library FTABusSafety

• Community Transportation Association of America (CTAA) – ADA Resources CTAA-ADA

State Publications

- ODOT – PTD State Management Plan SMP
- OARS Sections 732-005-0000 through 732-030-0035 OARS732
- Oregon Administrative Rules regarding Procurement (OAR Division 55) OARDiv55
- ODOT Department of Motor Vehicles Vehicle Code DMVCode

FORMS & DOCUMENTS

Below is a list of vehicle maintenance forms that can be found on the PTD website under *Reporting and Forms*:

- ✓ Sample large transit agency vehicle maintenance plan (CYRIDE) VehMaintPlan
- ✓ Sample mid-size transit agency vehicle maintenance program (RideSource) VehMaintProg
- ✓ Detailed quarterly preventive maintenance checklist (SURTC) PeriodicPMChecklist
- ✓ Sample PM schedule sheets for various size & type of vehicles (Columbia County) VehSchSheets
- ✓ Sample new driver orientation form (SURTC) NewDriverOrient
- ✓ Annual vehicle inspection chart (FTA website) AnnualInspect
- ✓ Combined driver's pre-trip/post-trip/vehicle damage report (WSDOT, NCDOT, SURTC) PrePostTripRpt
- ✓ Wheelchair lift preventive maintenance policy/procedure and PM schedule (Columbia County) WheelchairLift
- ✓ Bus safety equipment and on-board emergency response material (NMDOT) EmergResp
- ✓ Transit vehicle security inspection checklist (NTI) SecInsp
- ✓ Sample vehicle cleanliness inspection sheet (NCDOT) CleanInsp
- ✓ Vehicle inspection Test Study Guide (NMDOT) TestGuide
- ✓ Sample contracted maintenance review checklists (WSDOT) ContractMaint