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Chapter 1 -- Organizational Structure

<u>1.1 Introduction</u>

The purpose of this Pennsylvania Turnpike Commission Maintenance Manual is to disseminate information, instructions and policies of the PTC and to describe the organization and various maintenance functions in order to develop uniformity of methods and practices.

This manual contains information developed from technical bulletins, accepted standards, and procedures and policies from various transportation organizations. It also represents what is considered the best practices in maintenance work as developed through years of experience. These practices will be adopted as the standard methods that will be utilized by the Maintenance Department.

Hardcopies of the manual will be furnished to all district and section managers. These employees should read the manual carefully and will be held accountable for carrying out the instructions contained in this manual.

This manual will be maintained in hard copy as a loose leaf three-ring binder as well as available on the PTC Intranet. As changes, additions, or deletions are published, the holder of each hard copy manual will be responsible for inserting the page or pages in the binder immediately upon receipt to always insure an up-to-date manual.

Intranet updates will be managed by Central Office Maintenance Department.



Maintenance Department Management Organization Chart



Note: Designs, inspections and reviews by Engineering may be necessary prior to the replacement of drainage systems, signs, guiderail, etc. by Maintenance. Design Engineering will also be responsible for determining the need for obtainment of any permits associated with the work. All applicable procedures and guidelines outlined in the "Maintenance Field Guide for Erosion and Sedimentation Controls" must also be followed.

Environmental concerns such as wetlands, erosion control, and waterway pollution are to be addressed in the disposal of all excavated and waste materials and in all other actions related to any earth disturbance activity.

All environmental regulations in effect at the time shall be adhered to by maintenance forces. PTC "Stormwater BMP Maintenance Guidelines" and PTC "Maintenance Field Guide for Erosion and Sediment Controls" should be reviewed for BMP's (Best Management Practices) regarding installation and maintenance of erosion control devices related to any earth disturbance activities.



CHAPTER 2 PLANNING, SCHEDULING & BUDGETING

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Chapter 2 -- Planning, Scheduling and Budgeting

2.1 Introduction

The overall objective in Turnpike maintenance planning is to establish an adequate maintenance program capable of accommodating all travel in an orderly, safe, and efficient manner. Roads and structures must be maintained with the least amount of inconvenience to the traveling customer, the greatest degree of safety and with full consideration of the property owners adjacent to the Turnpike.

This chapter addresses planning and scheduling, important aspects of Highway Maintenance Operations. Proper planning provides many benefits. First, planning is necessary to ensure that each part of the organization will know when, how, and what to contribute toward maintaining the highway system. Planning also enables an organization to focus attention on established objectives and to gain efficiencies in operations. Cost is minimized because of the emphasis placed on consistent and efficient operations. Lastly, plans facilitate achieving goals.

Various management considerations are instrumental in determining and evaluating alternate courses of action. Selecting a course and deriving a plan is based on available resources, budgets, and maintenance needs.

Maintenance planning is the process that begins well before the work is scheduled and concludes with the weekly scheduling documents. This task is often difficult because the many variables which affect the maintenance; however, it is possible to plan and schedule most maintenance activities.

Some variables that may be controlled are: 1) having the correct materials at the job site when needed, 2) scheduling the type and amount of equipment, and 3) having labor available to perform the required tasks. The purpose of planning is to take care of controllable factors in the best way possible and to cope with the adverse effects of those factors which may cause disruption.

2.2 Planning

Maintenance Business Plan - The Central Office formulates an annual business plan, which takes into consideration the projected needs and formulates guidelines for



expenditures within the prescribed allocations. These plans establish realistic goals which the Maintenance Department works toward.

Annual Work Plan - The Annual Work Plan is usually developed over the winter months for the upcoming year beginning with Spring Operations. The Annual Work Plan identifies the type (assembly) and amount (production units) of work to be completed

Sections should consider cycle maintenance when developing their Annual Work Plans. Cycles may vary based on location, climate, budget, etc. Maintenance activities to consider for cycle maintenance should include, but are not limited to crack sealing, joint sealing, shoulder cutting/grading, bridge cleaning/flushing, sweeping, mowing, vegetation control, delineation, and drainage maintenance. Cycle maintenance can produce long term cost savings by directing effort towards preventive maintenance instead of demand maintenance; however, District cycle maintenance goals should be consistent with District and Central Office directions.

The Section Foreman is responsible to see that the Annual Work Plan is completed within the established timeframes and can be supported by the budget. The Operations Manager is responsible for the review of the completed plan to ensure District and Central Office initiatives are being addressed.

Intermediate Period Plan - The period planning process essentially adds more detail to the annual work plan. It is also used to ensure that operations are performed in the right sequence (e.g. it is always better to replace the pipe before you pave the road). The period plan identifies all assemblies to be performed during the scheduling period; which personnel will perform the work; planned production units to be completed; the time of year the work will be done, and location the assemblies will be performed. The Period Plan is the primary document used by the Section in developing Weekly Plans. It is important to note that work should be coordinated with any other private or public roadway users and stakeholders. For example, other planned Department, PSP, or Utility projects, or other special events need to be considered in our maintenance planning.

The process of preparing a period plan begins with the identification of projects remaining to be completed including projects from other departments. The next step is to determine which of the uncompleted projects are to be scheduled during the planning period using the production units from the previously prepared Annual Work Plan as a target.

The following must be considered when preparing the Period Plan:



- The priorities and sequencing of specific projects and the planned quantities of the Annual Work Plan.
- Holidays and sporting seasons.Work scheduling calendar (Figure 3.2).
- Inclement weather estimate and alternate work assemblies.
- Demand maintenance in response to customer concerns.



2.3 Work Scheduling Calendar

Work Activity	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Manual Patch	X	X	X	X	0	0					0	X
Manual Patch Emergency	0	0	0	0	0	0	0	0	0	0	0	0
Tunnel	0	0	0	0	0	0	0	0	0	0	0	0
Spray Patch	X	Х	Х	Х	0	0					0	Х
Spot Mill	X	Х	Х	0	0					0	Х	Х
Base Repair	X	X	Х	Х	0							Х
Crack Sealing				Х	Х	0				0	Х	Х
Recycling	X	Х	Х	0							0	Х
Spall Repair	X	Х	Х	Х	0	0				0	Х	Х
Shoulder Stabilization	0	0	0	Х	Х	Х				Х	Х	Х
Drainage – Cleaning	0	0	0	0	0	0	0	0	0	0	0	0
Drainage – Repairs	X	X	X	X	X	Х	0	0	0	Х	X	X
Sidedozing	X			Х	X	Х	0			0	X	Х
Restoration – Disaster	0	0	0	0	0	0	0	0	0	0	0	0
Storm Patrol	0	0	0	0	0	0	0	0	0	0	0	0
Graffiti	Х	Х	Х	Х	Х	0				0	Х	X
Interchange Cleaning	X	X									0	X
Tower Access Roads	0	0	0	0	0	0	0	0	0	0	0	0
Mowing	X	X	X	0	0						0	X

X = Period of Expected Performance O = Periods of Possible Performance

Blank = Periods When Activity Usually Should Not Be Scheduled



2.4 Budget

The department budgets are formulated on fiscal year basis of June 1 to May 31. Operating budgets are prepared to reflect the normal daily operations in the Annual Work Plans. The operating budget is completed at various levels from department to section based on the general ledger account. Capital budgets are prepared based on asset life cycles, changes to fleet requirements, etc.

CHAPTER 3 WINTER SERVICES

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3.1 Introduction

No other facet of maintenance requires more diligence and preparation than snow removal and ice control; perhaps because no other maintenance function is less tolerant of failure. Few things have a greater impact on the customer than the service rendered by our maintenance forces during the winter months. This chapter discusses all phases of snow removal and ice control operations, from the required planning through the necessary follow-up activities at the conclusion of each storm.

The primary maintenance objective during the winter months is to keep the Turnpike in a safe and passable condition and to provide highway safety and serviceability to the customer in the most efficient and cost-effective manner. All lanes should be maintained to the best of each section's ability.

Due to the dynamics of winter storm events, Levels of Service vary according to the time of day, day of week, elapsed time since start of event, traffic volume, storm intensity and specific local weather conditions. The ultimate goal of ice- and snow-free roads may be fully achieved only after a storm event has ended.

Planning, preparing, and scheduling of resources must occur far in advance of winter storms. In fact, a successful winter services program is a **year-round activity** and requires a continual **focus on fundamentals**. Preparations for next winter's operations begin on the last day of the previous winter season.

Focus On Fundamentals

Fundamental resources that must be ready for deployment include:

- **People:** Equipment Operators, Mechanics, Foremen and Managers who possess the knowledge and skills needed to perform their jobs well.
- **Materials:** Sufficient quantities of the correct materials for conditions, in the right locations and ready for proper application.
- **Equipment:** The right types and pieces of equipment properly maintained and available when and where needed to perform winter operations.

• Schedules & Reporting: Detailed operational assignments for people, equipment and materials ready to achieve Levels of Service goals for each priority during and after winter storm events, along with properly reporting the work that has been completed, including equipment, materials and manpower.

Communications

Efficient, accurate and timely transmission of information before, during and after winter storm events among parties who need to know, including PTC staff and external partners.

Situational Awareness

Having accurate and up-to-date awareness of road and weather conditions is an important component of Situational Awareness. Successful snow and ice control operations require continual monitoring of weather conditions, weather forecasts and resources deployed. Such monitoring provides awareness of current and changing conditions. This knowledge is indispensable for communications among relevant parties dealing with the winter storm event.

Contingency Planning

Having plans to address potential challenging situations is an important component of contingency planning. Situational awareness is essential to contingency planning. Temporary redeployment of resources may be necessary if conditions warrant. Situational awareness supports decisions to activate contingency plans.

Chapter Organization and Scope

This chapter discusses all phases of ice and snow control operations. As nearly as possible, it chronologically lists all winter-related activities starting with those performed in the spring, continuing with summer and fall activities and concluding with the winter season. Employees throughout PTC perform these activities.

Changeable conditions during winter storms require flexibility of operations. Ice and snow control is a highly complex and varying task requiring knowledge and expertise. The types and amounts of deicing materials to be applied and determining plowing versus spreading are field decisions and must be made by the management team at the District/Section levels.

Subject to weather conditions and irregular winter schedules, the PTC will continue to perform such other maintenance activities as stated in Section 3.5.12, Dark Hours Training and Other Activities Performed during Winter Season. However, because of the major impact that winter storms have upon our society, other maintenance activities are secondary to the ice and snow control program.

3.2 Winter Related Activities during April and May

A successful ice and snow control program must be approached as a year-round activity. If adequate preparations have not been completed by the time the first snow falls on the ground, it will be impossible to do the job efficiently no matter how good or experienced the maintenance department has become.

Figuratively speaking, it may be said that the next winter begins on the day that this winter ends. Beginning winter preparations about nine months ahead allows ample time to focus on the fundamentals, particularly the people, equipment, and materials that must be ready for deployment by the start of the next winter season.

In preparation for next winter, topics addressed during the spring season include:

- 1. Review of operations for the winter that just ended and end of season After Action Review (AAR). See Appendix A for an example.
- 2. Inspection, repair, and storage of equipment.
- 3. Inventory and storage of winter materials (end of season inventory to be completed by May 15th annually).
- 4. Cleanup and repair of stockpiles.

3.2.1 End of Season Review of Winter Operations

District & Section End of Season Review

The best way to start preparing for next winter is to review what happened last winter. Use AAR's to document winter operations. Conduct a Section AAR at the end of each winter season by April 15th or shortly after the last winter storm event while the operational aspects of winter services are still fresh in everyone's minds. Participants should include all maintenance personnel that were involved with winter activities. The Section AAR's should then be reviewed at the District level at a final winter close out meeting and compiled into one District AAR to be submitted and reviewed by Central Office.

The District Maintenance Superintendent must send a memo outlining the results of the District AAR to the Director of Maintenance by April 30th. Documenting and sharing what each district learned about improving winter operations will better prepare the Maintenance Department for next winter.

Additionally, the Director of Maintenance may request an AAR after any specific event in addition to the required end of season AAR.

AAR's reveal what worked well and what did not. AAR findings should trigger shortterm corrective actions and contribute to long-term planning. An example of a short-term corrective action is ordering and installing a replacement engine for a snow blower. Problem areas and opportunities for improvement that require more time, resources and planning often involve:

- Equipment routing, cycle times and scheduling of personnel
- Materials supply and application rates
- Agility agreements
- Shift schedules
- Call out procedures
- Situational awareness
- Contingency planning

Address any longer-term items or issues identified during the spring AAR's and resolve them prior to the start of the next winter season, whenever possible.

Central Office End of Season Review

The Chief Operating Officer, Director of Maintenance and Central Office staff will review the results of the District AARs in May of each year. This review includes all District personnel as determined necessary.

The Central Office AAR should evaluate each District's ice and snow control operations. Use the AAR to identify best practices, particularly new and innovative practices. Items noted in the District reviews that require Central Office action should be addressed at the appropriate time. As with District AAR's, topics covered during Central Office AAR's should include:

- Equipment routing, cycle times and scheduling of personnel
- Materials supply and application rates
- Agility agreements
- Shift schedules
- Call-out procedures
- Situational awareness

• Contingency planning

The results and action items should be incorporated into the Winter Work Plan, Snow Academies, and the appropriate manuals.

3.2.2 Winter Equipment Inspection, Repair and Storage

The months of April and May are the best times to inspect snow removal equipment. This allows time to evaluate the condition of the equipment and to schedule needed repairs and maintenance so that the equipment is in proper working condition for the next winter season.

The Director of Maintenance determines the equipment inspection protocol. This may involve a set inspection procedure to follow each year, or the inspection procedures may be left to the District Maintenance Superintendent to decide. In the latter case, inspection methods will vary depending on the type of winter and the age and general condition of each Section's snow removal equipment. Documented results of inspections, including needed repairs and maintenance, is essential to the preparation for the upcoming year. A Winter Equipment Checklist is included in Appendix B.

Foremen are responsible for scheduling repairs and maintenance so that equipment is in good working order by the start of the next winter season. The Automotive Equipment Supervisor should monitor progress and verify that all needed repairs have been completed.

3.2.3 Winter Materials Inventory and Storage

Qualified personnel are to inventory all winter materials at each stockpile location where they reside in accordance with the current SAP Plant Maintenance standards. Material moved between stocking areas shall be "transferred" in SAP Plant Maintenance and "issued" from current materials when used.

The following are key milestones:

- Complete adjustments and reconcile with SAP Plant Maintenance inventories after each storm or at a minimum monthly.
- Complete end of winter physical inventory by April 30th.
- Complete data input including adjustments and reconciliation into the SAP Plant Maintenance system by May 15th.

Annually, by March 1st, Facilities Operations, should provide Maintenance with a list of any storage facilities in which they anticipate repairs or rehabilitations for the upcoming year. The District Maintenance Superintendent will instruct the Foreman on depletion of inventory and where to move remaining salt.

3.2.4 Spring Cleanup of Maintenance Stocking Areas

Following FEMO Model Stockpile Guidelines, Maintenance should always maintain stocking areas in a neat and orderly condition.

District Maintenance Superintendents and Foremen are responsible for ensuring that stockpiles meet the Commission's expectations. The annual spring cleanup of stockpile locations deserves special emphasis. At this time, clean and repair bins and storage buildings, as needed, before transferring remaining salt and other environmentally sensitive materials into them (see Section 3.4.13, Winter Material Storage and Environmental Considerations). Soil- and salt-staining cleanup must comply with FEMO Model Stockpile guidelines. Salt laden aggregate produced by the cleaning of stockpile grounds both during and after the winter season which cannot be recovered and reused will be disposed of using residual waste handling procedures.

3.3 Winter Activities during June, July and August

Winter Services is a year-round priority for PTC. The following sections explain what activities must be accomplished during the summer months to ensure that the Commission is prepared for an effective winter season. Having a comprehensive equipment plan, along with preparation of snow routes and development of proper training materials, are all part of the strong fundamentals that help ready the Commission for winter. Planning for contingencies is also a key part of winter preparation. Above all, effective communication, both within the Commission and externally to key stakeholders, helps to keep the winter services strategy on track.

Included in this section is information about:

- 1. Review truck section snowplow routings
- 2. Review/repair winter related equipment.
- 3. Review and coordinate repairs with FEMO for material storage including brine making/storage facilities.
- 4. Review and verify Equipment Operator certifications.
- 5. Review and update Snow Academy presentation and Winter Services Guide.

3.3.1 Truck Section Snow-Plow Routings Review

District Maintenance Superintendents should meet with each Foreman and review the previous year's truck routings. Any modifications/adjustments identified through the AAR process should be incorporated. Also, any infrastructure changes should be identified and incorporated.

3.3.2 Winter Equipment Review/Repair

Repairs or modifications identified on the post winter equipment checklist should be addressed during this period. Any repair or replacement parts should be ordered and installed. Implementing any AAR findings with regards to equipment should be completed. Annual and/or preventative maintenance such as painting of plows, greasing/oiling of spreaders and live bottoms, cleaning and storage of liquid dispensing equipment should be planned and completed during this period.

3.3.3 Material Storage Including Brine Making/Storage Facilities (FEMO) Review/Repair

Facilities should be reviewed for any needed modifications or repairs during this period. Reviews must be done jointly with FEMO and Maintenance personnel due to each having their own responsibilities. Implementing any AAR findings with regards to facilities should be completed. Building replacements/repairs need to be planned and completed prior to fall/winter activities. Brine makers and tanks are to be inspected, cleaned, and flushed annually during this period. Any needed plumbing or electrical repairs will need to have notifications placed into SAP for FEMO to schedule and complete.

3.3.4 Equipment Operator Certification

The Commission requires that all Equipment Operators be certified to operate the equipment safely and maintain it properly. The District Maintenance Superintendent must ensure that enough workers are trained and certified so that snow removal equipment can be operated as required according to the Section Winter Shift Schedule.

Summer months are a good time to train Equipment Operators in the basics of snow removal operations. While this season of the year prevents the actual plowing of snow, it does not preclude training and testing on items such as:

- Trucks, graders and loader operations
- Mounting and adjusting the plow

- Familiarity with plow and spreader control
- Driving skills involving turning and backing
- Clearance judgment for the front, wing, and tow plow.

Annual presentations by the Maintenance Department will cover equipment readiness, personnel, command/control and other topics relating to each District Plan.

3.3.5 Snow Academy Presentation and Winter Services Guide Review

Annually, a Maintenance Department group will convene to review any recommendations from the previous year's AARs. Any additions, corrections or deletions will be incorporated into the final Snow Academy document in a timely manner so that the document can be reproduced in preparation for the upcoming season's training. In addition to the Snow Academy presentation, the PTC's Winter Services Guide information, such as, personnel, equipment and facilities will be updated as required.

<u>3.4 Winter Related Activities during September, October and November</u></u>

The months of September, October and November are critical to preparations for upcoming winter operations. Fall season activities affect other seasons' work and deal with the full span of resources and capacity available to PTC to perform its winter services. This section details the responsibilities and necessary actions that prepare the Maintenance Department to handle routine and emergency services when winter arrives.

The section opens with two essential topics: situational awareness and contingency planning. Both topics require strong up-front efforts so that downstream activities benefit.

- 1. Situational Awareness: The fall tasks deal with assuring that processes for gathering timely, relevant and accurate information are understood and in place. To disseminate that information, adequate communication equipment and knowledgeable staffing must be available when needed.
- 2. Contingency Planning: The process that prepares PTC to effectively handle unexpected, non-routine or emergency situations and such situations include all aspects of winter services.

The section continues by describing other elements of fall season preparations necessary for safe and effective operations during both routine and extreme winter conditions, including:

- 1. General maintenance of stockpiles.
- 2. Shift planning and updated call lists.
- 3. Identify Mobile Emergency Teams (MET's).
- 4. Review adverse weather protocols and contingency plans (Weather Event Management Playbook) (Appendix C).
- 5. Identify and review weather forecasting services.
- 6. Equipment inspection, calibration, and dry runs.
- 7. Material types, storage, and quantity.
- 8. Conduct winter preparedness meeting.
- 9. Major improvements of stocking areas.
- 10. Storage facilities.
- 11. Winter materials storage & environmental considerations
- 12. Sampling material.
- 13. Snow fence.

3.4.1 Situational Awareness

Situational awareness is a state-wide incident communication process for use on, not only the Turnpike, but all of Pennsylvania's highway systems. For the PTC, the use of PA 511 and WAZE help to notify our traveling customers of our road conditions.

The Situational Awareness process is not limited to the winter season. PTC's Operation Center is utilized 24/7 365 days a year.

From November 1 thru March 31, road conditions are monitored and updated in accordance with the PTC protocol.

Situational awareness for winter activities includes:

- Being fully informed about weather forecasts.
- Ensuring timely communications with all PTC participants, external partners and the public.
- Having complete understanding of procedures and actions necessary to provide accurate assessment of a winter event.
- Fostering a perspective that enhances the ability to address developing events.

Section and District Offices are to implement the PTC's plans and procedures for providing timely and accurate information to ensure situational awareness for PTC personnel, external partners and the customers regarding winter storm events.

Sections in this chapter provide guidance for creating situational awareness:

- Central Office Command
- PTC District Command
- Weather Emergency Traffic Management Plan
- Weather Forecasting
- Emergency Procedures
- Proactive Call Procedures
- Operations Center Communications

Field personnel are responsible for a variety of situational awareness activities:

The Foreman monitors field conditions and communicates current conditions through the ENS and through the PTC Operations Center.

Weather conditions dictate the winter weather emergency roadway traffic levels.

Examples of information that may be requested during an event are as follows:

- **Personnel** Available number of personnel and the number currently on-duty; manpower status reports by section.
- **Equipment** Types and number of equipment required and the types and number in service by section.
- Materials Current material totals listed by section.
- **Roadway Conditions** Current condition.

3.4.2 Contingency Planning

Contingency plans are courses of action developed in advance to accommodate unexpected emergency or non-routine events. Contingency planning is necessary preparation to address winter storm situations that are not part of the established winter operations plan. The PTC contingency plan is outlined in the PTC Weather Emergency Traffic Management Plan.

3.4.3 General Maintenance of Stockpiles

The general maintenance of stockpiles includes but is not limited to the proper storage and handling of all winter material including calcium chloride (rock salt), anti-skid, premix material, Calcium Magnesium Acetate (CMA), liquid calcium chloride and liquid sodium chloride (salt brine), etc. It is every employee's duty to perform good housekeeping measures within the stockpile such as keeping materials within storage bins, sweeping up salt and antiskid, as well as, keeping equipment washed and garages clean and in an orderly fashion. MS4 guidelines and checklists should be adhered to for stockpile maintenance.

3.4.4 Shift Planning and Call Lists

Districts should have call lists already established by section. A review of the lists should be conducted to ensure all employees working within the section for the winter are included. Winter shifts must be established and bid by the first week in November.

Emergency Procedures

The Maintenance Department has established procedures that are activated during emergencies caused by severe winter weather, flooding or other disasters.

The Maintenance Department maintains a call list available in the department's Sharepoint library.

This list includes:

- District and Section telephone numbers
- Telephone numbers of designated Central Office, District and Section personnel
- Telephone number of other pertinent agencies such as the Accuweather, Weather Bureau, Pennsylvania Emergency Management Agency (PEMA) and Pennsylvania State Police (PSP).

3.4.6 Review Adverse Weather Protocols and Contingency Plans (Weather Emergency Traffic Management Plan)

All information regarding the PTC Weather Event Management Playbook is updated and disseminated via the Traffic Engineering and Operations Department (see Appendix C). Dynamic message sign usage adheres to the manual referenced in Appendix D.

3.4.7 Identify and Review Weather Forecasting Services

PTC has a statewide weather forecasting contract to forecast winter events and provide advanced warning. For additional information regarding the current statewide contracts, please contact the Maintenance Planning Supervisor.

Possible other sources of weather sources include:

- National Oceanic and Atmospheric Administration (NOAA)
- Accuweather
- The Weather Channel
- Local media

3.4.8 Equipment Inspection, Calibration and Dry Runs

Inspections

Each Section is required to establish an equipment inspection review date prior to winter shifts. All trucks are required to have a 63-01 (Operators Daily Report for Mobile Equipment) completed along with a dry run sheet. Loaders, graders and blowers must also have a formal inspection completed unless a preventive maintenance (PM) was performed within three (3) months of the winter preparedness date (November 15).

Calibration of Winter Equipment

All truck and spreader combinations shall be calibrated every year. Calibration is necessary to ensure that the equipment is working as specified and that proper amounts of solid chemicals, liquid chemicals and/or abrasives are discharged at each setting. This information is then used in conjunction with the guidelines for material application rates to select the proper auger setting for the desired application rate.

Important notes on calibration are:

- All Sections will calibrate with salt since salt is the most expensive deicing material and is the focal point of environmental concerns.
- Auger and spinner settings are to be the same through the Turnpike. A matrix will be supplied to each AES prior to calibration for consistency purposes.

Dry Run

After equipment route assignments have been completed in accordance with equipment allocation guidelines and strip maps, each Operator shall ride the entire Section as well as their specifically assigned route within the Section. To ensure effective dry runs are completed by each Operator, use the Dry Run Checklist (Appendix E).

Conduct dry runs in daylight as well as in dark hours. This practice will assist the Operator in noting items or situations that can be easily overlooked during dark hour operations.

Identify all drains, roadside obstructions, depressions and overhead bridges or other potential obstructions that may interfere with plowing operations.

3.4.9 Material Types, Storage and Quantity

Sections are responsible for maintaining salt inventory levels throughout the winter season as follows:

- Initial fill of all salt storage stockpiles quantities must be 90% of working storage capacity by November 1st.
- Maintain a minimum of 80% of working storage capacity throughout the winter season.
- The determination to fill the salt stockpiles at the end of the season will be made by the Director of Maintenance. This is for budgeting and planning purposes.

3.4.10 Conduct Winter Preparedness Meeting

Central Office Winter Preparedness Meeting

Central Office will conduct their winter meeting annually in the month of October. For the Central Office meeting, the Director of Maintenance conducts the meeting, and it is attended by all essential Central Office staff, District Maintenance Superintendents, Operations Managers, Foremen, Assistant Foremen and Automotive Equipment Supervisors. The purpose of the meeting is to discuss current PTC policies and procedures to be followed throughout the coming winter.

District Maintenance Winter Preparedness Meeting

Districts shall conduct their winter meeting annually in the month of November prior to the start of winter shifts. For the District meeting, the District Maintenance

Superintendent conducts the meeting and is attended by all District Operations Manager, Foremen, Assistant Foremen and Automotive Equipment Supervisors. The Field Operations Manager should make every effort to attend all district winter meetings. The purpose of the meeting is to discuss any information conveyed at the Central Office meeting including, but not limited to, current PTC policies and procedures to be followed throughout the coming winter. Also, any specific district or section requirements should be conveyed at this meeting. It is the Foreman's and Assistant Foreman's responsibility to ensure that all information from the winter meeting is conveyed to their employees at the section level.

Additionally, elements of winter operation plans, contingency plans and other aspects of winter services applicable to the local conditions are the primary topics for discussion.

Suggested agenda items include:

- Outcomes from the previous winter AAR
- Priorities
- Shift schedules
- Union issues
- Call out procedures
- Equipment maintenance, washing and cleaning
- Spreader calibration
- Plowing and spreading techniques including materials application rates
- Non-snow removal and dark hour activities
- Environmental considerations and FEMO guidelines
- Contingency plans
- Situational awareness
- Weather forecasts and forecasting services
- Training opportunities as available
- Other items at the discretion of the District Maintenance Superintendent

As preparation for the fall season District meeting, District Maintenance Superintendent should ensure that items from the End of Season AAR meeting are reviewed (see Section 3.2.1, End of Season Review of Winter Operations). Outstanding items from the AAR should be addressed, as necessary, at the fall meeting.

Based on the outcomes of the fall meeting, all winter services planning, equipment assignments, schedules and personnel assignments are to be completed in accordance with the winter preparedness date.

3.4.11 Major Improvements of Stocking Areas

Prior to making improvements to any facility, check with the Regional Facility Managers in FEMO to ensure compliance with Labor and Industry guidelines.

Annually, a request for major upgrades should be submitted to the Director of Maintenance by the District Maintenance Superintendent for FEMO concurrence and inclusion in their capital plan.

3.4.12 Storage Facilities

The PTC utilizes varies types of storage facilities, including, but not limited to, domes, barns, and bay storage facilities.

The following list of material storage facilities includes a brief description of the buildings currently used by the PTC.

These are examples for 4-foot-high walls.

Diameter Size	Design Capacity	Working Capacity
(ft)	(tons)	(tons)
60	1,500	1,000
80	2,500	1,800
110	4,300	3,500
120	6,600	5,500

- *Dome Storage* When loading the wood dome buildings, salt should never be stored against the panels that comprise the building shell.
- *Barn Storage* The barn type storage building is ideal for sites requiring less than 1500 tons of storage capacity.
- *Bay Storage Bins* Bay storage bins can be utilized depending on the amount of salt to be stored, multiple bins can be constructed.

General dimensions of these buildings are 20' x 30' per bin with a vertical clearance of about 15 feet. Because of this relatively low vertical clearance, all salt must be dumped in front of the building and carried in by a front-end loader.

The front of this building is open, and when the building is full, the salt is partially exposed. Therefore, follow these environmental protection guidelines to guard against leaching and runoff:

- Extend the bituminous pad on which the building is placed for a distance of 20 feet past the front of the building.
- Do not overload the building so that salt spills out past the front of the building.
- When fully loaded, cover the front of the salt pile with tarpaulins.
- Keep the immediate area around the building clean of salt spillage that will normally occur when loading the building with trucks. This is especially important for the pad surface in front of the building.

3.4.13 Winter Material Storage and Environmental Considerations

When storing winter materials as described below, ensure all Stockpile Academy Guidelines are followed.

Anti-skid Material – Anti-skid material by itself can be stored in any accessible area of the storage site. Segregate anti-skid material from other materials, keep it in manageable quantities, and store it in a location that gets maximum exposure to the sun to help guard against freezing or ensure is stored inside. For safety reasons, form the anti-skid piles with no overhangs or irregular shapes.

Treated Winter Materials – Treat stockpiles of anti-skid material with salt to help prevent freezing. The Section Foreman makes the decision to treat or not to treat anti-skid materials.

When treating with salt, the recommended ratio is one ton of salt for each ten tons of antiskid material. Depending on the climate, the amount and type of anti-skid stockpiled, and the percentage of moisture content, the recommended quantities of salt may need adjustment.

If anti-skid is treated by any method, protect the environment by controlling leaching and runoff from the chemicals used. All mixed material shall be handled in the same manner as salt, following stockpile guidelines.

Salt (Sodium Chloride) – Salt deliveries start in the fall and all initial fill requirements should be at capacity by November 1st. Thereafter, as the salt is used, deliveries continue throughout the winter to replenish supplies. During the initial stocking and the following deliveries, take special care to minimize adverse environmental effects by loading and piling all salt in the approved manner and keeping salt storage locations neat and orderly. Salt may not be delivered to any location that is not properly prepared in accordance with the PTC's most recent policy and quality assurance requirements for salt storage areas.

Bagged Calcium Chloride – Bagged calcium chloride is to be stored on pallets and, whenever possible, stored in a dry, well-ventilated building. Bagged calcium chloride is to be used in the same order that it is received.

Calcium Magnesium Acetate (CMA) – CMA is utilized in environmentally sensitive areas such as designated Service Plazas and/or where the use of rock salt is prohibited. Liquid deicing chemicals require a storage vessel made of a non-corrosive material such as polyethylene. Depending on the type of chemical solution, periodic agitation or circulation may be required. The storage vessel should be thoroughly flushed with water whenever the type of chemical being stored is changed.

3.4.14 Sampling of Material

All materials shall be tested for conformance to contract specifications by Quality Assurance within the Engineering Department.

3.4.15 Snow Fence

Snow Fence installation/removal/storage – The PTC's representative shall design and mark the area where the snow fence is to be installed. The Foreman should contact PA 1-CALL to identify utilities. Snow fence(s) should not be placed outside of the right of way without prior approval from Director of Maintenance.

Install and remove snow fence in accordance with the following schedule:

- Install after November 1st and remove by April 15th. The District Maintenance Superintendent can opt to leave the snow fence up year-round with approval from the Director of Maintenance.
- Snow fence shall be stored at the Section.

3.5 Winter Activities during December, January, February and March

Effective winter operations build on a strong foundation of year-round preparations. Fundamental resources, including people, equipment, and materials, must be in place and ready to deploy before the first snowfall of the season. Efficient deployment of resources requires advance planning, including scheduling personnel, allocating equipment and arranging timely deliveries of materials. Good working relationships with external partners must be established before winter begins. A winter storm is a dynamic event that unfolds over hours and days. Changing conditions during a storm require continual monitoring. Information about ongoing operations, including roadway, traffic, and weather conditions, must be shared within the Commission and with external partners. Timely communications provide the situational awareness that enables adjustments to snow fighting tactics as needed to achieve the PTC goals, including implementing contingency plans when conditions warrant.

This section describes how careful planning and the right resources properly deployed produce a successful ice and snow control program. Topics addressed include:

- 1. Objectives of winter operations and definitions of key terms and concepts
- 2. Priorities
- 3. Storm callout procedures
- 4. Materials applications and storm plowing procedures
- 5. Specialty equipment (plows, spreaders, blowers, graders, trucks, loaders, etc.)
- 6. Tower road and access roads
- 7. Cleanup of roadways and stockpiles
- 8. Frost heave
- 9. Review of equipment damage or breakdown
- 10. Care and cleaning of equipment
- 11. Issue of winter materials and storm reporting in SAP
- 12. Dark hours training

3.5.1 Objectives and Definitions

The primary maintenance objective during the winter months is to keep all Turnpike roadways in a safe and passable condition. Operations will proceed as quickly and efficiently as possible but within the limitations imposed by weather conditions, availability of resources, environmental concerns and employee safety requirements.

The PTC will make every effort to achieve its stated goals. However, natural emergencies (e.g., regional or statewide blizzard, flood or extremely low temperatures, ice storm causing downed power lines/trees, major bridge closing due to ice jam, etc.) and unforeseen situations (e.g., salt shortages, diesel fuel supply/quality issues, homeland security events, crashes, etc.) may prolong the PTC effort from fully achieving all goals. Maintenance management should use their judgment based on experience and training in conducting proactive and/or remedial work to overcome roadway snow and ice hazards. As each storm is unique and varies as to intensity, precipitation type, duration and track, it is important to emphasize that these are merely guidelines to assist Maintenance staff in

making sound, consistent, informed and practical decisions in the exercise of their respective snow and ice control duties and responsibilities.

A *spreading storm* is a winter storm having a minimal accumulation of snow, sleet, or freezing rain or a combination of the three. Application and reapplication of deicing and/or anti-skid materials will occur when warranted during the course of the storm. Plowing may be required to clear snow or slush from the highway during the storm and/or after the storm has ended.

A *plowing storm* is a winter storm having greater accumulation of snow, sleet or freezing rain or a combination of the three. Plowing will be the predominant activity to remove snow and/or ice from the highway. Application of deicing and/or anti-skid materials will normally occur at the beginning of the storm to prevent the bonding of snow and/or ice to the pavement surface. Reapplication of deicing materials and/or anti-skid may be needed during the storm as warranted to ensure traction by vehicles and/or to prevent bonding of snow and/or ice to the pavement surface.

3.5.2 Priorities

This section details the guidelines for snow removal by priority.

- 1. First Priority Mainline, Interchanges, Key Connectors, Service Plaza Ramps, Access Gates
- 2. Second Priority Plowing back shoulders
- 3. Third Priority Wide Areas, Gate Cleanup and Access Roads not previously treated
- 4. Fourth Priority Tower Roads, Interchange Cleanups, Parking Lots

3.5.3 Storm Callout Procedures

The District Maintenance Superintendent and Foreman shall establish storm call out procedures to activate the maintenance organization when adverse weather is imminent. These procedures will specify a method of notifying the Foreman or designated assistant, with authorization to call out operators immediately.

3.5.4 Material Applications and Storm Plowing Procedures

PTC Application Rates Guidelines -- See Appendix F.

This section details the guidelines for snow removal.

Plowing Operation

- Plow trains are a recommended plowing method for use on first priority PTC roadway and should be spaced close enough to prevent vehicles from disrupting the plowing pattern.
- Plow train trucks should be positioned as shown in the example located in Appendix G. This may vary based on Section.
- Use of a shadow vehicle is highly recommended whenever plow train operations are in use. Use of First Responder vehicle or spare pick-up with message board is acceptable.
- Application of deicing materials should be completed by the trucks located within the travel lanes. The shoulder truck should NOT be spreading.
- The application rate for each truck must be adjusted so the application per lane mile meets the PTC's application rate guideline. See Appendix F.

Spreading Operation

- Roads may be treated with straight salt or a chemical enhancer.
- A salt/anti-skid mix can be used when conditions are such that straight chemical applications are not effective due to lower temperature or additional traction is needed.
- Although the decision to use a straight chemical application or a salt/anti-skid mix is basically a field decision, following the recommended application rates will help to provide a consistent level of service while conserving materials.
- Liquid enhancers may be used as pre-wetting agents to augment the activation of the salt. Sodium chloride (salt brine) should primarily be used as the pre-wetting agent when the temperature is above approximately 15°F. When the temperature falls below approximately 15°F, calcium chloride should be used as the pre-wetting agent. With both materials, the recommended application rate is between 6 and 12 gallons per ton. Other considerations supervision needs to factor in include wind speeds, wind chill, road surface (concrete, etc.), type of precipitation, etc.
- Ultimately, field personnel must decide the final selection of deicing material, or a combination of materials based on availability and experience.

Anti-icing

Anti-icing is the application of a chemical freezing point depressant to prevent bonding between frozen precipitation or frost and a pavement surface. At temperatures below

15°F, falling snow is generally dryer which allows it to blow over the roadway surface. Under these conditions, anti-icing is not recommended. The decision to perform antiicing may be made by using the PTC's Anti-Icing Decision Tree contained in Appendix H.

3.5.5 Specialty Equipment

Under certain conditions, the PTC uses specialty equipment.

Snow Blowers – Snow blowers can be used to remove deep snow, clean interchanges, gore areas, retaining wall areas, bridge decks and areas that require the movement of large volumes of snow.

Graders – Useful in plowing operations, graders can also remove ice and packed snow because of the down pressure that can be applied to the under-carriage blade. Negatives are that they are slow when compared to trucks and cannot spread deicing materials.

Anti-icing Trucks – Anti-icing trucks are designed for pre-treating the roadway surface prior to the start of a storm event. Refer to PTC Anti-icing Decision Tree, Appendix H.

3.5.6 Tower Road and Access Roads

Operators should exercise care and use slower plowing speeds when working in areas of tower and access roads to avoid potential damage.

Also, caution must be utilized when plowing tower and access roads to avoid windrowing snow in front of private drives or accesses. Slower speeds can reduce windrows.

3.5.7 Cleanup of Roadways and Stockpiles

The time for cleanup operations is after the travel portion of the roadway has been properly treated. Cleanup activities will open drainage systems, providing a place for both snowmelt and future snowfall.

The following areas may require additional attention as part of the cleanup operations and to ensure MS-4 Guidelines are adhered to:

- Auxiliary lanes such as interchange ramps
- Median barriers and guide rail

- Super elevated curves
- Bridge expansion dams
- Inlets and drainage devices
- Gore areas
- Intersections
- Potential drift areas
- Access gates
- Wide areas
- Tower roads
- Median crossover
- Stockpile parking areas
- Bridge decks NOTE: Removal of excess snow from bridge decks decreases the "dead load" and reduces icing conditions created by freeze-thaw cycles.

3.5.8 Frost Heave

Frost heave is a result of freeze-thaw cycles that can occur often during the winter months. Frost heave causes vertical movement of highway sections most often at bridge approach slabs and paved shoulders. All Maintenance personnel engaged in roadway work or patrols during the winter season should remain alert to report frost heave conditions to the District Maintenance Superintendent as soon as they are noticed.

3.5.9 Review of Equipment Damage or Breakdown

Following each winter storm, Equipment Operators are responsible for cleaning and checking their equipment and for reporting repairs required to the Foreman. The Foreman, upon receiving the 63-01, Operators Daily Report for Mobile Equipment Form, should schedule repairs for the equipment and provide the Auto Mechanic, Automotive Equipment Supervisor and Operations Manager with a list of needed repairs.

3.5.10 Care and Cleaning of Equipment

The Commission has a large investment in equipment, and to protect this investment, the following applies:

• After each storm, the Foreman/Assistant Foreman must ensure the Equipment Operator wash all pieces of equipment (i.e., trucks, plows, tow plows, loaders, etc.) that is exposed to either chemicals or anti-skid materials.

- NOTE: Wash water from equipment cleaning should be directed to the appropriate runoff control or drainage facility.
- Equipment Operators should monitor plow blades before, during and after use to have them replaced when needed.
- Equipment Operators should check plow and plow assist valves for proper operation before and after each use.
- At the end of the snow removal season, the Foreman/Assistant Foreman is responsible for ensuring that all winter equipment is thoroughly cleaned and serviced to prevent corrosion from any chemical residue.
- Conveyers and augers are to be coated with a protective material for summer storage. All vehicle bodies, snowplows and spreaders are to be routinely inspected.
- District and Section management personnel responsible for the proper maintenance of equipment should inspect all equipment periodically to assure that necessary repairs are scheduled and completed to maintain a state of readiness.

3.5.11 Issue of Winter Materials and Storm Reporting in SAP

SAP/Plant Maintenance System tracks winter material issue and receipt. Timely reporting is very important to ensure accurate inventory controls. Each Operator is to maintain tracking documents for each 24-hour period.

Definition

A Winter Storm occurs when materials are applied to the roadway in conjunction with precipitation. The storm ends when precipitation has stopped; the roadway is wet; and the median, shoulder, wide areas, and mainline access roads are clear. A break in activity of 10 hours will be considered a new event and a new winter storm work order shall be created.

Work Orders

- The Winter Operations Activity work order will be used for all winter operation activities not included on the Winter Storm work order including routine winter patrol, pre and post storm roadway condition patrol, storm prep, storm clean up and cleaning tower roads, bridge/road freeze up, blowing and drifting snow, snow fence repair.
- Winter Storm work orders are created using order type PM06 for a roadway section (PTC-D01-ROD-HOME). The priority is Emergency. Set the PM

Activity Type on the Header Data tab to RWO and set the Title on the Damage tab to 2205 for the Activity Type (In Storm Work). Change the start and finish dates to reflect the actual day the storm starts and stops as necessary. Enter the shed name and storm number in the description - (Homewood Winter Storm 3).

- Storm Number is a consecutive number assigned to a storm, starting with number 1 at the beginning of each winter season in every section.
- The storm activity starting and ending calendar dates and times will be entered in the work order extended description area.
- Winter Storm task lists will be created for each section. Search for it by entering *Storm* in the Short Text field on the Task List Selection screen. Adjust the number and duration columns for each work center as necessary and review the materials that were loaded on the components tab.
- Do not plan any materials on Winter Storm Work Orders.
- Ensure all winter materials are charged out to the correct date on the work order before closing the Winter Storm Work Orders.

Fleet Work Orders

- Mechanics time and materials for minor equipment repairs (30/30 rule) will be charged to the Fleet Equipment Support, not to the Winter Storm Work Order.
- Equipment repairs that exceed the 30/30 rule will have a separate work order created for the specific equipment. All materials and hours will be charged to that work order, not to the Winter Storm Work Order.
- Equipment prep and clean up labor hours resulting from a Winter Storm will be reported to the Equipment Seasonal Prep and Detail Work Order.

Winter Storm Work Order Reporting

- Storm related labor hours, material issues, and equipment work center hours will be reported against the work order for each calendar day.
- Labor: Actual time of personnel actively engaged in snow removal activities.
- Materials: Only winter materials, salt, anti-skid, calcium, salt brine, and other roadway deicing products, will be charged to the winter storm report.
- Plow blades and accessories should be charged to the work order for the PLOW.
- Equipment Work Centers: The hours reported for equipment work centers will be the actual hours used.
- Production: The production units will be entered for each day of the storm against the Roadway Section Functional Location.

- Example: Functional Location. (PTC-D01-ROD-HOME)
- The Inches of Precipitation should include a description of the type of precipitation.
- Plow Trains are the total number of hours that plow trains are in operation and should also include text defining starting and stopping times.
- Any section personnel, including Foremen, Assistant Foremen and clerical staff, that are actively engaged in snow removal operations will report their hours to the Winter Storm work order.
- Any non-section personnel, excluding district management staff that is actively engaged in snow removal operations will be reported to the snowstorm work order for the roadway section they assist.
- The section will be responsible for all entries for all snow removal equipment used during the storm in their section.
- Equipment utilization hours must coincide with actual time in use and documented on employee's time slips.
- Salt quantities in each facility will be verified and reconciled after each storm so that appropriate adjustments to storms and materials can be reflected correctly.

3.5.12 Dark Hours Training and Other Activities Performed During Winter Season

It is PTC policy to make a concerted effort to manage our resources wisely and to maintain a level of productivity that is consistent with current PTC goals. This is particularly critical during the winter months.

Clearly, there will be extended periods during the winter when mild weather permits work other than snow removal. Managers must assign projects for non-daylight shift workers. During the winter season, work schedules should maintain productivity while retaining the required flexibility to deal with interruptions caused by inclement weather.

The following are examples of potential productive dark hour work assignments:

Winter/Snow Removal

- Mix salt/anti-skid
- Transfer material
- Repair spreaders/augers
- Receive winter materials
- Perform storm cleanup
- Conduct snow/ice patrol
- Install/remove/repair plows/blades
- Check spreader calibration
- Clean bridges
- Cut bleeders/scuppers under guide rail

Equipment Related Activities

- Clean equipment inside and out
- Perform preventive maintenance on equipment
- Transfer equipment
- Paint equipment
- Sharpen cutting tools
- Implement equipment repairs
- Prepare summer equipment

Training

Stockpile/Garage/Administrative

- Perform general housekeeping
- Building painting
- Paint garage area

Supplies

- Check and maintain stockpiles
- Repair/install fences
- Litter pickup

Roadway/ Bridge Work

- Prepare for daylight activity
- Survey guide rails
- Perform other bridge maintenance
- Sweep bridge water tables

- Maintain Emergency Pull-Off Areas (EPO)
- Survey/repair right-of-way fences
- Handle emergency pothole patching
- Open/clean drainage courses, ditches, inlets, outlets
- Conduct patrols
- Replace/repair signs/posts
- Perform rock-slide removal
- Clean up accident residue
- Conduct sign surveys
- Delineation review

3.6 Stockpile Planning and Development

This should be coordinated with Legal, FEMO, Engineering and Executive Departments.

CHAPTER 4 SHOULDERS

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4.1 Introduction

The term "shoulder" refers to the graded area or surface adjacent and parallel to the travel lane. Its purpose is to give lateral support to the road surface and to be used by traffic in an emergency. Shoulders should be stable enough to support normal traffic loading and their surface should be adequately sloped to provide for the quick removal of surface water from the roadway into the drainage system.

4.2 Shoulder Maintenance Schedule

The Foreman should plan the routine maintenance of shoulders in accordance with a detailed seasonal schedule. The following is a list of items which may require completion during each season of the year. It is meant as a guide in the development of the PTC seasonal plan.

Spring

- Field inspection of shoulders by PTC managers to determine the amount and type of maintenance work required and the priority of that work.
- Conduct inventory of concrete shoulder patching and joints that will need to be sealed in the fall.
- Patching of bituminous paved shoulders.

Summer

- Surface treatment when needed on stabilized, paved and combination shoulders.
- Removing all false ditches along shoulders.
- Raising low spots on paved shoulders.
- Making permanent repairs to the surface and/or base on paved shoulders.
- Resurfacing paved shoulders.
- Continue routine inspection of all shoulders.
- Patch concrete shoulders.
- Upgrade shoulders where necessary.

Fall

- Completion of improvements and major repairs.
- Sealing all cracks and joints adjacent to rigid pavement. Care shall be taken as to not cover any traffic line with sealant unless absolutely necessary.
- Continue routine inspection of all shoulders.
- Seal joints on concrete shoulders.

Winter

- Patching potholes in paved shoulders.
- Continue routine inspection of all shoulders paying particular attention to ice conditions caused by improper shoulder grade.

4.3 Paved Shoulders

As the term implies, a paved shoulder is one having a special wearing course. This course may be composed of Portland cement concrete, bituminous concrete, penetration macadam, bituminous surface treatment or RAP. In general, the slope of a shoulder should be $\frac{1}{2}$ to $\frac{3}{4}$ inch per foot of width.

Maintenance of a paved shoulder is similar in many ways to that of a roadway of the same surface type although the degree of importance is different.

The methods of maintaining paved shoulders correspond to those set forth in this manual for surfaces of similar types. The maintenance of paved shoulders includes the following operations:

- Patching with plant mix bituminous material (hot)
- Surface treatment
- Repair of base failures
- Skin patching
- Sealing cracks and/or joints

When paved shoulders are patched with bituminous material, care should be taken to see that the surface of the patch is even with the surrounding surface. The material used for patching a paved shoulder should be the same as the material of the existing shoulder. When the bituminous surface on a paved shoulder becomes lean, dry or oxidizes, the surface should be sealed, or surface treated. When the failure of a paved shoulder is due to the failure of the base, the repair procedure outlined in the appropriate performance standard should be followed. In general, repairs of this type include the following operations:

- Scarifying
- Removing and replacing unstable material
- Reshaping the base material
- Compacting material to obtain correct grade and slope

When the failures are caused by water trapped in the subgrade, the use of French drains or underdrains is required. The use of subsurface drainage is covered in detail in the drainage structures section of this manual.

Skin patching should be used under the following conditions: in areas where there is insufficient bituminous material or dryness (oxidation), on bituminous surfaces where raveling or spalling is evident, or on limited areas where there is map or alligator cracking. The importance of skin patching cannot be emphasized enough because of its ability to revitalize a shoulder surface and prolong its life at an economical cost.

Cracks and/or joints in portland cement concrete and bituminous concrete will be sealed as prescribed for each in the respective performance standard. The weakest point in a paved shoulder and the place where most failures start is the joint between the roadway pavement and the paved shoulder. "Pumping" often develops when joints are not kept sealed, and water is allowed to enter. Special attention should be given to the maintenance and sealing of this joint. During winter months, the freeze-thaw cycle tends to break the joint.

4.4 Emergency Pull-Off Areas

It is necessary at these locations to stabilize shoulders with suitable material and to provide regular maintenance. Proper shoulder slope must be maintained for the full width of the shoulder to insure adequate drainage. The slope should be as previously indicated for a particular shoulder type discussed in this manual.

CHAPTER 5 UNPAVED SURFACES

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Chapter 5 -- Unpaved Surfaces

5.1 Introduction

The surface of some unpaved roads consists of natural earth. Other surfaces are mixtures of aggregates and clay. The aggregates may be sand, stone, gravel, crushed slag, chert, red dog or cinders.

A road with a surface of natural earth is constructed by performing simple grading and shaping with the necessary provisions for drainage.

Any unpaved road surface that is upgraded utilizing milled bituminous material (RAP) will be considered and maintained as a paved surface.

Frequent inspection of unpaved roads is required for good maintenance. The surface of an unpaved road must be graded and compacted as required. The surface must be shaped so that surface water will move quickly from the roadway to established waterways. Rapid surface drainage is dependent on smoothness, slope and stability. The maintenance of a proper crown or super elevation is essential for good drainage. Each drainage structure must be inspected to determine if it needs to be cleaned, repaired, or replaced.

5.2 Distress Types

Unpaved roads have two primary distress types. These are surface deterioration and surface deformation.

Common types of surface deterioration are:

Raveling

The loss of the coarser aggregates under traffic is referred to as raveling. In an aggregate surfaced road, fine and course aggregates interlock to form a dense stable surface.

The fine aggregates fill the voids between the coarser aggregates and hold or bind the coarse aggregates in place. When fine binder aggregates are lost either as dust or by erosion, the coarse aggregate becomes loose and then can be worn away by the action

of traffic. The correction of raveling involves grading or blading with the addition of binder material to improve the gradation of the surface material.

Slipperiness

Aggregate surfaces containing excessive amounts of fine aggregate and soil tend to become slippery during wet weather. This condition can be corrected by adding coarse aggregate and by blading and grading.

Common types of surface deformation include:

Rutting

Ruts are longitudinal depressions in the wheel paths. Rutting is caused by a combination of factors that include high moisture content in the soil beneath the road surface, inadequate thickness of the surface course and traffic loads. The correction of rutting requires adding coarse aggregate, grading, and rolling. Drainage improvements may also be required.

Corrugations

Corrugations are a series of ridges and depressions across the surface of the road perpendicular to the centerline. The lack of cohesion and vehicle speed appears to be major causes of corrugations. Blading only is not a satisfactory repair technique. The cohesive qualities of the surface materials must be improved. This requires remixing to obtain a well-graded mixture that contains a reasonable percentage of fine binder aggregates. Therefore, correction requires the addition of material to improve gradation, scarifying, grading and rolling.

Depressions

Depressions are localized low areas one or more inches below the surrounding surface. Depressions are caused by traffic, settlement, excessive moisture content and improper drainage. Since depressions tend to collect water. The condition is aggravated with shoving and rutting of the wet surface material by traffic. Correction requires filling the depressions with well graded aggregate, grading, and rolling. Drainage improvements may also be required.

Potholes

Potholes are generally caused by excessive moisture content, poor drainage, and poorly graded aggregates. Repairs normally involve spot grading. Spot "patching" with crushed aggregate can also be performed as a short-term corrective measure. Do not use hot or cold patching. Drainage improvements may also be required.

5.3 Maintenance Operations

There are eight principal operations involved in maintaining smoothness and surface drainage:

- 1. Grading and blading
- 2. Scarifying and reshaping the surface to remove corrugations or ruts
- 3. Adding new material
- 4. Patching soft and unstable access
- 5. Stabilizing by adding appropriate materials
- 6. Raking
- 7. Rolling to assure initial and overall re-compaction of materials
- 8. Maintenance of the drainage system

5.3.1 Grading and Blading

Grading should be done in the spring as soon as the frost leaves the ground or as soon as possible after a rain while the surface materials are still moist but not wet. Grading when the road surface is dry may do more harm than good since moisture is required to re-bond the materials. It is usually best to begin grading at the outer edge of the road and to work from the ditch to the centerline. The loose material is deposited in ruts, holes, and other low places in the road surface.

After the loose material has been brought across the surface from both edges to the center, it should be carried back to both edges in such a manner that all the material is spread over the surface and no surface material is left to form a windrow at the edge of the road. If in the process of grading, unsuitable material such as weeds, trash or topsoil is left in the traveled way, it should be removed so it will not become mixed with the surfacing material. It is advisable to mechanically rake the roadway after the grading operations to remove small windrows and aid in smoothing the surface.

If large rocks are present in the natural soil near the surface of an unpaved road, they tend to work their way to the surface during the grading operation. If such a rock appears, it should be removed, and the void filled with suitable material. Compaction of unpaved roadways by traffic should produce a hard surface crust that helps to hold the surface

aggregates in place. Blading or dragging is a smoothing operation performed with the moldboard tilted forward and with light down pressure on the grader blade to minimize disturbance of the surface crust.

Blading is used to pull loose material from the sides of the roadway or spread windrowed aggregate to fill surface irregularities and to some extent restore crown. Blading should be avoided during dry periods to minimize the loss of fine aggregates. It is not effective for correcting corrugations or other extensive surface and subgrade failures.

5.3.2 Adding Aggregates

The addition of material is usually accompanied by blading and grading, although light applications of medium sized and fine aggregates may be made occasionally to correct slippery conditions. When increasing the depth of the surface, filling depressions, restoring crown and profile, or correcting other problems that require coarse aggregates, well graded aggregate mix should be dumped in windrows along the area to be repaired for spreading by a motor grader.

Fine aggregates needed to correct raveling, and in some cases corrugations, are usually obtained by blading material from the shoulders and ditch lines. Fine aggregates can also be hauled and spread in a manner similar to coarse aggregates. Stabilization typically involves scarifying the existing surface, adding the stabilizing material, mixing in place, grading and then compacting. Application rates for the stabilizing material vary depending upon the gradation, type, design thickness and moisture content of the aggregate.

5.3.3 Corrugation Removal

An unpaved road is preferably scarified at a time when the surface material is damp. If new material is needed, it should be added at this time and thoroughly mixed by grading and blending before compaction is begun. After the surfacing materials have been properly mixed, the surface should be shaped to the correct crown or super-elevation and rolled. If necessary, water should be added. When water is applied, the surface should be graded and rolled until the material is thoroughly compacted.

5.3.4 Rut Removal

When ruts occur, the road surfaces should be scarified and graded, suitable material added and rolled. Filling ruts with a large size aggregate is not good practice for the following reasons: (1) these aggregates interfere with subsequent grading operations, and

(2) traffic will usually slip from these narrow strips of material and will form new ruts alongside the old ones. At best, the use of stone is a temporary expedient and is not worth the expense involved. Draining the ruts and filling them with material from the roadbed is more effective.

5.3.5 Eliminating Soft Spots

Soft spots are generally caused by the lack of proper drainage or stabilizing material. The cause may be a plugged pipe, an improperly placed pipe, the absence of a pipe or the side ditches may not be deep enough to lower the water table to the proper level. When the soil is in poor condition, the remedy is to replace with a suitable material such as stone, slag, or gravel. Often stabilizing material must be laid the full roadway width to a suitable depth to correct the deficiency.

CHAPTER 6 PAVED SURFACES

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6.1 Introduction

The maintenance of paved surfaces is one of the most visible activities performed by the Pennsylvania Turnpike Commission, whether by contract or by Commission forces. The Commission is judged by the condition of the highway surface. Therefore, it is important that surface maintenance be performed to a uniformly high standard statewide.

The ideal for surface maintenance is to have all pavements on the system upgraded to a load carrying capacity and surface condition that would virtually eliminate potholes and depressions and provide a smooth and safe ride.

To accomplish this, it is essential that the service life of the good and fair roads be extended by timely and quality maintenance, i.e., liquid skin patching, seal coating, joint and crack sealing, mechanized patching, concrete patching, drainage repair and cleaning and shoulder cutting.

<u>6.2 Types of Paved Surfaces</u>

Rigid Pavements

Rigid pavements are those constructed of Portland cement concrete. Concrete is a rigid material that is strong in compression and weak in tension. Concrete pavement acts as a beam when carrying a moving load. The load carrying capacity of a concrete pavement is a function of the strength of the concrete, the strength of the subgrade and the thickness of the concrete slab.

Plain Cement Concrete

Plain Portland cement concrete pavement is a pavement constructed with Portland cement and aggregates without reinforcing steel. Shrinkage is controlled using short joint spacing, which is normally 15' to 20'. Load transfer joints are used in the transverse joints and tie bars are used in the longitudinal joint.

Reinforced Cement Concrete

Reinforced Portland cement concrete pavement is a pavement constructed with Portland cement, aggregates and reinforcing steel. Reinforcing steel, in the form of welded wire fabric, is used to control shrinkage cracking and does not add to the structural strength of the pavement. Transverse joint spacing may vary from 20' to 76.5' and may or may not be skewed depending on when the pavements were built. Load transfer units are used in the transverse joints and tie bars are used in the longitudinal joints.

Rigid Base Pavement (Composite)

A pavement with a bituminous surface and a Portland cement concrete or brick base is a rigid base pavement. The structural capacity of a rigid base pavement is a function of the concrete thickness and bituminous surface composition and thickness and subgrade support.

Flexible Base Pavement

A pavement with a bituminous surface on a base other than Portland cement concrete or brick is a flexible base pavement. The structural capacity of a flexible base pavement is a function of the thickness and quality of the base course(s), the thickness and quality of the surface course(s) and the strength of the subgrade.

6.3 Rigid Pavement Maintenance

The goal of rigid pavement maintenance is to maintain a smooth riding pavement, without an overlay, for as long as possible. This is accomplished by:

- 1. Emphasis on joint sealing, permanent joint spall repair, concrete patching and pothole and surface spall repair.
- 2. Slab jacking of settled slabs before more serious failures occur.

Routine Maintenance

Routine surface maintenance activities are those which are done primarily by Commission forces to provide preventative maintenance and otherwise maintain the integrity of the pavement until such time as surface improvement is required and programmed. These activities are included in the Annual Work Plan and scheduled on the Weekly Plan. The following are routine maintenance activities:

Pothole Patching

This activity includes the preparation and patching of potholes and deteriorated concrete in concrete pavements. The potholes normally occur along cracks and longitudinal or transverse joints and may extend the full depth of the slab.

Surface Repairs

Surface repairs are those made to restore the riding surface of the pavement. Primarily, they are repairs of surface spalls, pop-outs, and scaling. Spalls and pop-outs are surface defects that occur in the slab away from a joint.

Blowups

Blowups are characterized by a tenting effect at a transverse joint caused by expansion of the pavement on either side of the joint. This expansion causes the adjacent pavement slabs to rise off the subgrade and may create an obstruction to traffic.

Crack and Joint Sealing

This activity includes the cleaning and sealing of random cracks and transverse and longitudinal joints in plain or reinforced Portland cement concrete pavements.

Joint Rehabilitation

Joint rehabilitation is the creation of an adequate sealant reservoir in a joint and the sealing of existing transverse contraction, construction or expansion joints. Joint rehabilitation may also be required on the longitudinal joint.

Joint Spall Repair

Joint spall repair is the repair of spalls adjacent to longitudinal or transverse joints. The condition is characterized by the cracking, breaking, or chipping of slab edges adjacent to a longitudinal or transverse joint. It usually does not extend through the thickness of the slab but meets the joint at an angle.

Joint Replacement

Joint replacement is the replacement of the entire transverse joint. It is intended to repair crushed joints or joints which have several spalls. Normally, an area of four feet on each side of the existing joint will be removed and replaced.

Sub-sealing

Sub-sealing is the stabilization of faulted slabs with grout or polyurethane foam pumped beneath the pavement. It is intended to be used where minor faulting has occurred.

Sub-sealing and Slab-jacking

Sub-sealing and slab-jacking is the correction of minor settlement of the slabs and the filling of voids beneath the pavement. It will also be used to correct isolated faulting of slabs.

Sub-sealing, Slab-jacking, and Grinding

Sub-sealing, slab-jacking, and grinding is the filling of voids beneath the pavement, the correction of minor settlements and the grinding of the surface to restore the profile on major rehabilitation contracts. Grinding is done after sub-sealing and slab-jacking. It is generally done as a part of a concrete rehabilitation project.

Overlay

This is the resurfacing of an existing pavement to restore the pavement to smooth riding condition. Overlays include both bituminous and concrete. Micro-surfacing can be used for texturing purposes.

Full-depth Concrete Patching

Full-depth concrete patching should be limited to isolated spot repairs which may potentially present a safety problem to the motoring public and when there is a need to act in a timely manner. Any full-depth concrete patching needs approval of Director of Maintenance or designee.

6.4 Rigid and Flexible Based Pavement Maintenance

Routine Maintenance

Routine surface maintenance activities are those which are done primarily by Commission forces to provide preventative maintenance and otherwise maintain the integrity of the pavement until such time as surface improvement is required and programmed. They are activities that are included in the Annual Work Plan and scheduled on the Weekly Plan.

The following are routine maintenance activities:

Pothole Repair

The objective of manual pothole repair is to have the Maintenance Section plan, schedule and carryout pothole repair work in accordance with Maintenance Performance Standards. The work is to be done correctly with properly staffed and equipped crews to meet this objective. Spray patching utilizing specialized equipment which applies the material under pressure is also approved.

Crack Sealing

This activity includes all actions related to crack sealing bituminous surfaces with prepackaged material in a non-overbanding operation. Activity includes routing of cracks if applicable (working transverse and single random cracks), cleaning of cracks, applying material and squeegeeing on rigid or flexible base roads. The objective of this operation is to prevent more serious pavement distress such as base failures or potholes.

Skin Patching

Skin patching is the application of a layer of bituminous material and a layer of aggregate to seal limited areas of minor cracking, weathering, or raveling. It can be done manually or mechanically. This repair method is a process not recommended on PTC roadways.

Liquid Bituminous Treatment

A liquid bituminous surface treatment is the sealing of minor cracking, weathering, and raveling over large areas with two applications of a layer of liquid bituminous material and a cover layer of aggregate for each bituminous layer. This repair method is prohibited on PTC roadways.

Maintenance Paving

Paving is the application of hot bituminous plant mix material in a uniform lift of approximately 1" to 1 1/2" in compacted depth over the full roadway width and placed on a prepared surface over extended lengths of roadway in excess of 500 feet. The intent of paving is to be a finished wearing course and additional surface applications are not normally anticipated in the immediate future.

Micro-surfacing

Micro-surfacing is a thin surface paving system composed of polymer-modified emulsion, crushed aggregate, mineral filler, water, and field control additives as needed. Micro-surfacing can be utilized for preventive maintenance and surface rehabilitation on both low and high ADT pavements. Its uses include texturing, sealing and rut filling.

Nova Chip

Nova chip is a paver placed seal/wearing course of open graded, plant mixed, bituminous concrete placed on a polymer modified asphalt emulsion tack/seal coat.

Slurry Seal

Slurry seal is the application of a mixture of slow setting emulsified asphalt, fine aggregate and mineral filler with water added to produce slurry consistency, mixed in a traveling plant and spread through a squeegee screen on a plant mix bituminous surface, with a good base, to provide a moderate extension of service life by sealing the surface.

Ultra-Thin White-topping

Ultra-Thin White-topping (UTW) is a process where a thin layer of concrete (2-4 in.), usually high strength and fiber reinforced, is placed over a prepared surface of distressed asphalt. The UTW utilizes short joint spacing and bonds to the underlying asphalt surface. The underlying asphalt surface should be a minimum of 3 inches thick after preparation.

Mechanized Patching

Mechanized patching is intended to repair small areas of severe weathering or raveling, block cracking and multiple shallow potholed areas.

Base Repair

Base repair is intended to repair large severely fatigue cracked, potholed or distorted pavement sections and restore the structural integrity of the pavement.

Leveling

Leveling is the application of bituminous material over extended lengths of roadway to correct surface distortions such as irregular cross section or wheel path rutting.

Joint Repair

Joint repair is the correction of tented joints and blowups on bituminous overlaid concrete pavement. The entire depth of pavement structure is removed and replaced with bituminous concrete.

Milling, Leveling, Bituminous Surface Treatment

This is the improvement of seriously distressed pavements by milling selected areas of the irregular surface, restoration of the profile as needed with a leveling course and sealing the surface. The amount of milling will vary depending on the type of distress identified.

Milling, Recycling, Leveling and Resurfacing

This is the restoration of the cross section of a severely distressed pavement by milling and the recycling of the milled material into the pavement and/or shoulder reconstruction. It also provides a uniform surface to begin resurfacing and reduces the thickness of shoulder reconstruction.

Reconstruction

This activity is the complete reconstruction of a section of road done to upgrade the structural capacity or to improve safety.

CHAPTER 7 DRAINAGE AND DRAINAGE SYSTEMS

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7.1 Introduction

Drainage is one of the most essential elements to be considered in the maintenance of a highway system. The purpose of drainage is to convey water away from the road as quickly as possible to prevent erosion of the roadway and saturation of the subgrade. An efficient highway drainage system provides for the disposal of surface water from the roadway section and the elimination or control of subsurface water.

Included in a surface drainage system are the roadway crown, shoulder, curbs, gutters, drop inlets, storm drains, ditches and culverts. A surface drainage system is provided to permit water to flow from the roadway surface as rapidly as possible and away from the highway.

Subsurface drainage systems include pipe under drains, pavement base drains, combination storm sewer and under drain. Examples of these are available through PTC Engineering. The objective of a subsurface drainage system is to convey away any water that gets into base material. Subsurface drainage is a practical and economical way of maintaining firm, stable subgrades, and structural foundations, eliminating wet cuts and preventing or reducing frost heave.

All drainage facilities should be maintained in first class operating condition with special attention given to fall cleaning so that structures will be ready to handle spring and summer rains. This requires year-round maintenance with emphasis on side ditch cleaning in the fall and early clean-up in the spring.

Routine maintenance of drainage systems should consist of regular inspections and drainage cleaning activities. Regular inspections should be conducted to confirm that satisfactory conditions exist and to evaluate needs for clean-up and repair. Marked settling of an area or part of a roadway (usually with pavement breakups or cracks) during or following the wet season is generally an indication that a drainage problem may exist. Standards for Roadway Construction Drawings should be consulted for all maintenance needs.

In summary, proper drainage can keep water from collecting on and under a pavement. Keeping the subsurface properly drained will ensure stability and minimize maintenance costs.

7.2 Classifications of Surface Drainage

Two types of water courses that handle surface drainage are natural water courses and manmade water courses. Natural water courses consist mainly of rivers and streams but may be a valley or swale that directs water into a river or stream. An important part of drainage maintenance is the cleaning of obstructions such as trees, branches, boulders, and sandbars from around drainage facilities to ensure that stream flow is not directed toward bridge abutments. There are two regulations associated with the regulation of "waters of the US" (Section 404 of the Federal Clean Water Act administered by the US Army Corps of Engineers) and "waters of the Commonwealth" (Chapter 105 administered by PADEP). Under Section 404, a hydrologic connection to a traditionally navigable waterway can make a "ditch", a regulated resource. Similarly, a "defined bed and bank" can result in a "ditch" or "swale" being regulated under state regulations. In relation to the regulations PTC has the Illicit Discharge Detection & Elimination Program Manual for addition training. This link <u>a 1llicit Discharge Detection & Elimination Program Manual 2020-10-30.pdf</u> is to the manual.

Ditches are generally classified as parallel ditches, diversion ditches and inlet or outlet ditches. Parallel ditches are channels that are constructed parallel to the roadway for the purpose of carrying runoff coming from the pavement, shoulders, and adjacent areas. They are usually open unless crossing under side roads, driveway, or walkways. A parallel ditch may be lined with paving material; rock lined in mountainous terrain or vegetated.

Diversion ditches are constructed parallel to the top of a cut and are intended to intercept surface drainage from flowing over the face of the slope, thus preventing erosion and slides due to excessive moisture. They may be paved, rock lined or vegetated depending again on design velocity.

Inlet and outlet ditches serve primarily to carry water to and from cross pipes, are generally perpendicular or slightly skewed to the centerline of the road and often extend from or onto private property. Maintenance is responsible to clean drainage structures.

Typical sections for parallel ditches and diversion ditches are shown on PTS180 Roadside Development. Periodic inspections should be made, especially after heavy rains and in the spring after snow and ice melt. The inspection should include but not necessarily be limited to:

- Checking ditch line for uniformity and obstructions.
- Checking side slopes for erosion and possible need for protection of erosion.

- Checking condition of ditch paving materials.
- Checking sediment deposits and weeds and brush growth in ditch line.
- Checking for erosion.

Ditches and drainage channels should be maintained to the original line, grade, depth, and cross section to which they were constructed or subsequently improved. They should be kept reasonably clear of weeds and obstructing materials which may restrict the normal flow of water. Presently approved herbicides are effective and may be used for this purpose. Paved ditches should be maintained in a condition to ensure a smooth and impervious surface to prevent underflow of water. Cracks and joints in asphalt or concrete paved ditches and paved gutters should be repaired as necessary and the joints sealed.

Gutters are channels or curbs used along the side of a roadway surface to collect and control the flow of water and direct it to an inlet or outlet ditch, a catch basin or shoulder drain leading the water into a nearby stream or another natural watercourse.

All ditches and drainage channels should be kept clean of debris and trash. Any settlement should be corrected according to PTC's Engineering Department and repairs of broken or eroded surfaces should be made with appropriate materials.

Refer to PTC Foreman's Manual for additional information concerning activity requirements and production and planning units.

7.3 Authorization to Enter Private Property for Drainage Activities

The purpose of this section is to clarify procedures for the Commission or its authorized representatives to enter upon any property if entry is necessary to correct, maintain or restore existing drainage facilities.

Act 2007-44 (H.B.1590), P.L. 169, Section 3, (74, Pa. C.S. Section 8101, et. sec.) supports the Commission's position and the following policies and procedures discussed in this Chapter concerning this subject.

This policy applies in all cases where work is to be done by Maintenance Department forces or by contractors which have been engaged by the Commission.

Drainage problems usually result from either a natural impairment (e.g., growth of weeds, siltation, etc.) or a physical block by the property owner. In the case of a natural impairment of drainage facilities requiring entry onto private property, the first step

should be personal contact with the property owner to explain the problem and our plan to correct it. The Commission's representatives should request the property owner to sign PTC RW-397A, Authorization to Enter Non-Waiver of Claim for the Commission's protection. However, refusal of the property owner to sign the form does not prevent the Commission from taking necessary corrective action. If the property owner refused to allow the Commission to enter the property to correct the problem, the property owner should be sent a certified letter informing the property owner of the problem, our plan to correct the problem and the date we intend to enter. The corrective work should then be performed on the date indicated.

If a dangerous condition exists on the roadway because of a blocked drainage, the Maintenance Foreman should act as soon as possible to cure the problem and the preceding steps are not required. However, personal contact should be when and where possible.

In the case of a physical blockage caused by the property owner, the first step is to make personal contact with the property owner. The property owner should be told the action is in violation of the law and that the property owner must correct the problem within a reasonable time.

If the property owner fails to correct the problem within a reasonable time the property owner should be sent a certified letter detailing the problem, indicating that the property owner is in violation of state law and demanding correction within a reasonable time in consideration of all the circumstances, generally, two weeks. If the property owner still does not correct the problem, the district submits the matter to the Office of Chief Counsel for filing of an equity action to require the property owner to correct the problem. Again, if a dangerous problem exists on the roadway because of blocked drainage the Commission should act immediately to cure the problem and the preceding step is not required.

Letters notifying the property owner that a drainage issue must be resolved are prepared by Legal.

The responsibility for ensuring that authorization to enter has been obtained rests with the District Maintenance Superintendent.

Form PTC RW-397A, Authorization to Enter Non-Waiver of Claim and Form PTC RW-397, Authorization to Enter Waiver of Claim can both be obtained from the Office of Chief Counsel. Caution should be exercised on private property to prevent damage to any trees, shrubs, etc. when reestablishing drainage facilities. Ditches should be shaped to original design. The placement of additional pipe on private property is not permitted. The property should be left in a clean and well-graded condition.

When opening the pipe under adverse circumstances, ask the property owner if he wants the excavated material. Do not, under any circumstances, leave it piled next to the excavated ditch. If the owner wants it placed on another portion of his property, oblige him. If he insists that you leave it next to the ditch, remove the material and store it at the local PTC stockpile. It is the property owner's material, and we may have to give it back.

When replacing pipes refer to the Foreman's Manual.

7.4 Drainage Discharge Problems

Section 420(e) of the State Highway Law of 1945 and, as amended, March 7, 1982, and Pennsylvania Code Title 67, Chapter 441 supports the Commission's position in this matter.

Section 420 (e) makes it a summary offense for any person to:

- (a) Violate any rule or regulation promulgated under authority of Section 420.
- (b) Willfully destroy, injure or damage any highway by any method or device.

It is unlawful for any person or entity to discharge sewage or drainage on or within Turnpike property. Any such discharge should be considered an unlawful trespass and should be reported immediately to the Engineering and Legal departments. In the event the discharge presents an imminent danger to the health and safety of traveling public, actions should be taken immediately to block or remove the drainage and protect the traveling public. The Engineering and Legal departments should be promptly advised of any such actions to be taken by maintenance personnel.

7.5 Drainage Maintenance Responsibilities Concerning Municipalities and Utilities

Maintenance has the responsibility of maintaining our drainage system within our rightof-way. There are many drainage agreements between the Turnpike, municipalities, landowners, and organizations. The agreements are constantly changing. If there are issues that arise dealing with drainage that is outside of our right-of-way, the best way to deal with it is to contact the Legal Department. If during our maintenance operations it is necessary to do major excavation, refer to our Maintenance Field Guide for Erosion and Sediment Controls Manual. If there is a stream or wetland involved, contact our Environmental Manager in the Engineering Department before you do any excavation.

7.6 Pipes, Culverts, Inlets, End Walls

Highway maintenance activities that are generally performed by the Maintenance Department and are associated with pipes, culverts, inlets, and end walls include the following:

- 1. Cleaning pipes and culverts (See Foreman's Manual).
- 2. Cleaning inlets and end walls (See Foreman's Manual).
- 3. Repair and/or replacement of inlets and end walls (See Foreman's Manual).
- 4. Replacement of pipes and culverts (See Foreman's Manual).

The Maintenance Departments objective is to maintain the above referenced structures in a condition to efficiently carry away collected surface and/or subsurface water.

Surface water that does not drain from the roadway surface and the shoulder or subsurface water that reaches the roadway during periods of freezing weather can produce icy spots. Such icy spots can be a problem, particularly when they occur on an otherwise clear or dry roadway and motorists will not expect to encounter them. The best corrective measure is prevention. The locations of icy areas should be documented so that they may be repaired later.

The importance of maintaining and installing drainage facilities to preclude the formation of icy spots should not be overlooked. Annual inspections should be made after the snow and ice season and routine inspections after heavy rains. These inspections are a very important part of preventative maintenance. Maintenance Department employees should watch for signs of drainage problems or failures whenever they travel the roadways.

Inlets and end walls should be checked to determine if any structural repair work is necessary. Frames and grates should be properly seated. Pipe culverts should be checked for condition of pipe, alignment of inlet and outlet ditches and for blockages.

Necessary repairs to concrete and masonry structures should be made as required providing structurally sound units. Replacement of inlets and end walls should be made in accordance with Commission Specification 605 and PennDOT Roadway Construction Standard Drawings RC-31M, RC-45M, AND RC-46M.

Culverts should be kept reasonably clean and unobstructed. Obstructions and sediment deposits should be removed as quickly as practical. Inlet and outlet channels should be properly aligned and maintained so that culverts can function to capacity. Often the inlet channel needs realignment to prevent sedimentation. Areas around culvert inlets and outlets should be controlled to limit vegetation and permit free flow of water.

It may be necessary to clean debris from a channel or natural water course beyond the right-of-way line to keep rains from washing material into a culvert inlet. Written permission should be obtained from the property owner before entering private property to clean up debris. Reference the previous section, Authorization to Enter Private Property, for more information.

Clogging of pipe by silt, leaves or other debris is a common occurrence. The solution for the leaves and other debris is frequent cleaning. If silting continues to occur, consideration should be given to determining the cause or source of the erosion and stabilizing where appropriate to preclude the introduction of silt and debris to the drainage system.

Scour at inlet ends of pipe is caused by turbulence that results when more water is collected at the inlet than can rapidly be discharged by the pipe. When water collects at the inlet end of pipe culverts, the cause should be determined as soon as possible, and the necessary correction should be made promptly to preclude culvert failure. If the ground is not protected a headwall, pipe end section or riprap should be installed.

Scour at outlet ends of pipe is caused by fast, uncontrolled discharge of a volume of water into an outlet channel that is easily eroded or from a pipe whose discharge elevation is not complimentary to that of the drainage channel into which it discharges. Undermining and failure of the outlet head wall can result from such scouring. When scour occurs at the outlet end of a pipe culvert, the alternatives for correcting this condition are to build a concrete or stone apron on the spillway beneath the end of the pipe or to construct an energy dissipater in accordance with PTS-124 Standard Drainage Details. It may also be necessary to line the bed of the outlet channel or where practical, change the outlet elevation of the pipe.

7.7 Subsurface Drainage

In addition to providing facilities for draining water from surface areas of the highway, it is also important to provide drainage for the removal of water from beneath the surface. Subsurface water conditions can be more damaging than surface water conditions.

Subsurface water can soften the subgrade of a pavement causing weakness and eventual failure of the pavement. Roadside problems such as slides, slip outs, and rock falls can also result from excessive amounts of subsurface water.

All subsurface water must be drained away from the highway. Subsurface drains should have free flowing outlets and should be located to direct water to some type of surface watercourse such as a parallel ditch, flume, or pipe. Proper drainage will prevent subsurface water from collecting under the roadway or reaching the surface of the roadway.

The following types of subsurface drains are shown in Commission Specifications 604, 610, 612 and 615:

- 1. Pipe under drain
- 2. Pavement base drain
- 3. Subgrade drain
- 4. Combination storm sewer and under drain

Also noted are subsurface drain outlets that serve the purpose of outletting the under drain.

Pipe under drains is generally used for the following purposes:

- 1. To drain springs and cut off seepage in the original ground either under an embankment or along benches where the highway is located on the side of a hill.
- 2. To lower the ground water level so that it will be below the surface of the subgrade.
- 3. To provide an outlet for water that gets into the base and subbase.

Subgrade drains are designed to handle water from springs or seepage that cannot be cut off before it gets to the subgrade or water that may get to the subgrade from the surface of the road. Frequent inspection of subsurface drains is very important. Subsurface drains should have outlets and these outlets should be kept open. Otherwise, the subsurface drain acts as a reservoir for water and does more harm than good. All repair and replacement work of subsurface drains should be done in accordance with the associated PennDOT Roadway Construction Standard Drawings and Commission Specifications previously referenced in this section.

7.8 Standards for Bridge Clearance, Channel Improvement and Bridge <u>Rehabilitation Projects</u>

Planned work of bridge clearance, channel improvement and bridge rehabilitation projects must be submitted to the Engineering Environmental Manager and the Bridge Engineer for review and submission of applications for permits. No work may be performed until all applicable permits have been received by the Commission. Typically, this work is performed in the spring and summer months. Submission to Engineering is needed at least 120 days prior to the beginning of the work to obtain the necessary permits.

CHAPTER 8 GUIDERAIL, BARRIER & ATTENUATOR DEVICES

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Chapter 8 – Guiderail, Barrier & Attenuator Devices

8.1 Introduction

The purpose of guide rail and concrete median barrier is to make the consequences of a crash less severe than if the guiderail/barrier had not been there. Barrier should be used only where it is warranted, namely where the results of striking an object or leaving the roadway would be more severe than the consequences of striking the barrier.

For all new construction, guiderail and concrete median barrier will be as provided by Engineering in accordance with the latest construction specifications. The Maintenance forces will not be performed any extensive new construction.

8.2 Reconstruction and Replacement

In those cases where a section of guiderail/barrier requires replacement or extensive maintenance, consideration should be given to the reconstruction of the entire section and if it does not confirm to the latest design criteria.

Please follow the criteria to be applied in accordance with PTC standards, policies and directives when reconstructing or replacing guiderail and concrete barrier.

8.3 Inspections

Inspections should be made at least twice a year, in the spring after the snow season is over and in the fall prior to the snow season. These inspections should be concerned with alignment, appearance, and general condition. Any sections in need of repairs or maintenance should be noted and scheduled for repair by the Foreman.

Because the turnpike usually carries higher volumes of traffic, it is important that damaged guiderail systems in need of repair are done so in a timely manner to minimize risk exposure to the department and our motorists.

8.4 Attenuator Devices

The maintenance of attenuating devices varies from district to district; therefore, Traffic Engineering should be contacted prior to any repairs.

CHAPTER 9 LINE PAINTING

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9.1 Introduction

The goal of the Maintenance Department is to provide pavement markings throughout the PTC roadway system that are visible, reflective, and sustainable that will safely guide motorists from origination to destination.

For detailed information regarding the PTC's line painting guidelines, refer to the PTC Line Painting Standard Operating Guidelines, Appendix I.

CHAPTER 10 UTILITY CROSSINGS

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Chapter 10 -- Utility Crossings

10.1 Introduction

A utility crossing includes gas, water, electric, sewer, petroleum, communications, etc. In general, there are three categories of procedures:

- 1. Emergency
- 2. New Crossings, Alterations, & Relocations
- 3. General Procedures

10.2 Emergency Procedures

This is when a Facility Owner (Utility, Municipality, Authority, Company or Individual) requires entry onto Commission property to perform immediate work due to pending danger to life or property. Approval is usually verbal to Facility Owner due to the emergency.

- 1. The Facility Owner should contact the PTC for permission to do emergency repair work.
- 2. Depending on who the initial contact from the Facility Owner is with internally, the District Maintenance Superintendent, Engineering Department and the Operations Center, all must be notified of the situation.
- 3. The District Maintenance Superintendent should evaluate the situation and aid as needed. The Engineering Department needs advised of actions to be taken as soon as practically possible.
- 4. If time permits, the District Maintenance Superintendent shall meet with the applicant in advance of the project to schedule or provide any necessary MPT and notify the Operations Center who, if necessary, notifies the Pennsylvania State Police.
- 5. The District Maintenance Superintendent shall notify the Operations Center upon work completion. Other departments will be notified as needed.

10.3 New Crossings, Alterations and Relocation Procedures

This is when an applicant requests, in writing, permission from the Chief Engineer or his/her Designee, to install a new facility and/or to add, delete, repair, relocate, totally remove, or upgrade an existing facility. Approval in writing to the Facility Owner is provided as a planned work situation.

- 1. The Engineering Department will review the request for approval and obtain traffic stoppage restrictions. Upon approval by Engineering, authorization to proceed is sent to the Facility Owner with permitted working days, hours, and instructions to contact the District Maintenance Superintendent to make necessary arrangements. A copy of this letter is sent to the Director of Maintenance and the Pennsylvania State Police for follow-up, i.e., MPT and Traffic Stoppage.
- 2. The District Maintenance Superintendent shall discuss with the applicant in advance of the project. The District Maintenance Superintendent should notify, the Director of Maintenance, Operations Center, Pennsylvania State Police, Facility Owner, etc. of the schedule and any necessary MPT.
- 3. The District Maintenance Superintendent shall notify the Ops Center when line crossing complete contact erica. Other departments will be notified as needed.

The Utility Management Application User Manual and related forms can be found at <u>Utility Management App (UMA)</u>.

<u>10.4 General Procedures</u>

Facility Operations may also be listed on contract drawings as a Facility Owner contact for the Commission. FEMO is usually the contact for location of facilities at Service Plazas, interchanges and other Commission facilities. In these cases, a representative from FEMO will be required to visit the site, locate, and mark existing utilities.

When maintenance forces discover a Facility Owner (Utility, Municipality, Authority, Private Company or Individual) within Commission Right-of-Way without proper consent, they should notify the District Maintenance Superintendent. The District Maintenance Superintendent should notify the Engineering Department for investigation and appropriate action.

Should you have any questions concerning utility crossings, please contact the Engineering Department.

CHAPTER 11 EMERGENCY OPERATIONS

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<u>11.1 Introduction</u>

This chapter familiarizes Maintenance personnel with proper procedures relative to incident management including localized and wide-spread activity. The document provides information necessary to understand the Commission's role in incident response/management and the minimum protocols which are to be followed. These procedures are for use in emergency situations for day-to-day operation of the Maintenance Utility Worker (MUW) and all patrols.

The target audience includes all Department personnel that have or may be assigned a role in responding to or managing highway incidents.

It is also intended to reinforce the protocol for the Department's participation in National Incident Management System (NIMS) and the Unified Command structure for managing highway related incidents. The Commission's position within the structure will be determined during each incident and can range from liaison for Commission resources to Incident Commander.

11.2 General Procedures

The procedures outlined in this chapter represent an extension of the Commission's responsibilities and activities, relative to the Commonwealth's "Emergency Operations Plan" and the "Commonwealth of Pennsylvania Disaster Recovery Plan."

The Chief Executive Officer has delegated the administrative authority through the Chief Operating Officer to the Director of Traffic Engineering & Operations.

The term "Emergency Operations", as it relates to the PTC functions and responsibilities, is defined as a "combination of circumstances creating a crisis which calls for decisive action" or "a single circumstance that requires immediate action to return the roadway to a clear and safe condition for our customers."

Emergency operations include the following:

• An incident on the Commission's right-of-way that has caused a roadway lane restriction, highway closure or highway to be partially blocked.

- A national or state of emergency which affects PTC operations.
- A situation wherein the potential (or actual) exists for a serious accident or damage to property or significant interference with operations of the Commission.
- A situation which could reflect major discredit upon the Commission.
- A situation not so categorized above which is so classified by an appropriate authority.

In the descriptive narrative above, the terminology "decisive action" connotes a requirement for critical decisions, decisions which must be made by proper authority. In such situations, the decision-making process at the appropriate levels of authority is completely dependent upon efficient and effective communications.

For example, a specific emergency occurrence may require a timely decision by the Chief Executive Officer or Chief Operating Officer. Such a decision will not be timely, if it is rendered at all, if a failure in communications occurs. Effective communications are a function of standardized and efficient procedures to assure the right decision, by the right person, at the right time is made. Effective control is thus a function of organization, procedures, and communications. A deficiency, in any of these areas can result in a critical failure of the Commission to adequately respond to a situation.

Authorization

The Commission has a Business Continuity Plan (BCP) that can be referenced. This plan is closely coordinated with the Commission Continuity of Operations Plan (COOP), which includes general protection of employees and assets, training requirements, incident reports, disaster analyses, recovery, and exercises of the plans.

PTC Key Tasks:

- 1. Mitigation activities shall include the following:
 - a. Emergency response procedures
 - b. Preventive maintenance
 - c. Desktop exercises
 - d. Training
 - e. Resource analysis
 - f. Logistics
 - g. National incident management structure
 - h. Mutual aid agreements
 - i. Agility agreements

- 2. Preparedness activities include the following:
 - a. Maintain plans and procedures for the implementation of assigned emergency response activities.
 - b. Maintain plans and procedures for the emergency evacuation of Commission facilities to include dissemination of alert information to employees, implementation of evacuation and designation of key personnel to maintain essential Commission functions.
 - c. Maintain plans and procedures, in coordination with the Pennsylvania State Police, for routing and route control associated with the emergency evacuation of geographical areas.
- 3. Emergency response activities should include the following:
 - a. Deploy emergency response team representatives to the PTC Operations Center and PEMA for the coordination of Commission emergency response activities.
 - b. Collect and report to PEMA information on major disaster disruption of and damage to PTC facilities and highway infrastructure.
 - c. Assist, as requested by PEMA, in the emergency supply of motor fuels and transport services in accordance with all applicable federal and state laws and regulations.
 - d. Assist, as requested by PEMA, in the designation of routes for the emergency movement of people.
- 4. Recovery activities shall include the following:
 - a. Prepare and submit to PEMA appropriate requests and applications for Federal Assistance in the repair of disaster damage to the PTC infrastructure.

<u>11.3 National Incident Management Systems (NIMS) – Overview and</u> <u>Training Requirements</u>

On February 28, 2003, Homeland Security Presidential Directive, HSPD #5 was issued. HSPD #5 directed the Secretary of Homeland Security to develop and administer a National Incident Management System (NIMS). NIMS provides a consistent nationwide template to enable all government, private sector, and nongovernmental organizations to work together during domestic incidents. NIMS is a comprehensive national approach to incident management that is applicable to all jurisdictional levels and across functional disciplines.

The intent of NIMS is to:

- 1. Be applicable across a full spectrum of potential incidents and hazard scenarios, regardless of size and complexity.
- 2. Improve coordination and cooperation between public and private entities in a variety of domestic incident management activities.

HSPD#5 requires Federal departments and agencies to make the adoption of NIMS by state and local organizations a condition for Federal preparedness assistance (grants, contracts, and other activities) by FY 2005. The Commission utilizes NIMS as the management tool during emergency incidents.

The NIMS is a standardized, on-scene, all hazards incident management concept. NIMS allows its users to adopt an integrated organizational structure to match the complexities and demands of single or multiple incidents without being hindered by jurisdictional boundaries.

NIMS has considerable flexibility.

- It can grow or shrink to meet different needs.
- Meet the needs of incidents of any kind or size.
- Allow personnel from a variety of agencies to meld rapidly into a common management structure.
- Provides logistical and administrative support to operational staff.
- Be cost effective by avoiding duplication of efforts.

NIMS consists of procedures for controlling personnel, facilities, equipment and communications. It is a system designed to be used or applied from the time an incident occurs until the requirement for management and operations no longer exists.

One of the key aspects of becoming NIMS complaint is to ensure that appropriate personnel are trained. The required training courses, provided by the Federal Emergency Management Agency (FEMA), are web based and available free of charge.

FEMA Independent Study Courses WEB address for this training is <u>https://training.fema.gov/.</u>

The following individuals are required to take the following courses:

Managers (Superintendent, Operations Manager,), Paint Crew Foremen, Foremen and Assistant Foremen & HMW/MUW or personnel completing any patrol activities:

- ISC-100
- ISC-200
- IS-700
- IS-800

Mobile Emergency Teams

The Mobile Emergency Teams are created as needed.

Combined Facilities Response Plan (CFRP)

Each Department facility (owned or leased) shall have a current CFRP Plan developed and updated and posted in a visible location.

<u>11.4 Disaster Recovery</u>

The purpose of this section is to give a brief overview of the programs available to the Commission. These procedures apply to minor or localized conditions as well as general disaster conditions which occur over a major geographical area.

It is the responsibility of the Maintenance Department to ensure the proper reporting procedures are being followed. Each emergency/disaster event is unique unto itself and will be managed according to severity and geographical properties associated with the emergency/disaster. Generally, this applies to all emergencies/disasters that have Gubernatorial or Presidential Disaster Declarations.

The PTC may be eligible for federal or state funds for damages to the roadway, facilities or for preventive safety measures and snow removal.

Responsibilities

The Chief Financial Officer is responsible for establishing procedures within the PTC to collect essential disaster information such as damages, repair costs, anticipated repair timelines, etc. and develop priorities for the repair of damages.

Each Department Head is responsible for the damage assessment and repairs specific to his/her area of responsibility. The data collected shall include type of damages to bridges, roadways, and other assets, anticipated repair costs and costs incurred due to storm situations.

<u>11.5 Incident Response Expectations</u>

Maintenance personnel will respond to incidents and provide customer assistance when requested by the PTC Operations Center.

Maintenance may be called upon to provide Maintenance Protection of Traffic (MPT) at incidents.

Response Activities

The Commission's response shall be limited to the following actions:

- Provide traffic control for the safety and protection of emergency responders and the motoring public including activities such as the erection of traffic control devices in cooperation with federal, state and/or local authorities.
- The Commission typically will not provide personnel for flagging operations or manual traffic direction at intersections.
- Detour routes should be activated according to Plan X implementation guidelines and in cooperation with state and local police authorities as necessary.
- Activate Dynamic Message Signs (DMS) services according to the Plan X implementation guidelines.
- Provide materials (i.e., sand, anti-skid, etc.) as appropriate at the emergency scene.
- Assist in removing highway incident debris. (This is primarily the ASP's responsibility.)
- Participate in the Unified Command.
- Any response to hazardous materials spills, refer to Employee Orientation Safety Manual, Chapter 9.

Response Methods

Typically, the Maintenance Utility Worker (MUW) or patrol is the first on scene and needs to provide timely and accurate scene information to the Operations Center and other responding agencies.

<u>11.6 Maintenance Utility Worker (MUW) and Patrol Duties</u>

The following information is in accordance with the Directive giving written instructions for the Maintenance Departments minimum expectations for all patrols.

All patrols must:

- Fill out all required check lists, logbooks, etc.
- Respond to calls from the Operations Center.
- Do not change tires or do any repairs. This is the ASP's responsibility.
- Sit behind all broken down vehicles until they are on their way, after the ASP has done the repairs or tows the vehicle or after the Customer is transported and the vehicle is unoccupied.
 - An exception to this will be if you are sitting behind a vehicle and are called to report to another incident and leaving will not endanger the Customer. You do not need to sit behind an unoccupied vehicle unless it is an accident totally or partially blocking a travel lane.
- If the vehicle is in a Service Plaza area where the Customer can safely walk to the Service Plaza, you do not need to sit behind it. If the vehicle is on a Service Plaza ramp or the Customer cannot safely walk to the plaza, you need to sit behind the vehicle as defined above.
- Report all unoccupied vehicles and put cones behind any vehicle close to the solid line or in a bad spot.
- Be courteous to the Customer, Radio Operator, ASP or State Police patrol. *THIS IS MANDATORY!*
- Do not discuss pricing or get in any inappropriate discussions or arguments.
- Hand out all appropriate literature.
- If you feel a situation you respond to or come upon is unsafe let the Operations Center know as well as your Supervisor. We do not want anyone to be in an unsafe situation. If a situation becomes hostile leave the immediate area.
- When you are behind a backlog, warning traffic of what is ahead, call the Operations Center every 15 minutes to update them of the location of the backlog.

- You are required to run a minimum of three (3) patrols, two (2) patrols during winter operations, around your entire section each shift and perform other duties outlined by your Supervisor. We understand because of traffic, accidents or spending time with a customer sometimes this might not be possible.
- Remove deer and any other obstructions and dispose of them according to instructions from your supervisor.

An inclusive and comprehensive manual is located at https://paturnpike.sharepoint.com/:b:/r/sites/DepartmentLibrary/Maintenance/Operat ions/Training/MUW%20%5BANNUAL%5D/MUW%20Training%20Folder/MUW%20Manu al 8.5x8.5 8.2022.pdf?csf=1&web=1&e=aEF2Wj or can be accessed in the Department Library on the PTC Intranet at Maintenance/Operations/Training/.

CHAPTER 12 SIGNS & TRAFFIC SERVICES

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Chapter 12 – Signs and Traffic Services

<u>12.1 Introduction</u>

Department of Traffic Engineering and Operations issues a Traffic Services Manual that is available on the PTC Intranet. With respect to the needs of motorists, the requirements for traffic control devices and work area safety compliance with the Pennsylvania Vehicle Code, the PTC adheres to the Manual for Uniform Traffic Control Devices (MUTCD).

12.1.1 Nighttime Review

Purpose

To establish uniform guidelines for nighttime reviews of traffic control devices which provide for the safety, guidance and convenience of the night-time motorist.

Guideline

In addition to the annual sign review, Districts should also attempt to conduct nighttime review by section as time and manpower permits. All nighttime reviews should be made under normal nighttime driving conditions. Reviews should not be made when rain, snow, frost or dew is present since these elements reduce the retro-reflectivity of signs and delineators.

Random sampling of retro-reflectivity should be completed during this review. Sign retro-reflectometers will be made available to the foreman from central office maintenance.

All nighttime reviews should evaluate:

- 1. The need for new traffic control devices
- 2. The effectiveness of existing traffic signs and delineators and the need to replace, wash or relocate the devices
- 3. The effectiveness of existing pavement markings
- 4. The effectiveness of existing DMS in the surrounding environment
- 5. The presence of any device or object which appears to interfere with traffic or to be confused with or to obstruct the view or effect of any traffic control devices.

12.1.2 Signs and Banners Across or Within the Legal Limits of a Highway

It shall be unlawful to place any sign, banner, or advertising matter of any kind whatsoever on or across the system or on or across any structure within the legal limits of the Turnpike without first having obtained written consent from the Commission.

Any such sign, banner or advertising matter placed without the consent is hereby declared to be a public nuisance and may be removed by the Commission with or without notice to the persons responsible for the placing of such sign.

12.1.3 Removal of Illegal Advertising Devices

When an advertising device is removed by Turnpike forces, the owners of such advertising devices will be required to reimburse the Turnpike for the full cost of removal of said device. All work associated with any removal as indicated above must be charged to work activity 2620 - Traffic Services, Safety. A separate work order must be established for each device removal.

<u>12.2 Standardization of Signs</u>

Each standard sign shall be displayed only for the specific purpose prescribed for it in Publication 236 "Handbook of Approved Signs". Signs required by road conditions or restrictions should be removed immediately when those condition cease to exist, or the restrictions are withdrawn. Important as standardization is with respect to design and placement, uniformity of application is at least equally important. Identical conditions should always be marked with the same type of sign, irrespective of where those particular conditions occur.

12.2.1 Excessive Use of Signs

Care should be taken when placing regulatory or warning signs to effectively control traffic. Excessive or capricious use of signs will reduce their effectiveness.

12.3 Maintenance of Signs

12.3.1 Privately-Owned Signs Adjacent To The Turnpike

Owners or occupants of abutting property or traveling public have no right of ingress or egress to, from, or across the Turnpike. Outdoor advertising devices or other facilities which are off the right of way must be serviced from the service roads adjacent to the system or from the network of public highways in the area. Any violation noted should be reported to the Legal Department.

12.3.2 Replacement Of Signs

A major responsibility of maintenance forces is the replacement and repair of signs and posts. A sign or post must be replaced when the sign or post has been damaged or when the legibility of the sign is impaired by fading of the sign face or by loss of retro reflectivity. The history of all sign maintenance that involves the replacement of a sign must be captured in SAP using a sign notification.

Emphasis is to be placed on assuring necessary sign repairs follow the winter maintenance season.

Any special sign order or needs should be coordinated with Engineering, Traffic Unit through the District Warehouse Manager.

As always, any damage to signs that follows completed springtime repairs should also be repaired in a timely manner throughout the year. This includes completing appropriate repairs or replacements before the winter season begins and the Commission's ability to address them is lost until the following year.

The Traffic Engineering Unit will be responsible for performing engineering studies to identify new or revised signing needs.

Signs used for MPT shall be bright, clean and legible. Signs that are not clean, legible or in a good state of repairs must be replaced.

12.3.3 Field Repairs and Straightening

The Foreman will determine what field repairs will be done. His decision must be based on good judgment and sound economics. Field repairs must not be made unless they will be economical and effective. As noted above, any field repair that involves the replacement of a sign must have a sign notification created and closed in PM after the fact.

In the case of minor damage to a sign, such is a slight deformation, which does not impair legibility, repairs will normally be made without removing the sign from its support.

In many instances the sign support is bent or knocked out of position without damage to the sign itself. Wood posts in good condition must be reset. Metal posts, which are deformed to a minor degree, can be bent to proper shape. All non-standard posts must be replaced with a breakaway post. On an asphalt or concrete surface, a v-lock must be used with the post. Occasionally, a sign becomes loosened from its support because of wind vibration or because the original installation was not properly made. Any replacement of posts is to be with a 4x6 treated wooden post. Each sign crew will carry a supply of materials and suitable tools for making such field repairs.

12.3.4 Obstructions

Removal of obstructions to maintain visibility around signs is an extremely important maintenance task. Visibility of regulatory and warning signs is of particular importance. Special attention must be given to all STOP and YIELD signs to make sure that they are always visible. Where normal right-of-way mowing, and trimming operations are not adequate, special mowing and trimming to make signs visible will be necessary.

Where sign visibility is restricted or entirely obscured by snowbanks, the removal of snow may require hand shoveling.

If a maintenance crew notices any obstruction to the visibility of a warning sign, that crew will take immediate measures to remove the obstruction.

A maintenance crew will not park a vehicle on the right-of-way at a place where the visibility of a regulatory or warning sign will be obstructed.

12.3.5 Sign Damage by Maintenance Operations

Each maintenance crew is cautioned to use extra care when working near a road sign. If a sign is damaged in the performance of work, the crew must do what they can to repair the damage.

12.3.6 Removal of Unnecessary Signs

Guide signs directing traffic to and on temporary routes or detours, or signs erected indicating road conditions or restrictions should be removed when no longer applicable. Removal of any permanent regulatory or warning signs should only be accomplished with a concurrence from the Traffic Engineering & Operations Department. A work order must also accompany this work and notification to Traffic Engineering & Operations Department must be made so the sign can be removed from the database.

Also, if a maintenance operation is not completed, the last thing the Foreman must do before leaving the job location at the end of the day is to be sure that all signs and other traffic devices which are not needed and might tend to confuse drivers are removed or covered.

If it is necessary to erect temporary signs at a hazard such as a pavement heave or settlement, the signs must be removed as soon as the repairs are completed.

12.3.7 Storing, Handling and Transporting Signs and Posts

Traffic signs will be stored under cover in a dry place and in such positions that warping, or disfigurement will not take place. Signs covered with reflective sheeting are easily damaged by rough handling and must be transported and stored vertically. Shelves and vertical compartments will be constructed in such a manner that the surfacing and symbols on one sign will not contact an adjoining sign. To protect the sign faces, slip sheeting (a heavy wax paper), thin foam, or cardboard is provided to separate signs and to protect the sign face. These separators should be kept against the sign face until the sign is installed.

Posts will be stored under cover and in such a manner that they will not warp or spring. Normally, they are stacked horizontally with the bottom of each raised off the ground or floor so that an air space is between the posts and the ground or floor. When posts are being sorted or removed from storage, care must be taken not to damage the finish. The same care is necessary when posts are being transported from the storage place to the field locations.

12.3.8 Sign Supports

All signs must be erected on breakaway posts. A V-lock must be used if the post is installed in asphalt or concrete surfaces.

12.3.9 Work Area Protection

Depending on the type of maintenance operations being performed, it is necessary to establish proper MPT to protect the workers as well as the public. For the type of devices required for a specific operation refer to MPT PTS-900's.

CHAPTER 13 FACILITIES, BUILDING GROUNDS AND STORAGE AREAS

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Chapter 13 -- Facilities, Building Grounds and Storage Areas

13.1 Introduction

Please refer the Stockpile Academy Guidelines for facility procedures and the proper storage and handling of materials and supplies.

13.2 Municipal Separate Storm Sewer System & Good Housekeeping

MS4 is an acronym for "Municipal Separate Storm Sewer System".

MS4 Definition:

A system that conveys <u>solely stormwater</u> and is owned or operated by a municipality or "similar regulated entity" like PTC. It is made up of storm inlets, pipes, ditches, swales, and basins used to collect and transport stormwater runoff which could be discharged into streams and rivers or penetrated into the groundwater.

Stormwater Management Program

To prevent pollutants from being discharged into streams and rivers, the Environmental Protection Agency (EPA) and PA Department of Environmental Protection (PADEP) require municipalities and other entities such as the Commission develop a STORMWATER MANAGEMENT PROGRAM to reduce pollutants from being discharged to waters of the Commonwealth.

PTC's Stormwater Management Program includes elements #1 through #6 and are often referred to as Minimum Control Measures – MCMs.

MS4 Permit Components	MCM = Minimum Control PRP = Pollution Reductio	Measures n Plan	
MCM#1 – Public Education and Outreach		Understand	
MCM#2 – Public Involvement and Participation	MCM#2 – Public Involvement and Participation		
MCM#3 – Illicit Discharge Detection and Elimination		Pollution	
MCM#4 – Construction Site Runoff Control		Escaping Mud	
MCM#5 – Post-Construction Stormwater Man	nagement	Functionality	
MCM#6 – Pollution Prevention and Good Ho	usekeeping	Maintenance	
Pollutant Reduction Plan		Mitigation	
		some i TURN PIKE	

MCM#1 – Provides understanding of the negative effects of pollution in stormwater

MCM#2 – Encourages joining the effort to reduce pollution

MCM#3 – Identifies pollution sources so they can be removed

MCM#4 – Focuses on stopping migration of material and soil from construction sites

MCM#5 – Promotes long-term maintenance to ensure stormwater management facilities continue to remove pollution

MCM#6 – Advocates keeping PTC-owned and operated properties clean and tidy, so they are not pollution sources

PRP – Provides a strategy to reduce unavoidable pollution and has not been designated as an MCM

MAINTENANCE RESPONSIBLITIES of the MS4 Permit Components fall within MCM#3 – MCM#6

MCM#3 – Refer to Illicit Discharge Detection and Elimination Guide

https://paturnpike.sharepoint.com/sites/DepartmentLibrary/ENG/Restricted/Forms/AllIte ms.aspx?id=%2Fsites%2FDepartmentLibrary%2FENG%2FRestricted%2FEmployee%20 Portal%20Forms%2FMS4%2FIDDEFieldGuide%5FJuly%202019%2Epdf&parent=%2F sites%2FDepartmentLibrary%2FENG%2FRestricted%2FEmployee%20Portal%20Forms %2FMS4

Potential Illicit Discharge Report (PID)

				Version Date: January 8, 20
		Observe	r Information	
Name:				
Contact Phone Number:			Date and Time Discharge Di	scovered:
		Discharge	e Information	
Mile Marker/Lane Directio	n/Facility:			
District:			Nearest Intersection/Landma	ark:
GPS location, if known:			Lat:	Long:
	68		Nature of Discharge or Flow	:
How Long since Last Rair	nfall:		Solid (Continuous)	Intermittent (Occasional)
Raining Now 0-2	2 Days	3 or more Days	Pulsing (Fluctuating)	Transitory (Prior Spill)
If possible, identify the so	urce of the discharge		Potential for Discharge to en	iter into:
Pipe Outfall	Gutter		Chrosen Mileter Bach	
Sanitary Wastewater	Ditch		Stream/water Body	
Septic System			U Wetland	
Storm Sewer	Other:		Storm Drain	
* Add descriptions of dischar	pe/source to Field Photo	graph Log Sheet	Other:	
Was water flow observed	7 Ves			
Direct Connection to nine	/inlet? Yes		Was a photo taken? 🗋 Yes	No If yes, attach photos.
Describe Odor:				
None	Musty		Rotten Eggs (Sulphur)	Rancid/Sour Milk
Sewage	Gas/Petrole	um 🗆	Cooking Oil	Other:
Describe Clarity:				
Clear	Cloudy		paque 🗌 She	en 🗌 Gray
Describe Color:				
Red Vellow	/ Brown	Green	Gray White	Other:
Solids/Floatables:			1993	
Garbage S	ewage 🗌 Tissu	e 🗌 Oil She	een 🔲 Suds 🗌 Scur	n 🔲 Iron Sheen 🗌 Unkno
Additional Information to a	assist in the Investiga	tion (Vegetation Im	pacts?):	The concern concern subscript of an and
Describe Upstream/Sourc	e Origin/Land Use: []Forest □Ag	Res Farmstd Com	Ind Vac Inst Muni N
Follow up Investigatio	on (to be completed	by other)		District
FIFLD ANALYSIS		within U		District
Odor:		Solids/F	loatables:	Flow:
Clarity:		Sheen/s	Scum:	Source Confirmed?Y
Color:		Conditio	on of Vegetation:	Direct Connection?Y
Comments: (Imme	ediate Environment	al Concern? Y		
DATE	Inspector	Name	Additional n	otes to file:
DAIE.				

MCM#4 – Construction Site Run Off

Maintenance Roadway Staff should report pollution escaping from construction sites to Foreman. Foreman should notify PTC Construction Manager responsible for site.

Note: Maintenance Roadway Staff disturbing less than 25 acres of earth disturbance refer to Maintenance Field Guide for Erosion and Sediment Controls

Department Library - ES_Manual.pdf - All Documents (sharepoint.com)

MCM#5 – Post Construction Stormwater Runoff

Maintenance Roadway Staff should report observations of improperly functioning or damaged stormwater control measures (SCM) to Section Foreman. Foreman should report Stormwater Control Measure problems/issues to Roadway Site Design Unit.

MCM#6 – GOOD HOUSEKEEPING & POLLUTION PREVENTION

The goal of MCM#6 is to ensure Commission properties are exemplary in pollution prevention. This includes keeping maintenance and salt facility sites clean and orderly. Creating and maintaining records when good housekeeping and pollution prevention activities are completed.

Standard Operating Procedures have been established to create a documentation trail for routine duties performed with regards to pollution prevention. The SOPs outline Foremen and Operator Responsibilities. The Foreman is responsible to ensure the SOPs are completed, deficiencies are corrected, and documentation is properly stored. The Operator is responsible to complete the SOPs, correct issues, if able, and report observations to the Foreman.

Frequency: Inspections are to be performed on a weekly basis.

Office Preparation: Build a work order for this activity (4500 Illicit Discharge/4520). Assign a staff member to complete weekly Good Housekeeping task listed on Standard Operating Procedure (SOP) assignment sheet. Pay special attention to ACCEPTABLE APPEARANCE and ROUTINE ACTION REQUIRED columns.

Forms: Forms are to be completed with accuracy. They must have a date and staff member's initials recorded on them.

Example of an SOP

Responsible Party: The following tasks are job duties of any Maintenance Staff given the assignment Frequency: 1/month: Week /							
ITEM	ACCEPTABLE APPEARANCE	INVENTORY	ROUTINE REQUIRED	CONDITION REPORT (Satisfactory / Deteriorated / Malfunctioning)	Yes	No	COMMENTS (If Condition Report answer is "No", describe)
General Area*	Clean and Tidy Pumps and pavement clean Generally organized appearance Lighting, if present, is in working condition (no burnt out bulbs, etc.)	Other: Offer: Offer: Required signage Tank Number Suddinglstructure Number Vin Off Engine Filling of portable Contable new No topping off Contable new No topping off Contable new Sum offer Sum	Gather litter and debris in the vicinity and dispose in trash receptacle Wipe signs, if required Empty trash receptacle Replace burnt out bulbs	Is the expiration date on fire extinguisher current? Are signs clean and legible? Are emergency contact phone numbers clearly posted?			
Spill Kits*	Located at Fuel Island; Labeled "Spill Kit" Spill Kit" Spill Kit as closed latched lid (but latches are easy to open)	Contain rules Spill kit present Directions for spill kit use conveniently located inside lid of spill kit Absorbents (socks, pads and granular materials) are fully stocked Safety signage available (for alerting area users of active clean up area)	 Restock Spill kit, if necessary (Note-Some spill kits are installed with safety seal to indicate spill kit has been opened and used. Only inventory and restock spill kit if seal has been broken or is missing if installed with seal) Check latches and lid Wing exterior of spill kit Note deficiencies 	 Are labels, directions, and phone numbers legible? Are latches and lid is easy to open, close, and secure? 			
uel Pumps*	Fuel pump hoses kink free and hung on pump correctly	Fuel pumps Fuel Product & SDS (MSDS) labels Emergency shut-off Posted emergency numbers Spill buckets	Un-kink fuel hose and rehang, if necessary Clean pump handle and pump display, if necessary Check Split bucket Check kose and nozzle Note deficiencies	Are labels and directions legible? Is Fuel pump equipment free of leaks? Is pump hose free of bulges, slices and leaks? Are connections and pump nozzle free of corrosion and leaks? Check emergency shut-off – Is it free of corrosion and operable? Are split buckets clean? Are instractable hose handlers properly working and holding extra hose length close to pumps and off of driving surface area?			
'rash Management*	Waste container/trash receptacle is within capacity and not overflowing	Waste container/trash receptacle is present Waste container/trash receptacle has a closed or weatherproof lid	Empty Waste container/trash receptacle, if necessary Note deficiencies	Is trash receptacle is overflowing? Is trash receptacle iid closed? Is trash receptacle anchored? Is trash receptacle free of bulges, holes, deformities and leaks?			
Pavement*	 Pavement is free of wet (active) fluid spills or leaks Absorbent, if present, is perceptibly freshily deployed Disposal bags, brooms and shovels stored properly but readily accessible 	 Disposal bags, broom and shovel are present 	Sweep pavement and dispose of debris or spent absorbent in trash receptacle Apply fresh absorbent or other containment to active leaks, spills or drips Note deficiencies	 Is pavement broom swept? (Free of dirt, debris, and litter) Is soaked absorbent collected into disposal bags and placed in trash receptacle? (Soakec absorbent is considered to be special waste but not hazardous waste) 			

Additional information can be found in your section's Good Housekeeping Manuals (Blue Book)

https://teams.microsoft.com/_#/files/General?threadId=19%3Aaa9c2d94c8f24b249f0226ded063989e%4 Othread.skype&ctx=channel&context=Blue_Books_Good_Housekeeping_O_M_Manuals&rootfolder= %252Fsites%252FMS4CommitteeSub-

committees%252FShared%2520Documents%252FGeneral%252FMCM%2520%25236%2520-%2520Pollution%2520Prevention%2520%2526%2520Good%2520Housekeeping%2520-%2520Samantha%2520Willans%252FBlue Books Good Housekeeping O M Manuals

CHAPTER 14 PROPERTY DAMAGE CLAIMS

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Chapter 14 -- Property Damage

<u>14.1 Introduction</u>

The repair of damaged highway facilities is a duty of the PTC and it is entitled to reimbursement.

This chapter establishes policy for seeking reimbursement for damaged PTC property such as guide rail, median barrier, bridges and signs, equipment damage and traffic control and accident cleanup resulting from vehicle accidents.

14.2 Objective

The objective of this program is to identify, locate and quantify accident damaged PTC property and to seek reimbursement from the responsible party.

14.3 Data Entry

Refer to the SAP Plant Maintenance End User Procedures and Appendix J for instructions on creating and modifying a Property Damage Claim notification.

<u>14.4 Contracted Repairs</u>

Contracts for the repair of accident damage should be developed when it is determined that maintenance forces cannot perform the repairs. For PTC vehicle damage a minimum of two (2) estimates are required.

<u>14.5 Inquiries</u>

All inquiries should be addressed through the Risk Management Department.

CHAPTER 15 TUNNEL MAINTENANCE

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Chapter 15 – Tunnel Maintenance

15.1 Introduction

The PTC has eight (8) tunnels in District 2 (Headquarters – Everett) and two (2) tunnels in District 5 (Headquarters – Pocono).

The District 2 tunnels are as follows:

- Allegheny Tunnel 6,070 feet Twin Tubes Somerset & Kegg Sections
- Tuscarora Tunnel 5,326 feet Twin Tubes Burnt Cabins Section
- Kittatinny Tunnel 4,727 feet Twin Tubes Burnt Cabins Section
- Blue Mountain Tunnel 4,339 feet Twin Tubes Burnt Cabins Section

The District 5 tunnels are as follows:

• Lehigh Tunnel – 4,646 feet – Twin Tubes – Slatington Section

15.2 Tunnel Operations

Follow the Tunnel Operations Standard Operating Guidelines (SOG) – Quick Reference Guide. All tunnel employees will be trained on the Tunnel Operations SOG. A PowerPoint presentation is available at each tunnel location through the Tunnel Supervisor.

15.3 Tunnel Maintenance

The tunnel is maintained by the Tunnel Maintainers as well as other maintenance forces. The roadway repair, replacement, patching, joint sealing, traffic line painting, wall cleaning and washing tunnel walls and tunnel approach signing is done by maintenance forces. Specialized personnel such as electricians, plumbers, carpenters, HVAC, and welders perform needed repairs and replacement of utilities, plumbing, heating, and electrical work. Tunnel Maintainers review for structure, drainage, facility maintenance, ceiling hangar rod replacement, piping of water seepage, electrical repairs, and unusual maintenance repairs.

15.4 Tunnel Equipment

Each tunnel is equipped with an emergency vehicle that can be utilized in removing wrecked and/or disabled vehicles from the tunnel and portal entrances. Also authorized

service providers (ASP) are available to assist as needed. Equipment, when needed for maintenance, is supplied by the District and/or Section.

15.5 Annual Work Plan

The following activities should be performed as indicated:

- Washing (minimum twice a year spring and fall)
- Re-lamping
 - High Pressure Sodium
 - Total replacement every 5 years
 - Spot replacement annually
 - Fluorescent

- Total replacement every 3 years
- Spot replacement annually
- LED Traffic Control Lights (at portal) every 5 years
- Air Duct Inspection (minimum twice a year spring and fall)
- Drain Inspection/Cleaning (minimum twice a year spring and fall)
- Ceiling & Wall Inspection annually
- Outside Portal Inspection annually
- Delineation annually
- Joint Sealing annually
- Line Painting annually
- Patching as needed
- Barrier Replacement as needed

Other inspections and maintenance activities performed within the tunnels include:

- Generator
- Ventilation Fan
- Fire Suppression
- Fire Hydrants
- Furnace
- HVAC
- Various other inspections completed by outside vendors through maintenance contracts

CHAPTER 16 ROADSIDE MAINTENANCE

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Chapter 16 – Roadside Maintenance

16.1 Introduction

Roadside management activities and responsibilities involve the vegetation establishment and maintenance within the highway right-of-way. Service Plazas, emergency pull-offs and roadside litter pick-up/disposal are also management responsibilities included in this Chapter.

Routine roadside management programs and activities include the following:

- 1. Mowing
- 2. Herbicide vegetation control
- 3. Mechanical and manual vegetation control (trimming and removal activities)
- 4. Revitalization, planting and plant maintenance
- 5. Roadside litter control

16.2 Mowing

Roadside mowing is an essential maintenance activity which contributes to motorists' safety, sign visibility, vegetation control and roadside appearance. Mowing is required to maintain safe unobstructed views at interchanges, sign structures, gore areas, maintenance stockpiles, ramp infields, access gate areas, tower roads, tunnels, signs, etc. The increased use of smaller vehicles compounds the sighting problems caused by overgrown vegetation.

Mowing must be routinely performed in designated areas to prevent growth and development of noxious or invasive weeds and trees. Proper and timely mowing creates a favorable public impression of highway maintenance. The public's perception of highway maintenance is frequently based upon visible features such as height of grass, presence of weeds and litter or the encroachment of brush and tree limbs into the roadway.

"No Mow" areas will be designated with delineation as established by the Roadway Site Design Coordinator.

Contract Mowing

Contracts for mowing will be coordinated through the Roadway Site Design Coordinator, including contract mowing inspection, acceptance, and invoicing. Mowing schedules, frequency, traffic protection, quality, liability, and other requirements are defined in each mowing contract.

Mowing Safety

Commission equipment operators must routinely (daily as a minimum) inspect cutting blades, teeth, tines, and shields to assure that all mower parts are secure and not subject to being thrown into passing vehicles or onto adjacent property.

Personnel mowing with small rotary mowers, sickles or scythes must be careful to maintain good footing and be constantly aware of the proximity of fellow workers. The foreman must insist on a safe spacing distance between workers using cutting tools.

When tractor mowers are traveling on the shoulder, crossing a bridge or while performing shoulder mowing, they must be followed by a truck mounted attenuator in accordance with the current requirements.

16.3 Vegetation Management

Roadside activities may be incorporated into each major highway construction project as part of the contractor's responsibility. Until such time as the project is completed, no roadside maintenance work is to be conducted within the limits of the project. However, where a section of roadside maintenance must be initiated to aid in the establishment of desirable trees, shrubs, and turf to prevent loss of plant material or invasion of prohibited or undesirable plant growth, roadside maintenance can be conducted.

Roadside vegetation management is intended to provide safety, utility, and economy to the roadside area. Utility is provided by stabilizing roadside soils and preventing erosion and by growing and encouraging desirable vegetation in place of undesirable and future problem vegetation. Economy is provided by the selection of vegetation which needs no mowing or fertilization, low maintenance grasses or other types of vegetation which can withstand roadside environmental contaminants such as salt, ozone, etc.

16.4 Vegetation Control

The overall management of the Commission's herbicide program is the responsibility of the Roadway Site Design Coordinator or their designee. It will be the Maintenance Field Operations Manager to act as the liaison between the Districts and the Roadway Site Design Coordinator. In each District, the herbicide crew will be required to obtain/maintain a Public Pesticide Applicator Certification and be licensed in the applications of herbicides and pesticides. Additionally, the District Operations Manager will be tasked with managing the program within all the sections within the district and will coordinate the annual spraying program.

Purpose

The Commission conducts annual herbicide programs manage roadside vegetation economically and effectively. The purpose of herbicide application is to control or eradicate prohibited and noxious plans and to control other undesirable vegetative growth within the highway right-of-way. Through prudent and timely application of herbicides, the frequency of mowing, tree trimming, and future tree removal is substantially reduced. This represents cost savings in maintenance operations, savings in energy consumption and a reduction in motorist/maintenance activity conflicts.

Program Control

Herbicide material, application technology, federal & state regulations and public acceptance are continually changing in this program. Close coordination and communication must be maintained between the Roadway Site Design Coordinator and the maintenance districts if maximum benefits are to be attained. Any neighbor or customer complaint must be promptly investigated.

In areas where tree cutting was done, and stump treatment is necessary, immediate notification to District Operations Manager must be made. The pesticide hypersensitivity registry notifications are the responsibility of the applicators. All notifications will be consistent with the requirements set forth by the PA Department of Agriculture.

Herbicide Use Position

All motorist and highway frontage residents are exposed to the Commission's roadside vegetation management practices. It is prudent that all people impacted by this program understand the herbicide policies and practices relative to roadside vegetation management.

The management of roadside vegetation in Pennsylvania is predicated by the need to maintain a travel way free of obstructing vegetation as first priority. The roadside aesthetic quality is influenced by the local environment, financial resources available for maintenance and the professionalism of the Maintenance Department.

The use of desirable vegetation and appropriate herbicides are all implemented by the Commission to control undesirable growth. The success of our vegetative management program can be complicated by the desires of our neighbors, customers and by highway construction projects.

Our program of vegetation control involves three major functions: mowing, herbicide spraying and manual tree trimming or removal. Generally, herbicide spraying is based on legal, moral, administrative, and financial dictates. Legally, Act No. 74, Noxious Weed Law, identifies some of the weeds which must be controlled from spreading and overtaking adjacent land. It is the Commission's obligation to control roadside vegetation which adversely affects our neighbors and customers.

Administratively, it is the Commission's policy to conduct a herbicide application program each year along segments of the roadway system, in order to control undesirable vegetation and to reduce costs related to roadside mowing and brushing activities. Financially, there is an enormous savings through the utilization of herbicides as compared to performing these vegetative management operations with hand labor, mechanized equipment or by other means.

The Commission's policy is to utilize chemicals that are approved for use by the Environmental Protection Agency (EPA) and applied by certified applicators approved and licensed as required by the Pennsylvania Pesticide Act. Our program is carefully planned and monitored to assure the most effective and environmentally safe results. The safety of pesticide chemicals, particularly the herbicides used along the roadway system, are given additional credence by the intensive research and laboratory tests required by the EPA prior to approval for marketing.

General Guidelines

All herbicide spraying will be performed by either licensed Commission personnel or contracted service providers and managed by the District Operations Manager and/or Roadway Site Design Coordinator. Maintenance will purchase, store, and dispense all herbicide materials. The materials will be stored at predetermined maintenance locations.

The Roadway Site Design Coordinator and/or District Operations Manager are required to maintain all regulatory records pertaining to the issuance of materials.

Areas

The District Operations Manager/designee and the Roadway Site Design Coordinator will annually review the areas to be sprayed in the upcoming spray season or for any future contracts.

Department Responsibility

Economic - By controlling weed growth in mow areas the frequency of mowing is reduced substantially. Turf quality is greatly enhanced providing the maximum soil stabilization and erosion control for the roadside area.

Legal - Safety for the traveling public and a safer work environment for our employees are the major priorities of roadside maintenance. Appropriate and consistent vegetation management provides a safer roadway environment and thereby reduces the Commission's exposure to tort liability. Additionally, the use of herbicides is crucial to the control of noxious weeds and compliance with the state law regulating the growth and spread of these weeds. The Pennsylvania Pesticide Act controls the use of these materials in Pennsylvania including the requirements regarding hypersensitive individuals.

Aesthetic - An attractive roadside is the secondary benefit of a sound vegetation management program. The major purpose of maintaining and controlling vegetation along the highway is to provide safety for the traveler and to assure the stability of the roadway section. The aesthetic quality attained by well managed and weed free roadside turf areas reflects favorably upon the Commission and its maintenance ability.

Stewardship – The Commission, in an effort to cultivate the goodwill of both the motorist and roadside neighbors, are dedicated to maintaining our roadside vegetated areas to a quality compatible with the adjacent landscape. In urban and developed areas, the PTC strives to maintain the roadside area to a higher degree than is demanded through agricultural or forested areas.

Storage and Handling of Pesticide Materials

A person may not use, handle, transport, store, display or distribute pesticides in a manner that is inconsistent with its label. All pesticides must be stored in accordance with current Department of Agriculture Regulations. Guidelines are as follows:

- Stored in an enclosed heated building, with a minimum temperature of 40°F and not subject to water, dampness, or other adverse conditions.
- Area must be completely enclosed and locked.
- Adequate space available to accommodate the annual pesticide requirements and to allow for similar chemicals to be stored together.
- Areas must be accessible for handling pesticide containers.
- Area must have windows or other means of ventilation if, and when, needed.

Only authorized individuals shall be permitted to sign out pesticide materials.

16.5 Tree Trimming, Selective Thinning and Removal

Refer to Tree Clearing Management Guidelines, Appendix K.

The following is an overview of the laws and policies governing this activity.

- "The Commission shall have the absolute right to trim, cut and remove any trees, grasses, shrubs and vines growing within the legal right-of-way and to trim and cutaway any trees, grasses, shrubs and vines growing on adjacent property insofar as they overhang or encroach upon the legal right-of-way of the PTC roadway."
 [Act of June 1, 1945, P.L. 1242 (36 P.S. §670- 410) as amended July 7, 1972, P.L. 738 Act No. 173].
- 2. No trimming of trees, thinning, damage to or removal of vegetation is permitted by any property owner without prior approval from the Commission's Legal Department.
- 3. When trees located within the legal Commission right-of-way have blown down onto private property, it is permissible and normally desirable, from a public relations standpoint to remove the wood from the private property once the property's owner's permission is secured. The wood shall not be provided to the neighboring property owner and Commission employees shall not enter onto
neighboring property to deliver such wood. Rather, the wood shall be removed from the site and disposed of appropriately.

- 4. The Commission has the right to remove any neighboring property owner's tree limbs, grasses, shrubs, and vines insofar as they overhang the Commission's limited access right-of-way and dispose of that which is removed appropriately.
- 5. If a tree located on neighboring property is dead, weakened, or decayed and poses a hazard, promptly notify the neighboring property owner, and inform him/her of the condition of the tree and their responsibility to remove the tree or be subject to future damage claims that may arise if the tree falls onto Commission property. If it is determined that the Commission will remove the tree, request that the property owner sign an Authorization to Enter form prior to performing the work. If the tree presents a safety hazard or the situation is emergent, maintenance may enter without the form; however, an effort should be made to contact the property owner prior to entering the property. If the tree or limbs from a dead, weakened, or decayed tree fall upon the Commission's property and cause damage to the Commission's right-of-way fence or other Commission property, notify the property owner that he/she is responsible for the cost of the damage to Commission property.

Maintenance Department Operational Duties

These procedures along with the Tree Clearing Management Guidelines document apply to both Commission and contractor operations.

- 1. No Commission or contractor operations shall be performed for the removal or pruning of vegetation which specifically increases the visibility of roadside businesses or activities without authorization and permits.
- 2. The Commission may negotiate, on a case-by-case basis, whereby the abutting property owner would be responsible for vegetation maintenance. This permit would require and indemnification agreement with the adjacent property owner to cover any liability.
- 3. Dead, weakened, or decayed trees and limbs within the right-of-way constitute a dangerous condition to the Commission roadway and shall be scheduled for removal. Non-emergency tree removals must be reviewed and approved by the Roadway Site Design Coordinator.

- 4. Where the Commission has been notified that dead, weakened, or decayed trees and limbs exist beyond the right-of-way limits and pose a hazard of falling onto the Commission's right-of-way, the Commission shall:
 - a. Notify the property owner by certified mail of the condition and advise the owner of the owner's responsibility to remove or be subject to future damage if the tree falls.
 - b. If the tree is an imminent danger to the roadway, seek authorization from the property owner to remove or trim and prepare the Authorization to Enter Form obtained from PTC Legal department.
 - c. If an emergency arises, enter the property, and perform the necessary work without prior notice.

All work outside the Commission right-of-way must be done at a reasonable time and in a reasonable manner under all surrounding circumstances. All work must be documented as fully as possible. The Commission should seek contribution from the property owner for removal of trimming costs.

- 5. Hazardous trees and trees near utility lines shall be removed by skilled and adequately insured tree expert contractors. Commission forces shall not attempt to remove any vegetation from utility lines and shall contact the appropriate utility company in all such situations, including emergencies. Do not jeopardize Commission personnel or equipment in performing tree removal activities.
- 6. All brush resulting from trimming and/or removal activities is to be chipped but not blown onto the adjacent slope area. Chips should be blown into an enclosed chip box and disposed of at the most convenient and acceptable location near the job site. Wood and chips resulting from these operations shall not be utilized by Commission employees for personal gain. The stockpiling and composting of these chips for Commission landscape mulching purposes is encouraged. Composting shall be done as follows:
 - a. Stored in an open area away from buildings and fuel sources
 - b. Materials should be piled no higher than 15 feet
 - c. Turn materials at a minimum of once a month
 - d. Material can be used as mulch after stockpiling for one year
 - e. New stockpiles should be started on an annual basis

- 7. All wood from tree cutting is to be gathered and stored at a designated location within each District. When a minimum of two cords is gathered, notify the District Warehouse Manager for sale.
- 8. Removal of vegetation around official traffic signs, call boxes and bridge abutments are the responsibility of the Maintenance Department.

<u>16.6 Requests for Vegetation Control to Improve the Viewing Zone for an</u> <u>Outdoor Advertising Device (Billboards, Business, Attractions)</u>

Requests to trim or remove vegetation must be forwarded to the Roadway Site Design Coordinator.

An outdoor advertising device is considered screened by vegetation if its view is obstructed as viewed from the center of the lane of traffic of the highway and from a height of no more than 60 inches above the highway surface. A device's view is obstructed when the intent of the advertising is not discernible for a total of five seconds in the viewing zone. The viewing zone of a device is that distance measures along the center of the lane of traffic of a highway over which a vehicle will travel at the posted speed limit. Vegetation is defined as all trees, grasses, shrubs, and vines growing within the legal right of way of the Commission roadway.

The Roadway Site Design Coordinator schedules a meeting with Maintenance personnel to review the site and determine whether or not the work can be performed by Maintenance personnel. If Maintenance personnel can perform the operation, they will prepare a cost estimate for the work to be performed. The Roadway Site Design Coordinator will provide the cost estimate to the sign owner. Upon written agreement, the sign owner will reimburse the Commission for the work performed. Maintenance personnel will complete the work. Upon completion Maintenance will contact the Roadway Site Design Coordinator with an updated cost estimate. The Roadway Site Design Coordinator will coordinate the invoicing of the sign owner.

If the Maintenance Department is unable to perform the work, then the work will be performed by the sign owner's contractor. Coordination will be done by the Roadway Site Design Coordinator.

16.7 Revitalization and Plantings

Revitalization

Revitalization work consists of applying lime, fertilizer, seed and mulch to roadside earthen areas where the existing vegetation is weak, deteriorating, damaged or in such a condition that erosion is imminent. This work is also performed where Commission grading operations have taken place and erosion is considered a problem.

The furnishing and placing of topsoil, sod, ground cover plantings and erosion protection materials as specified in the Pub 408 and Erosion and Sedimentation Control Guideline are also items appropriate for revitalization activities.

This work shall be programmed in coordination with the District Operations Manager and Roadway Site Design Coordinator who will determine the seed formula, lime, fertilizer and mulch types and rates for the problem areas.

The District Operations Manager should report problem areas or anticipated work areas to the Roadway Site Design Coordinator for their review. A determination will be made whether Maintenance personnel or a contractor will perform the work.

Roadside Planting

The Commission is dedicated to the design, construction, and maintenance of the "complete" highway. This philosophy incorporates the need for roadside plantings of trees, shrubs, and vines. Each new highway construction project is analyzed in the design stages relative to the need for roadside plantings and appropriate planning is included.

There are many miles of highway which have not been planted and along which specific planting could be accomplished. There are locations where accent plantings would provide a useful purpose such as framing an exceptional panoramic view, screening an objectionable feature, or providing a psychological or noise abatement screen for a roadside property owner.

Planting for evergreen seedlings for live snow break purposes or for reforestation of roadside areas which are appropriate for this purpose are programs covered by this activity.

Roadside Plantings Areas & Responsibilities

Roadside plantings will include:

- Maintenance, State Police and Trades Buildings These areas will be maintained by Maintenance Personnel.
- Interchange and Fare Collection Buildings These areas will be maintained by Fare Collection Personnel and/or Maintenance Personnel.
- Ramps and Roadway Plantings These areas will be maintained by Maintenance Personnel and/or Contracted Personnel.
- Stormwater Structure Plantings Refer to Stormwater BMP Maintenance Guidelines. These areas will be maintained by Maintenance Personnel and/or Contracted Personnel.

Maintenance of Plantings

Plantings cannot serve their intended purpose unless intensive maintenance is provided during the establishment period. This activity begins when the maintenance warranty period expires. The Roadway Site Design Coordinator will notify Maintenance personnel when this occurs. This maintenance consists of mowing, weeding, cultivating, pruning, mulching, fertilizing and other operations related to plant establishment and care. Coordination with these activities should be done with the Roadside Site Design Coordinator.

Competing vegetation, rodents, insects and disease, climatic conditions and mowing equipment are the major factors which must be controlled or modified to permit desirable plants to establish along the roadside.

The mulch rings around plantings will eliminate vegetative competition, reduce a favorable habitation for rodents and insects, and keep mowers away.

Insects and disease are ever present, and their control is important to prevent ultimate destruction of the plants. Generally, it requires several seasons of an uncontrolled population growth before plants are severely damaged so that control programs can be formulated after observing the initial damage. Where insect and disease damages occur, the Roadway Site Design Coordinator shall be contacted to determine the insecticide most effective and best spray schedule for your problem.

CHAPTER 17 BRIDGES

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<u>17.1 Introduction</u>

Bridge preventive maintenance is extremely important in extending serviceable life of structures throughout the Turnpike system as well as the nation. Structure condition has been cited as one of the most pressing transportation problems facing the nation and one of the major contributing factors to these problems is insufficient or deferred maintenance.

Structure condition deteriorates for many reasons. Among them are increased truck volume and weight, environmental elements and the lack of preventive maintenance. Preventive maintenance can, and should, be used extensively to arrest or delay deterioration of bridge elements.

In the belief that most problems can be prevented or minimized by timely preventive maintenance, the problems normally experienced in the various bridge elements will be identified and the preventive maintenance activity that could prevent or minimize the condition will be discussed.

The goal of this chapter is to identify elements or areas of structures that can substantially benefit from preventive maintenance, and to provide policy and guidelines to accomplish this very important activity. In addition to bridge preventive maintenance, emergency events such as floods require additional resources to monitor scour critical bridges.

The following routine activities should be performed annually by the Maintenance Department:

- Clean anti-skid material from mainline and overhead bridge decks as soon as the weather permits.
- Repair deck spall with concrete and seal cracks in the deck.
- Check bridge joints and advise the Field Operations Manager of any major or significant problems (i.e., leaks, loose, missing joints, etc.).
- Check guiderail connections to the bridge. Tighten any loose connections and replace damaged panels, posts, or connections; also do the same to the concrete median barrier. Provide proper guiderail transitions in accordance with PTC Standards.
- Clean and flush all drainage systems (i.e., scuppers, inlets, slope pipes, etc.).

- Flush dirt and debris from abutment and pier bearing seats.
- Clean dirt from the bituminous curb; also repair/replace deteriorated curb.
- Backfill and stabilize eroded areas around the wingwalls.
- Repair spall to the abutment walls and piers when accessible.
- Provide shoring and/or shielding at designated locations; also check all temporary wooden supports and tighten as required.
- Monitor and remove loose concrete from the bridge decks, T-beams and parapets.
- Check the protective fencing for loose connections and/or vehicular damage.
- Remove vines growing on the protective fence and parapets.
- Check approach roadway slab for settlement and notify Field Operations Manager of any significant deficiencies.
- Check all drainage structures (culverts) for any major obstructions.
- Remove trees from around culvert headwalls, wingwalls and under bridges.
- Notify the Field Operations Manager of any unusual conditions.

17.2 Maintenance Responsibilities of Bridges

The maintenance responsibility of bridges built to carry local or off-system roads over or under the Turnpike is as follows:

Overpass

Where the Turnpike passes over an off-system road, the PTC will maintain the entire substructure and superstructure. The local jurisdiction will be expected to assume maintenance responsibility on the road itself.

Underpass

Where the Turnpike passes under an off-system road, the PTC may or may not maintain ownership of the bridge. Contact the Bridge Engineer Manager when there is a question regarding whether the PTC owns a bridge. Generally, if the bridge is owned by the PTC, the PTC is responsible to maintain the bridge from end joint to end joint; all other features and facilities beyond the end joints of the bridge are the maintenance responsibility of the local jurisdiction. One exception to this is if a sidewalk was added to an existing Turnpike owned bridge after the bridge was built. If the sidewalk was added at the request of a local jurisdiction, the local jurisdiction may be responsible for the maintenance of the sidewalk. If there is a question regarding whether the PTC is responsible for the sidewalk maintenance on a PTC owned bridge, please contact the Bridge Engineer Manager. If the bridge is owned by the local jurisdiction, the local jurisdiction is responsible for the maintenance of the bridge as well as all other features and facilities beyond the bridge.

<u>17.3 Bridge Maintenance Planning</u>

Developing and maintaining a plan for completing bridge maintenance is a vital step to ensuring continued serviceability of bridges. Maintenance and Engineering must work together in developing a strategic plan that prioritizes bridge maintenance activities in the annual work plans. This plan should consist primarily of preventative maintenance activities with small repairs added that can be performed by the Maintenance Department forces.

<u>17.4 Preventative Maintenance Activities</u>

Preventive maintenance is only required on specific elements of a structure, and it is likely that this chapter will be used by maintenance crews with little or no structural training. The following material will be presented with as little theoretical reference as possible.

Decks

Proper maintenance of bridge decks is very critical, not only from a structural integrity preservation viewpoint but also from one of public perception. Decks littered with antiskid materials contribute to the chloride contamination of concrete and corrosion of reinforcing steel which, in turn, accelerates the formation of potholes and the ultimate deterioration of highway structures.

Decks normally consume a large part of the maintenance dollar, and all efforts to reduce these sometimes-unnecessary expenditures should be encouraged as much as possible by managers at all levels. A quality deck preventive maintenance program will go a long way in minimizing repair costs.

Removal of Debris and Chemical Accumulation

Winter snow and ice removal activities deposit antiskid materials and chemicals on bridge decks which normally tend to accumulate over the winter within the area of the water table near scuppers and around structural members (panel points of trusses, flange angles and bottom flanges of plate girders). As soon as practical (when the threat of snow has subsided to a reasonable level), this debris should be removed by sweeping and/or flushing per the Foreman's Manual according to the guidelines given in PennDOT Publication 55, Bridge Maintenance Manual, Chapter 11: Cleaning.

Care should be exercised when cleaning decks to prevent debris from entering the drainage system (scupper and downspouts) which could compromise the drainage system. Structural members of the superstructure such as end posts, diagonals and vertical web members, panel points of trusses and flange angles, stiffeners, web plates and bottom flanges of plate girders that lie within the wheel splash zone should also be cleaned of debris and salt residue by pressurized flushing, air blasting, scraping, brushing or mechanical devices. Areas that exhibit signs of corrosion should be noted, reported to the Bridge Engineer Manager via the Field Operations Manager, and scheduled for painting or repair.

Protective Coatings

Protective coatings for reinforced concrete surfaces are available that prevent or minimize scaling or spalling. Apply to exposed concrete roadway surfaces of bridge decks, curbs, sidewalks, divisors, concrete median barriers, inside and top surfaces of parapets, abutments, pier caps and end walls. Materials which can be used are boiled linseed oil, petroleum spirits mixture and epoxy-resin. To be effective, these sealants should be applied before opening the roadway to traffic. For application rates and when to apply, refer to PennDOT Pub. 408, Sections 503 and 1019. Coordinate with the PTC Bridge Engineering Department before using.

Anti- Graffiti Coatings

Anti-graffiti coatings are applied to bridges to prevent graffiti from adhering permanently to the surface. Any graffiti should be removed as soon as possible (within in 24 hours if possible) to assist in the ease in removal.

Cracking

Concrete deck cracking is a linear fracture of the deck concrete. It may extend partially or completely through the deck. The cracks are classified as longitudinal, transverse, diagonal, alligator, pattern, map or random.

Isolated longitudinal, transverse, or diagonal cracks should be sealed using the procedures outlined in PennDOT Pub 408, Section 1091. Asphalt deck surface cracking is very similar to roadway pavement cracking and is classified as alligator or map cracking, where the edge cracks have joint cracks, reflection cracks, shrinkage cracks and

slippage cracks. Alligator and slippage cracks should be repaired by removing the distressed area to sound material and patch using conventional pothole patching procedures. The remaining types of cracks should be sealed using the procedures outlined in the Foreman's Manual. Early detection and repair of minor cracks is very important to prevent more serious defects. A semi-annual walk-around inspection should be completed to detect new cracking.

Bridge Deck Joint Systems

Bridge deck joint systems are a very important part of the bridge superstructure and one that is very often overlooked by maintenance forces. Joints allow movements of the superstructure under live loading as well as thermal expansion and contraction. They also provide protection to the substructure by waterproofing the area under the joint. Joint systems that are not properly designed or maintained allow chemically laden moisture and debris to reach critical structural elements beneath the deck road system. Bridge seats and bearings are very susceptible to corrosion by deicing chemicals and are normally located directly below the joint areas. Deck joints are classified as open or closed joints. Open expansion joints are designed to provide for longitudinal movement of the superstructure and perhaps some means of partially bridging the joint opening to permit traffic to cross smoothly.

Closed expansion joints consist of an arrangement of various materials to completely seal bridge joint openings and provide for longitudinal movement of the superstructure. Such devices may or may not provide water proofing in their design.

Open Joints

Open joints chiefly consist of sliding plate, finger joints, normally on larger structures with long spans, and an open joint consisting of formed concrete edges or, in some cases, armored edges.

Many of the latter joints use mastic or other types of sealers to prevent the intrusion of debris and to waterproof the area below.

Finger Joint

Finger joints are not capable of being sealed but some may provide drainage control by placing a drain trough directly below the finger joint to collect and direct runoff to the bridge drainage system. The most common problem associated with this type of open joint expansion system is the clogging of the drainage trough with roadway litter, antiskid and other debris; and when a drainage route is not provided, the roadway drainage carries and deposits deicing chemicals and debris onto the support system as well as the flanges of superstructure members. This accumulation will often prevent proper operation of the expansion device by clogging the expansion finger openings which may cause the fingers to rise.

Drain troughs should be cleaned frequently to prevent clogging, and if extreme difficulty is experienced in cleaning, modifications should be made to the system to facilitate cleaning and flushing. If the deck is kept clean, a minimum amount of debris will enter the drainage system and will reduce the need for frequent cleaning.

Sliding plate

The sliding plate, one of the most commonly used joints, consists of a horizontally positioned flat steel plate anchored into the bridge deck at one edge and permitted to slide across an angle anchored to the opposite edge of the opening (armored edge). The major problems associated with this type of joint is that while the joint design deters the passage of dirt and debris through the joint, it fails to prevent water and dissolved chemicals from reaching the bridge elements underneath. Also, antiskid and road patching material, if permitted to accumulate and compact along the free edge of the sliding plate, will produce increased resistance to expansion and may eventually lead to deformation of the plate or to cracking of the deck.

Little can be done to prevent this type of joint from leaking. If leakage is a problem, one solution to the problem is to install a drain trough beneath the expansion device to collect and drain water passing through the joint away from sensitive areas. Sheet metal deflectors may also be installed as an interim measure to prevent water from draining onto flanges, bearings, bearing seats, etc.

Sliding plate expansion devices (properly designed and installed) are relatively trouble free. Occasional cleaning of the small trough between the fixed and sliding parts of the device prevents the device from binding. Frequent cleaning of the deck, especially after the winter season, will minimize the deterioration of the structure beneath the expansion joint subjected to water and dissolved contaminants.

Other open joint

Other open joints that generally provide a mastic sealant material to prevent the intrusion of debris and to waterproof the areas beneath should be inspected during the structure preventative maintenance and, if any signs of sealant failure are present, the

joint should be cleaned and resealed. The work should be done as per the procedures outlined in PennDOT Publication 55, Bridge Maintenance Manual, Chapter 11: Cleaning and Chapter 13: Deck Expansion Joints.

Closed Joints

The following types of closed joints are used on the Turnpike system: pre-molded filler, compression seal and elastomeric expansion devices.

Elastomeric expansion device

Elastomeric expansion device is general terminology defining a sealed, waterproof joint system utilizing steel plates and angles molded into a neoprene covering. The steel provides for anchorage and load transfer while the neoprene serves as a protective covering for the steel and a waterproof material to prevent water from passing through the joint system.

Little preventive maintenance is required of this expansion device other than frequent cleaning. Cleaning should be done each spring after the threat of snow has subsided.

Pre-molded filler (filled butt joint-hot poured sealant)

A pre-molded joint material usually made out of rubber is used to seal butt joints. The joint material is usually attached to one face of the joint or supported from below by an offset in the vertical face of the slab. A sealing compound is poured from the roadway surface to seal the opening. Maintenance requirements include annual cleaning, replacement of the surface seal, replacement of the filler when necessary and repairs to the roadway surface adjacent to the joint. If the seal is not kept watertight, the filler below will deteriorate and make resealing difficult. Non-compressible that work their way into the seal can cause the joint to jam.

Compression Seals

Compression seals consist of various types of extruded neoprene (or similar material) whose design and elastic properties provide for the retention of its original shape. The seal is installed in a preformed joint opening at the span ends. An adhesive provides a bond between the joint face and the sealant to produce a waterproof system.

Preventive maintenance of this type of seal mainly consists of frequent cleaning of the joints to remove antiskid material and other debris from the recess between the top of the joint material and the surface of the deck. The abrasive action from this debris

will cause rapid wearing of the top surface of the seal if the debris is permitted to accumulate on top of the seal.

Deck Drainage Systems

The operation and maintenance of bridge drainage systems is a very important element of bridge preventive maintenance. Deck drainage is required for proper maintenance of bridges since the lack of proper drainage affects many elements of the structure.

Poor drainage is normally due to the accumulation of antiskid material and other debris within the drainage system preventing proper operation. Backed up water might then freeze and rupture the pipe and may contain corrosive chemicals which, when leaked through the rupture, will attack structural elements of the bridge. Bridge drainage systems consist of scuppers-drop through and piped, gratings (open steel grid floors), open joints with troughs and all associated piping.

Scuppers

Scuppers are provided in bridge decks to collect the water on the deck and direct the water through short drop through pipes or into a closed drainage system of relatively small diameter. Each type of downspout pipe presents its own individual problems; these problems--long downspouts, horizontal runs with inadequate slope, sharp directional changes and small diameter discharge pipes--are all conducive to clogging. Short drop through pipes that drain directly under the bridge may cause corrosion of structural steel and concrete surfaces of piers and abutments and possibly erode abutment earth slopes.

All scuppers should be examined frequently for proper operation and cleaned when necessary. Antiskid or other debris should be removed by water pressure or metal probes. Particular attention should be applied when flushing antiskid from decks to prevent it from entering the drainage systems and compounding the problem.

Protective coating may be applied to piers, structural steel and any other elements exposed to the corrosive liquids from drop through scuppers to prevent or retard corrosion.

Open Joints and Troughs

As mentioned under bridge deck joint systems, troughs under open joints are susceptible to debris accumulation with subsequent backup of drainage which contributes to the accelerated deterioration of concrete, corrosion of steel and erosion of earth. These troughs should also be inspected for tears and clogging at frequent intervals and repaired or cleaned as required.

Superstructure Systems

Bridge superstructures on the Turnpike system are made of steel or concrete.

Bearings

Bearings are used to transmit and distribute the superstructure loads to the substructure while permitting the superstructure to undergo necessary movements without developing harmful stresses. The various types of bearings are roller expansion bearings, fixed steel bearing, rocker expansion bearings, sliding bearings, pot bearings, elastomeric bearings or pin and hanger bearings.

Steel

An effective preventive maintenance measure to control rust and resultant corrosion of steel bridge members is to spot/zone paint exposed members. Spot and zone painting should be scheduled on a four (4) or five (5) year cycle unless conditions warrant otherwise. Qualified bridge painting inspectors with training and/or knowledge related to the various paint systems shall be assigned to inspect the work.

Concrete

Concrete deck structures have a common problem in that the riding surface is an integral part of the structure and any loss of bond between the reinforcement and concrete because of spalling, steel corrosions or wearing will reduce the load capacity of the structure. Un-bonding of the reinforcement in the top mat of the slab is normally associated with chloride contamination of the deck and reinforcing steel. A waterproof membrane is normally provided to reduce or prevent this contamination. However, from a purely preventive maintenance approach, little can be done other than a regular program of deck cleaning and possibly the application of a penetrating sealant.

Beam ends

Beam ends, which would include the last five feet of the beam and the back side of the bearing at expansion joints, are most vulnerable to be damaged due to leaky joints. Beam ends should be flushed along with the cleaning of bearings and beam seats. Such cleaning will minimize deterioration and extend bridge life. Regardless of the type, the preventive maintenance procedures are essentially the same. Each maintenance organization should:

- Have a program to clean dirt and debris off caps, seats, beam ends and bearings at regular intervals usually in the spring after the threat of snow and ice has subsided.
- Have a program to properly maintain deck joints that are designed to be sealed but are not functioning properly and are allowing moisture and debris to fall on the bearing areas.

Substructure Systems

The substructure of a bridge is the portion that transmits the load and stresses from the superstructure or load supporting system to the ground. Substructures may be classified as abutments or piers. Footings, piles, columns, walls, pedestals, caps, bridge seats and bearings systems are components of the substructure. While all the above are important, the discussion in this section will concentrate on the problems associated with bridge caps, seats, and bearings systems and how they relate to preventive maintenance.

Caps and bridge seats

This element is the top of the piers, bents, and abutments upon which the bearings rest. Any deterioration of this section could result in differential settlement of the superstructure and unanticipated stresses. The most common problem is the general deterioration of the concrete. This can be the result of chemical attack, poor aggregates, poor concrete, freeze/thaw damage, insufficient reinforcing steel coverage or various combinations of these. The damage is usually in the form of scaling, pop outs or sloughing off at the corners. Due to the proximity of leaking joints which tends to deposit chemical-laden dirt and debris in this area, the depth of deterioration is likely to be greater at this location than at other locations.

The most important step in preventing damage to the caps and seats is to reduce the amount of leakage from the joints. Runoff from scuppers and joints should be diverted by pipes or splash plates. The chemical-laden dirt and debris should not be allowed to accumulate on these surfaces. These surfaces should be flushed annually after the threat of snow and ice has diminished or passed.

In the event the caps and seats are steel, the most common problem is rust and the resultant corrosion. The same preventive maintenance procedures outlined for concrete should be followed for steel and, in addition, proper painting schedules should be developed to prevent corrosion problems.

<u>17.5 Bridge Component Definitions</u>

Bridge - A structure including supports erected over a depression or an obstruction such as water, highway or railway and having a track or passageway for carrying traffic or other moving. The bridge approach slab is considered to be part of the structure.

Bridge Length - The greater dimension of a structure measured along the center of the roadway between backs of the abutment back-walls or between ends of the bridge floor.

Bridge Roadway Width - The clear width of structure measured at right angles to the center of the roadway between the bottom of curbs or, if curbs are not used, between the inner-faces of the parapet or railing.

Loads of Structures

Dead Load - The weight of the structure itself and the weight of any permanent fixtures which are supported by the structure. It is a fixed load which remains in position during the life of the structure unless removed and can be increased.

The most common cause of an increase in dead weight is the placing of additional wearing courses.

Live Load - The live load includes all loads or forces due to vehicular or pedestrian traffic which act on the structure.

Impact Load - This is an allowance, equal to a calculated percentage of the live load, which is added to the live load of the structure to provide for the dynamic and vibratory efforts of traffic loadings.

Wind Load - The effect of wind blowing against the structure and the live load.

Longitudinal forces - The effect of the forces created by traffic moving across the bridge. These forces act longitudinally, i.e., parallel to the center of the bridge.

Thermal forces - This is a force applied to the structure due to temperature variation.

Deck Elements

Wearing Course - The wearing course provides the riding surface for traffic and is placed on top of the structural slab. There are also wearing courses poured integral

with the structural slab. When this technique is used, it is generally referred to as a monolithic deck.

Wearing courses can be either bituminous concrete or Portland cement concrete and are not considered to provide load carrying capacity.

Structural Deck - The structural deck or slab provides the load carrying capacity of the deck system.

Typical structural deck systems are:

- Reinforced concrete
- Steel Plates (Orthotropic decks) within thin wearing course overlay
- Steel grid (open or concrete filled)
- Wood Planking
- Pre-stressed concrete box beams
- Precast concrete planks

Sidewalks - Sidewalks are provided on structures where pedestrian traffic counts warrant their use. Otherwise, safety walks are generally recommended.

Typical sidewalks are:

- Reinforced concrete
- Steel plate
- Wood planking
- Filled grid

Curbs - Curbs are provided in conjunction with sidewalks and safety walks. Curbs can be constructed of reinforced concrete, pre-cut granite, timber or steel plate.

Railings - Railings are placed along the extreme edges of the Deck system and provide protection for traffic and pedestrians. There are a wide variety of railing materials and configurations.

Some of the more common railings are:

- Metal multiple rail systems
- Box Beam
- W-Beam
- Reinforced concrete
- Timber

Superstructure Elements

Rolled Beams – The rolled beam is used for short spans. The beam comes from the rolling mill as an integral unit composed of two flanges and a web. The flanges resist the bending movement and the web resists shear.

The more common types of rolled beam shapes are (See Figure 17.1):

- Standard Beam
- Wide Flange
- Channel Section



Figure 17.1

The following illustration (See Figure 17.2) is a typical longitudinal section for a rolled beam span:

Figure 17.2



Plate (built up) Girders - This type of structural member is used for intermediate span lengths not requiring a truss and yet requiring a member larger than a rolled beam. The basic elements of a plate girder are a web to which flanges are riveted or welded at the top and bottom edges.

The most common forms of cross section are shown below (See Figure 17.3):



Figure 17.3

The component parts of a typical plate girder are illustrated below (See Figure 17.4):

Figure 17.4



The portion above the neutral axis of the beam or plate girder will be in compression and the portion below the neutral axis will be in tension for simple span structures. The neutral axis is defined as the axis along the length of the beam or plate girder which has no stress.

- 1. **Flange Angles** Flange angles are used for riveted plate girders and carry tensile or compressive forces induced by bending.
- 2. **Cover Plates** Cover plates are welded or riveted to the top and/or bottom flanges of the girder to increase the load carrying capacity.
- 3. **Bearing Stiffeners** These are either plates or angles placed vertically at the location of the support and attached to the web. Their primary function is to transmit the shearing stresses in the web plate to the bearing device to prevent web crippling and buckling.
- 4. **Intermediate Stiffeners** Intermediate stiffeners are used at points of concentrated loads or for deep girders to prevent web crippling and buckling.

Reinforced Concrete Beams – The concrete beams are reinforced within the tensile stresses (whether resulting from bending, shear or combinations thereof produced by transverse loadings) are by design carried by the steel reinforcement. The concrete takes compression and shear only. These beams are commonly rectangular or T-shaped with its depth dimension greater than its stem width.

Pre-stressed Concrete Beams - The two main types of pre-stressed concrete beams are box beams and I-beams. The box beams are constructed with a rectangular cross section with a single void inside. The top and bottom slabs of the box act as the flanges while the sidewalls act as webs. The most common pre-stressed concrete I-

beams are the AASHTO shapes. The cracking and tensile forces in the pre-stressed concrete are greatly reduced by compressing it with pre-tensioned strands, wire, or bars.

Pin Hanger Connections - These connections are devices put in bridges to permit expansion movement and rotation. When they are used in suspended span configurations in non-redundant two-girder bridges, they are fracture critical.

Trusses - The truss is one form of structural system which, because of its characteristics, can be used to span greater lengths than rolled beams and girders. The truss functions basically in the same manner as a rolled beam or girder in resisting loads--the top and bottom chords act as the flanges of the beam and the diagonal members act as the web.

Typical types of structural systems that are used for highway structures are illustrated in as follows (Figure 17.5):

(These truss types may be used as "Thru Type" or "Deck Type".)

- 1. **Chord** In a truss, the upper and lower longitudinal members extending the full length are termed chords. The upper portion is designated the upper or top chord and correspondingly the lower portion is designated the lower or bottom chord. For a simple span, the top chord will always be in compression and the bottom chord will always be in tension and should be considered a main structural member. Failure of either chord will render the truss unsafe.
- 2. **Diagonals** The diagonal web members span between successive top and bottom chords and will either resist tension or compression depending on the truss configuration and the live load position. Most diagonals are also main structural members and their failure would be extremely critical and render the truss unsafe.
- 3. Verticals Vertical web members between top and bottom chords which will resist either tension or compression stresses depending on the truss configuration. Most verticals are also main structural members and their failure would usually be critical and render the truss unsafe.
- 4. **Panel Point** The point of intersection of primary web and chord members of a truss.

Items 5 through 11 below can be considered secondary structural members and, although their failure should receive immediate attention, an individual member failure will not render the structure unsafe.

- 5. **Portal Bracing** The portal bracing is found overhead at the ends of a thru truss and provides lateral stability and shear transfer between trusses.
- 6. **Sway Bracing** Sway braces are secondary structural members spanning between the trusses at interior panel points and provide lateral stability and shear transfer between trusses.
- 7. **Top Lateral Bracing** The top lateral braces lie in the plane of the top chord and provide lateral stability between the two trusses and resistance to wind stress.
- 8. **Bottom Lateral Bracing** The bottom lateral braces lie in the plane of the bottom chord and provide lateral stability and resistance to wind stresses.
- 9. **Floor Beam** The floor beam spans between trusses at the panel points and carry loads from the floor stringers and deck system to the trusses.
- 10.**Stringers** The stringers span between floor beams and provide the primary support for the deck system. The deck loading is transmitted to the stringers and through the stringers to the floor beams and to the truss.
- 11. **Gusset Plates** These plates connect the structural members of a truss, on older trusses, pins are used instead of gussets.

Bearings - Bearings transmit the superstructure load to the substructure. They are also provided for longitudinal movement due to expansion and contraction and rotational movement due to deflection.

Some typical bridge bearings are shown below (See Figure 17.5):



Figure 17.5

Substructure Elements

Abutments – Abutments are a substructure unit which supports the end of a single span or extreme end of a multi span superstructure and usually retains or supports the approach fill.

- a. **Stub Abutment (Perched Abutment, Dwarf Abutment)**: An abutment set near the top of an embankment or slope and having a relatively small height. While often supported upon piles driven through the embankment or natural ground, stubs may also be founded on gravel fill, the embankment, or the natural ground itself.
- b. **Full-Height Abutment (Shoulder Abutment)**: A cantilever abutment extending from the grade line of the road below to that of the road overhead.

Usually set just off the shoulder. These may be on piles or spread footings and of the open or closed design.

Piers - Bridge Piers transmit the load of the superstructure to the foundation materials and provide intermediate supports between abutments.

Piles - Piles are used to transmit the bridge loads to the foundation material when soil conditions are not suitable for receiving the load in bearing. Typical pile types are:

- Steel H Piles
- Concrete piles (both CIP and precast)
- Concrete filled pipe or shell piles

Miscellaneous

Clearances - Clearances refer to the minimum distances that are provided by the bridge relative to the passage of traffic.

Camber - This is an initial upward curvature, built into a beam, girder, or truss to allow for vertical curves or cross slopes in the road section.

Reinforcement for Concrete - Concrete cannot resist tensile stresses and therefore is reinforced with steel bars or wire. Two types are generally used for concrete reinforcement.

Deformed Bars – Deformed bars are for main reinforcement. These bars may be epoxy coated or galvanized to resist corrosion. Wire mesh for low stress areas, for example, temperature stresses.

Welding - Structural welding on all bridges shall be performed by qualified welders who are certified in accordance with AWS standards. All personnel classified as welders shall be qualified and certified.

High Strength Bolts - These bolts develop a strong clamping force when tightened to a very high tension. Within the last 15 years, the A325 high strength bolt has become the prime field fastener of structural steel. The specifications call for a heavy hexagon structural bolt, a heavy semi-finished hexagon nut, and either one or two washers. Bevel washers may be required. Approved methods should be used to assure proper bolt tension. **Fatigue** - This term applies to the phenomenon whereby a structural member, subjected to alternating tension and compression stresses due to moving loads on the bridge, has its useful life decreased. A crack, very often minute, will develop and gradually enlarge on the member, thereby decreasing its load carrying capacity to a dangerous point at which a sudden failure is possible.

Expansion Joints - These are joints placed in the deck to accommodate for longitudinal movement expansion and contraction of the superstructure due to changes in temperature, creep, and shrinkage. They prevent cracking in the deck. Temporary expansion joint systems for maintenance repairs include asphaltic plug, preformed silicone and two-part silicone joint.

Scuppers - These are located along the curb line and provide drainage from the deck.

Downspouts - When it is not desirable to allow water from the scuppers to fall free, it is carried off by pipes (downspouts).

CHAPTER 18 RENTAL EQUIPMENT

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18.1 Introduction

The Maintenance Department's responsibilities include planning, authorization, scheduling, use, supervision, and control of outside rented equipment in conjunction with normal work plans for summer and winter operations as well as emergencies. Once Department equipment is scheduled and committed, a need shall be established for rented equipment to assist Department equipment in completing the planned maintenance programs within the scheduled time period.

18.2 Planned Rentals

The requestor must obtain a quote of best value. The District submits a shopping cart with the quote attached including the start date and end date. After the approved shopping cart is received, the Strategic Sourcing & Asset Management (SSAM) Department will issue a purchase order and contact the requestor with the necessary information.

18.3 Contracted Rentals

The requestor will determine need and type of equipment. The requestor will meet with the SSAM department to draw up the proposal. Purchasing advertises by means of an RFP and awards to the lowest responsible bidder. SSAM will then notify the requestor when the contract is awarded. A signed contract needs to be executed before contacting the requestor with the necessary information.

18.4 Emergency Rentals

During regular business hours call the SSAM office with the request. During off hours, the on-call supervisor will approve the emergency rental. Procurement cards can be utilized if within the allowable dollar amount.

CHAPTER 19 RADIO COMMUNICATIONS

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Chapter 19 - Radio Communications

<u>19.1 Introduction</u>

The PTC radio system is primarily used to direct field operations within the Maintenance forces in conjunction with PSP, ASP, and the Operations Center. It is essential that each radio operator study the operation of the radio equipment as outlined in Radio Communications Manual.

CHAPTER 20 AGILITY

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Chapter 20 – Agility

20.1 Introduction

Agility is a "way of doing business" which allows PTC and eligible partners to exchange services with each other. One of the biggest advantages of the Agility Program is that relationships are developed between PTC and the partners.

Trading services for services among eligible community organizations and local governments enables PTC and its partners to stretch limited resources and share equipment and staff. Eligible partners include local governments, water, sewer, housing and municipal authorities, council of governments, metropolitan and rural planning organizations, schools, volunteer fire and rescue companies, volunteer emergency medical transport companies, state and federal government agencies and charitable hospitals. The Agility Program is available throughout the Turnpike system.

Service exchanges are reasonably equal in value between the PTC and its partner. To avoid the exchange of services that may have a negative effect on the workforce, PTC enters into Agility Work Plans in cooperation with the Teamsters. In this way, the PTC, Teamsters and the eligible partner provide services that benefit everyone without the need to pay each other cash for the services rendered. A Work Plan can be implemented after a fully executed Agility Agreement is in place.

Central Office and District Maintenance Superintendents are responsible for the proper completion and implementation of the Work Plan. Each Work Plan contains PTC's management, union representation, if needed, and the partner's signatures. Agility Agreements are valid for five years but can be cancelled after the terms of the agreement and Work Plan have been met. The Agility Agreement can be renewed based on the desires of the partner and PTC.

CHAPTER 21 SERVICE PLAZA AGREEMENTS

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Chapter 21 – Service Plaza Agreements

21.1 Introduction

The Commission has an agreement with AppleGreen and 7-11 to provide traveling customers with comforts at Service Plazas. This agreement can be accessed and viewed on the PTC Intranet.

21.2 Maintenance Responsibilities

Maintenance responsibilities are as follows:

- Hazardous Material (HazMat) Spills
 - Maintenance WILL NOT respond for hazmat spills IN the Service Plazas.
 - Maintenance WILL respond for hazmat spills OUTSIDE the Service Plazas on entrance and exit ramps, travel lanes and bridges.
 - Maintenance WILL provide MPT as required for any closures at Service Plazas.
- Signs
 - The Commission reserves the right to install any parking signs they deem necessary in the Service Plazas, including, but not limited to, handicapped parking and State Police parking signs.
- Snow Removal
 - The Commission shall remove snow and ice from the entrance and exit ramps, travel lanes and bridges.

When questions arise refer to the Service Plaza Agreements and Area Mosaics. Any additional questions can be addressed by Concession Services Supervisor and the Director of Facilities.

CHAPTER 22 INTERCHANGE AGREEMENTS

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Chapter 22 – Interchange Agreements

22.1 Introduction

Interchange agreements define the limits of work that the PTC and PennDOT are responsible for outside their respective rights-of-way. Please reference Interchange Agreements.
CHAPTER 23 MEDIA RELATIONS & LEGISLATIVE INQUIRIES

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Chapter 23 – Media Relations & Legislative Inquiries

23. 1 Media Relations

Department policy is that no employees engage in conversation or provide information to members of the media without prior approval from the Director of Maintenance or designee. All inquiries must be referred to the Director of Maintenance or designee.

The Director of Maintenance will confer with Media relations to obtain guidance on how the inquiry should be handled.

The Director of Maintenance will then contact the appropriately trained maintenance personnel and provide direction on how to handle the request. Only personnel who have successfully completed the PTC Media Training will be approved to speak to the media.

Upon completion of a media interview, a summary of content and any outstanding issues should be provided to the Director of Maintenance.

23.2 Legislative Inquiries

Any legislative inquiries should be forwarded to the Chief of Compliance, Legislative & Cultural Affairs.

23.3 Customer Complaints

Complaints may be in various forms such as request for improvements, while others are justified complaints about a specific problem which requires our PTC forces to correct. It is an established policy of the Commission to investigate and make personal contact if possible, on all complaints regardless of their nature or validity. Speed in handling all complaints is important. Diplomacy and tact are two virtues which must be employed to insure good public relations when receiving and handling complaints. The investigator must exercise care not to commit the Commission to work which cannot be completed or work which is not a Commission responsibility.

23.4 Processing Customer Complaints

The processing of complaints is a most important phase of public relations involved in maintenance operations. A complaint frequently is made because the patron or public is not familiar with the exact responsibilities and limitations of the maintenance organizations.

A complaint of this type can usually be handled easily by contacting the complainant within 24 hours and explaining the duties, responsibilities, and limitations of the Maintenance Department. Other complaints may be based on actual deficiencies. Such a complaint should be investigated by the District Maintenance Superintendent or designee. A determination of what action will be taken, and the complainant contacted and informed when they can expect the condition to be corrected and exactly what will be done or why it is necessary to delay action.

All complaints which have been submitted through the Central Office shall be processed and a complete report will be made back to the Central Office. This report will contain all pertinent facts relating to the investigation.

CHAPTER 24 QUALITY ASSURANCE

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24.1 Introduction

The Maintenance Quality Assurance (QA) Program has been developed to increase productivity, ensure the preservation of our assets, develop more efficient use of resources and develop greater efficiencies in work processes. The intent is to provide a fair evaluation of each maintenance operation for compliance with established policies and procedures outlined in this Maintenance Manual and the Foreman's Manual. This creates a uniformly maintained system across the Turnpike.

This is accomplished through a standardized system of evaluations, evaluation criteria, inspections, inspection procedures and training programs. The Quality Assurance Program provides the data to ensure that the work is performed uniformly throughout the Maintenance locations. The program will collect information from key maintenance activities and analyze the data to establish baseline efficiencies and best practices. Operational QA's will typically be performed between April and October.

24.2 Maintenance Quality Assurance Evaluations

- 1. Access tower roads
- 2. Bridge operations
- 3. Bridge repair/replace/inspection
- 4. Daily/annual right-of-way litter pick-up/debris removal
- 5. Delineation replacement
- 6. Detention basins
- 7. Drainage/cleaning inlets
- 8. Drainage cleaning/repair/replacement
- 9. Equipment maintenance
- 10. Guiderail/concrete barrier/attenuator repairs/replacement
- 11. Interchange cleaning
- 12. Inventory control/maintenance
- 13. Line painting
- 14. Maintenance facility inspection
- 15. Mowing
- 16. MUW & HMW Responder
- 17. Patching
- 18. Pavement joint sealing

- 19. Right-of-way fence maintenance
- 20. Roadway signage
- 21. Roadway sweeping
- 22. Salt usage inventory
- 23. Snow & -ice control (winter operations)
- 24. Tunnel maintenance (includes relamping, washing, general inspection)
- 25. Vegetation management
- 26. Maintenance Protection of Traffic (MPT)

24.3 Quality Assurance Process

The Quality Assurance Process steps are as follows:

- 1. Evaluator arrives on site.
- 2. The Evaluator will:
 - a. Communicate expectations for the process
 - b. Summarize QA evaluation process
 - c. Request any required documentation
 - d. Perform review of operations
 NOTE: A MPT QA is completed with every operational review when MPT is a requirement for the operation.
- 3. When an evaluation receives a SATISFACTORY score, the Evaluator will:
 - a. Perform closeout with Foreman or Assistant Foreman and provide copy to Foreman or Assistant Foreman.
 - b. Forward results to Maintenance Training & Roadway Programs Supervisor.
 - c. Maintenance Training & Roadway Programs Supervisor forwards copies of closeouts to District Management.
- 4. In the event that an evaluation receives a score of less than **<u>SATISFACTORY</u>**,
 - a. A closeout must be completed with the District Maintenance Superintendent if available or District Operations Manager or that is available and Field Operations Manager in person.
 - b. The Evaluator submits their reports to the Maintenance Training & Roadway Programs Supervisor for review and approval.
 - c. The Maintenance Training & Roadway Programs Supervisor forwards copies of closeouts to District Manager.

5. **NOTE:** An After-Action Review (AAR) is required for any category with a less than SATISFACTORY, the AAR must be completed within 10 working days and a copy is forwarded to the Director of Maintenance, Field Operations Manager, District Maintenance Superintendent and Maintenance Training & Roadway Programs Supervisor. See Appendix A for an example.

24.4 Scoring Categories on the QA Form

Category A

- Elements identified as most critical to the operation
- Any element scoring <3 will result in an AUTOMATIC UNSATISFACTORY for the entire QA

Category B

- Elements identified as important to the operation, but not as critical as the Category A elements
- For some QA's elements scoring <3 will result in an Automatic Unsatisfactory for the entire QA

Category C & D

• Elements identified as important to the operation, but not as important as Category A & B elements

Appendix A After Action Review Form

PA-MQA-1

AFTER ACTION REVIEW FORM Please Type or Print Information In Blue or Black Ink PENNSYLVANIA TURNPIKE COMMISSION



Date of After Action Review	Foreman	
QA Evaluation – Work Activities	Superintendent	
QA Closeout Date	District/Section	

Mission and Intent	
Summary of Events	
Policy and/or Procedures	
Discussion of Key Issues	
Summary of Actions	
ATTENDEES	

JULIEUR		
NAME	PHONE	TITLE
COMMENTS		

Rev (3/2013)

Appendix B Winter Equipment Checklist

WINTER EQUIPMENT INSPECTION REPORT Revised 10/12/2									
Location Date Equi			Equip	ment #	ment # Spreader		Tank	Plow	/Wing
					07-		06-	58-	
								58-	
Last PM & State Insp. Date:					Mileage/Ho	ours:			
Annual Filters Last Change Date:				General Tru	ick Conditio	on: Good	Average	Fair	
Annual Brake Service Date:				Comments:	:				
Last 63-01 Repairs Date:									
					-				
Cab Related Items:					Bed Relate	d Items:			
Heater Controls: Function	ional (Y/N):				Bed Overall	General Co	ndition Rate 1-5	:	
Wipers: Functi	ional (Y/N):				Steps		Rate 1-5:	:	
Window Washer: Functi	ional (Y/N):				Latches		Rate 1-5:		
Lights: Functi	ional (Y/N):				Chains		(Y/N):	:	
Backup Alarm: Functi	ional (Y/N):				Lift Cylinder	r, Bolts, Mo	untings (Y/N):	:	
Safety Triangles: Functi	ional (Y/N):				Bed Vibrato	or	Functional (Y/N):	:	
Roadwatch Function	onal (Y/N):				Bed Limit S	witch	Functional (Y/N):		
TP Radio: Function	nal (Y/N):				Body Up Sw	vitch	Functional (Y/N)	:	
Tires-Front:	Rate 1-5:								_
Tires-Rear:	Rate 1-5:				Spreader In	stalled (Y/N	l):		
Batteries (clean terminals, se	cure) (Y/N)				Spreader Fu	unctional (Y	/N):		
Fire Extinguisher onboard (Y	/N):								
Date:				-	Prewet Tan	k Installed	Y/N):		
Auxillary Idle Reduction Syste	em Installed	(Y/N/NA):			Prewet Tan	k Functiona	il (Y/N):		
If yes, Functional (Y/N):					Bolt in Cont	trol Box Lid	(Y/N):		
Hydraulic Emergency Button	Functional	(Y/N):		Coils Nul	led & Ground	Speed Cali	bration Completed (Y/N):	
Front Plow Blade Type:	Steel:		Rubber:						
Float Set (Y/N):					Marker Stic	ks:		Yes	No
Trip Mechanism:	Pass	Fail			Moldboard	:		Pass	Fail
Bolts/Mounts:	Pass	Fail			Blade: (with	nin wear tol	erance):	Pass	Fail
Frame:	Pass	Fail							
					-				
Wing Plow Type:	Steel:		Rubber:		Marker Stic	ks:		Yes	No
Greased (Y/N):					Lights Func	tional:		Yes	No
Cylinder:	Pass	Fail			Moldboard	:		Pass	Fail
Bolts/Mounts:	Pass	Fail			Blade: (with	nin wear tol	erance):	Pass	Fail
Frame:	Pass	Fail							
Repairs Needed (please circl	e): Yes	or No	Detail b	elow in C	omments				
Comments:									
Signature of Inspectors:									
Complete repairs within 30 o	days of insp	ection dat	te noted at	t top of fo	orm.				
Comments related to Repair	Work:			Repair W	/ork Order #:				
Supervisors Signature:						Date:			

Revised 10/12/2017

Appendix C

Weather Event Management Playbook

Use Link Below

https://paturnpike.sharepoint.com/sites/WeatherOperationsTeam/Shared Documents/Forms/AllItems.aspx?id=%2Fsites%2FWeatherOperationsTeam%2FShared Documents%2FGeneral%2FWeather Plans %26 Guidelines%2FJanuary 2021 PTC Weather Event Management Playbook Version 1%2E6 %2Epdf&parent=%2Fsites%2FWeatherOperationsTeam%2FShared Documents%2FGeneral%2FWeather Plans %26 Guidelines

Can also be accessed in the Department Library on the PTC Intranet at TEO/Operations/TO/Weather Management/Weather Event Management Playbook/

Appendix D Portable Changeable Message Sign Manual

Use Link Below

https://paturnpike.sharepoint.com/:b:/r/sites/DepartmentLibrary/Maintenance/Standards/Manuals/Portable_Chang eable_Message_Sign_Manual.pdf?csf=1&web=1&e=F2epho

Can also be accessed in the Department Library on the PTC Intranet at Maintenance/Standards/Manuals/

Appendix E Dry Run Checklist

PTC DRY RUN CHECKLIST - ROADWAY CONDITIONS							
DATE	SECTION						
OPERATOR							
FOREMAN	BEGIN MM						
ASST. FOREMAN	END MM						
One form is required for each patrol are Identify where inbetween tenth m	a within the section. Identify each problem area liste arkers the hazard is located as follows - "B" -Beginning	d by Direction and Mile Marker. 3, "M" - Middle and "E" - End.					
DRAINAGE FAC	ULITIES OR OTHER AREAS THAT NEED DELL	NFATORS					
3	URFACE AND SHOULDERS POTHOLES						
RC	ADSIDE OBSTRUCTIONS (ROCK CUTS)						
	OVERHANGING LIMBS OR BRUSH						

PTC DI	RY RUN CH	IECKLIST	- ROADWAY CO	ONDITIONS
		NARROW	STRUCTURES	
DOCCIPI			C (Record on Drovious	Observations)
PUSSIDI			S (Based on Previous	Observations)
	GUIDERAI	L (DAMAGE	D POSTS, PANELS, ETC	2.)
	_			
LOW SHOULI	DERS (INCLUDE	D APPROXIN	ATE LENGTH AND DE	PTH OF LOW AREA)
		ADDITIONA		

PTC DRY RUN	CHECKLIST - ROADWAY C	ONDITIONS	
DATE	SECTION		
OPERATOR	TRUCK #		
FOREMAN	BEGIN MM		
ASST. FOREMAN	END MM		
		YES	NO
Section Show Removal Plan for are	ea to be plowed		
Has spreader been calibrated and i	is calibration card in truck?		
Emergency Equipment in Cab (Fire	Extinguishers, Triangle, Insurance		
Card, Owners Card)?			
Inspect and Operate Spreader (No	te any Deficienices on the 6301)		
Inspect and Mount Plow (Note any	/ Deficiencies on the 6301)		
	,		
Ensure all Obstacles or Obstructior	ns are delineated.		
Operator has been trained on thei	r assigned area?		
Has the equipment been cleaned a	and winter inspection completed?		
Operators Signature		Date	

Appendix F Application Rates & Spreader Settings

PTC's Application Rates Guideline								
Scenario	Surface Temp	Application Rate (#'s / Lane Mile)	Pre-Wet Agent					
1	30° & Up	250 #'s	NaCl					
2	20° to 29°	300 #'s	NaCl					
3	19° & Below	350 #'s	CaCl					
NOTE:	NOTE: Anti-Skid can be used when snowpack or icing conditions are encoursed or when the temperature falls below 0° Fahrenheit. Mix Ratio should be between 350 #'s and 7 per Lane Mile							

PTC's Calibration Requirements for All Trucks										
	Spreader Settings and Widths									
Setting #	1	2	3	4	5	6	7	8	9	
Spread Width	1 Ft	2 Ft	3 Ft	4 Ft	5 Ft	6 Ft	7 Ft	8 Ft	9 Ft	
	Auger Settings and Application Rates									
Setting #	1	2	3	4	5	6	7	8	9	
	100	200	300	400	500	550	600	650	700	
Application Rate	#'s	#'s	#'s	#'s	#'s	#'s	#'s	#'s	#'s	

Appendix G Plow Train Diagram Example



Appendix H Anti-Ice Decision Tree



Appendix I

PTC Line Painting Standard Guidelines

Use Link Below

https://paturnpike.sharepoint.com/:w:/r/sites/DepartmentLibrary/Maintenance/Standards/Manuals/Pavement %20Marking%20Handbook%202-26-2013%20FINAL%20DRAFT.docx?d=w514d6cda412f4e8d9b1ed2aa576cea48&csf=1&web=1&e=Yk5OSs

Can also be accessed in the Department Library on the PTC Intranet at Maintenance/Standards/Manuals/

Appendix J PD Claim Processing

- 1. An accident or incident occurs that results in damage to any PTC Property. (Roadway, Facilities, Equipment, PTC Vehicles, other)
- 2. When on the scene of any incident, the units in the field are responsible to identify and report to the Operations Center when there is property damage. Operations Center dispatchers should inquire of field units whether property damage has occurred. The Operations Center will label the incident in the Computer Aided Dispatch System (CADS) system as a property damage event.
- 3. The Operations Center assigns a PTC Event Number (CADS Incident Number) when notified of the accident or incident. The PSP RMS Report Number is generated at the same time and logged with the PTC Event Number.

Important Note: In the past, some property damage claims were created without notification to the Operations Center. However, *it is mandatory that all property damage is reported to the Operations Center so that an Event Number can be generated*. The PTC Event Number is a prerequisite to the creation of a SAP Work Breakdown Structure (WBS) element. (The WBS element is the common cost accumulation mechanism for each property damage event). In particular, all accidents and incidents involving PTC vehicles, regardless of the location of the accident (i.e., whether on or off the Turnpike), must be reported to the Operations Center so a PTC Event Number can be assigned. Toll equipment damaged by an accident/incident is to be reported to the Operations Center. However, requests regarding malfunctioning toll equipment should be reported to Network Control as usual.

- PTC Event Numbers and associated incident information, PSP RMS Report Number, date/time of incident, milepost location of incident, etc., in the CADS will be available for viewing by selected PTC personnel, via SharePoint Home Page, Roadway Operations, TOC Daily Report. Link is <u>TOC Daily -Home (sharepoint.com)</u>
- 5. To request a WBS element number send an email to the District PDCLAIMS mailbox that MUST include:
 - a. In the subject line:
 - i. PTC Event Number
 - ii. Date of Event
 - b. In the body:
 - i. PTC Event Number
 - ii. PSP PMS Report Number in the following format (T0-4030077)
 - iii. Date & time of incident
 - iv. Milepost (including Letter designation) and/or location of incident
 - v. PTC Equipment number (if applicable)
 - vi. Brief description of the damage
 - c. Attachments to the email:
 - i. Photos of the damages.
- 6. Once reviewed at the district, an email is forwarded to the PDCLAIMS mailbox which is handled by Central Office.

- 7. A WBS element number is assigned and sent to the requestor via email. A WBS element number (beginning with DC and ending with 01) must be used in order to capture and charge all repair costs (labor, materials, equipment, contractor work) to a particular property damage event. Although the PTC Event Number and PSP RMS Report Number will be referenced in the WBS information, once it's assigned, the WBS Number replaces the PTC Event Number for all subsequent references and correspondence for that particular property damage incident. Labor is reported on SAP/HCM Time Sheet using assigned WBS element number. Materials/services charges are processed in AP/SRM through either the Inventory or Purchasing functions using the assigned WBS element number.
- 8. The Operations Manager needs to review the Work Order (WO) to ensure all costs (labor, material and equipment) are reported correctly.
- 9. Upon completion of all work for a property damage repair, the Operations Manager will send a completion notice email to the PDCLAIMS mailbox. This email informs Risk Management that no more charges will be forthcoming to this WBS element number. A photo must be included in the email of the completed work. Risk Management will periodically follow-up with involved departments to ensure timely submission of costs. Any additional work by an outside vendor or the department is noted in the completion notice email.
- 10. Concrete Barrier Damage Claims require additional steps to ensure payment for damage is billed to insurance company. Click link for training material. DPD CLAIMS or can also be accessed in the Department Library on the PTC Intranet at Maintenance/Operations/Training/PD Claims/

NOTE: Equipment Property Damage Claim may include additional steps and time with regard to required PTC forms.

IMPORTANT NOTE: ONCE THE PROPERTY DAMAGE CLAIM INVOICE IS PREPARED, NO ADDITIONAL REPAIR COSTS CAN BE CHARGED TO THAT CLAIM'S WBS ELEMENT AND THE DEPARTMENT MUST ABSORB THOSE COSTS IN THEIR OPERATING BUDGET.

Emergency Work to Be Completed within 24 hours

If emergency repairs are needed on the system, the on-call supervisor will determine if the repairs can be handled by maintenance forces or will need to be contracted. In either case, notification to the Operations Centers must occur first. If contactor repairs are needed, the Operations Center will notify the appropriate Engineering personnel. If maintenance personnel are to complete the repairs, authorization by the District Maintenance Superintendent must be obtained for any emergency procurement of materials or equipment to abate the emergency. Follow the Procurement Business Process, C-2, Urgent Purchase. If the Superintendent is unavailable, contact should be made to the Field Operations Manager or Director of Maintenance for approval.

Appendix K Tree Clearing Management Guidelines

These guidelines are for the tree removal and pruning practices along the Pennsylvania Turnpike Commission (PTC) highway system. These guidelines are only for areas between the Limited Access Right-of-Way line and the edge of roadway. They do not apply to surplus parcels of PTC property.

General:

- 1. Clear Cutting of all trees that are within roadside areas of 3:1 or flatter slope and are outside of the Clear Zone* is prohibited unless approved by the Chief Engineer and the Director of Maintenance.
- 2. Any trees on cut slopes located 100 feet or more above the Turnpike roadway as measured from the edge of shoulder may remain.
- 3. Any trees on fill slopes located 50 feet or more below the Turnpike roadway as measured from the edge of shoulder may remain.
- 4. In Residential areas, a vegetative buffer shall remain in place outside of the clear zone is possible.

On Cut Slopes: (Slopes with grades, 3:1 or steeper)

- 1. All trees on cut slopes 3:1 or steeper should be removed up to a distance of 100 feet up the cut slope as measured from the edge of shoulder, including any benched areas. If a residential area exists at the top of the cut slope and directly adjacent to the Limited Access Right-of-Way fence line, then all trees should be removed only up to and including the first bench.
- 2. Shrub type plants that are 10' or less can remain on the slopes.
- 3. Tree stumps should be cut down to a height of 4 inches or less and sprayed with an herbicide as outlined in the Commission Specification Section 810**.

On Top of Cut Slopes: (Less than 100 feet above the roadway)

- 1. All trees leaning towards the roadway, or are diseased, dying or dead, as determined by a certified arborist, should be removed in these areas.
- 2. All trees should be removed from the top of cut slope areas that are 10 feet wide or less as measured from the Limited Access Right-of-Way fence line to the top of the cut. If a residential area exists at the top of the cut slope and directly adjacent to the Limited Access Right-of-Way fence line, then only the diseased, dying or dead trees, as determined by a certified arborist may be removed and all other healthy trees must remain.
- 3. Additionally, on top of cut slopes that are less than 40 feet above the roadway as measured by the edge of shoulder, any trees that are tall enough to reach the roadway, as determined by a certified arborist, should be removed.
- 4. If residential areas are present on the top of the cut slopes than a vegetative buffer shall remain in place if possible.

On Fill Slopes: (Areas behind guiderail less than 50 feet below the roadway)

- 1. All diseased, dying, or dead trees, as determined by a certified arborist, should be removed in these areas.
- 2. Trees that are leaning towards the roadway and are tall enough to reach the roadway as determined by the certified arborist should be removed.

- 3. Prune back all branches that are hanging over the travel lanes and shoulder in accordance with Commission Specification Section 810. If tree pruning results in the tree becoming one-sided and unsafe, as determined by the certified arborist, then remove the entire tree.
- 4. Tree stumps in fill slope areas should be cut down to a height of 12 inches or less, and do not have to follow the Commission Specification Section 810 for stump height.
- 5. Tree stumps must be sprayed with an herbicide as outlined in Commission Specification Section 810.

On Roadside Areas: (Cut or fill areas, 3:1 slope or Flatter)

- 1. All trees should be cleared within the Clear Zone* (approximately 30 feet from edge of travel lane).
- 2. Trees located outside the Clear Zone but are tall enough to reach the shoulder and travel lanes, as determined by the certified arborist, should be removed.
- 3. Tree stumps should be cut down to a height of 4 inches or less and sprayed with an herbicide as outlined in the Commission Specification Section 810**.
- 4. If residential areas are present, then a vegetative buffer shall remain in place if possible.

Behind Sound Walls:

- 1. All trees leaning towards the roadway, or are diseased, dying, or dead, as determined by a certified arborist, should be removed in these areas.
- 2. Prune back all branches that are hanging over the travel lanes and shoulder in accordance with Commission Specification Section 810. If tree pruning results in the tree becoming one- sided and unsafe, as determined by the certified arborist, then remove the entire tree if the risk of the tree falling would cause damage to the adjacent property.
- 3. Tree stumps should be cut down to a height of 4 inches or less and sprayed with an herbicide as outlined in the Commission Specification Section 810**.

Trees extending over Limited Access Right-of-way Fence:

- 1. On trees located off of PTC Limited Access Right-of-Way, prune back all branches and portions of these trees that are hanging over the travel lanes and shoulder, as determined by a certified arborist, and in accordance with Commission Specification Section 810.
- 2. When dead, weakened or decayed tree and limbs that exist on neighboring property beyond the PTC's Limited Access Right-of-Way pose a hazard from falling onto the PTC's right-of-way, promptly notify the neighboring property owner by certified mail of the condition, inform the owner of his/her responsibility to remove the tree or be subject to future damages claims as they may arise if the tree falls across the Limited Access Right-of-Way. After consulting with a certified arborist, remove any overhanging branches or limbs.
- 3. If the tree limbs from such dead, weakened or decayed trees and limbs fall upon PTC property, dispose of fallen tree appropriately and promptly notify the property owner that he/she will be responsible for the damage to the fence or other Commission property.

* Clear zone is defined by AASHTO's Roadside Design Guidelines as the unobstructed, traversable area provided beyond the edge of the through traveled way for the recovery of errant vehicles and typically is 30' in width for high-speed facilities such as the Turnpike but could be greater based on site considerations.

** Commission Specification Section 810 is Selective Tree Removal and Trimming.

Glossary

ABRASION – Wearing away by friction.

- ANTI-SKID Graded granular material used to reduce or prevent slipperiness on road surfaces.
- ADHESION The force by which one substance clings to another of a different nature.
- ADDITIVE A substance or agent added in small amounts to a basic ingredient of a mixture prior to mixing.
- ALLIGATORING A large number of cracks or checks in bituminous surfaces extending over areas of variable proportions and resulting from a yielding of wet subgrade due to live loads or from drying out of the surface.
- ASPHALT A bituminous substance, soluble in gasoline or naphtha; used in liquid form for maintenance work in crack and joint sealing and to cement together and coat the surface of mineral aggregates.
- BACKFILL Material used to replace or the act of replacing material removed during construction; also may denote material placed or the act of placing material adjacent to structures.
- BASE COURSE The layer or layers of specified or selected material of designed thickness placed on a subbase or a subgrade to support a surface course.

BINDER -

- 1. Materials used to stabilize or cement together loose soil or aggregate.
- 2. An intermediate course between a base course and an asphalt surface course usually consisting of a coarse graded aggregate asphaltic concrete.
- BITUMEN Any of several flammable substances (hydrocarbons) which may be liquid, semiliquid or solid. For road maintenance work, "bitumen" commonly means any of several road oils, either asphalt or tar.
- BITUMINOUS CONCRETE A designed combination of dense graded mineral aggregate filler and bituminous cement mixed in a central plant, laid and compacted while hot.
- BLEEDING The accumulation of excess bituminous material on the roadway surface, caused by heat or the use of excessive quantities of bituminous material in construction, patching or resurfacing.
- BLOWUP Displacement of rigid-type pavement by a combination of vertical and horizontal stresses due to expansion. Generally, a blow-up is a heave in a concrete or brick pavement caused by pavement expansion from excessive heat, sometimes resulting in shattering or displacement of the road surface.

- BRIDGE A structure including supports erected over a depression or an obstruction such as water, highway or railway, and having a track or deck for carrying traffic or other moving loads and having an opening measured along the center of the roadway of more than eight feet between supports.
- BUDGET A plan showing estimates of costs and revenue for proposed activities for a given period.
- CALCIUM CHLORIDE Deliquescent (melting) chemical flakes used to lay dust, to stabilize gravel surfaces, to accelerate the curing of portland cement concrete and as an aid in ice control.
- CAMBER The upward curvature given to a beam or superstructure in order to compensate for the downward curvature resulting from the application of the load.
- CHECK-DAM A structure, usually made of stone or concrete, placed in a water course to retard the flow of water, thereby reducing erosion
- CHIPS Small, angular fragments of stone containing little or no dust.
- COLD PATCH A mixture of bituminous material and aggregate used for general winter maintenance pavement patching and applied at below normal temperatures.
- CONCRETE A mixture usually of portland cement, an aggregate of hard, inert particles and water.
- CONTRACT The written agreement between the contracting agency and the contractor setting forth the obligations of the parties thereunder for the performance of the prescribed work.
- CONTRACTOR The individual, partnership, firm, corporation or any acceptable combination thereof, or joint venture, is contracting with the highway agency for performance of prescribed work.
- CONTRACT ITEM A specific unit of work for which a price is provided in the contract.
- CONTRACT TIME The number of working days allowed for completion of the contract.
- COURSE A layer of road material, separately compacted, used as a wearing surface or as a base for a wearing surface.
- CRACK A fissure or open seam not necessarily extending through the depth of the pavement.
- CROWN In tangent section of highway, the difference in elevation of the center of the road in relation to the outside edge of the road surface.
- CULVERT Any structure under the roadway with a clear opening of eight feet or less measured along the center of the roadway, not classified as a bridge.
- CUTBACK Bituminous material mixed with light, volatile, petroleum distillate to reduce viscosity and increase workability.

- CUT SECTION That part of the roadway which, when constructed, is lower in elevation than the original ground.
- DEADMAN A buried object serving as an anchor, such as cable guiderail guy anchors.
- DECIDUOUS Having leaves which are shed at the end of the growing season (as opposed to evergreen).
- DELINEATOR An indicator, such as a reflectorized button, flag, etc., used to improve night-time visibility on a highway.

DENSITY -

- 1. The degree of consolidation or compatibility.
- 2. The ratio of weight to volume of a substance.

DUST PALLIATIVE -

- 1. Any chemical, in flake form or in solution, used to lay dust (such as calcium chloride or sodium chloride).
- 2. Liquid bituminous material.

ELEVATION -

- 1. Altitude; height in relation to sea level or any assumed datum.
- 2. A view on a plan drawing usually as seen from the front.
- EMBANKMENT A structure of soil or soil-aggregate or broken rock between the embankment foundation and the subgrade.
- EMERGENCY An unforeseen occurrence or combination of circumstances which calls for immediate action or remedy.
- EMULSION An asphalt emulsion is a suspension of extremely small droplets of asphalt coated with water in the presence of an emulsifying agent, which is usually a type of detergent.
- ENCROACHMENT Unauthorized use of highway right-of-way or easements as for signs, fences, buildings, etc.

EROSION – A slow wearing away of the surface by natural action of wind and water.

EXCAVATION -

- 1. The act of taking out material.
- 2. The materials taken out.
- 3. The cavity remaining after materials have been removed.
- FILL SECTION That part of the roadway which, when constructed, is higher in elevation than the original ground.

- FLASH POINT That particular temperature at which a material gives off a flammable vapor in sufficient quantity to burn instantaneously at the introduction of a flame or spark.
- FLEXIBLE PAVEMENT A pavement structure which maintains intimate contact with and distributes loads to the subgrade and depends on aggregate interlock, particle friction, and cohesion for stability.
- FLOW-LINE The bed or lowest point of a stream or culvert that water flows over.
- FROST HEAVE Displacement of pavement by an accumulation of ice crystals which builds up in the subgrade to the extent that the pavement is heaved up and badly distorted.
- GORE The area immediately beyond the divergence of two roadways, bounded by the edges of those roadways.

GRADE -

- 1. The profile of the center of the roadway or its rate of ascent or descent.
- 2. To shape or reshape an earth road by means of cutting or filling.
- 3. To arrange according to size.
- GRADATION A general term used to describe the composition by size of aggregate in a mixture. Gradation is expressed as the percentage of aggregate that will pass each of several size sieves.
- GRADING Planing or smoothing the surface of various parts of the road by means of motor- driven equipment designed for this purpose (i.e., motor grader).
- GRAVEL Aggregate composed of hard, durable stones or pebbles, crushed or uncrushed, often intermixed with sand.
- GROUT Mortar, composed of sand, cement and water of such consistency that it can be worked easily.
- HEADWALL A vertical wall (usually of concrete) at the end of a pipe constructed to prevent earth from spilling into the channel, and also to prevent erosion of soil at the pipe inlet.
- HOT MIX A general term used for hot plant- mixed bituminous concrete and sheet asphalt mixtures which are manufactured and laid at temperatures ranging from 250F and above.
- IMPERVIOUS A layer or bed of hard or water- proof material through which water will not move under ordinary hydrostatic pressure.
- INVERT The paved flow line of a pipe or culvert.
- JOINTS designed or designated vertical planes of separation used in placing concrete pavement to aid in contraction, expansion or construction.

- LEVELING COURSE The layer of material placed on an existing surface to eliminate irregularities prior to placing an overlaying course.
- MEDIAN The portion of a divided highway separating the traveled ways for traffic in opposite directions.
- MOISTURE CONTENT The percentage, by weight, of water contained in soil or other material usually based on the dry weight of that material.
- MORTAR In cement concrete a mixture of cement, sand and water.
- MULCH Any organic matter such as leaves, straw, etc., used to protect plant material and surface soil from heat, cold and erosion and to conserve water.
- NOXIOUS Injurious, destructive, objectionable; as in "noxious weeds or odors".
- ORGANIC Consisting of, or containing, decayed or partially decayed plant and/or animal matter.
- OUTCROP The cropping out of a rock stratum; exposed at or near the surface of the ground.
- PATCHING Mending, repairing; especially, to repair a road surface.
- PAVEMENT STRUCTURE The combination of subbase, base course and surface course placed on a subgrade to support the traffic load and distribute it to the roadbed.
- PERVIOUS A layer of material, through which water will move under ordinary hydrostatic pressure.
- PLANS The contract drawings which show the location, character and dimensions of the prescribed work, including layouts, profiles, cross sections and other details.
- PLUMB Vertical.
- POROUS Full of pores; having many small openings through which liquids may pass.
- PORTLAND CEMENT A hydraulic cement consisting of compounds of silica, lime and alumina; so called because of its resemblance in color, when set, to the Portland stone of England.

PREMIX -

- 1. To mix in a central mixing plant, or elsewhere, previous to placing.
- 2. Any prepared bituminous patching or surfacing material that can be applied either hot or cold.
- PROFILE A longitudinal section of a highway, drainage course, etc., usually showing the grade.
- PUMPING the unintended movement of the roadway surface caused by unstable subsurface conditions amplified by normal or heavier than normal traffic loads.

- RANDOM SAMPLE A small part of a lot which is used to represent the whole, so chosen that each portion of the lot has an equal probability of being selected.
- RAVELING The progressive loosening and loss of the aggregate in the surface course of a road.
- REFLECTION CRACK A crack appearing in a resurface or overlay caused by movement at joints or cracks in underlying base or surface.
- REPAIR To restore or mend, usually a more extensive operation than patching.
- RESURFACING The placing of one or more new courses on an existing surface.
- RIGID SLAB A section of portland cement concrete pavement bounded by joints and edges, designed for continuity of tensile stress.
- RIGHT-OF-WAY A general term denoting land, property or interest therein, usually in a strip, acquired for or devoted to transportation purposes.
- RIGID PAVEMENT A pavement structure which distributes loads to the subgrade having as one course a portland cement concrete slab of relatively high bending resistance.
- RIP RAP The installation of stone to stabilize slopes and/or ditches to prevent erosion. Erosion control stone should meet the requirements of Form 408, Section 850 and the standard drawings.
- ROADBED The graded portion of a highway within top and side slopes, prepared as a foundation for the pavement structure and shoulder.
- ROAD MATERIAL Any road material, such as concrete, gravel, crushed stone, slag, etc., which is used for a wearing surface.
- ROADSIDE A general term denoting the area adjoining the outer edge of the roadway.
- ROADWAY The portion of a highway, including shoulders, for vehicular use.
- RUNOFF The surface discharge or rate of discharge of a given watershed after a fall of rain or snow.
- SAND (Size <#4 Sieve >#200 Sieve) Loose, single-grained material resulting from the natural disintegration of rocks or the crushing of rocks.
- SCALING Separated and flaking off; initial surface disintegration, as on concrete pavements.
- SCREED A long piece of wood or metal moved across the surface of newly placed concrete with a sawing motion to close and level the surface.

- SEAL COAT A thin treatment consisting of bituminous material, usually with cover aggregate, applied to a surface course. The term includes but is not limited to sand-seal, chip seal, slurry seal and fog seal.
- SHOULDER The portion of the roadway contiguous with the traveled way for accommodation of stopped vehicles for emergency use, and for lateral support of base and surface courses.
- SILT (#200 Sieve (75mm)) Finely divided soil material which may appear cloudy when dry, but which breaks down easily and has a soft, floury feel when rubbed between the thumb and finger. Silt has little plasticity; when wet, the soil runs together readily.
- SKEW Oblique; not at right angles.
- SKIN PATCH A surface patch which is 2 inches or less in thickness.
- SLURRY SEAL A mixture a slow-setting emulsified asphalt, fine aggregate and mineral filler with water added to produce slurry consistency mixed in a traveling plant and spread through a squeegee screed.
- SODIUM CHLORIDE Common salt, used in stabilization of roads and in ice control (rock salt).
- SPALLING Chipping along the edges, as at joints in concrete pavement and structures, or on the surface.
- SPECIFICATION The compilation of provisions and requirements for the performance of prescribed work.
- STABILIZATION Modification of soils or aggregates by incorporating materials that will increase load bearing capacity, firmness and resistance to weathering or displacement.
- SUBBASE The layers of specified or selected material of designed thickness placed on a subgrade to support a base course.
- SUBGRADE The top surface of a roadbed upon which the pavement structure and shoulders including curbs are constructed.
- SUBSEALING The process of correcting pumping at a joint by injecting hot bituminous material under the slab to fill voids and seal off the source of water.
- SUBSTRUCTURE The foundation of a bridge below the level of the end supports.
- SUPERELEVATION The rise of the outer edge over the inner edge of the road surface at curves, expressed in feet per foot, for the purpose of counteracting centrifugal forces.
- SUPERSTRUCTURE The bridge structure above the level of the end supports.

- SURFACE COURSE One or more layers of a pavement structure designed to accommodate the traffic load, the top layer of which resists skidding, traffic abrasion and the disintegrating effects of climate. The top layer is sometimes called "Wearing Course".
- SURFACE TREATMENT An application of bituminous material and cover aggregate or thin plant mix (under 3/4 inch thickness) on an old pavement.
- TACK COAT An application of bituminous material to an existing surface to provide bond with a superimposed course.
- UNDERDRAIN Porous concrete, perforated drainpipe or graded aggregate under a roadway or shoulder used to provide subsurface and capillary drainage.
- UNSTABLE Subject to change; base material subject to frost heave or settlement.
- VERTICAL CURVE A curve laid out in a vertical plane instead of a horizontal plane.
- VOIDS The empty spaces between particles in a substance or mixture.
- VOLATILE Evaporating readily. The substance in paint or in cutback asphalts that evaporates and causes the substance to "set".
- WINDROW Material deposited along the road in a continuous mound.