NDOR

Nebraska
Department of Roads

Maintenance Manual

April 2010

INTRODUCTION

The Nebraska Department of Roads is responsible for the maintenance and operation of approximately 10,000 centerline miles of highway throughout the state. Our mission statement summarizes the Department's responsibility and gives some indication of its importance to the state.

NDOR MISSION STATEMENT

We provide and maintain, in cooperation with public and private organizations, a safe, reliable, affordable, environmentally compatible and coordinated statewide transportation system for the movement of people and goods.

The role of maintenance is clearly a high priority to the Department. Safety, reliability, affordability, and environmental compatibility are all affected in important ways by the proficient performance of the maintenance function. Winter operations are more important than ever to keep large numbers of commuters and freight trucks safely moving during inclement weather. Pavement preservation through the application of the right maintenance procedure on the right road, at the right time, is vital to maintaining quality road surfaces with a minimum expenditure of scarce resources. Environmental stewardship, through the careful selection of processes and materials, and an awareness of the impact of our activities on our surroundings, will help preserve the land, air and water for future generations.

This manual is intended to provide essential information to the maintenance forces throughout the state. It will provide standard procedures, guidelines, and best practices that will assist the practitioner and the manager in their daily work efforts. The manual exists in a dynamic and ever-changing work environment. It will require periodic updates to remain current*. Corrections and suggestions for improvements should be directed to the office of the Maintenance Engineer, Operations Division, in Lincoln, Nebraska.

*The most current version of the manual will be available for download from the NDOR website.

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CHAPTER 1 OBJECTIVE AND POLICY STATEMENT

The objective of Maintenance Management is to preserve the investment in the Nebraska Highways System by establishing standards of maintenance service for effectively utilizing labor, equipment, materials and financial resources. The standards of maintenance are achieved through the development of a work program and reporting system.

An annual work program represents the objective and goals of the Department of Roads for a fiscal year planning period. To achieve this program, Maintenance personnel must be familiar with:

1. Maintenance work activity definitions.
2. Maintenance Performance Guidelines.
3. Work authorization through scheduling.
4. Work reporting.

The Nebraska Department of Roads has formalized objectives relative to the Maintenance Program and its execution through the following Maintenance Policies.

The approved policy statements as related to Maintenance Management are:

1.1 MAINTENANCE PROGRAM OBJECTIVES

The Nebraska Department of Roads is responsible for maintaining highway structures and facilities on the State Highway System as defined by statute.

The objectives of the Maintenance Operations are as follows:

1. To preserve the investment made in the roadways, structures and facilities.
2. To provide reasonable levels of safety and convenience to the highway user.
3. To provide effective and economic use of labor, equipment, materials and financial resources in the accomplishment of the Maintenance Program.

These objectives shall be accomplished through the effective management of Maintenance Operations and resources.

1.2 MAINTENANCE GUIDELINES

Maintenance guidelines are established to assist in the attainment of desired levels of service, to provide uniformity and consistency throughout the state of Nebraska and to give a quantitative basis on which to plan and carry out maintenance programs.

Maintenance Guidelines for each significant work activity will:

1. Define the level of service for each activity.
2. Estimate work requirements in measurable terms.
3. Establish suggested work methods and procedures.
4. Establish a range of average daily productivity.

1.3 ANNUAL MAINTENANCE PROGRAMS AND PERFORMANCE BUDGETS

The Maintenance Programs shall be developed and revised as needed by the District Engineer or designee. The approved Maintenance Program is then the basis for preparation of maintenance budgets and for the allocation of resources to the management units responsible for carrying out the Maintenance Program. These budgets are reviewed by the Deputy Director-Operations and the Director.

Budgetary allocations are provided for:

- System Preservation
- Operations
- Snow & Ice Control
- Unusual & Disaster Operations
- Indirect Operations

1.4 MAINTENANCE WORK REPORTING

A system of authorizing and reporting maintenance has been established to provide information on work accomplished in terms directly relatable to maintenance work programs.

CHAPTER 2 MANAGEMENT RESPONSIBILITIES

Effective management requires responsibility definitions at all levels. Responsibilities must be clearly understood and executed for an efficient and economically operated system. Within each level of management responsibility, specific assignments of management responsibilities are defined according to organizational positions.

2.1. DIRECTOR AND STAFF

1. Top management will establish an overall policy for the maintenance function.
2. Publish statements of the Department's policies and objectives to attain the desired levels of maintenance services, with emphasis on economy, safety and aesthetics as the basis for the development of standards for maintenance quality.
3. Review maintenance accomplishments and comment on the District's programs.

2.2 DISTRICTS

The Districts are principally concerned with the development of guidelines, budgeting and planning values, the allocation of resources and providing the complete maintenance operation. District Engineers and District Operations and Maintenance Managers are responsible for directing all Maintenance Operations in their respective Districts.

2.2.1 District Responsibilities

1. Develop, plan, and accomplish maintenance procedures that define the expected quality, quantity and production for specified maintenance activities.
2. Continuously review and update as needed Maintenance procedures to reflect the impact of new technological developments, advanced techniques or revised levels of service.
3. Conduct an annual review of maintenance workload planning values in order to reflect changes in standards of quality, quantity and/or productivity.
4. Provide updated planning values for use in the development of the annual maintenance budget.
5. Develop and recommend policies and procedures affecting the maintenance planning functions.
6. Evaluate the maintenance workload and determine District staffing, equipment, and material allocation needs.
7. Maintain the Maintenance Management system to include making necessary revisions and/or additions related to:
    i. Management reporting system instructions
    ii. Activity description and designations
    iii. Equipment and material designations
    iv. Report distribution
1. Participate in research investigation and adoption of improved managerial and technological development to cope with highway maintenance problems.

2.3 DISTRICT ENGINEERS

District Engineers, or their designees, are principally responsible for budgeting, planning, scheduling, performing, work reporting and evaluating maintenance management for their respective Districts. System responsibilities are to include:

1. Conduct periodic inspections of roads to identify projects for this coming year.
2. Identify roads to be included in the resurfacing program
3. Investigate requests for special projects to determine feasibility and need.
4. Provide engineering advice and assistance to the field forces.
5. Ensure conformance with authorized maintenance allocation and budget.

2.4 DISTRICT OPERATIONS AND MAINTENANCE MANAGER

The responsibilities of the District Operations and Maintenance Managers are to:

1. Conduct a periodic inspection of roads assigned to each Maintenance Superintendent in order to evaluate the performance of that Superintendent and/or Supervisor.
2. Identify, indicate and outline to the Supervisors all maintenance improvement items to be performed during the coming year.
3. Identify roads to be included in the resurfacing program.
4. Make routine informal on site field inspections of Maintenance Operations in progress to evaluate quality and conformity with approved standards and to provide guidance for improvement where needed.
5. Make arrangements to share resources, as necessary, among Districts.
6. Distribute updated standards and other system material to Maintenance Superintendents and coordinate the implementation of update data.
7. Assist in training of Maintenance personnel.
8. Assist in the preparation of the annual work program and budget. Direct the planning, scheduling, performing, work reporting and evaluation of the Maintenance Management System.
9. Coordinate emergency response activities utilizing Department resources and personnel.
10. Plan for acquisition, maintenance and retirement of equipment and facilities throughout the District.
11. Manage the District Operations Centers and associated technologies.

2.5 MAINTENANCE SUPERINTENDENTS

The responsibilities of the Maintenance Superintendents are to:

1. Conduct weekly inspection of roads under assigned responsibilities in order to evaluate the performance of the Maintenance Supervisors and Maintenance personnel.
2. Make periodic informal on site inspections of Maintenance Operations in progress to evaluate quality and conformity with approved standards and to provide guidance for improvement where needed.
3. Coordinate necessary arrangements for utilization of resources between areas of responsibilities.
4. Distribute updated standards and other systems materials to Maintenance Supervisors and coordinate the implementation of the updated data.
5. Assist in training of Maintenance personnel.

6. Ensure equipment and facilities are properly maintained.
7. Respond to emergencies in their area of responsibility.

2.6 MAINTENANCE SUPERVISORS

The Maintenance Supervisors are responsible for effective utilization of crews, equipment and material to perform the maintenance workload. These responsibilities include:

1. Conduct weekly inspection of the roads system in his area to identify specific maintenance required to maintain satisfactory levels of service.
2. Conduct annual inspection of signs during hours of darkness to determine if adequate reflectivity exists. Have non-reflective signs replaced.
3. Conduct semi-annual inspection on all bridges to determine if repairs are needed. Special attention should be given to erosion around all portions of bridges and approaches.
4. Prepare and review weekly work schedules with the Maintenance Superintendent prior to actual scheduling and performance of work in accordance with approved Performance Guidelines. Schedule alternate activities for circumstances which require deviating from original schedule.
5. Perform the planned work as scheduled with adjustments where necessary. Work is to be performed in accordance with Performance Guidelines and reported on appropriate reporting documents (crew cards and time sheets).
6. Always be aware of methods to improve performance through training, more specific instructions to personnel, clearer supervision and better working conditions.
7. Make recommendations for Performance Guidelines revisions to the Maintenance Superintendents for consideration and evaluation.
8. Directly responsible for proper maintenance of equipment and facilities at their location.
9. Respond to emergencies in their area of responsibility.

2.7 DISTRICT MECHANICS

District Mechanics are responsible for activities relating to all aspects of managing the District equipment fleet. These responsibilities include:

1. Plan and budget for shop equipment and tools.
2. Order equipment for the District.
3. Maintain District equipment and shop tool inventory.
4. Advise Shop Mechanics in equipment maintenance procedures and specific repair techniques.
5. Work with Fleet Management on warranty and non-warranty equipment issues.
6. Work with Fleet Management on the development of equipment specifications.
7. Work with Fleet Management to maintain and update the Department’s Equipment Manual (Service Bulletins).
8. Monitor District fuel card purchases including repair parts.

2.8 OPERATIONS DIVISION RESPONSIBILITIES

1. Provide guidance and assistance to District Maintenance Offices to solve field operating problems and achieve performance standards.
2. Coordinate the implementation of approved maintenance research findings and programs.

3. Assist in the development and conducting of maintenance training programs designed to train personnel in all work areas.
4. Develop and recommend policies and procedures affecting Maintenance and Operations.
5. Manage the Department's equipment fleet.
6. Maintain and revise the Maintenance Manual with appropriate input from Districts and Divisions.
7. Manage the procurement of materials and services required for statewide operations and maintenance of the highway system.
8. Provide support to the Districts with environmental regulations and stewardship.
9. Plan and implement ITS (Intelligent Transportation System) projects.
10. Plan and coordinate Capital Facilities projects.
11. Manage the State Credit Card System.
12. Manage the State Fuel System.

CHAPTER 3 WORK ACTIVITIES

3.1 WORK ACTIVITY DEFINITION

A Maintenance Activity is the name given to a routine maintenance job, which is repeated enough times during the year to make it important to identify.

A complete list of Maintenance Activities is included in this chapter. Each activity is described so as to provide a common understanding of the kind of work involved, the purpose of the work, and the condition to be corrected. All persons who plan, schedule, and report work must uniformly understand what is meant by each activity. Maintenance Activities will be used to:

1. Plan daily Maintenance Activities.
2. Establish Maintenance Performance Guidelines.
3. Authorize most maintenance work.
4. Report maintenance work.

3.2 CODING

Each activity in the Work Activity List has been assigned a four-digit code number in the 2000 series. This code number will be used to identify the activity for cost coding on related documents or reports. The list of activities in this chapter reflects reporting requirements for maintenance activities. Additional account code requirements and non-maintenance activities are identified in the Department Accounting Manual. The activity codes can be found on the Controller Section of the NDOR Intranet. You will need the intranet user id and password.

3.3 WORK MEASUREMENT

Work measurement units have been established for most maintenance activities to provide a basis for describing the amount of work planned or accomplished. These work units are shown in the right-hand column under "Unit of Measure." Activities with "No Crew Card" indicated in the "Unit of Measure" column signify that the activity is not reportable on a crew card. Labor, equipment, and personal expenses should be reported on the automated time report (Payroll Detail System) and procurements or personal expenses on the appropriate accounting documents.

3.4 WORK ACTIVITIES

A complete list of Maintenance Work Activities, each defined so as to provide a common understanding of what each activity covers, is shown on the following pages of this chapter.

3.5 WORK ACTIVITY LIST

ACTIVITY CODE	HIGHWAY MAINTENANCE ACTIVITY DESCRIPTION	WORK IDENTIFICATION REPORTING REQUIREMENTS	UNIT OF MEASURE
2000	Maintenance Payroll Suspense Used for reporting personal time on the PDS when work performed is a maintenance activity and is recorded on the crew card. The District Number required in the "Other" block is the District Number where the maintenance work is performed. Costs coded to this activity will be redistributed to maintenance activities reported on the crew cards.	District Number	No Crew Card

ROADWAY AND SHOULDER MAINTENANCE

2002	Road Profiling Milling bituminous surfaces with a rotomill for the purpose of restoring the roadway to its original shape	Highway and Reference Post	Square Yard
2003	Minor Milling Milling bituminous surfaces (by milling with a milling-head attachment or motorgrader) for the purpose of removing bumps or ruts from the roadway.	Highway and Reference Post	Square Yard
2004	Armor Coating Covering the roadway surface including shoulders, with asphaltic oil (or emulsion) and mineral aggregate to correct surface deficiencies and to extend the service life of the pavement. Includes preparation and clean-up activities; i.e., sweeping and dusting bleeding bituminous surfaces.	Highway and Reference Post	Square Yard
2005	Fog Seal Rejuvenation of the asphalt surface and sealing small cracks and surface voids by spraying emulsions diluted with clean water.	Highway and Reference Post	Square Yard

ACTIVITY CODE	HIGHWAY MAINTENANCE ACTIVITY DESCRIPTION	WORK IDENTIFICATION REPORTING REQUIREMENTS	UNIT OF MEASURE
2007	Mudjacking Adjusting Portland cement concrete slabs and structures to restore the grade line by filling the voids beneath the slab with a pumped slurry mix.	Highway and Reference Post	Man-Hour
2009	Maintenance of Highways Within City Limits State's share of maintenance costs to highways within municipalities as set forth by State-Municipal agreements. (Controller/Maintenance Division use only.)	Highway and Reference Post	No Crew Card
2013	Joint Cutting Sawing, cleaning and filling or replacing expansion joints with special materials to prevent entry of moisture and debris and to allow proper expansion and contraction of pavement.	Highway and Reference Post	Feet
2015	Subgrade Repair Removing and replacing unstable materials to restore highway subgrades to a stable condition. This includes the repair and replacement of surface materials. Correction of frost boils are included in this activity.	Highway and Reference Post	Man-Hour
2020	Hauling and Mixing Materials for Cold Mix Hauling of aggregates, filler and asphaltic oil or emulsions to a predetermined site. Includes windrowing, mixing and drying aggregates and filler; adding asphaltic oil or emulsions to the windrow and aerating. mixing until usable as a cold mix for patching and leveling the roadway surface.	District Number and Mixing Site Number in AFE Column	Man-Hour

ACTIVITY CODE	HIGHWAY MAINTENANCE ACTIVITY DESCRIPTION	WORK IDENTIFICATION REPORTING REQUIREMENTS	UNIT OF MEASURE
2025	Machine Patching of Roadway Surface Elimination of potential surface hazards by patching and leveling of roadway with bituminous material using machines.	Highway and Reference Post	Ton
2026	Spot Patching Minor patching of small areas on the roadway with hot or cold premix bituminous material and hand-tools to correct abrupt depressions, potholes, edge failures, upheavals and other surface hazards. Includes armor coating of small-patched areas.	Highway and Reference Post	Ton
2027	Concrete Patching Eliminate potential surface hazard by patching concrete roadway surfaces. Includes removing faulty surface sections and base or subgrade material as required and replacing with concrete and required base material. Also includes sawing, cleaning and filling or replacing expansion joints with special material to prevent entry of moisture and debris and to allow proper expansion and contraction of pavement. Includes concrete shoulders.	Highway and Reference Post	Cubic Yard
2030	Surfaced Shoulder Maintenance Patching and leveling of surfaced shoulder with bituminous material. This will include armor coating of surfaced shoulders after patching and leveling.	Highway and Reference Post	Ton
2031	Grade Shoulders Grading of shoulders without placing additional material to bring existing material up against the edge of the roadway surface.	Highway and Reference Post	Man-Hour
2032	Rebuilding Unpaved Shoulders The placement of additional material to correct low spots and replace lost material along with grading and reshaping the shoulder to bring the material up against the roadway edge.	Highway and Reference Post	Man-Hour
2035	Blading Unpaved Roads Blading, reshaping and smoothing unpaved roadway surfaces, without adding material or widening, to restore original shape and drainage, and provide a smooth riding surface.	Highway and Reference Post	Road Mile

ACTIVITY CODE	HIGHWAY MAINTENANCE ACTIVITY DESCRIPTION	WORK IDENTIFICATION REPORTING REQUIREMENTS	UNIT OF MEASURE
2036	Major Restoration of Unpaved Roads Major restoration of continuous sections of unpaved roadway. Includes adding material, reshaping and compacting to correct ruts, potholes, corrugations, washouts and to restore proper shape, proper drainage and provide a smooth riding surface.	Highway and Reference Post	Ton
2040	Maintenance of Frontage and Access Roads Any surface maintenance performed on an access or frontage road wherein the responsibility lies with the Department.	Highway and Reference Post	Man-Hour
2050	Unspecified Roadway and Shoulder Maintenance Other maintenance activities performed on the roadway and surfaced shoulders but not specifically listed as a separate activity, such as dust control, dusting bleeding bituminous surface, sweeping and washing of roadway, epoxy patching (does not include bridge deck), driveway maintenance and mailbox turnouts.	District Number	Man-Hour
2052	Miscellaneous Unnumbered Equipment Includes purchase, maintenance and repair of miscellaneous unnumbered minor road equipment such as tamper, concrete vibrator, concrete mixer, concrete drill, paving breaker, gopher getter, portable generator, paint sprayer, small air compressor, small non-steel non-fuel tank, sign washers, portable bandsaw, sledge hammer, push lawn mower, hand operated snow blower, small chain saw, fertilizer spreader, weed sprayer, hedge and line trimmer, power rake, lawn sweeper, garden tiller, lawn aerifier, lawn edger.	District Number	

DRAINAGE AND EROSION CONTROL

ACTIVITY CODE	HIGHWAY MAINTENANCE ACTIVITY DESCRIPTION	WORK IDENTIFICATION REPORTING REQUIREMENTS	UNIT OF MEASURE
2101	Drainage Structure Maintenance (Less than 20' Span Periodic inspection, cleaning, and removal of debris as required from box culverts, pipe culverts, catch basins and inlets to maintain proper drainage. Includes culvert extension and alteration work and maintenance on access structures.	Highway and Reference Post	Man-Hour
2102	Maintaining Miscellaneous Structures Cleaning, repairing, and replacing in kind all retaining walls, slope drains, rip-rap, flumes, ditch checks and other erosion control structures. Includes the building of additional erosion control structures to prevent further deterioration of the structures.	Highway and Reference Post	Man-Hour
2111	Reshaping Ditches and Filling Washouts Machine cleaning and reshaping of ditches and medians to restore original grade and shape to maintain proper drainage. Maintain shoulder slope, ditch, backslope and repair washouts by means of backfilling. Includes loading, hauling and disposal of excess material.	Highway and Reference Post	Man-Hour
2114	Channel Cleaning and Reshaping Removing material including debris, ice and other obstacles from open channels to restore the original grade or to improve the flow.	Highway and Reference Post	Man-Hour

MAJOR STRUCTURES (SPAN 20' OR GREATER)

ACTIVITY CODE	HIGHWAY MAINTENANCE ACTIVITY DESCRIPTION	WORK IDENTIFICATION REPORTING REQUIREMENTS	UNIT OF MEASURE
2201	Structure Painting Sandblasting, cleaning, priming and painting of structure elements to prevent deterioration.	Highway and Bridge Number or reference post	Man-Hour
2202	Curb and Railing Repair Repairing damage to curbs and rails including painting. Does not include accident damage, which is included in Activity 2602.	Highway and Bridge Number or reference post	Man-Hour
2203	Deck Repair and Maintenance Repairing or replacing decks, expansion joints, patching spalled areas, overlaying and repairing with other material as appropriate to restore the deck. Includes timber bridges.	Highway and Bridge Number or reference post	Man-Hour
2204	Bridge Structural Repair Repairs to bridge structural elements such as pilings, piers, abutments, trusses, stringers and other substructure or superstructure elements to restore load capacity and prevent further deterioration.	Highway and Bridge Number or reference post	Man-Hour
2220	Other Deck Preservation Maintenance Regular cleaning and preserving of decks, flushing, and sweeping.	District Number	Man-Hour

ROADSIDE AND RIGHT-OF-WAY MAINTENANCE

ACTIVITY CODE	HIGHWAY MAINTENANCE ACTIVITY DESCRIPTION	WORK IDENTIFICATION REPORTING REQUIREMENTS	UNIT OF MEASURE
2301	Machine Mowing Mowing of roadside vegetation on shoulders, medians, right-of-way areas, interchange islands, using tractor-driven mowers to maintain appearance and control impediments to visibility and drainage. (Does not include mowing at rest areas.)	Highway and Reference Post	Acre
2303	Chemical Control of Insects and Roadside Trees and Shrubs Covers the control of insects, rodents and other animals through the use of pesticides and the application of herbicides to roadside vegetation and soil to eradicate undesirable growth or to control growth. Includes payments to Weed Control Districts.	Highway and Reference Post	Man-Hour
2302	Hand Mowing Mowing and trimming of vegetation using hand tools and small power equipment in areas not accessible to tractor-driven mowers. (Does not include mowing at rest areas.)	District Number	Man-Hour
2304	Care and Replacement of Desirable Roadside Trees and Shrubs Maintenance of all roadside landscaped areas including trees, shrubs and plants by replanting or replacing, cultivating, removing, pruning, thinning, watering, spraying and planting. Does not include rest areas.	Highway and Reference Post	Man-Hour
2311	Litter Pickup Cleaning of the right-of-way to include picking up, loading, hauling and disposing of accumulated litter and debris. Includes payments to governmental agencies and approved vendors for trash disposal facilities and specific expenses for the Adopt-A-Highway Program such as highway signs and garbage expenses.	District Number	Man-Hour

ACTIVITY CODE	HIGHWAY MAINTENANCE ACTIVITY DESCRIPTION	WORK IDENTIFICATION REPORTING REQUIREMENTS	UNIT OF MEASURE
2313	Rest Area and Wayside Area Operations All costs incurred in operating and maintaining rest areas and wayside areas. Includes Rest Area Manager salary; janitorial and watchman services; supplies and materials; litter pickup, grounds pickup; grounds upkeep such as mowing, spraying, and planting of trees, shrubs and grasses; building maintenance and utility charges. Also included are costs incurred in taking samples of effluent and water from all facilities plus the testing of these samples. For vandalism, use AFE W-304. Includes all costs for rest areas including repairs	Rest Area Yard or Building Number or Wayside Area Number	No Crew Card
2315	Seeding and Sodding Seeding, sodding, mulching, fertilizing and watering of shoulders, backslopes, medians and other areas to restore vegetation for erosion control and beautification. Includes operation of sprinkler systems.	Highway and Reference Post	Acre
2332	Fence Repair Repairing and replacing fence along roadway and around living snow fences including cleaning of fences to remove debris.	District Number	Man-Hour
2350	Other Roadside Maintenance Other roadside maintenance activities that are not specifically identified as separate activities. Includes activities such as repairing and replacing right-of-way markers, repair of picnic tables and auto gates.	District Number	Man-Hour

TRAFFIC CONTROL

ACTIVITY CODE	HIGHWAY MAINTENANCE ACTIVITY DESCRIPTION	WORK IDENTIFICATION REPORTING REQUIREMENTS	UNIT OF MEASURE
2401	Sign Repair or Replacement Routine repair, resetting or replacement of traffic signs, directional markers, reference posts, delineators, guide posts and load restriction signs to insure the preservation of reflectivity and legibility for the safety of motorists. Includes erecting new signs and cleaning of signs.	District Number	Man-Hour
2402	Repair of Overhead Signs Repair of all overhead signs to preserve the reflectivity and legibility for the safety of the motorists. Includes all power costs for sign luminaries.	District Number	Man-Hour
2408	Centerline and Edgeline Striping Painting and repainting centerline and/or edgeline stripes including no passing zones, to maintain safe driving conditions and adequate traffic control.	District Number	Lane Mile
2409	Contract Striping Contracted pavement marking of centerline, edgeline, no passing zones and other pavement markings to maintain safe driving conditions and adequate traffic control. Also, any expenses incurred by the Department as part of the contract. This includes, but is not limited to, the inspection of the contract accomplishments, advertisements and completion of the Department's Pavement Marking Report.	District Number	No Crew Card
2410	Other Pavement Markings Installing pavement messages, directional markers, gore areas, curbs, railroad crossings, crosswalks and traffic islands to provide well-defined markings for vehicular and pedestrian traffic control; installation of thermoplastic markings and airplane markings; and the removal of pavement markings.	District Number	Man-Hour

ACTIVITY CODE	HIGHWAY MAINTENANCE ACTIVITY DESCRIPTION	WORK IDENTIFICATION REPORTING REQUIREMENTS	UNIT OF MEASURE
2415	Maintenance of Traffic Control Devices All maintenance, except storm/accident damage, of all traffic control devices to restore safe driving conditions including power costs. For a complete list of traffic control devices, please refer to the Traffic Control Device Code Table in the MMS portion of the IHI .	Highway and Signal Number	No Crew Card
2416	Highway Lighting Maintenance The repair, maintenance and power costs of highway lighting systems to insure safe driving conditions. Includes repairs due to vandalism, but not due to storm or accident damage.	Highway and Reference Post	No Crew Card
2417	ITS Element Maintenance Repair and maintenance of Intelligent Transportation Systems and components including power costs. Vandalism costs are included, but repair and replacement costs due to either a storm or accident will be coded to the appropriate activity.	Highway and Traffic Control Device Number	No Crew Card
2421	Guardrail Maintenance Repairing or replacing all types of guardrail including the supporting posts to restore safe driving conditions. Does not include accident damage included in Activity 2602.	Highway and Reference Post	Man-Hour
2422	Maintenance of Crash Control Barriers Placing and replacing, filling, painting and other maintenance necessary to establish or restore crash control barriers at designated sites.	Highway and Reference Post	Man-Hour

OPERATIONS

ACTIVITY CODE	HIGHWAY MAINTENANCE ACTIVITY DESCRIPTION	WORK IDENTIFICATION REPORTING REQUIREMENTS	UNIT OF MEASURE
2450	Other Traffic Operations Other traffic operation activities that are not specifically identified as separate activities. Includes activities such as rumble strip maintenance, erecting special signs and barricades (not part of a previous activity), flagging operations (not part of a previous activity), historical markers, glare screens or jersey barriers.	District Number	Man-Hour
2501	Erecting and Removing Snow Fence Erecting, maintaining and removing snow fence which aids snow removal operations. Includes planting, replacing and caring for "living" snow fence. Includes all damage payments resulting from this operation.	District Number	Man-Hour
2505	Brush Cutting Removal of unsightly, hazardous, undesirable growth from the roadway system. Includes chemical applications to aid brush cutting.	Highway and Reference Post	Man-Hour
2510	Joint and Crack Filling Cleaning and filling open joints and cracks in the surface with sealant to prevent entry of moisture and debris. Also includes cleaning and filling open cracks between the roadway and shoulder.	Highway and Reference Post	Feet
2511	Snow Plowing and Spreading of Winter Chemicals and Sand Removing snow and ice from the roadway surface, shoulders and bridges using power equipment and hand methods; spot and continuous treatment with chemicals and/or sand to reduce the hazard of icy road surfaces to maintain safe driving conditions; plotting weather conditions; payments to contractors. Does not include loading and hauling of snow.	District Number	Man-Hour

ACTIVITY CODE	HIGHWAY MAINTENANCE ACTIVITY DESCRIPTION	WORK IDENTIFICATION REPORTING REQUIREMENTS	UNIT OF MEASURE
2514	Loading and Hauling of Snow Maintaining safe driving conditions by loading and hauling of snow and ice from long bridges, viaducts, intersections and interchanges with loading equipment and trucks.	District Number	Man-Hour
2521	Stockpiling/Mixing Chemical and Sand for Winter Operations Stockpiling chemical and sand at loading sites for winter operations. Includes mixing, loading/unloading of material and also the costs of the material. Includes calcium chloride and other chemicals mixed with the salt and sand.	District Number	Man-Hour
UNUSUAL OR DISASTER OPERATIONS			
2601	Repairing Storm Damage Removing and cleaning up debris due to storms and floods, repairing the roadway and roadside, repairing and replacing bridges, repairing and replacing signs knocked down due to major storms, plus any other work necessary for public protection resulting from a storm or other natural disaster.	Highway and Reference Post, Signal Number, or Bridge Number	Man-Hour
2602	Repairing Accident Damage Removing and cleaning up debris, plus all other work required in the repair of all damages to a road system resulting from an accident.	Highway and Reference Post, Signal Number, or Bridge Number	Man-Hour
2603	Correct Vandalism of Roadside Features Any activity needed to correct damage caused by vandalism to roadside features. This includes, but is not limited to, removal of graffiti on bridges, signs and sound walls; cleanup of debris left by vandals at roadside areas; replacement of signs and posts. For vandalism, use AFE W-304.	Highway and Reference Post, Signal Number, or Bridge Number	Man-Hour

ACTIVITY CODE	HIGHWAY MAINTENANCE ACTIVITY DESCRIPTION	WORK IDENTIFICATION REPORTING REQUIREMENTS	UNIT OF MEASURE
2604	Emergency Assistance to Government Entities Activities performed while assisting government entities off the National and State Highway System. These activities are usually performed following a disaster such as a major snowstorm, tornado, flood, etc., when FEMA or NEMA has asked for our assistance. This activity does not include the training or inspection for such emergencies. WHEN CODING COUNTY NUMBER, ENTER IN HIGHWAY NUMBER FIELD WITH A LETTER C AND LEAVE THE FOURTH POSITION BLANK. (Sample: County 03 is coded as Highway C03, Reference Post 000 or C03 000.)	AFE and County Number	No Crew Card

INDIRECT (OVERHEAD) CHARGES

2900	Maintenance Administration Includes salaries for selected Operations Division personnel who are directly involved with the administration of the maintenance function. (Excludes the Division Head, Administrative Assistant and Office Clerk.)	District '0"	No Crew Card
2901	Supervision Includes salaries and expenses of Maintenance Superintendents and Maintenance Supervisors when doing work not directly chargeable to a specific activity.	District Number	No Crew Card
2902	Program 571 Redistribution – Maintenance Controller Only.		

ACTIVITY CODE	HIGHWAY MAINTENANCE ACTIVITY DESCRIPTION	WORK IDENTIFICATION REPORTING REQUIREMENTS	UNIT OF MEASURE
2903	Office Staff Includes salaries and expenses of Maintenance Superintendent's and Maintenance Supervisor's office staff when doing work not directly chargeable to a specific activity. This includes office rent, office equipment and supplies, postage, etc., but does not include yard or building work activities, which are charged to activities in the 4400 series.	District Number	No Crew Card
2904	Hand Tools and Miscellaneous Unnumbered Equipment and Supplies Includes purchase, maintenance, repair and storage of hand tools (shovels, picks, axes, files, etc.), and miscellaneous supplies in small quantities only when it is impractical to make these charges to a specific activity (cost of kerosene included). Reference Procedure 4.03 in the Accounting Manual for perpetual AFE requirements when costs for personal protective safety equipment is charged to this activity.	District Number	No Crew Card
2906	Salvage and Obsolescence Operations necessary to junk or salvage road accessories (guardrail, posts, signs, etc.), culverts and structures or any materials no longer of use in their present location or condition. Does not include Department numbered road equipment. Also used to record credits for transfers of costs to construction activities, i.e., striping projects.	District Number	No Crew Card

ACTIVITY CODE	HIGHWAY MAINTENANCE ACTIVITY DESCRIPTION	WORK IDENTIFICATION REPORTING REQUIREMENTS	UNIT OF MEASURE
2908	Base and Mobile Radio Purchase, Operation, Maintenance, and Repair Costs incurred in the purchase, operation, maintenance and repair of all radio system equipment including yard, building and tower lines. New construction or purchases of radio towers are charged to the capital facility activities.	Base or Mobile Radio Number	No Crew Card
2915	Unspecified Labor and Equipment Charges Maintenance activities that are of an unusual nature which cannot be specifically charged to any other activity such as time spent waiting for materials not delivered according to schedule, down time due to equipment failures, and the special movement of equipment between different sites.	District Number	No Crew Card
2930	Liquidated Damages-Maintenance Contracts Damages to Department of Roads' property done by outside contractors while performing maintenance contract and/or agreement activities. An example of damages is the cost to repair or replace signs and/or delineators damaged while mowing highway ROW by contract mowers. Liquidated Damages would be entered on the payment document as a deduction to the contractor payment.	District Number	No Crew Card
2950	Special Maintenance To be used as a budget allotment contingency account from which funds can be reprogrammed to activities such as snow and ice control operations, unusual and disaster operations, etc. This is a non-reportable activity code. (For Controller Division use only.)	District Number	No Crew Card

CHAPTER 4 PERFORMANCE GUIDELINES

4.1 DEFINITION

The Department of Roads has established a method of performing each major maintenance work activity so that it can uniformly be performed throughout the State. These are called Performance Guidelines. A complete set of these Performance Guidelines for Nebraska's major maintenance work activities is included in this chapter. As new and improved methods are tested and proved, these guidelines will be updated.

A Performance Guideline for any activity recommends:

1. The most effective crew size.
2. The types of equipment required.
3. The major types of material.
4. Recommended procedures for performing the activity.
5. An expected average daily accomplishment.
6. Scheduling criteria.
7. Supervisor responsible for authorizing work.
8. Type of work.

The daily productivity rate is an average, which is known to be attainable as developed from experience over a period of time. It is not expected that each day's achievement will meet this rate. If actual maintenance performance is to come close to planned maintenance, this average rate should be attained over the year.

4.2 MAINTENANCE ACTIVITY TYPES

Maintenance activities have been categorized into two types of work:

4.2.1 Routine –

This category includes activities for which work can be performed when need and/or policy has been established. There can be no quantity limitation for these activities as they will be needed to perform the work for the safety of the traveling public. The work program quantity is an estimate based on average conditions. In any particular year, the quantities may be somewhat more or less than what the work program requires.

4.2.2 Special –

This category includes activities that are not urgently needed. The planned work is desirable but not critical if all of the planned work program is not completed during any one planned year. The planned quantities represent an average value planned to produce the desirable level of experience.

This group provides the flexibility in the work program. The amount of work may be expended or reduced during the year to meet the variations experienced by other routine activities.

4.3 PERFORMANCE GUIDELINES OVERVIEW

Maintenance supervisory personnel at the field level should become thoroughly familiar with these guidelines. These guidelines are intended to be tools used to plan and monitor the Maintenance Program. In the event that a District finds that their work requirements routinely and uniformly differ from these guidelines, the District Operations and Maintenance Manager should develop a District specific guideline for the activity in question.

Unless dictated by site requirements or special circumstances, the Supervisor should make an effort to:

1. USE STANDARD CREW SIZES.
2. USE STANDARD TYPES OF EQUIPMENT.
3. USE STANDARD MATERIAL REQUIREMENTS.
4. FOLLOW THE STANDARD WORK PROCEDURES INCLUDING ALL SAFETY PROTOCOL.

For additional information on maintenance activities, consult the Pavement Maintenance Manual or visit http://www.nebraskatransportation.org/docs/pavement.pdf .

4.4 PERFORMANCE GUIDELINES

<table>
<tr><th colspan="3">MAINTENANCE PERFORMANCE GUIDELINES</th></tr>
<tr><td>ACTIVITY Road Profiling</td><td></td><td>NO. 2002</td></tr>
<tr><td colspan="3">DESCRIPTION AND PURPOSE</td></tr>
<tr><td colspan="3">Planing bituminous surface by cold milling for the purpose of restoring the roadway to its original shape by removing rough or rutted pavement.</td></tr>
<tr><td colspan="3">AUTHORIZATION AND SCHEDULING</td></tr>
<tr><td colspan="3">This activity is special type work and is authorized by the District Operations and Maintenance Manager when corrugations or ruts are beyond tolerances as determined by pavement management criteria. Normally scheduled April through October.</td></tr>
<tr><td>CREW SIZE</td><td colspan="2">ACCOMPLISHMENT</td></tr>
<tr><td>8</td><td colspan="2">Unit of Measure: Square Yard
Daily Productivity: 14000 – Statewide</td></tr>
<tr><td>EQUIPMENT</td><td colspan="2">MATERIAL</td></tr>
<tr><td>1 Milling Machine
1 Semi-tractor Truck
6 Tandem Trucks
2 Pickup
1 Motor Grader*
Traffic Control Devices as required*
1 Sweeper
1 – Water Truck
1 – Loader</td><td colspan="2">ID Reporting
Coding Description Unit

No Materials Required</td></tr>
<tr><td colspan="3">RECOMMENDED PROCEDURE</td></tr>
<tr><td colspan="3">1) Place appropriate traffic control devices and position flaggers as needed.
2) Remove corrugations, bumps or ruts with rotomill.
3) Load in trucks.
4) Haul to stockpile site.
5) Sweep/clean roadway
6) Install lane temporary markers or permanent striping
7) Remove traffic control devices.</td></tr>
<tr><td>DATE OF ISSUE: 5/28/2003</td><td colspan="2"></td></tr>
<tr><td>EFFECTIVE DATE:</td><td colspan="2">MAINTENANCE TECHNICAL COMMITTEE:</td></tr>
</table>

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Minor Surface Milling		**NO. 2003**
DESCRIPTION AND PURPOSE		
Planing bituminous surface using a milling head attachment or milling blade on a motorgrader for the purpose of restoring the roadway to its original shape.		
AUTHORIZATION AND SCHEDULING		
This activity is special type work and is authorized by the Maintenance Supervisor. This activity is scheduled year round.		
CREW SIZE	**ACCOMPLISHMENT**	
4	**Unit of Measure:** Square Yard **Daily Productivity:** 1500 – Statewide	
EQUIPMENT	**MATERIAL**	
1Tandem Truck 1 Pickup 1 Motor Grader or Skidsteer loader with milling head attachment on a trailer* 1 Loader* 1 Sweeper* *As Required	ID Reporting Coding Description Unit No Materials Required	
RECOMMENDED PROCEDURE		
Place portable traffic control devices and position flaggers as needed. Remove corrugations, bumps or ruts with rotomill or milling blade. Haul to salvage site if necessary. Sweep/clean roadway Install temporary lane markers if necessary Remove traffic control devices.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Armor Coating / Chip Seal Roadway Surfaces & Surfaced Shoulders		**NO. 2004**

DESCRIPTION AND PURPOSE

Covering a section of surface with emulsion and aggregate to seal the surface, improve skid resistance and to prevent further deterioration of the surface. Includes armor coating/chip sealing surfaced shoulders and other maintenance work relative to armor coating/chip sealing, such as sweeping, dusting bleeding bituminous surface, etc.

AUTHORIZATION AND SCHEDULING

This activity is special type work and is authorized by the District Operations and Maintenance Manager. Temperature requirements restrict the effective placement of armor coat to the warmer months. This activity should be coordinated with major resurfacing and reconstruction programs. Normally scheduled April through October.

CREW SIZE	**ACCOMPLISHMENT**
12	**Unit of Measure:** Square Yard **Daily Productivity:** 40,000 – Statewide
EQUIPMENT	**MATERIAL**
1 Distributor Truck 4 Tandem Trucks 1 Roller 1 Loader* 1 Sweeper-Rotary Broom* 1 Armor Coat Spreader 2 Pickups 1 Water Tanker Traffic Control Device as required*	ID Reporting Coding / Description / Unit 0101 Emulsions Gallon 0201 Gravel Ton

RECOMMENDED PROCEDURE

Place portable traffic control devices and position equipment at work site. Station flaggers, as needed.
Sweep loose material from surface to be sealed.
Apply temporary lane pavement markers and install DO NOT PASS and PASS WITH CARE signs.
Apply emulsion heated to proper temperature. Apply at approximate rate of .17 to .33 gallons per square yard of surface.
Apply aggregate with spreader immediately at approximate rate of 15 to 27 pounds per square yard.
Roll entire sealed area.
Sweep loose material from surface As soon as practicable and no later than the following day.
Remove tab covers on lane markers and then remove temporary traffic control devices except DO NOT PASS and PASS WITH CARE signs. Apply permanent lane markings and then remove remaining signs.

DATE OF ISSUE:	
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Fog Seal		**NO. 2005**
DESCRIPTION AND PURPOSE		
Rejuvenation of old asphalt surface, sealing small cracks and surface voids by spraying emulsions diluted with clean water.		
AUTHORIZATION AND SCHEDULING		
This activity is special type work and is authorized by the District Operations and Maintenance Manager. Normally scheduled April through October. Activity should be coordinated with major resurfacing and reconstruction programs.		
CREW SIZE	**ACCOMPLISHMENT**	
5	**Unit of Measure:** Square Yard **Daily Productivity:** 25,000 – Statewide 20,000 - Interstate	
EQUIPMENT	**MATERIAL**	
1 Dump Truck* 1 Distributor Truck 1 Pickup 1 Traffic Control Devices as required *As Required	ID Reporting Coding / Description / Unit 0101 Emulsions Gallon	
RECOMMENDED PROCEDURE		
Place traffic control devices and barricades as needed. Install temporary lane marking tabs and NO PASSING/PASS WITH CARE signs. Emulsion will usually be diluted 50-50 with water. Applied at the rate of 0.05 to 0.12 gallon per square yard depending on the texture and dryness of the old pavement. Cover aggregate is not required. Under normal conditions the break is rapid permitting traffic within an hour or two. Remove temporary traffic control devices. Install permanent pavement marking and remove remainder of signs.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES

ACTIVITY Mudjacking | **NO. 2007**

DESCRIPTION AND PURPOSE

Raising and leveling Portland Cement concrete slabs and structures by pumping slurry mix underneath the slab to eliminate surface hazards caused by settlement to restore grade line and to fill voids beneath pavement. Includes drilling and capping of holes involved in the operation.

AUTHORIZATION AND SCHEDULING

This activity is special type work and will be authorized by the District Operations and Maintenance Manager. Maintenance Superintendents will designate the specific location where mudjacking is needed. Normally scheduled May through September as long as there is no frost in the ground.

CREW SIZE

4

ACCOMPLISHMENT

Unit of Measure: Man-Hour
Daily Productivity: 32 – Statewide
32 - Interstate

EQUIPMENT

1 Mudjack
1 Air Compressor
1 Pickup
1 Tandem
Traffic Control Devices as required

*As Required

MATERIAL

ID Reporting Coding	Description	Unit
0304	Portland Cement	Bag
0310	Flowable Fill	Cu Yd
0207	Filler	Ton

RECOMMENDED PROCEDURE

Place appropriate traffic control devices and position flaggers as needed.
Drill holes in pavement as determined by Superintendent.
Prepare slurry mix using specified materials.
Pump slurry mix slowly into holes to fill void before attempting to raise slab.
Plug holes with wooden pegs and raise slab, pumping in sequence.
Check with straight edge or string line to assure slab is level with other surface.
Cap holes with slurry mix and strike off.
Remove traffic control devices.

DATE OF ISSUE:

EFFECTIVE DATE:

MAINTENANCE TECHNICAL COMMITTEE:

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Joint Cutting		**NO. 2013**
DESCRIPTION AND PURPOSE		
Sawing, cleaning and filling or replacing expansion joints with special material to prevent entry of moisture and debris and to allow proper expansion and contraction of pavement.		
AUTHORIZATION AND SCHEDULING		
This activity is routine type work and is authorized by the District Operations and Maintenance Manager. Normally scheduled April through November.		
CREW SIZE	**ACCOMPLISHMENT**	
5	Unit of Measure: Feet Daily Productivity: 100 – Statewide 100 - Interstate	
EQUIPMENT	**MATERIAL**	
1 Concrete Saw 1 Tandem Truck 1 Pickup Traffic Control Devices as required*	ID Reporting Coding / Description / Unit 0401 Adhesive Can 0403 Preformed Joints Each	
RECOMMENDED PROCEDURE		
Place appropriate traffic control devices and position flaggers as needed. Cut across pavement with rock cutter. Clean area to be filled with air tools. Fill with specified filler material. Remove traffic control devices.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Subgrade Repair		**NO. 2015**
DESCRIPTION AND PURPOSE		
Removing and replacing unstable materials to repair and restore highway subgrades to a stable condition. This includes the repair and replacement of surface materials. Correction of frost boils are included in this activity.		
AUTHORIZATION AND SCHEDULING		
This activity is routine type work and is authorized by the Maintenance Superintendent. Normally scheduled February through November.		
CREW SIZE	**ACCOMPLISHMENT**	
5	Unit of Measure: Man hour Daily Productivity: 40 – Statewide None – Interstate	
EQUIPMENT	**MATERIAL**	
1 Loader 1 Motor Grader* 2 Tandem Trucks 1 Pickup Traffic Control Devices as required* 1 Gradall or Backhoe 1 Compactor* 1 Air Compressor*	ID Reporting Coding / Description / Unit 0102 Emulsified oil Gallon 0201 Gravel Ton 0204 Sand Ton 0212 Recycled Asphalt Ton 0302 Hot Mix Ton 0303 Cold Mix Ton	
RECOMMENDED PROCEDURE		
Place appropriate traffic control devices and position flaggers as needed. Break out and remove old pavement. Remove unstable or wet base material to a depth that is stable. Install under drains, if necessary. Place base material in 6-inch lifts and compact. Apply tack coat. Lay surface material. Remove traffic control devices.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES

ACTIVITY Hauling and Mixing Material for Cold Mix | **NO. 2020**

DESCRIPTION AND PURPOSE

Hauling of water, aggregates, filler and emulsion to a predetermined site. Includes windrowing, mixing and drying aggregates and filler, adding emulsion to windrow and aerating until usable as a cold mix for patching and leveling the roadway surface.

AUTHORIZATION AND SCHEDULING

This activity is routine type of work and is authorized by the Maintenance Superintendent. Normally scheduled April through October.

CREW SIZE	**ACCOMPLISHMENT**
5	Unit of Measure: Man hour Daily Productivity: 40 – Statewide 40 – Interstate

EQUIPMENT	**MATERIAL**		
4 Tandem Truck	ID Reporting		
1 Loader*	Coding	Description	Unit
1 Motor Grader			
1 Pickup	0101	Emulsion	Gallon
1 Tractor with Rotovator*	0201	Gravel	Ton
	0207	Filler	Ton
*As Required	0204	Sand	Ton

RECOMMENDED PROCEDURE

Prepare mixing site.
Stake proper load distance.
Haul material.
Even material and windrow.
Apply emulsion.
Thoroughly mix with motor graders, rotovator or disc.
Mix with motor graders by moving windrow back and forth across mixing site.

DATE OF ISSUE:	
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Machine Patching of Roadway Surfaces		**NO. 2025**
DESCRIPTION AND PURPOSE		
Patching and leveling of roadway surface with hot or cold mix material with the use of machines to eliminate potential surface hazards.		
AUTHORIZATION AND SCHEDULING		
This activity is routine type of work and is authorized by the Maintenance Superintendent. Normally scheduled May through October.		
CREW SIZE	**ACCOMPLISHMENT**	
10	Unit of Measure: Ton Daily Productivity: 200 – Statewide 30 – Interstate	
EQUIPMENT	**MATERIAL**	
2 Motor Grader 2 Roller 1 Loader 1 Distributor Truck 1 Pickup 3 Tandem Trucks 1 Power broom Traffic Control Devices as required 1 Laydown Machine* 1 Backhoe* *As Required	ID Reporting Coding / Description / Unit 0102 Asphaltic Oil Gallon 0302 Hot Mix Ton 0303 Cold Mix Ton 0212* Recycled Asphalt Ton	
RECOMMENDED PROCEDURE		
Place appropriate traffic control devices and position flaggers as needed at each site. Sweep surface. Apply tack coat. Apply material with laydown machine or screed with motor grader. Roll and compact with rollers. Clean excess material from shoulder and sweep surface. Apply temporary pavement markings. Remove traffic control devices.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES

ACTIVITY Spot Patching | **NO. 2026**

DESCRIPTION AND PURPOSE

Minor patching of small areas on the roadway with hot or cold premix bituminous material using hand tools to correct abrupt depressions, potholes, edge failures, upheavals and other surface hazards. Includes armor coating of small-patched areas.

AUTHORIZATION AND SCHEDULING

This activity is routine type of work and is authorized by the Maintenance Supervisor. Normally scheduled January through December.

CREW SIZE

3

ACCOMPLISHMENT

Unit of Measure: Ton
Daily Productivity: 2.5 – Statewide
2.0 – Interstate

EQUIPMENT

1 Pickup
1 Tandem Truck
1 One Ton Pickup
1 Loader*
1 Spray Injection Machine*
Traffic Control Device*

*As Required

MATERIAL

ID Reporting Coding	Description	Unit
0101	Emulsion	Gallon
0102	Asphaltic Oil	Gallon
0201	Gravel	Ton
0212	Recycled Asphalt	Ton
0302	Hot Mix	Ton
0303	Cold Mix	Ton
0309	Cold Patch	Ton

RECOMMENDED PROCEDURE

Place appropriate traffic control devices and position flaggers as needed.
With hand tools, square area to be patched to a depth of at least 4 inches.
Remove all loose material and debris from hole.
Tack sides and bottom of hole if necessary.
Place material in hole in lifts not exceeding 2 inches in depth and tamp each lift.
Fill hole slightly higher and tamp or compact to surface level.
Clean loose material from work area.
Remove traffic control devices.

DATE OF ISSUE:

EFFECTIVE DATE:

MAINTENANCE TECHNICAL COMMITTEE:

MAINTENANCE PERFORMANCE GUIDELINES

ACTIVITY Concrete Patching | **NO. 2027**

DESCRIPTION AND PURPOSE

Patching concrete roadway surfaces by removing faulty surface sections including base or subgrade material as required and replacing with concrete and required base material to eliminate potential surface hazard. Sawing, cleaning and filling or replacing expansion or contraction joints with special material to prevent entry of moisture and debris and to allow proper expansion and contraction of pavement. Includes concrete shoulders.

AUTHORIZATION AND SCHEDULING

This activity is routine type of work and is authorized by the Maintenance Superintendent. Normally scheduled April through October.

CREW SIZE	**ACCOMPLISHMENT**
6	Unit of Measure: Cubic Yards Daily Productivity: 5.0 – Statewide 3.0 - Interstate

EQUIPMENT	**MATERIAL**		
1 Air Compressor*	ID Reporting		
1 Concrete Saw	Coding	Description	Unit
1 Loader			
1 Vibrator or vibrating screed	0201	Gravel	Ton
appropriate traffic Control Device*	0204	Sand	Ton
2 Tandem Trucks	0301	Ready Mixed Concrete	Cu. Yd.
1 Pickup*	0304	Portland Cement	Bag
1 Concrete breaker*	0305	Concrete Cure	Gallon
	0307	Quick Set Cement	Bag
*As Required	0822	Calcium Chloride	Gallon

RECOMMENDED PROCEDURE

Place appropriate traffic control devices and position barricades and flaggers as needed.
Saw limits of the patch, break up old pavement with air hammer and cut reinforcing bars.
Remove old pavement carefully to minimize disturbance to the subgrade.
Prepare sub base as needed, replace unsuitable material when necessary and recompact loosened material.
Undercut around edges of existing pavement to a minimum of 6 inches.
Treat exposed edges with bonding material.
Set forms, pour concrete, screed and finish by striking off patch so that it is even with existing pavement surfacing. Insulate patch if necessary.
Provide signs, barricades and other traffic control devices.
Do not allow traffic on repair surface until sufficiently cured.

DATE OF ISSUE:	
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Surfaced Shoulder Maintenance		**NO. 2030**
DESCRIPTION AND PURPOSE		
Patching and leveling of surface shoulder with bituminous material.		
AUTHORIZATION AND SCHEDULING		
This activity is routine type of work and is authorized by the Maintenance Supervisor. Normally scheduled January through December.		
CREW SIZE	**ACCOMPLISHMENT**	
6	Unit of Measure: Ton Daily Productivity: 35 – Statewide 35 – Interstate	
EQUIPMENT	**MATERIAL**	
2 Tandem Trucks 1 Motor Grader* 1 Loader 1 Roller* 1 Pickup 1 Spray injection machine *As Required	ID Reporting Coding / Description / Unit 0101 Emulsion Gallon 0102 Asphaltic Oil Gallon 0201 Gravel Ton 0212 Recycled Asphalt Ton 0302 Hot Mix Ton 0303 Cold Mix Ton 0309 Sylvax Ton	
RECOMMENDED PROCEDURE		
Place appropriate traffic control devices and position flaggers as needed. Clean surface to remove loose and broken material. Spot or machine patch and compact any serious damage. Apply tack coat. Apply material and screed with grader. Roll to compact. Be sure to maintain proper slope for drainage. Remove traffic control devices.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Grading of Shoulders		**NO. 2031**
DESCRIPTION AND PURPOSE		
Grading of shoulders without placing additional material to bring existing material up against the edge of the roadway surface.		
AUTHORIZATION AND SCHEDULING		
This activity is routine type of work and is authorized by the Maintenance Supervisor. Normally scheduled year round.		
CREW SIZE	**ACCOMPLISHMENT**	
2	Unit of Measure: Man Hour Daily Productivity: 16 - Statewide - Interstate	
EQUIPMENT	**MATERIAL**	
1 Motor Grader 1 Pickup *As Required	ID Reporting Coding Description Unit No Material Required	
RECOMMENDED PROCEDURE		
Place appropriate traffic control devices as needed. Set blade on grader to bring material flush and against the roadway. Roll with grader wheel. Remove traffic control devices.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES

ACTIVITY Rebuilding Unpaved Shoulders		**NO. 2032**

DESCRIPTION AND PURPOSE

The placement of additional material to correct low spots and replace lost material together with grading and reshaping the shoulder to bring the material up against the roadway edge.

AUTHORIZATION AND SCHEDULING

This activity is routine type work and is authorized by the Maintenance Supervisor. Normally scheduled April through October

CREW SIZE	**ACCOMPLISHMENT**
4	Unit of Measure: Man Hour Daily Productivity: 32 - Statewide - Interstate

EQUIPMENT	**MATERIAL**		
1 Loader 1 Pickup 1 Motor Grader 2 Tandem Trucks 1 Roller *As Required	ID Reporting Coding 0203 0208 0212	Description Crushed Rock Dirt Recycled Asphalt	Unit Ton Ton Ton

RECOMMENDED PROCEDURE

Place appropriate traffic control devices and position flaggers as needed.
Spread material on shoulder.
Work shoulder material next to roadway to maintain proper drainage slope away from roadway.
Roll material to obtain proper compaction.
Remove traffic control devices.

DATE OF ISSUE:	
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Blading Unpaved Roads		**NO. 2035**
DESCRIPTION AND PURPOSE		
Blading, reshaping and smoothing unpaved roadway surfaces without adding material or widening, to restore proper shape, proper drainage and a smooth riding surface.		
AUTHORIZATION AND SCHEDULING		
This activity is routine type work and is authorized by the Maintenance Supervisor. Normally scheduled January through December. Performed best under favorable moisture conditions		
CREW SIZE	**ACCOMPLISHMENT**	
1	Unit of Measure: Road Mile Daily Productivity: 15 - Statewide None – Interstate	
EQUIPMENT	**MATERIAL**	
1 Motor Grader 1 Pickup *As Required	ID Reporting Coding Description Unit No Materials Required	
RECOMMENDED PROCEDURE		
Set blade for even cut. Move gravel from side to side of road to get an even distribution, but not so heavy as to become a driving hazard.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Major Restoration of Unpaved Roads		**NO. 2036**
DESCRIPTION AND PURPOSE		
Major restoration of continuous sections of unpaved roadway. Includes adding material, reshaping and compacting to correct ruts, potholes, corrugations, washouts, and to restore proper shape, proper drainage and a smooth riding surface.		
AUTHORIZATION AND SCHEDULING		
This activity is special type work and is authorized by the District Operations and Maintenance Manager. Normally scheduled April through October.		
CREW SIZE	**ACCOMPLISHMENT**	
3	Unit of Measure: Ton Daily Productivity: 100 - Statewide None - Interstate	
EQUIPMENT	**MATERIAL**	
1 Motor Grader 1 Loader* 1 Tandem Truck 1 Pickup *As Required	ID Reporting Coding / Description / Unit 0201 Gravel Ton 0203 Crushed Rock Ton	
RECOMMENDED PROCEDURE		
Place appropriate traffic control devices and barricades and position flaggers as needed. If necessary, scarify road surface. Shape road surface with motor grader. Work new material into roadbed and compact with roller. Excess material may be placed on shoulders provided it does not create a traffic hazard or impair drainage. Remove traffic control devices and barricades.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Maintenance of Frontage and Access Roads		**NO. 2040**
DESCRIPTION AND PURPOSE		
Any maintenance work performed on an access or frontage road where in the responsibility lies with the department. Includes contract payments to local entities.		
AUTHORIZATION AND SCHEDULING		
This activity is routine work and is authorized by the Maintenance Supervisor. Normally scheduled January through December.		
CREW SIZE	**ACCOMPLISHMENT**	
As required for the actual activity being performed	Unit of Measure: Man Hour Daily Productivity: 16 - Statewide 16 – Interstate	
EQUIPMENT	**MATERIAL**	
*As Required for the actual activity being performed	ID Reporting Coding / Description / Unit 0201 Gravel Ton 0203 Crushed Rock Ton 0212 Recycled Asphalt Ton 0302 Hot Mix Ton	
RECOMMENDED PROCEDURE		
As Required for the actual activity being performed..		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Unspecified Roadway and Shoulder Maintenance		**NO. 2050**
DESCRIPTION AND PURPOSE		
Other maintenance activities performed on the roadway and surfaced shoulders but not specifically listed as a separate activity, such as: Dust Control – Sweeping and Washing of Roadway – Epoxy Patching – Driveway Maintenance – Mail Box Turnouts – Access Roads.		
AUTHORIZATION AND SCHEDULING		
This activity is routine work and is authorized by the Maintenance Supervisor. Normally scheduled January through December.		
CREW SIZE	**ACCOMPLISHMENT**	
3	Unit of Measure: Man Hour Daily Productivity: 24 - Statewide 16 – Interstate	
EQUIPMENT	**MATERIAL**	
1 Pickup 1 Tandem Truck 1 Motor Grader* 1 Loader* Appropriate Traffic Control Device* 1 Sweeper* *As Required	ID Reporting Coding Description Unit As required from the material list	
RECOMMENDED PROCEDURE		
As required to safely produce a quality product		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Drainage Structure Maintenance (Span <20 Feet)		**NO. 2101**
DESCRIPTION AND PURPOSE		
Periodic inspection, cleaning and removal of debris as required from box culverts, pipe culverts, catch basins, and inlets to maintain proper drainage. Includes culvert extension and alternative work and maintenance on access structures.		
AUTHORIZATION AND SCHEDULING		
This activity is routine work and is authorized by the Maintenance Superintendent. Normally scheduled January through December.		
CREW SIZE	**ACCOMPLISHMENT**	
3	Unit of Measure: Man Hour Daily Productivity: 24 - Statewide 24 – Interstate	
EQUIPMENT	**MATERIAL**	
1 Loader 1 Tandem Truck 1 Pickup 1 Gradall or backhoe* *As Required	ID Reporting Coding 0905 0212	Description Culvert Recycled Asphalt	Unit Lin. Ft. Ton
RECOMMENDED PROCEDURE		
Place appropriate traffic control devices as needed. Remove debris and undesirable vegetation from inlet and/or outlet channel to restore original grade. Clean out silted material from culvert. Check for damage to structure. Notify Maintenance Superintendent if repair work is necessary. Correct any eroded area around inlet or outlet. Remove traffic control devices		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES

ACTIVITY Maintaining Miscellaneous Structures | **NO. 2102**

DESCRIPTION AND PURPOSE

Cleaning, repairing and replacing in kind all retaining walls, slope drains, rip-rap, flumes, ditch checks and other erosion control structures. Including the building of additional erosion control structures to prevent further deterioration of the structures.

AUTHORIZATION AND SCHEDULING

This activity is routine type work and is authorized by the Maintenance Superintendent. Normally scheduled January through December

CREW SIZE	**ACCOMPLISHMENT**
4	Unit of Measure: Man Hour Daily Productivity: 32 - Statewide 32 – Interstate

EQUIPMENT	**MATERIAL**		
1 Motor Grader*	ID Reporting		
1 Loader	Coding	Description	Unit
1 Pickup			
2 Tandem Trucks	0102	Asphaltic Oil	Gallon
1 Gradall or Backhoe*	0205	Rip Rap	Ton
	0212	Recycled Asphalt	Ton
*As Required	0303	Cold Mix	Ton
	0905	Galvanized Culvert	Lin. Ft.

RECOMMENDED PROCEDURE

Determine work to be done by type of problem encountered.
Place appropriate traffic control devices and position flaggers as needed.
Repair damage to minor drainage structures as required.
Remove traffic control devices.

DATE OF ISSUE:	
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Reshaping Ditches and Filling Washouts		**NO. 2111**
DESCRIPTION AND PURPOSE		
Machine cleaning and reshaping of ditches and medians to restore original grade and shape to maintain proper drainage. Maintain slopes including the shoulder slope, ditches, backslope and repairing washouts by means of backfilling. Includes loading, hauling and disposal of excess materials.		
AUTHORIZATION AND SCHEDULING		
This activity is routine work and is authorized by the Maintenance Superintendent. Normally scheduled January through December		
CREW SIZE	**ACCOMPLISHMENT**	
4	Unit of Measure: Man Hour Daily Productivity: 32 - Statewide 32 – Interstate	
EQUIPMENT	**MATERIAL**	
1 Loader 1 Pickup 2 Tandem Trucks 1 Motor Grader* 1 Gradall or Backhoe *As Required	ID Reporting Coding / Description / Unit 0205 Rip Rap Ton 0208 Dirt Ton 0212 Recycled Asphalt Ton	
RECOMMENDED PROCEDURE		
Place appropriate traffic control devices and position flaggers as needed. Fill in washouts with material. Dress back and foreslope and reshape ditch to original grade and profile. Reseed area as needed. Dispose of waste material. Remove traffic control devices.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Channel Cleaning and Reshaping		**NO. 2114**
DESCRIPTION AND PURPOSE		
Removing material including debris, ice and other obstacles from open channels to restore the original grade or to improve the flow.		
AUTHORIZATION AND SCHEDULING		
This activity is special type work and is authorized by the Maintenance Superintendent. Normally scheduled January through December.		
CREW SIZE	**ACCOMPLISHMENT**	
3	Unit of Measure: Man Hour Daily Productivity: 24 - Statewide 24 – Interstate	
EQUIPMENT	**MATERIAL**	
1 Loader 1 Pickup 1 Tandem Trucks 1 Gradall or Backhoe *As Required	ID Reporting Coding Description Unit As required from the material list	
RECOMMENDED PROCEDURE		
Analyze the problem and determine equipment, manpower and material requirements. Place appropriate traffic control devices and position flaggers as needed. Remove debris and undesirable vegetation and restore flowline on inlet and outlet channels. Remove traffic control devices.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Structure Painting		**NO. 2201**
DESCRIPTION AND PURPOSE		
Sandblasting, cleaning, priming and painting of structure elements to prevent deterioration.		
AUTHORIZATION AND SCHEDULING		
This activity is routine type work and is authorized by the District Operations and Maintenance Manager. Normally scheduled April through October. Due to EPA rules this activity is normally contracted.		
CREW SIZE	**ACCOMPLISHMENT**	
3	Unit of Measure: Man Hour Daily Productivity: 24 - Statewide 24 – Interstate	
EQUIPMENT	**MATERIAL**	
1 Pickup 1 Sandblaster* 1 Air Compressor* appropriate traffic Control Device* 1 Tandem Truck *As Required	ID Reporting Coding Description Unit As required from the material list	
RECOMMENDED PROCEDURE		
Place appropriate traffic control devices and position flaggers as needed. Use appropriate personal protective equipment. Follow all applicable EPA requirements. Place appropriate containment devices, Sandblast and paint the same areas in the same day. Use caution if work is accomplished on windy days so that paint spray does not drift to other areas Remove traffic control devices.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

<table>
<tr><th colspan="3">MAINTENANCE PERFORMANCE GUIDELINES</th></tr>
<tr><td>ACTIVITY Curb and Railing Repair</td><td></td><td>NO. 2202</td></tr>
<tr><td colspan="3">DESCRIPTION AND PURPOSE</td></tr>
<tr><td colspan="3">Bridge curb and rail maintenance including painting.
Does not include accident damage or guardrail maintenance.</td></tr>
<tr><td colspan="3">AUTHORIZATION AND SCHEDULING</td></tr>
<tr><td colspan="3">This activity is routine type work and is authorized by the Maintenance Superintendent. Normally scheduled January through December.</td></tr>
<tr><td>CREW SIZE</td><td colspan="2">ACCOMPLISHMENT</td></tr>
<tr><td>2</td><td colspan="2">Unit of Measure: Man Hour
Daily Productivity: 16 - Statewide
16 - Interstate</td></tr>
<tr><td>EQUIPMENT</td><td colspan="2">MATERIAL</td></tr>
<tr><td>1 Dump Truck
1 Pickup
Appropriate Traffic Control Device*

*As Required</td><td colspan="2">ID Reporting
<u>Coding</u> <u>Description</u> <u>Unit</u>

As required from the material list</td></tr>
<tr><td colspan="3">RECOMMENDED PROCEDURE</td></tr>
<tr><td colspan="3">Analyze problem and determine procedure for its correction.
Place appropriate traffic control devices and position flaggers as needed.
Perform repair as necessary.
Remove traffic control devices.</td></tr>
<tr><td>DATE OF ISSUE:</td><td colspan="2"></td></tr>
<tr><td>EFFECTIVE DATE:</td><td colspan="2">MAINTENANCE TECHNICAL COMMITTEE:</td></tr>
</table>

MAINTENANCE PERFORMANCE GUIDELINES

ACTIVITY Deck Repair and Maintenance | **NO. 2203**

DESCRIPTION AND PURPOSE

Repairing or replacing bridge decks, expansion joints, patching spalled areas, overlaying and repairing with other material as appropriate to restore the deck. Includes numbered timber bridges.

AUTHORIZATION AND SCHEDULING

This activity is routine type work and is authorized by the Maintenance Superintendent. Normally scheduled January through December.

CREW SIZE	**ACCOMPLISHMENT**
4	Unit of Measure: Man Hour Daily Productivity: 32 - Statewide 32 - Interstate

EQUIPMENT	**MATERIAL**		
1 Tandem Truck	ID Reporting		
1 Pickup	Coding	Description	Unit
Concrete Saw			
Concrete Vibrator	0301	Ready Mixed Concrete	Cu. Yard
Concrete Screed	0307	Quick Set Cement	Bag
Appropriate Traffic Control Device*	0611	Silica Sand	Bag
*As Required			

RECOMMENDED PROCEDURE

Determine work to be done.
Place appropriate traffic control devices, barricades and flaggers as needed.
Perform repair work as required. Clean up work area.
Remove traffic control devices and barricades.

DATE OF ISSUE:	
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Bridge Structural Repair		**NO. 2204**
DESCRIPTION AND PURPOSE		
Repairs to bridge structural elements such as pilings, piers, abutments, trusses, stringers and other substructure or superstructure elements to restore load capacity and prevent further deterioration.		
AUTHORIZATION AND SCHEDULING		
This activity is special type work and is authorized by the District Operations and Maintenance Manager. Normally scheduled January through December.		
CREW SIZE	**ACCOMPLISHMENT**	
4	Unit of Measure: Man Hour Daily Productivity: 32 - Statewide 32 Interstate	
EQUIPMENT	**MATERIAL**	
1 Pickup 1 Tandem Truck Appropriate Traffic Control Device* *As Required	ID Reporting Coding Description Unit As required from material list	
RECOMMENDED PROCEDURE		
Determine manpower, equipment and material requirements. Place appropriate traffic control devices and other safety devices as needed. Perform repair work. Clean up work area. Remove traffic control devices.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Other Deck Preservation Maintenance		**NO. 2220**
DESCRIPTION AND PURPOSE		
Bridge Maintenance activities that are not specifically chargeable to another activity such as flushing and sweeping.		
AUTHORIZATION AND SCHEDULING		
This activity is routine type work and is authorized by the Maintenance Superintendent. Normally scheduled January through December or as needed.		
CREW SIZE	**ACCOMPLISHMENT**	
3	Unit of Measure: Man Hour Daily Productivity: 24 - Statewide 24 – Interstate	
EQUIPMENT	**MATERIAL**	
1 Pickup 1 Dump Truck 1 Sweeper or Broom 1 Water Truck* Traffic Control Devices * *As Required	ID Reporting Coding / Description / Unit 0611 Silica Sand Bag	
RECOMMENDED PROCEDURE		
As Required		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Machine Mowing		**NO. 2301**
DESCRIPTION AND PURPOSE		
Mowing of roadside vegetation on shoulder medians, right-of-way areas, interchange islands, using tractor driven mowers to maintain appearance and control impediments to visibility and drainage. (Does not include mowing at rest areas or wayside areas.) Includes costs associated with contract mowing and leased mower tractors.		
AUTHORIZATION AND SCHEDULING		
This activity is routine work and is authorized by the Maintenance Supervisor. Refer to current guidelines for normal scheduling.		
CREW SIZE	**ACCOMPLISHMENT**	
1	Unit of Measure: Acre Daily Productivity: 20 - Statewide 25 – Interstate	
EQUIPMENT	**MATERIAL**	
1 Tractor/Mower 1 Pickup *As Required	ID Reporting Coding Description Unit No Materials Required	
RECOMMENDED PROCEDURE		
Prior to accomplishing this activity the operator must understand the current mowing policy. Refer to guidelines in Chapter 9 of this manual or as provided by the Roadside Development Section.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Hand Mowing		**NO. 2302**
DESCRIPTION AND PURPOSE		
Mowing and trimming of vegetation using hand tools, tractor mounted guardrail mowers and small power equipment in areas not accessible to tractor driven mowers. (Does not include mowing at rest or wayside areas.) Includes contract hand mowing.		
AUTHORIZATION AND SCHEDULING		
This activity is routine work and is authorized by the Maintenance Supervisor. Scheduled as per current mowing policy.		
CREW SIZE	**ACCOMPLISHMENT**	
2	Unit of Measure: Man Hour Daily Productivity: 16 - Statewide 16 – Interstate	
EQUIPMENT	**MATERIAL**	
1 Pickup 1 Mower* *As Required	ID Reporting Coding Description Unit No Materials Required	
RECOMMENDED PROCEDURE		
All normal safety precautions should be taken. Refer to guidelines in Chapter 9 of this manual, or as provided by the Roadside Development Section.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Chemical Control of Insects and Vegetation.		**NO. 2303**
DESCRIPTION AND PURPOSE		
Covers the control of insects, rodents and other animals through the use of pesticides and the application of herbicides to roadside vegetation and soil to eradicate undesirable growth or to control growth. Includes payments to Weed Control Districts.		
AUTHORIZATION AND SCHEDULING		
This activity is special work and is authorized by the Maintenance Superintendent.		
CREW SIZE	**ACCOMPLISHMENT**	
2	Unit of Measure: Man Hour Daily Productivity: 16 - Statewide 16 – Interstate	
EQUIPMENT	**MATERIAL**	
1 Tandem Truck 1 Weed Sprayer 1 Pickup 1 Tractor *As Required	ID Reporting Coding Description Unit No Materials Required	
RECOMMENDED PROCEDURE		
Equipment must be determined according to the job to be accomplished. Use of chemicals will conform to existing Department guidelines and the manufacturer's recommendations. Care must be taken to avoid drift which may result in the contamination of or damage to other areas. Restricted use chemicals must be applied by a licensed applicator. Refer to guidelines in Chapter 9 of this manual or as provided by the Roadside Development Section.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Care and Replacement of Desirable Roadside Trees and Shrubs		**NO. 2304**
DESCRIPTION AND PURPOSE		
Maintenance of all roadside landscaped areas, including trees, shrubs and plants by replanting or replacing, cultivating, removing, pruning, thinning, watering, spraying and planting. Does not include work performed at rest or wayside areas.		
AUTHORIZATION AND SCHEDULING		
This activity is routine type work and is authorized by Maintenance Superintendents. Normally scheduled April through August.		
CREW SIZE	**ACCOMPLISHMENT**	
3	Unit of Measure: Man Hour Daily Productivity: 24 - Statewide 24 – Interstate	
EQUIPMENT	**MATERIAL**	
1 Tandem Truck 1 Pickup 1 Basket Truck* 1 Chain Saw* 1 Chipper* *As Required	ID Reporting Coding Description Unit No Materials Required	
RECOMMENDED PROCEDURE		
Procedure will depend upon task to be performed. In the event any chemicals are utilized during the performance of this activity, their use will conform to Department guidelines and the Manufacturer's recommendations. Refer to guidelines in Chapter 9 of this manual or as provided by the Roadside Development Section.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Litter Pickup		**NO. 2311**
DESCRIPTION AND PURPOSE		
Cleaning of the right-of-way to include picking up, loading, hauling and disposing of accumulated litter and debris. Includes payments to governmental agencies and approved vendors for trash disposal facilities and specific expenses for the "Adopt a highway" program such i.e. highway signs and garbage expenses.		
AUTHORIZATION AND SCHEDULING		
This activity is routine type work and is authorized by the Maintenance Supervisor. This activity should be set up on a schedule based on seasonal usage. Emphasis on litter pickup should be given prior to mowing operations.		
CREW SIZE	**ACCOMPLISHMENT**	
2	Unit of Measure: Man Hour Daily Productivity: 16 - Statewide 16 – Interstate	
EQUIPMENT	**MATERIAL**	
1 Tandem Truck 1 Pickup *As Required	ID Reporting Coding Description Unit No Materials Required	
RECOMMENDED PROCEDURE		
One person starts litter pickup at the beginning of the assigned area. Second person drives ahead approximately 500 feet, leaves truck and starts litter pickup. When the first person reaches the vehicle, he empties his container in the truck and drives ahead a reasonable distance, leaves the vehicle and starts litter pickup.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Seeding and Sodding		**NO. 2315**
DESCRIPTION AND PURPOSE		
Seeding, sodding, mulching and fertilizing of shoulders, backslopes, medians and other areas to restore vegetation for erosion control and beautification.		
AUTHORIZATION AND SCHEDULING		
This activity is routine type work and is authorized by the Maintenance Superintendent. Normally schedule March through May and August through October.		
CREW SIZE	**ACCOMPLISHMENT**	
3	Unit of Measure: Acre Daily Productivity: 3 - Statewide 3 – Interstate	
EQUIPMENT	**MATERIAL**	
1 Tractor* 1 Pickup 1 Tandem Truck 1 Seed Drill* 1 Hay Buster* *As Required	ID Reporting Coding / Description / Unit 1011 Hay Ton 1012 Seed – Native Grass Acre	
RECOMMENDED PROCEDURE		
Work should be carried out according to Department guidelines or as directed by the Roadside Development Section.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Fence Repair		**NO. 2332**
DESCRIPTION AND PURPOSE		
Repairing and replacing fence along roadway and around “living” snow fence.		
AUTHORIZATION AND SCHEDULING		
This activity is routine work and is authorized by the Maintenance Supervisor. Normally scheduled January through December as required.		
CREW SIZE	**ACCOMPLISHMENT**	
3	Unit of Measure: Man Hour Daily Productivity: 24 - Statewide 24 – Interstate	
EQUIPMENT	**MATERIAL**	
1 One Ton Pickup *As Required	ID Reporting Coding / Description / Unit 0500 Wood Fence Post Each 0501 Steel Fence Post Each 0504 Chain Link Fence Feet 0505 Barbed Wire Feet 0506 Woven Wire Feet	
RECOMMENDED PROCEDURE		
Make an assessment of the job to be done. Repair fence so that its intended function is restored.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Other Roadside Maintenance		**NO. 2350**
DESCRIPTION AND PURPOSE		
Other roadside maintenance activities that are not specifically identified as separate activities. Includes activities such as : Repairing and Replacing Right-of-Way Markers		
AUTHORIZATION AND SCHEDULING		
This activity is routine work and is authorized by the Maintenance Supervisor. Normally scheduled January through December.		
CREW SIZE	**ACCOMPLISHMENT**	
2	Unit of Measure: Man Hour Daily Productivity: 16 - Statewide 16 – Interstate	
EQUIPMENT	**MATERIAL**	
1 Pickup 1 Tandem Truck 1 Skidsteer loader *As Required	ID Reporting Coding / Description / Unit 0212 Recycled Asphalt Ton 0702 Steel Sign Post Each	
RECOMMENDED PROCEDURE		
As required.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES

ACTIVITY Sign Repair or Replacement | **NO. 2401**

DESCRIPTION AND PURPOSE

Routine repair, resetting, and replacement of traffic signs, directional markers, reference posts, delineators, guide posts and load restriction signs to insure the preservation of reflectivity and legibility for the safety of the motorist. Includes erecting new signs and cleaning of signs.

AUTHORIZATION AND SCHEDULING

This activity is routine type work and is authorized by the maintenance Supervisor. Normally scheduled January through December.

CREW SIZE	**ACCOMPLISHMENT**
2	Unit of Measure: Man Hour Daily Productivity: 16 - Statewide 16 – Interstate

EQUIPMENT	**MATERIAL**		
1 Sign Truck 1 Pickup 1 Basket Truck* *As Required	ID Reporting Coding	Description	Unit
	0702	Sign Post–Steel	Each
	0706	Sign Post–Wood	Each
	0713	Sign Post–Eze Erect	Each
	0717	Safe–Hit Delineator	Each

RECOMMENDED PROCEDURE

Observe all safety requirements.
Repair or replace as required.
Damaged signs or posts replaced due to vandalism will be reported on crew cards to Material ID 07991 or 07992.

DATE OF ISSUE:	
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Repair of Overhead Signs		**NO. 2402**
DESCRIPTION AND PURPOSE		
Repair of all overhead signs to preserve the reflectivity and legibility for safety of the motorist to include all power costs for sign luminaries.		
AUTHORIZATION AND SCHEDULING		
This activity is routine type work and is authorized by the Maintenance Superintendent. Normally scheduled January through December.		
CREW SIZE	**ACCOMPLISHMENT**	
4	Unit of Measure: Man Hour Daily Productivity: 32 - Statewide 32 – Interstate	
EQUIPMENT	**MATERIAL**	
1 Truck with Aerial Lift 1 Pickup* *As Required	ID Reporting Coding Description Unit 0708 Ballast Each 0709 Beam–Aluminum H Each	
RECOMMENDED PROCEDURE		
Observe all safety requirements. Repair or replace as required.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Portable Striping Operation		**NO. 2407**
DESCRIPTION AND PURPOSE		
Painting and repainting centerline, edge line and lane lines to restore adequate traffic control. This activity is usually performed with a portable striper on small sections of highway.		
AUTHORIZATION AND SCHEDULING		
This activity is special type work and is authorized by the District Operations and Maintenance Manager. Normally scheduled January through December as weather permits.		
CREW SIZE	**ACCOMPLISHMENT**	
2	Unit of Measure: Man Hour Daily Productivity: 16 - Statewide 16 – Interstate	
EQUIPMENT	**MATERIAL**	
1 Pickup 1 Portable Striper *As Required	ID Reporting Coding / Description / Unit 0606 Paint–Traffic White Drum 0608 Paint–Traffic Yellow Drum 0609 Beads–Paint Bag	
RECOMMENDED PROCEDURE		
Temperature limitations should be observed. Prepare portable striper as needed. Mark as necessary.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES

ACTIVITY Centerline and Edgeline Striping		**NO. 2408**

DESCRIPTION AND PURPOSE

Painting and repainting centerline and/or edgeline stripe including no passing zones to restore adequate traffic control.

AUTHORIZATION AND SCHEDULING

This activity is special type work and is authorized by the District Operations and Maintenance Manager in accordance with Striping Policy provided by Traffic Engineering Division. Normally scheduled April through December as weather permits.

CREW SIZE	**ACCOMPLISHMENT**
5	Unit of Measure: Lane Mile Daily Productivity: 40 - Statewide 40 – Interstate

EQUIPMENT	**MATERIAL**		
1 Striper Truck 2 Pickup 1 Truck-Tractor 1 Truck mounted Attenuator *As Required	ID Reporting Coding 0606 0608 0609	Description Paint–Traffic White Paint–Traffic Yellow Beads–Paint	Unit Drum Drum Bag

RECOMMENDED PROCEDURE

Prepare striper, load with paint

Painting operation to proceed with sequential arrow in operation.

DATE OF ISSUE:	
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Other Pavement Markings		**NO. 2410**
DESCRIPTION AND PURPOSE		
Install pavement messages, direction markers, gore areas, crosswalks, railroad crossings, curbs and traffic islands to provide well-defined markings for vehicular and pedestrian control. To include installation of thermoplastic markings and airplane markings.		
AUTHORIZATION AND SCHEDULING		
This activity is routine type work and is authorized by the Maintenance Superintendent. Normally scheduled May through September.		
CREW SIZE	**ACCOMPLISHMENT**	
3	Unit of Measure: Man Hour Daily Productivity: 24 - Statewide 24 – Interstate	
EQUIPMENT	**MATERIAL**	
1 Pickup 1 Striper Truck* *As Required	ID Reporting Coding Description Unit 0606* Paint–Traffic White Drum 0608 * Paint–Traffic Yellow Drum 0609* Beads–Paint Bag 0617 Pavement Markers–Specific Ea 0618 Primer Can 0620 White Latex Paint Gallon	
RECOMMENDED PROCEDURE		
Place appropriate traffic control devices as needed. Temperature limitations for marking should be observed. Surface should be cleaned well for installations by brooming if necessary. Complete marking or pavement marking removal operation. Remove traffic control devices.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Guardrail Maintenance		**NO. 2421**
DESCRIPTION AND PURPOSE		
Repairing and replacing all types of guardrails, steel beam or cable, including the support posts to restore safe driving conditions. Does not include accident damage included in Activity 2602.		
AUTHORIZATION AND SCHEDULING		
This activity is routine type work and is authorized by the Maintenance Supervisor. Normally scheduled January through December.		
CREW SIZE	**ACCOMPLISHMENT**	
3	Unit of Measure: Man Hour Daily Productivity: 24 - Statewide 24 – Interstate	
EQUIPMENT	**MATERIAL**	
1 Tandem Truck 1 Pickup 1 Loader* *As Required	ID Reporting Coding / Description / Unit 0212 Recycle Asphalt Ton 0909 Guardrail Each 0910 Rail Block Each 0911 Rail Post Each 0912 Post–Guardrail Cable Each 0913 Guardrail Cable Feet	
RECOMMENDED PROCEDURE		
Assess job and load necessary materials. Place appropriate traffic control devices as needed. Remove bad sections and replace or align posts. Install hardware. If excess dirt exists, dispose by smoothing it on shoulder or on right-of-way. Paint posts if necessary and replace delineators if needed. Remove traffic control devices.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Maintenance of Crash Control Barriers		**NO. 2422**
DESCRIPTION AND PURPOSE		
Placing and replacing, filling, painting and other maintenance necessary to establish or restore crash control barriers at designated sites.		
AUTHORIZATION AND SCHEDULING		
This activity is routine type work of an emergency nature to be completed as soon as possible and is authorized by the Maintenance Supervisor. Normally scheduled January through December as required.		
CREW SIZE	**ACCOMPLISHMENT**	
3	Unit of Measure: Man Hour Daily Productivity: 24 - Statewide 24 – Interstate	
EQUIPMENT	**MATERIAL**	
1 Pickup *As Required	ID Reporting Coding Description Unit 0922* Crash Barrels and/or Liners Each	
RECOMMENDED PROCEDURE		
Place appropriate traffic control devices as needed. Restore barrels to original condition. Position barrels to original position. Remove traffic control devices.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Other Traffic Operations		**NO. 2450**
DESCRIPTION AND PURPOSE		
Other traffic operation activities that are not specifically identified as separate activities. Includes activities such as: Rumble strip maintenance, erecting special signs and barricades, flagging operations, historical markers, glare screens, jersey barriers.		
AUTHORIZATION AND SCHEDULING		
This activity is special type work and is authorized by District Operations and Maintenance Manager. Normally scheduled January through December.		
CREW SIZE	**ACCOMPLISHMENT**	
3	Unit of Measure: Man Hour Daily Productivity: 24 - Statewide 24 – Interstate	
EQUIPMENT	**MATERIAL**	
1 One Ton Pickup *As Required	ID Reporting Coding Description Unit As Required from the Material List	
RECOMMENDED PROCEDURE		
As Required.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Erecting and Removing Snow Fence		**NO. 2501**
DESCRIPTION AND PURPOSE		
Erecting, maintaining and removing snow fence, which aids snow removal operations, including all damage payments as a result of this operation. This activity also includes planting, replacing and caring for "living" snow fence.		
AUTHORIZATION AND SCHEDULING		
This activity is routine type work and is authorize by the Maintenance Superintendent. State Statutes provide that snow fence may not be erected on private property before October 15 and shall be removed before April 1, unless consent is obtained from the landowner.		
CREW SIZE	**ACCOMPLISHMENT**	
4	Unit of Measure: Man Hour Daily Productivity: 32 - Statewide 32 – Interstate	
EQUIPMENT	**MATERIAL**	
1 One Ton Pickup 1 Post Driver* 1 Pickup 1 Tandem Truck/Trailer *As Required	ID Reporting Coding / Description / Unit 0501 Steel Fence Post Each 0510 Snow Fence Roll	
RECOMMENDED PROCEDURE		
Erecting Fence Select sites and make necessary arrangements with landowner. When erecting fence, care should be taken to avoid unnecessary crop damage. Set posts at approximately 16 foot intervals and stretch snow fence. Removing Fence Make necessary arrangements with landowner. When removing fence, care should be taken to avoid unnecessary crop damage. Remove fence and posts. Pick up all tie wire and any broken fence laths.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Brush Cutting		**NO. 2505**
DESCRIPTION AND PURPOSE		
Removal of unsightly, hazardous, undesirable growth from the roadway system. To include chemical applications to aid brush control.		
AUTHORIZATION AND SCHEDULING		
This activity is routine type work and is authorized by the Maintenance Supervisor.		
CREW SIZE	**ACCOMPLISHMENT**	
3	Unit of Measure: Man Hour Daily Productivity: 24 - Statewide 24 – Interstate	
EQUIPMENT	**MATERIAL**	
1 One Ton Pickup 1 Chain Saw* 1 Pickup* 1 Brush Chipper* 1 Tandem Dump Truck* 1 Skidsteer loader *As Required	ID Reporting Coding Description Unit No Materials Required	
RECOMMENDED PROCEDURE		
Dependent upon job to be undertaken. Observe all safety precautions. Use of chemicals will conform to existing Department policies and the Manufacturer's recommendations. Refer to guidelines in Chapter 9 of this manual or as directed by Roadside Development.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Joint and Crack Filling		**NO. 2510**
DESCRIPTION AND PURPOSE		
Cleaning and filling open joints and cracks in the surface with sealant to prevent entry of moisture and debris.		
AUTHORIZATION AND SCHEDULING		
This activity is routine type work and is authorized by the Maintenance Superintendent. Fill joints only when joint filler is broken, brittle or missing and allow dirt and water to enter. Considerable advantage can be obtained by sealing in fall or spring when pavements are about halfway between maximum and minimum expansion. Normally scheduled January through December.		
CREW SIZE	**ACCOMPLISHMENT**	
6	Unit of Measure: Feet Daily Productivity: 3800 - Statewide 3800 – Interstate	
EQUIPMENT	**MATERIAL**	
1 Pickup 1 One Ton Pickup 1 Tandem Truck 1 Air Compressor 1 Router or Heat Lance appropriate traffic Control Device* 1 Asphalt Heater *As Required	ID Reporting Coding Description Unit 0404 Rubber Asphalt Joint Seal Box	
RECOMMENDED PROCEDURE		
Place appropriate traffic control devices and position flaggers as needed. Rout cracks ¼ inch or greater or use heat lance. Clean cracks with air compressor. Apply rubber asphalt sealant heated to proper temperature as suggested by manufacturer. Fill cracks to within ¼ inch of surface to allow for expansion and to decrease the tracking. Remove traffic control devices.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES

ACTIVITY Snow Plowing and Spreading of Winter Chemicals and Sand. | **NO. 2511**

DESCRIPTION AND PURPOSE

Removing snow and ice from the roadway surface, shoulders and bridges according to Department policy. (Refer to Chapter 8.) Does not include loading and hauling of snow. Includes payments to contractors.

AUTHORIZATION AND SCHEDULING

This activity is routine type work and is authorized by the Maintenance Supervisor in accordance with established policy. Equipment should be ready for this activity October through march. Schedule dictated by snowfall.

CREW SIZE

5

ACCOMPLISHMENT

Unit of Measure: Man hour
Daily Productivity: 40 - Statewide
40 – Interstate

EQUIPMENT

1 Motor Grader
1 Truck AWD w/Snow Plow*
1 Pickup
1 One Ton Pickup
1 Loader
4 Tandems

*As Required

MATERIAL

ID Reporting

Coding	Description	Unit
0201	Gravel	Ton
0204	Sand	Ton
0211	Slag	Ton
0820	Salt	Ton
0821	Calcium Chloride–Flake	Bag
0822	Calcium Chloride–Liquid	Gallon
0823	Magnesium Chloride	Gallon
0824	Iceban 50	Gallon

RECOMMENDED PROCEDURE

To be determined by the Supervisor as dictated by the intensity of the storm and the amount of snow and ice.

Refer to guidelines in Chapter 8 of this manual.

DATE OF ISSUE:

EFFECTIVE DATE:

MAINTENANCE TECHNICAL COMMITTEE:

<table>
<tr><th colspan="3">MAINTENANCE PERFORMANCE GUIDELINES</th></tr>
<tr><td colspan="2">ACTIVITY Loading and Hauling of Snow</td><td>NO. 2514</td></tr>
<tr><td colspan="3">DESCRIPTION AND PURPOSE</td></tr>
<tr><td colspan="3">Loading and hauling of snow as required.</td></tr>
<tr><td colspan="3">AUTHORIZATION AND SCHEDULING</td></tr>
<tr><td colspan="3">This activity is special type work and is authorized by the Maintenance Superintendent. Scheduled when snowfall dictates.</td></tr>
<tr><td>CREW SIZE</td><td colspan="2">ACCOMPLISHMENT</td></tr>
<tr><td>3</td><td colspan="2">Unit of Measure: Man hour
Daily Productivity: 24 - Statewide
24 – Interstate</td></tr>
<tr><td>EQUIPMENT</td><td colspan="2">MATERIAL</td></tr>
<tr><td>1 Loader
1 Tandem Truck
1 Pickup*

*As Required</td><td colspan="2">ID Reporting
Coding Description Unit

No Materials Required</td></tr>
<tr><td colspan="3">RECOMMENDED PROCEDURE</td></tr>
<tr><td colspan="3">Position traffic control devices and flaggers as needed.
Load snow into trucks, haul snow to dump site.
Remove traffic control devices.</td></tr>
<tr><td>DATE OF ISSUE:</td><td colspan="2"></td></tr>
<tr><td>EFFECTIVE DATE:</td><td colspan="2">MAINTENANCE TECHNICAL COMMITTEE:</td></tr>
</table>

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Stockpiling/Mixing Chemicals & Sand for Winter Operations.		**NO. 2521**
DESCRIPTION AND PURPOSE		
Stockpiling chemical and sand at loading sites for winter operations. Includes mixing, loading and unloading of chemicals and also the costs of the chemicals. Includes calcium chloride, but not aggregate.		
AUTHORIZATION AND SCHEDULING		
This activity is routine type work and is authorized by the Maintenance Superintendent. Normally scheduled September through March.		
CREW SIZE	**ACCOMPLISHMENT**	
2	Unit of Measure: Man hour Daily Productivity: 16 - Statewide 16 – Interstate	
EQUIPMENT	**MATERIAL**	
1 Tandem Truck 1 Loader *As Required	ID Reporting Coding Description Unit Use Only I.D.s beginning with “8” on Activity 2521 Crew Cards.	
RECOMMENDED PROCEDURE		
Determine quantities to be mixed and stockpiled. Mix in the most appropriate manner.		
DATE OF ISSUE:		
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Repairing Storm Damage		**NO. 2601**
DESCRIPTION AND PURPOSE		
Removing and cleaning up debris due to storms and floods, repairing the roadway and roadside, repairing and replacing bridges, repairing and replacing signs knocked down due to storms, plus any other work necessary for public protection resulting from a storm or other natural disaster.		
AUTHORIZATION AND SCHEDULING		
This activity is routine type work and is authorized by the Maintenance Superintendent. Due to emergency nature, this work is scheduled as necessary January through December.		
CREW SIZE	**ACCOMPLISHMENT**	
4	Unit of Measure: Man hour Daily Productivity: 32 - Statewide 32 – Interstate	
EQUIPMENT	**MATERIAL**	
1 Pickup 1 Tandem Truck 1 One Ton Pickup 1 Loader 1 Gradall or Backhoe* 1 Motor Grader* 1 Sign Truck* *As Required	ID Reporting Coding Description Unit As required from Material List	
RECOMMENDED PROCEDURE		
As Required.		
DATE OF ISSUE:	**MAINTENANCE ENGINEER:**	
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Repairing Accident Damage		**NO. 2602**
DESCRIPTION AND PURPOSE		
Removing and cleaning up debris, plus all other work required in the repair of all damages to a road system resulting from an accident.		
AUTHORIZATION AND SCHEDULING		
This activity is special type work and is authorized by the Maintenance Supervisor. Scheduled as required January through December.		
CREW SIZE	**ACCOMPLISHMENT**	
3	Unit of Measure: Man hour Daily Productivity: 24 - Statewide 24 – Interstate	
EQUIPMENT	**MATERIAL**	
1 Pickup 1 Tandem Truck 1 Loader appropriate traffic Control Device* 1 Sign Truck* *As Required	ID Reporting Coding Description Unit As required from Material List	
RECOMMENDED PROCEDURE		
Place appropriate traffic control devices as needed. Perform repair to accident damage area. Remove all debris and clean up work area. Remove traffic control devices. Maintenance Supervisor to complete necessary reports on damage and submit to Risk Manager.		
DATE OF ISSUE:	**MAINTENANCE ENGINEER:**	
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

MAINTENANCE PERFORMANCE GUIDELINES		
ACTIVITY Correct Vandalism of Roadside Features		**NO. 2603**
DESCRIPTION AND PURPOSE		
Any activity needed to correct damage caused by vandalism to the roadway and roadside features. The includes, but is not limited to, removal of graffiti on bridges, highways, signs and sound walls; clean-up debris left by vandals at roadside areas; replacement of signs and posts.		
AUTHORIZATION AND SCHEDULING		
This activity is special type work and is authorized by the Maintenance Supervisor. Scheduled as required year-round.		
CREW SIZE	**ACCOMPLISHMENT**	
2	Unit of Measure: Man hour Daily Productivity: 16 - Statewide 16 – Interstate	
EQUIPMENT	**MATERIAL**	
1 Sign Truck* 1 Tandem* 1 Pickup 1 One Ton Pickup appropriate traffic Control Device* *As Required	ID Reporting Coding Description Unit As required from Material List	
RECOMMENDED PROCEDURE		
Place appropriate traffic control devices as needed. Perform repair to damaged area. Remove all debris and clean up work area. Remove traffic control devices. Maintenance Supervisor to complete necessary reports on damage and submit to Maintenance Division.		
DATE OF ISSUE:	**MAINTENANCE ENGINEER:**	
EFFECTIVE DATE:	**MAINTENANCE TECHNICAL COMMITTEE:**	

CHAPTER 5 CREW CARDS

5.1 GENERAL

Crew cards are online records that are used to record the employee time and equipment necessary to accomplish an activity on a specific segment. Each crew card represents one crew day in performing a maintenance activity.

5.2 REPORTING

C1
Enter your userid/password
Select 8 (IHI) on the menu screen

NOTE: If you do not see a selection 8 on your menu, you do not have the authority needed to accomplish this task. You must have your District Administrative Assistant complete the necessary BTSD form to get authorization.

Select 12 (MMS) on the menu screen
Select 1 (Maintenance) on the menu screen
Select 5 (Crew Card Data Entry) on the menu screen

Enter an ACTIVITY number and hit enter. This will pull in the headings and unit of accomplishment that is currently on the Maintenance Standards file. The system assumes you are going to "add" a crew card. You can see the function type in the upper left corner – second line (A).

(1) ACTIVITY
- A. Must be valid 4 digit crew card activity.
  NOTE: If the activity is invalid, you will see the message ACTIVITY NOT IN FILE on the message line above the PF1 HELP key.
- B. Once you type/enter an Activity code, that field is locked. You cannot change it. If you need the Activity to be a different value, you should F3 to exit and start again or delete the card, if it was added and start from scratch.

(2) SUPERVISOR NO.
- A. A three digit number identifying the Supervisor performing the activity. This number will also assist in locating data in various automated files in support of needs by Maintenance Supervisors.
- B. If you incorrectly type the Supervisor number, the system doesn't know if it's yours to use as there isn't an edit between the user-id logged on and this number. Quickly just "eye" it before you hit enter. If it's wrong, it will appear as the Supervisor you entered and not yours.
  NOTE: If the Supervisor Number is invalid, you will see the message INVALID SUPERVISOR NO. in the message line.

(3) CARD NUMBER
- A. This number is assigned by the system UNLESS you are going to query or update.

(4) WORK ACCOMPLISHMENT
- A. Must be entered – will not default to zero but entering a 0 is okay.
  NOTE: If not entered, you will see the message WORK ACCOMPLISHMENT IS REQUIRED in the message line.
- B. Must be numeric.

C. This field has 1 decimal position.
D. Since this field has a decimal position, if you want the value to end in something other than .0, you must enter it that way.
E. If you have to use more than one crew card for a specific task because there aren't enough lines to allow the employees or equipment used, do not duplicate the work accomplishment. Either put half on one and the other half on the second card, or just put all of it on one card and zero on the second card.

NOTE: If the unit of accomplishment is MAN HOURS such as in sign repair, once you have completed your card information and hit enter, the value you type in the WORK ACCOMPLISHMENT field is automatically set to the total of all employee HOURS WORKED. If the unit of accomplishment is TON or CUBIC YARD for surface maintenance, please make sure you enter what was used - rounded to one decimal position. For example, 24.56 would be entered as 24.6; 24.12 would be entered as 24.1.

(5) ACTIVITY DESCRIPTION

A. Not an input field.
B. The Maintenance Standards file is the source for populating this field.

NOTE: If you notice this is not the correct activity, please use PF3 to exit and start again.

(6) OE CODE

A. Value entered must be 6x3 where x = 1 through 8 and is normally your District #.

NOTE: If the OE entered is not valid, the message will read INVALID OE.

B. Value should be "where" you worked not where you are assigned. For instance, if you are helping out another District (3), use your supervisor number (IE 811), but the OE 633. Your PDS entry with activity 2000 should also contain the "District" number you were working within. Three for this example.

(7) WORK ID

A. Must be valid according to the activity requirements. The field headings will be displayed for the requirements. For example, if the activity requires a District number, you won't have highway / reference post(s). Tab over the fields you don't need.
    1. Highway
        i. Must be a valid highway on the state system.

NOTE: If not, you will see the message INVALID HWY NUMBER.

        ii. If the highway number is numeric, you need enter only the value (7, 12, 20, 137, 183, etc).
        iii. If the highway number is alphanumeric, you need to enter the value as 4 digits (S09A, L55W, etc.).
    2. Reference Posts
        i. Must be valid reference point(s).

NOTE: If not, you will see the message BEGINNING REFERENCE POST INVALID or END REFERENCE POST INVALID.

        ii. You do not need to enter the decimal point. Reference posts must be whole numbers. DO NOT PUT IN REF POSTS WITH A DECIMAL NOT EQUAL TO .00 AND DO NOT ENTER AN "END" POST EQUAL TO THE BEGIN POST. If you worked within a mile, you need only report the "start" post.
    3. District Number
        i. Must be 1 through 8

ii. May be followed by I to represent interstate work if the District is 1 through 6.
iii. Must equal the second digit of OE.
NOTE: If it doesn't, you will see the message OE MUST MATCH DISTRICT and the cursor will be placed on OE. Either fix OE or tab to DISTRICT NUMBER and fix it.

4. Bridge Number
i. Must be a valid "on system" bridge.
NOTE: If not, you will see the message BRIDGE REF POST INVALID.
ii. You must enter the decimal. Examples: 0.17, 21.01, 136.75.

NOTES:
1. Some activities could be either bridge or reference point. The headings for these fields will be on the screen, but you only need enter the appropriate number.
2. The edit will not check to see if the highway location is in your area or District. It is only checked for validity.

(8) AFE/SITE
A. Use this field to report the premix site number with Activity 2020 only.
B. Use AFE when applicable with any of the activities as directed by your District.

(9) WORK ACCOMPLISH DATE
A. Month
1. Must be a valid month – values 01 through 12.
B. Day
2. Must be valid day – values 1 through 31.
C. There is no edit to make sure your date is correct. You might want to quickly just "eye" that to make sure it is correct.

(10) EMPLOYEE NAME
A. Use the last name of the employee in this column. If you have 2 employees with the same last name, use the employee's first name initial to distinguish between employees.
B. Must have at least "1" employee on a crew card. If you are adding a crew card to correct a previous card, you may use the name NO ONE. For instance, if you forgot to include a unit of equipment and the card has been processed, you may use the same activity and 'work id' requirements as the processed crew card (but do not duplicate the accomplishments), put the name NO ONE, record 1 crew hour and report the equipment number and usage data that was omitted from the first card.

(11) HOURS WORKED
A. Must have at least one (1) crew hour reported on a crew card. This area does not allow decimal positions for employee hours. If you want them on your copy, put them in the NAME field. For instance, in the name field, you could type LASTNAME 5.5 and put either a 5 or 6 under HOURS WORKED.
B. Employee hours must be less than 25.
C. Overtime hours on the crew card are not distinguished from regular hours.
D. The employee's name does not relate to the equipment listed on the same line.

(12) EQUIPMENT NUMBER

A. Must be a valid equipment number.
NOTE: If not, you will see the message EQUIPMENT # INVALID.
a. There is no edit to make sure the equipment unit is from your area (owned or borrowed). If the number is a good one, the record stands.

(13) MILES/HOURS

A. If an equipment number is entered, the miles or hours must be greater than 0.
NOTE: If not, you will see EQUIPMENT # REQUIRES EQP HOURS/MILES.
B. If the equipment number begins with a 4 or 5 the miles must be equal to or less than 750.
NOTE: If not, you will see MILES/HOURS MUST BE LESS THAN 750.
C. If the equipment number does not begin with a 4 or 5 the hours cannot exceed 24.
NOTE: If not, you will see MILES/HOURS MUST BE LESS THAN 25.
D. If the equipment number begins with a 2, report actual dedicated hours to the activity not miles driven. IE: If the crew is out working for 8 hours and they use a truck (2) for 8 hours, you will show 8 in the MILES/HOURS column. If they only work for 4 hours on a specific activity with a truck, then show 4 in the MILES/HOURS column.

(14) METER HRS

A. This field is required based on the edit switch in EAMs data base. If the unit has an engine meter, then the switch is Y for yes. If not entered, you will see METER HOURS REQUIRED FOR EQUIP #.
B. This field requires a decimal point.
C. This field has one position after the decimal. If not entered, it defaults to ".0"
D. The field cannot be greater than 25.0 as it's the engine hours not the engine meter reading.
E. If the meter is broken, estimate the hours of actual usage.

(15) EQUIPMENT DESCRIPTION

A. This field is auto populated once you have hit enter based on the equipment # in column (12).

(16) ENTER NOTES BELOW

A. This section can be used for making notes. Nothing in this area is used by Controller. Use it for recording any information for your own records. IE: If you still want to keep track of materials used that day on that activity, go ahead and put the quantities in this area.

When all the data is typed, hit the ENTER key.

If there are no errors, the screen will become blank and you will see the message ADD COMPLETE.

If there are errors, the error notes mentioned in each section above will appear at the bottom of the screen and the cursor is usually placed at the field most likely to be wrong. Correct any errors and hit the ENTER key.

You may now use the PF5 key to refresh the screen (even though it is blank) and enter another Activity to start a new card or PF3 or PF12 to exit this screen.

ADDITIONAL NOTES:

1. Use the TAB key to skip over to fields rather than arrow keys. This way you are assured of being on the right line. For instance, you enter Activity 2004 which requires a highway and reference post. For this example, we will use Highway 20 (Reference Post 243). When you enter a 20 under highway number, use the TAB key so the program puts the cursor under the correct place to enter the 243. If you don't need an end reference post, use the TAB key to get your cursor to the next field. After you have entered everything you need to, the program will fill in the zeros as needed.

2. If you enter the card data and it has been processed (stored), then you realize you have the wrong activity number, the best way to correct this is to delete the card and re-enter a new one with the correct data.

3. All crew cards ***MUST*** be entered by the first Friday following the end of the pay period (the previous Sunday). Controller will then submit a job to process the crew cards for that pay period. What happens is that all card entries within that date range will be de-activated from the online table to go through our current edit and cost processes. You will not be able to "update" or "delete" records once they have been de-activated. If you find you have made an error on a crew card that has been de-activated, you may make a new crew card for the information that needs to be added or corrected on the crew card. Controller will then make sure this crew card information gets processed within the proper pay period; or you may email Stefanie Rauner in Controller or phone #402-479-4836 and she can make the necessary changes for you.

QUERY OPTION

C1
Enter your userid/password
Select 8 (IHI) on the menu screen
Select 12 (MMS) on the menu screen
Select 2 (QUERY) on the menu screen
Select 7 (CREW CARD QUERY SELECTION) on the menu screen

The CREW CARD SELECTION QUERY screen allows you to enter one or more of the following fields:
- Supervisor Number
- Crew Card #
- Activity Code
- Beginning and/or End Date

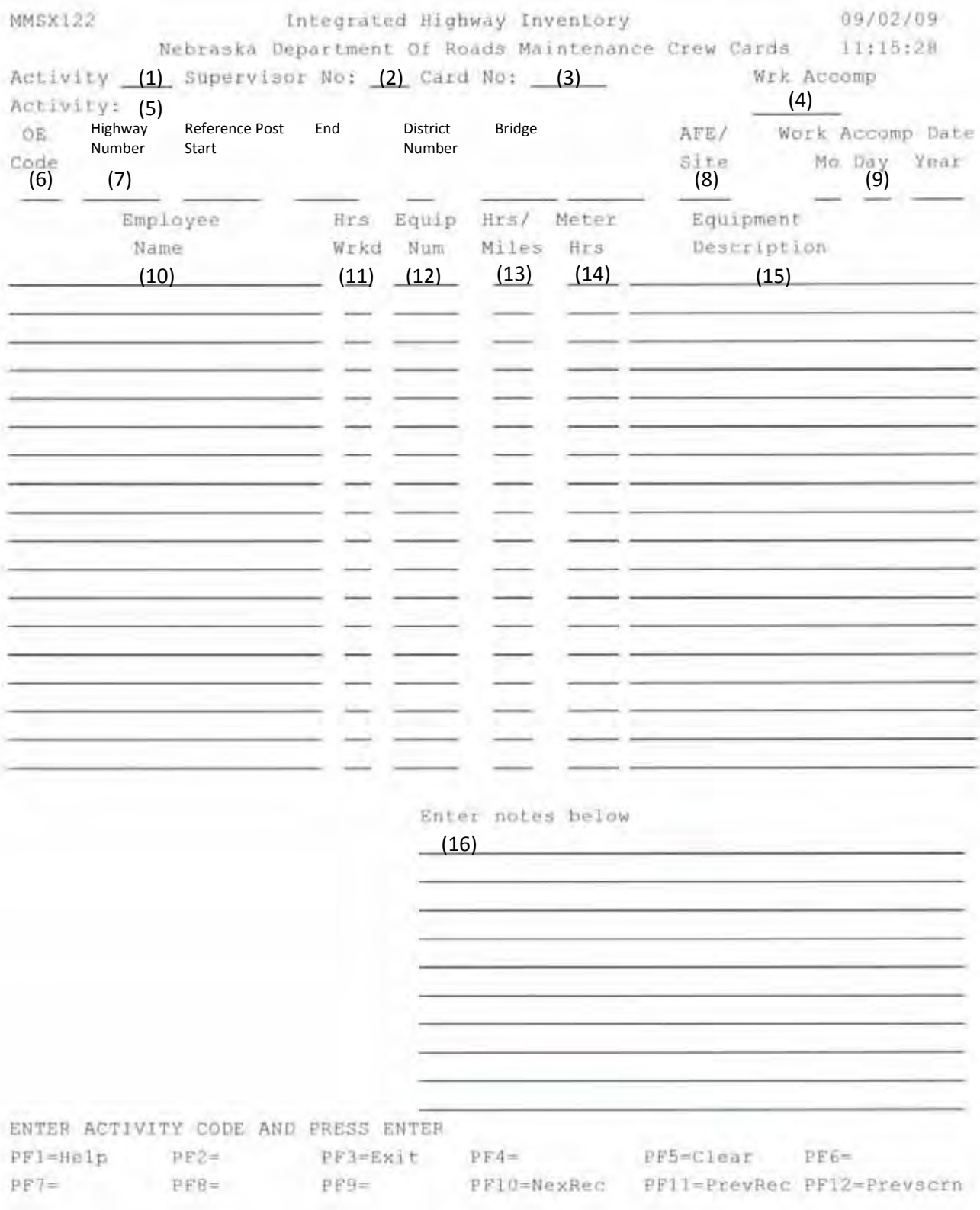
For instance, if you want to see all the crew cards that have been completed for Supervisor 811 with an Activity 2026, all you have to do is type in those 2 field values and hit enter to see a list of all the crew cards that fit your request. You may then TAB down the left side, type something (anything) under the SEL (selection code field) column, hit enter and you see the actual crew card. If you don't enter at least the Beginning Date, the system lists all the cards from the beginning which is October 2003.

A good rule of thumb is, when you think you have all your cards in for the week or pay period, do this query using your Supervisor # and Beginning Date only. Then you can scan the list to see if they all look like they are in. This also allows you to make sure there are no dates in the future.

You may also query using selection number 8 instead of 7, but this query is based on you knowing the crew card number. You must enter the supervisor number and a numeric value in the crew card # field. You cannot leave it blank like in the entry screen. You must type a value. If you use 1 and hit enter, the program will pull up the first crew card for that supervisor with a crew card number equal to/greater than 1. You may then F10 key to forward through. Keep in mind, if you start at card # 1 in this query, you will be paging forward from October 2003.

You then can use the PrntScreen key to print a copy – IF you want to. There are no business rules regarding this issue. Print a copy or not – that's totally up to you.

8-22-2003 / jam
9-14-2008/skh revised


MMSX122
Integrated Highway Inventory
09/02/09
Nebraska Department Of Roads Maintenance Crew Cards
11:15:28
Activity (1) Supervisor No: (2) Card No: (3)
Wrk Accomp
(4)
Activity: (5)
OE Code
Highway Number
Reference Post Start
End
District Number
Bridge
AFE/ Site
Work Accomp Date
Mo Day Year
(6)
(7)
(8)
(9)
Employee Name
Hrs Wrkd
Equip Num
Hrs/ Miles
Meter Hrs
Equipment Description
(10)
(11)
(12)
(13)
(14)
(15)
Enter notes below
(16)
ENTER ACTIVITY CODE AND PRESS ENTER
PF1=Help
PF2=
PF3=Exit
PF4=
PF5=Clear
PF6=
PF7=
PF8=
PF9=
PF10=NexRec
PF11=PrevRec
PF12=Prevscrn

5.3 NON-CREW CARD ACTIVITIES

5.3.1 Refer to Section 3.5 for activities that will not be reported on the crew cards, but reported in PDS.

5.3.2 In the event that an activity is performed by maintenance personnel outside of the highway maintenance function (the 2000 series), established reporting procedures are to be followed. Additionally, all leaves and compensatory time off are to be reported according to current procedures for PDS.

5.4 PERSONNEL WORKING OUTSIDE THEIR ASSIGNED HEADQUARTER

There are situations where personnel from the Central Headquarters or District perform work in another District.

Utilization of personnel performing work in another District should be coordinated through the District Engineer or designee.

Special procedures must be followed to assure accountability for all hours worked. The receiving District will report hours worked and equipment used on the crew card. The loaning District or Division will report the hours worked in PDS as activity 2000 with the receiving District #.

5.5 SUBMITTAL

Crew cards must be entered and submitted daily.

CHAPTER 6 MATERIALS

6.1 MATERIAL REQUIREMENTS

Materials are required for the majority of maintenance work. Performance Guidelines identify types of materials normally used while performing this work.

6.2 MATERIAL ACQUISITION

District offices should plan for the acquisition of materials well in advance of their actual need. Use the appropriate cost coding requirements as specified in the Department's Accounting Manual. Add Procurement DOR-OI reference.

6.2.1 Order/Payment Form

Material requisitions by the District are to be submitted on DR Form 225, Order/Payment Form, in accordance with the propriety of purchase outlined in the Department's Accounting Manual.

6.2.2 Stocked Material

Material requisitions by the Districts for stocked materials should follow procedures as established by the Operations Division.

6.2.3 Material Transfers Between Districts

A message containing the following information shall be sent to the e-mail group “DOR Controller Materials”

6.2.4 Construction Materials

6.2.4.1 Asphaltic Concrete for State Maintenance

When Maintenance uses Asphalt from the plant set up for a construction project, Controller Division must be notified. A message containing the following information shall be sent to the e-mail group

“DOR Controller Materials”:

- Supervisor number
- Project number
- Date
- Qty
- Activity
- Location of use

6.2.4.2 Delivered Not Incorporated

When materials are delivered to a construction site but not incorporated into the project, sometimes the Department opts for ownership. A project change order is completed for these types of transactions. When these materials are taken to the maintenance yard, the Controller Division must be notified. A message containing the following information shall be sent to the e-mail group "DOR Controller Materials":

Supervisor number
Project number
Date
Material Description
Qty
Price (as provided by Project Manager)

6.3 SIGNS AND OTHER MATERIALS

Request for fabrication of signs will be charged directly to a specific maintenance activity. All requests for sign fabrication will be submitted to the Lincoln Sign Shop on DR Form 124, Shop Work Order. Reference Chapter 4 of the Department Accounting Manual.

6.4 SELLING OF MAINTENANCE MATERIALS IN EXCESS OF NEEDS MATERIALS

The Department of Roads has the express authority under Neb. Rev. Stat. Section 39-1357 to sell to other government entities asphalt millings and other materials when they are not presently needed by the Department to carry on its work.

When the Maintenance Supervisor is contacted by a government official requesting to buy materials, the District Engineer or designee will determine if there are materials available in excess of Department needs.

The Controller Division must be notified. A message containing the following information shall be sent to the e-mail group "DOR Controller Materials":

Name of government entity
Contact person
Mailing address
Agreed rate per unit of material

CHAPTER 7 ROAD FEATURES INVENTORY

PAVEMENT MANAGEMENT INFORMATION INTRODUCTION

(from the NDOR Pavement Maintenance Manual – latest version available on the NDOR webpage)

Since 1984, personnel in the Pavement Management Section have been collecting data on the surface condition of Nebraska's highways. This data is just a small part of the information that is available on the Nebraska Pavement Management System (NPMS). The Pavement Management System was developed as a tool for the Department's administration to more efficiently manage the highways.

There are two main parts to the system:

1) a computer master file, and
2) interpreting programs.

The master file is the real foundation to the system and contains the following data for all rural and urban highways by highway number and reference post:

- ✔ Length, width and other layer geometric data
- ✔ Pavement structure, layer types, and design thickness
- ✔ Pavement distress condition data for bituminous and concrete pavement, Present Serviceability Index (PSI) and International Roughness Index (IRI) data
- ✔ Skid resistance data
- ✔ Traffic volume data (ADT), equivalent 18-kip axle load information, loads, frequencies, and vehicle classifications
- ✔ Pavement temperature and variation ranges during skid testing
- ✔ Regional weather data, highs, lows, precipitation amounts, and other miscellaneous items.
- ✔ Construction and maintenance rehabilitation costs by activity
- ✔ Bridge deficiency
- ✔ Safety records (fatalities and property damage data)
- ✔ Nebraska Highway Program data for the next six fiscal years

Deflection data, which is considered a valuable tool, is available on a limited project by project basis. All historical information will be kept for a 50-year time period. The master file is then used to: 1) report existing pavement conditions, 2) track progression of distress over the service life of a pavement, 3) list pavement section surface deficiencies, the extent of deficiencies, and valid rehabilitation repairs, and 4) report sections programmed for construction

PROCEDURES

Pavement Management personnel gather pavement condition data annually. Inspections are made of the pavement surface at sample locations. For rigid pavements, test sections of ten panels and joints at each mile or reference post are rated. Bituminous pavements are done by taking one-tenth mile test sections every mile as near to the reference post as practical. An overall "windshield" survey is done at highway speeds to verify the sample sections are representative of the entire segment.

Chapter 3 of the *NDOR Pavement Maintenance Manual* provides descriptions and illustrations of the various distresses. Results of the condition survey are generally available by September of the year in which they are taken.

The various distress factors are combined to provide an overall rating of each section. Ratings of greater than 70 are considered good and ratings of below 50 are considered poor, indicating the need for rehabilitation.

Ratings of 50-70 are considered fair and indicate only a few years of service life remain.

On the average, the rating of a bituminous road decreases three points per year for the first ten years and two points per year after that. In other words, a new asphalt road will rate 70 after ten years and rate 50 after twenty years. Ratings on concrete roads (>8") decrease at the rate of 1.25 points per year; so in forty years, a new concrete surface reaches a rating of 50.

More details on ratings may be found in Nebraska Department of Roads Pavement Management System dated January 1996.

Measurements of the roughness, or ride quality, are also taken each year. The measurements are expressed in terms of millimeters per meter (mm/m). Surfaces with ratings greater than 2.00 are considered rough and greater than 3.00 are very rough.

Maps showing the overall surface condition rating, referred to as the Nebraska Serviceability Index (NSI), the amount of rutting, and the roughness (IRI) for each highway are available from Materials & Research Division.

USES OF PAVEMENT MANAGEMENT DATA

The amount of data available is enormous. Interpreting programs are used to summarize the information and provide reports listing candidate sections of pavement suitable for rehabilitation. A list of pavement conditions is provided to the District Engineer each year to assist in establishing the six-year rehabilitation program. Another list is generated from which the Pavement Extension Program (PEP) projects are selected.

On a statewide basis, the Pavement Management data is used in preparation of the Department's annual 20-year Needs Assessment. In turn, the Needs Assessment is used to determine the amount of funding allocated to each District for highway improvements.

At the project level, life cycle cost analysis is available for rehabilitation strategies. Work is underway to develop life cycle cost analysis for maintenance strategies.

A review of the surface condition rating by Maintenance decision makers may help in selection of the proper preventive maintenance treatments.

The following section provides a detailed description of how to access the material available from the Pavement Management Section.

HOW TO ACCESS PAVEMENT MANAGEMENT DATA IN IHI

Shown below is a step-by-step procedure you may use to obtain current and historical data for highways in your area.

1. Open a Mainframe Session
2. Type C1, press enter
3. A “Production CICS1 Region” screen will appear, press enter
4. Type in your User ID: (if your number is DOR 26002 use DR26002)
5. Type in your Password, press enter
6. Next screen choose selection “8” (IHI1) IHI Integrated Highway Inventory System, press enter
7. On the Main Menu screen choose “18” Roadway Condition, press enter
8. On the Roadway Condition Menu choose “02” Query, press enter
9. On the Roadway Condition Query Menu choose what data you want to review. For example: choose “03” Bituminous Condition Ratings, press enter
10. Enter highway Number: Example “002”
    a. Enter Beg Ref Post, if desired
    b. Enter End Ref Post, if desired
    c. Enter Lane Dir Cde, if desired
    d. Enter Lane Typ Cde, if desired
    e. Enter Lane Num, if desired
    f. Enter Start/End Dates, if you want to see more than the current data
    g. Enter Restrn Idx Low/Hi, select range of Restoration Index values, if desired
    h. Enter Crking Idx Low/Hi, select range of Cracking Index values, if desired
11. Press enter.
12. Follow the directions on the lower portion of the screen in reference to the “PF” keys (“F” keys on the keyboard, the upper row of keys). The “PF” keys 13 and above can be accessed by pressing the “Shift” + “F” key. Example: “PF19” = Shift + F7; “PF20” = Shift + F8; etc.

If at step # 9 above, you chose to look at “01” Roadway Condition Summary Query; Pavement Management Data can also be accessed there. However, it will only be for the section being summarized. The process would then be Steps 1 thru 8 as above, then:

9. Choose “01” Roadway Condition Summary Query, press enter.
10. Enter District number on this screen, press enter.
11. Scroll down list (F8) and choose a section and place an “X” in the “Sel” column on the line of your selection, press enter.
12. Press enter on the next screen.
13. The next screen is the “Nebraska Pavement Management System Summary Query” screen. If you place the cursor in front of the IRI data on the lower portion of the screen or Rutting data, if this is a bituminous section or Faulting if this is a PCC section and press “F4”, the profiler data for this section will be displayed. If the cursor is placed in front of the Cracking Index, Trans. Cracking, NSI or Hist Low NSI, if bituminous and press “F4”, the bituminous ratings for this section will be displayed. Likewise, if the cursor is placed in front of the PCC rating elements and “F4” is pressed, the PCC ratings for this section will be displayed.

14. There are other types of data that are also accessible from this screen. “F7” calls up all the Crew Card Transactions for this section. “F9” shows the Maintenance Costs and various activities for the last 5 years. “F10” shows the condition history and the ratings for this section for the last 10 years.

Additional information may be accessed from those locations that have high-speed T1 lines. These locations include the District offices, about 90% of the Maintenance Superintendents’ offices and a few others . The following procedures apply to information that may be accessed if served by a T1 line.

PAVEMENT MANAGEMENT SYSTEM, VERSION 2.9, PROCEDURE FOR ACCESS

1. When your computer is booted up, there will be an icon that is a green box with a red car in it, double click on this icon or highlight it and press enter.
2. The next screen shows a file folder with several tabs on it and the option of Current Pavement Management Data or Historic Pavement Management Data. Choose selection from the Current Pavement Management Data.
   a. Statewide Data displays all highway data
   b. District Data displays only the chosen District
   c. Highway Data displays only the chosen highway.
   d. Other displays only Interstate, Priority Commercial or Expressway by District and/or Highway.
3. You may select data by the entire road system, District, highway, District and highway, or other. A number must be added in the dropdown box next to the District Data and the Highway Data buttons if those selections are used. To continue, just single click on one of these four buttons. The data will then be displayed.
4. The top half of the screen shows the selected statistics for the segment highlighted in yellow on the lower portion of the screen. You may navigate this screen by one of several methods.
   a. Using the four buttons on the upper right corner of the screen, you can to go to the top of the file, next record, previous record or go to the bottom of the file.
   b. Use the find button to search for a highway.
   c. You may also use the scroll bar on the right side of the lower half of the screen to locate a highway segment, and then use the mouse to select a segment by clicking on it once.
   d. You may also use the up and down arrows to locate a segment.
   e. The return button takes you back to the previous screen.
5. The bottom half of the screen lists the complete information on each highway segment. You can view this data by using the left and right arrow keys or using the scroll bar on the bottom of the screen. A definition of the column of data is displayed if the mouse button hovers over the column for a few seconds.
6. When you finish viewing the data, single click on the Return button or the “X” in the top right corner of the screen to exit.
7. Single click on the Exit button to quit the program. If any problems are encountered or if you have any questions regarding the use of either of these data sources, contact Gary Brhel at (402) 479-3620.

MAINTENANCE COSTS IN IHI

For a quick look at 5-year maintenance costs for a specific highway section, you may query the IHI on c1 if you’ve been authorized.
Path:

C1 > userid/password > 8 > 13 > 4 > enter a District #. You can also change the C to M if you want, although it doesn't make much difference since most of the construction District lines = maintenance District lines.
On the next screen, you can either page forward until you locate a section of the highway you want using the PF8 key OR on the bottom line above the Command Line, enter values and hit enter. An example:

```
     S90A      0.000    0.250   B    HOSKINS SPUR
 s   012     151      157       B    <***** Enter SPECIAL Highway / Ref. Posts
```

Because the IHI data starts and stops (begin and end reference posts) at all points that have been identified as a need, I look for a section that is closest to what I am wanting. Please note, the sections listed are A and D (not B for both) but that won't matter in this case because when reporting costs to highway – reference post sections, we do not distinguish between ascending and descending. Type something (x) in the SEL (selection column).

```
x   151.450 157.270   A    TH     01   9000.01 004.000 012
```

Once you have hit enter, the screen displays the data important to the Pavement Management System, such as the various ratings and classification codes. Note the bottom of the screen gives you data options to select.
Use the PF9 key to retrieve the maintenance costs. The first screen is a summary which is fine for a quick-look-see, but if you use PF10 for next record, you will get one reference post at a time within the section selected. You can see that from the heading line directly above the year headings as Total for Ref Post 151 rather than Summary Total:

```
     Hwy Num: 012
Beg Ref Post: 151.450
End Ref Post: 157.270

                                  Total for Ref Post 151
Actv     Activity          <=================================================>
Cde      Description         2004       2005       2006       2007       2008
==== ================== ========== ========== ========== ========== ==========
2002 Road Profiling
2003 Minor Milling
2004 Arm Coat Rdwy Srf                  5561.56                 70.60     211.98
2005 Fog Seal
2007 Mudjacking
2009 Maint/Muni Con Lnk
2510 Joint & Crack Fill
2013 Joint Cutting
2015 Subgrade Repair
2025 Mach Ptch Rdwy Srf                  406.34                6386.98
2026 Spot Patching          419.37      867.40    2290.97    3594.68     422.29
2027 Concrete Patching
2030 Surf Shld Maint
2031 Grading of Shld         60.58      301.34      79.12
2032 Rebuild Unpvd Shld     162.07                 1085.57                238.88
2035 Blading Unpvd Rds
2036 Maj Rst Unpvd Rds


Total:                      642.02     7136.64    3455.66   10052.26     873.15
```

Also note, these are only the surface and shoulder maintenance activities where a highway – reference post may be coded. I said may as last year there was a decision to make those fields 'optional' in some cases, so some major costs may not be reported to a highway section.

Costs for winter ops, pavement marking, signing and other maintenance activities are not cost to a highway section – only the District number. These are not captured or pro-rated.
At the time we worked on the Pavement Management System, only activities that may alter a highway rating were included.

If you want to see the crew card detail (maintenance work was performed by our District forces), from the Pavement Management Summary query screen, you may select PF7 – Crew Card Transactions.

In this query, all crew cards containing the reference post numbers requested are included, so some may go for a number of miles. For instance, the first one in the query starts at 121 and ends at 222. (I personally think this was a data entry error as normally, we don't cross District lines on the crew cards. Since the on-line crew cards didn't start until October 2003, I couldn't look at it on-line but I did find it on an old file and it was supervisor 822, so probably should end at 122.)

On this screen, you get more than just the last 5 years worth of information but you may narrow it down to a specific activity or time frame using the fields in the heading. Use the PF8 to page forward.

```
      Hwy Num: 012
 Beg Ref Post: 151.450
 End Ref Post: 157.270
 Lane Dir Cde: A
     Activity: ____
 Crew Card Id: ______
Start/End Dates: __________ __________

          Beg      End     Lne              Crew                Unit
Hwy       Ref      Ref     Dir Activity     Card     Work       of
Num       Post     Post    Cde Date         Ident    Accomp     Meas
======= ======== ======== === ========== ====== ========= ======
012     121.000 222.000   B   04/17/2002 029102       8.00  TON
ACTIVITY: 2026 - SPOT PATCHING
012     144.000 162.000   B   02/22/2007 168869      16.00  TON
ACTIVITY: 2026 - SPOT PATCHING
012     144.000 152.000   B   01/25/2007 164758      16.00  TON
ACTIVITY: 2026 - SPOT PATCHING
012     144.000 160.000   B   01/10/2007 162066      16.00  TON
ACTIVITY: 2026 - SPOT PATCHING
012     144.000 160.000   B   12/26/2006 160559      16.00  TON
ACTIVITY: 2026 - SPOT PATCHING
```

1-12-2009/ja

CHAPTER 8 WINTER OPERATIONS

8.1 GENERAL ITEMS

8.1.1 Description

Winter operations covers all work in connection with the removal of snow and ice from the roadway, snowdrift prevention work, abrasive and/or chemical supply, storage and application, equipment preparation and maintenance, and training. Anti-icing and deicing are included in these activities.

8.1.2 Policy

The policy of the Nebraska Department of Roads is to keep all state highways under its jurisdiction free of snow and ice insofar as available equipment, manpower and the weather will permit. Removal of snow and ice from the roadway is classified as an emergency operation and takes precedence over all other work. Snow plowing and icy surface treatment requirements vary throughout the state. It is the responsibility of the Superintendents and Supervisors to make arrangements to keep themselves apprised of weather reports and road conditions at all times. The Department shall strive to advise the traveling public, by all means at its disposal, about road conditions on a timely basis. (Paragraph 9.7)

8.1.3 Priority of Operation

When a snow or ice storm starts and when temperatures drop below freezing, many roads may require attention at the same time. Snow plowing and/or treatment operations can only proceed as fast as the equipment can cover the roads. There will be roads at the beginning of a storm that must wait their turn for plowing or treatment. A system of priorities is necessary so that the roads of higher traffic volumes and hazardous locations will be cared for first. Traffic volumes and hazardous locations should be studied in advance and a priority should be established by the District Engineer, District Operations and Maintenance Manager and the Maintenance Superintendent for the guidance of the field forces as follows: In general, the higher the traffic volume the higher the priority.

First Priority

First priority shall be given to Interstate. On multi-lane highways, the lanes leading to the city in the morning and leading from the city in the afternoon shall be given first priority.

Second Priority

Second priority shall be given to the heavier traveled sections of both primary and secondary highways. In this priority, special emphasis shall be on school bus routes, commuter to work segments and higher volume spur routes.

Third Priority

Third priority shall be given to the lighter traveled sections of highways, both primary and secondary.

The Department's goal is to keep the Interstate and high volume through routes open at all times. In order to accomplish this, contractor equipment may be used to supplement state equipment and construction employees shall be trained and used to supplement maintenance forces.
DR Form 83, "Snow and Ice Removal Plan," shall be prepared by the Superintendant and submitted to the District Engineer and the District Operations and Maintenance Manager by September 15 of each year. Snow plowing on construction projects shall be performed after all other roads are cleared and then only on projects that are opened to local traffic or to protect the road surface from damage, as instructed by the District Engineer.

8.1.4 Maintenance Decision Support System (MDSS)

MDSS is computer application that uses location-specific road weather forecasts, route data including pavement construction, traffic levels, and maintenance materials and practices, and reports of actual weather and road conditions and previous maintenance actions to make recommendations for future maintenance actions. The recommendations are intended to aid the maintenance practitioner in choosing the most effective maintenance action to achieve the desired Level of Service (LOS). Standard LOS definitions are as follows:

Level of Service	**Guideline**	**Target**
Route designation	**Traffic level (ADT)**	**Regain time (hrs)**
Super commuter	**> 50,000**	**4 (bare pavement)**
Urban commuter	**20,000 – 50,000**	**6 (bare lane)**
Rural commuter	**7,000 - 20,000**	**8 (bare lane)**
Primary	**2,500 - 7,000**	**12 (bare lane)**
Secondary	**1,000 - 2,500**	**24 (bare lane)**
Low Volume	**< 1,000**	**48 (bare lane)**

Please note that the District Operations and Maintenance Manager (DOMM) is responsible for designating the Level of Service for each route. Some routes may not match the traffic levels given in the table above.

Contact the Maintenance Engineer for more information on MDSS.

8.2 EQUIPMENT

Efficient and economical winter Maintenance Operations depend, to a considerable extent, upon the availability and use of the proper equipment. Through the coordinated efforts of the Maintenance Superintendents and the District Mechanics, all equipment shall be thoroughly inspected and the necessary repairs and adjustments made during late summer and early fall. Snowplows of the various types and sanding and liquid application equipment shall be assigned to each maintenance area closest to the roads to be covered on the basis of need and commensurate with the priorities and requirements of the particular areas. All operators shall be properly trained on a piece of equipment and must demonstrate proficiency before they are allowed to operate on the roadway.

All operators shall be alerted to the danger of carbon monoxide from the exhaust accumulating in tightly closed cabs. Muffler exhaust pipes shall be inspected regularly for any leakage and repairs made or new components installed promptly. All snow removal equipment shall carry small necessary tools and equipment.

8.3 DRIFT PREVENTION

It is the intent of the Department to prevent the formation of snow drifts on our highways through new grading projects and the use of living snow fences as much as possible. However, it is sometimes necessary to place temporary snow fence in areas that cause a hazard to the traveling public. Those areas need to be determined by the local Superintendent with input from the area personnel. Generally, permission should be obtained from the landowner or tenant on whose property the fence is to be placed. Section 39-1344 of the statutes provides that snow fence may not be put up before October 15 and shall be removed before April 1 of each year. Snow fence should be installed using the guidelines provided by the SHRP manual “Snow Fence Guide”.

8.4 MATERIALS

8.4.1 Aggregate

The anticipated amount of aggregate required for the winter operations shall be determined and placed in stockpiles at convenient locations in early fall to avoid delays and shortages during storms. Sufficient quantity of aggregate shall be premixed with salt or the proper chemical to prevent the stockpile from freezing and to provide an “anchor” for the aggregate when applied to snow or ice. Also, stockpiles should be covered and have adequate containment to prevent the leeching of the chemical into the surrounding environment.

8.4.2 Salt

All storage buildings and bins shall be filled with salt to their capacity before October 1 each year and salt shall be reordered promptly to keep the storage supply adequate at all times. During the Peak Season (November through February): Salt orders for all locations in the District will be ordered each week by the DOMM. Each location shall enter the amount of salt on hand into the Salt Database at least once per week.

All salt deliveries throughout the year must be promptly entered in the Salt Database.

8.4.3 Anti-icing/Deicing Chemicals

A supply of the appropriate chemicals shall be in storage for use in anti-icing/deicing operations and for use in treating aggregate to prevent freezing.

8.4.4 Approved Brands

The Operations Division maintains an Approved Brands List for anti-icing/deicing chemicals. Products not on the list must be rated using a Test and Evaluation process coordinated by the Operations Division before they can be ordered. Products that pass the Test and Evaluation become Approved Brands and will be included in the Invitation to Bid the following year. The Approved Brands can then be ordered at the contract price.

Form DR151 (Deicing Materials, Standard Test and Evaluation Form) shall be used to report the performance of specific chemicals undergoing Test and Evaluation. It is very important to keep good records of the weather and pavement conditions, application rate, and results during the test.

8.5 ICE CONTROL

Ice control is categorized into anti-icing or deicing.

8.5.1 Anti-icing

Anti-icing is a proactive snow and ice control strategy of preventing the formation or development of bonded snow and ice to a pavement surface by the timely application of a liquid chemical before or at the onset of a weather event. Anti-icing requires specialized equipment and knowledge to perform properly. The equipment must be calibrated prior to the event for maximum efficiency. A variety of chemicals can be used for this operation and if the material is purchased, the manufacturer’s recommendations should be followed until a person has gained adequate personal experience. The choice of material will generally be dependent upon the temperature. Pay close attention to the effective temperature range of the material to be used. Solids (rock salt, aggregates, or salt/aggregate mixtures) generally are not effective for anti-icing purposes. Traffic will remove the material from the roadway before it can be effective in preventing bonding.

8.5.2 Deicing

Deicing is a reactive operation in which a deicer is applied to the top of an accumulation of snow, ice, or frost that is already bonded to the pavement surface. To be effective, the deicer must be able to cut through snowpack to the surface interface to break the ice/pavement bond at which point it can be removed mechanically or displaced by traffic.

8.5.3 Solid Ice Control Materials

Aggregate is a common material used in ice control operations. However, aggregates do not melt ice and are not effective in breaking the ice/pavement bond. They can provide at least some measure of traction improvement when conditions are such that chemicals will not work effectively. Aggregates should be pretreated in the stockpile or pre-wetted at the spinner to reduce bounce and scatter when applied to the roadway and to “anchor” the material to the surface. When there are slippery conditions, treated abrasives may be spread on all critical areas such as hills, curves, intersections, bridges, railroad grade crossings, and other locations where traffic is required to stop.

Rock salt (sodium chloride) is an excellent material for ice control when temperature and weather conditions are right for its use, but it is certainly not a "cure all." It will sometimes prevent the formation of ice and sometimes will remove ice, but the salt does not provide traction for the traffic when the surface is covered with ice or packed snow. When clear salt is placed on ice it melts the surface making it more slippery than if salt were not applied. grade crossings, and other locations where traffic is required to stop. The rock salt should be pre-wet with an appropriate liquid ice control chemical prior to application. The water in the liquid ice control chemical starts the process of allowing the solid rock salt to generate “brine” more quickly than if “unwetted”. This also allows the salt to better “stick” to the surface reducing bounce and scatter and accelerating deicing.

The general rule is that salt should be applied when the surface temperature is 20 degrees F. or above and expected to rise. The amount of salt to be applied per lane mile will vary as to the surface temperature, whether the salt is pre-wetted or dry and the characteristics of the of the snow.

An application of salt during a storm when the snow is dry will result in a brine which will cause drifting snow to adhere to the pavement and the brine becomes diluted and ineffective. The resulting surface condition will be rough ice. Salt shall not be placed when drifting is occurring or is expected to occur.

Aggregate shall be spread at the rate appropriate to the conditions. Every effort shall be made to spread the materials at the selected rate; therefore, it is necessary to calibrate the equipment and to familiarize each operator with the proper settings and operation. The shields on the spinner-type spreaders shall be adjusted to prevent aggregate or salt from striking oncoming or parked vehicles.

8.5.4 Other Solid Ice Control Chemicals:

Although rock salt is the principal solid chemical used, others are available. Most common are calcium chloride and magnesium chloride. While being more expensive than rock salt, both are much more effective at lower temperatures. As with rock salt, these materials are more effective when pre-wetted before application. Effective temperatures and application rates for these materials should be available from the supplier.

8.5.5 Liquid Ice Control Materials:

Liquids will be the most versatile tool in your snow fighting tool kit. The most common liquid is brine which is made by dissolving rock salt in water. It is easy to make and is relatively inexpensive. Brine may be used for anti-icing and deicing and as a performance enhancer to wet solid materials. Other liquid chemicals available are solutions of calcium chloride, magnesium chloride, and potassium acetate. Organic products may be added to these to enhance performance. Effective temperature ranges vary by product. The supplier should be able to give recommendations as to proper use. When liquids are applied directly to the ice or compacted snow, pencil or streamer nozzles should be used. This will allow the brine to cut through the snow or ice more quickly and disrupt the ice/pavement bond.

8.6 SNOW REMOVAL

Prompt Removal of snow and slush prior to application of ice control materials prevents compaction, improves traction, and reduces the amount of chemical required to obtain the desired pavement condition. It is also important to allow sufficient time for chemicals to work before plowing them off.

8.6.1 Snowplow Operations

Snowplowing operations shall start as soon as the snow accumulates to a depth that plows can remove it and shall continue throughout the storm as visibility permits in accordance with policy before snow becomes packed by traffic. Packed snow is expensive to remove and often becomes a hazard to traffic when it becomes rutted. On the Interstate or multi-lane highways, snowplowing should be done in tandem fashion with trucks spaced 500 to 800 feet apart. It may in some cases be desirable to reverse the one-way plow on the left hand lane and deposit some of the snow in the median strip. In general, all snow shall be moved across both lanes for disposal on the outside.

8.6.2 Cleanup and Widening

When the storm subsides, widening and the removal of all snow beyond the shoulders shall be started. Snow shall be removed from the shoulder to facilitate drainage from the pavement and prevent the melting snow from softening the shoulder and subgrade. The cleared area also provides storage space for snow in the next storm. All snow shall be removed from bridge floors and from the area in front of guardrails by the use of rotary snowplows or front-end loaders. Snow shall not be pushed through bridge rails on overhead bridges such that the snow will fall on the roadway below. In such cases it may be necessary to load and haul the snow away for disposal. Disposal sites shall be selected in advance to avoid delay in the disposal operations. Wherever salts and abrasives have been used to control surface icing on bridge decks and at intersections, it shall be removed when necessary.

8.6.3 Opposing Traffic

Snow removal equipment shall not be operated against traffic, except when operating through the low side of deep drifts and then under such control as necessary to avoid a collision.

8.6.4 Passing or Meeting Traffic

Precautions shall be exercised when passing or meeting traffic to avoid throwing heavy snow or ice through a windshield or obstructing the vision of other motorists, particularly with the V-type plows. The operators shall also use extra care when meeting opposing traffic to avoid to the extent possible "side slip" when removing packed snow or ice with one-way plows or trucks equipped with a side-mounted wing.

8.6.5 Damage Precautions

Operators shall exercise care to prevent damage to official signs, delineators, posts, guardrails, bridge rails, mailboxes, or guide posts.

8.6.6 Damage to Buildings - Electric Advertising Signs - Utility Wires

Rotary snowplow operators shall reduce speed and adjust the chutes to prevent damage to buildings and neon or other electric signs or utility lines on or adjacent to the right-of-way or private property.

8.6.7 Damage to Parked or Abandoned Vehicles

The operators shall use care when removing snow in the vicinity of parked or abandoned vehicles on or adjacent to the traveled way. Even though cars are illegally parked on the surface, reasonable care shall be taken consistent with the clearing of the road for traffic.

8.6.8 Assistance to Motorists

Each employee is a public relations representative of the Department. Snowplow operators and other employees shall always be courteous and offer assistance to distressed motorists. In blizzards or severe storm conditions, stop to see if occupants of vehicles are sick, injured or suffering from the cold and if so, assist them to the nearest shelter.

Stalled vehicles that are blocking the traveled portion of the highway shall be towed to the shoulder. Any vehicle that presents a hazardous condition either to other traffic or its occupants shall also be towed to the shoulder. When a private vehicle is towed, extreme caution must be used in tying onto the vehicle. The owner shall tie to his own vehicle, if possible.

8.7 ROAD CONDITION REPORTING

8.7.1 Reporting

District staff are responsible for entering highway incident and condition information year round into DOR's internal on-line Highway Condition Reporting System (HCRS). Incidents may also be reported by the Nebraska State Patrol or DOR District staff to the Operations Division 24-hour call number, 402-416-0873. The on-call Operations Division staff member will enter incidents reported by NSP or DOR District staff into the on-line HCRS. This information is automatically shared with the 511 Advanced Traveler Information System for access by the general public.

8.7.2 Reporting Requirements

All incidents requiring roads to be closed or restricted for more than 20 minutes and weather related road conditions shall be promptly entered into the HCRS. Also, upon conclusion of the incident or a change in the road condition, this shall be promptly updated. Operations Division staff are available to assist with data entry should system access be unavailable. The HCRS is to be updated daily or as events dictate. The latest copy of the HCRS Quick Guide should be referred to for proper procedures in reporting incidents.

District staff shall attempt to keep all radio stations in their area aware of any unusual local conditions. The Communications Division shall notify the wire services.

The Operations Division shall give the State Patrol Communications Division a complete report and all updates. The Districts should work with the local State Patrol keeping each other informed of the situation.

8.8 ROAD CLOSURES

8.8.1 Priorities

The top priority activity for maintenance forces during the winter is snow removal and ice control. The Districts shall make every effort with available manpower to keep the highways open to traffic at all times. Interstate routes are the top priority within an area.

8.8.2 Decision to Close

The decision to close a highway is the responsibility of the Department of Roads. The Department of Roads shall consult with the State Patrol and request all available information and their recommendations. This consultation shall be at all levels.

8.8.3 Reasons to Close

The decision to close shall be based on one of the following reasons:

A. Severe drifting blocking highway.
B. Stalled trucks and other vehicles blocking highway.
C. Poor or no visibility.
D. Insufficient equipment available to keep highway open.

8.8.4 Responsibilities -Department of Roads

A Highway Maintenance Superintendent shall:

1. Keep District Engineer and District Operations and Maintenance Manager advised of the road condition and the condition of operators and vehicles.
2. Work with the local State Patrol Officers to be sure everyone is kept abreast of current conditions.
3. Establish any traffic controls as may be directed by the District Engineer or District Operations and Maintenance Manager.
4. Remove all traffic controls at the end of the emergency.
5. Inform local radio stations and emergency operations - headquarters of highway conditions.
6. Maintain communications with adjoining Maintenance Superintendents to ensure continuity in the plan.
7. In conjunction with the State Patrol, move vehicles blocking the roadway off the driven portion or have them towed.

B. District Engineer or District Operations and Maintenance Manager shall:
   1. Monitor the situation closely.
   2. Establish contact with State Patrol area headquarters.
   3. With Patrol Commander, make decisions on road closure.
   4. Promptly enter the road closure information into HCRS. Should system access not be available call the Operations Division 24 hour call number (402)416-0873) for assistance.
   5. Maintain communications with other affected District Engineers.
   6. Maintain communications with local Civil Defense headquarters.
   7. Give the local radio stations current conditions.

C. Lincoln Operations Division:
   1. Keep Director-State Engineer and Deputy for Operations informed of latest conditions.
   2. Maintain contact with State Patrol and through them with adjacent states.
   3. Assist with moving equipment and manpower as needed into affected areas.
   4. Notify all District Engineers of the conditions.
   5. Establish communications or liaison with the Nebraska Emergency Management Agency/State Emergency Operations Center.

8.8.5 Responsibilities- State Patrol

A. Trooper will:
   1. Keep Troop Area Commander or Lieutenant advised of the deterioration of road conditions.

B. Troop Commander will:
   1. Keep his Division Major and the District Engineer advised of all pertinent information regarding road conditions.
   2. After decision has been made to close the road, will coordinate with the Department of Roads Supervisor on the implementation of the closure.
   3. After the decision is made to re-open the road, will coordinate the re-opening with the Department's District Engineer and/or District Operations & Maintenance Manager or Department designee.

C. Division Major will:
   1. Coordinate with the District Engineer on whether conditions are severe enough or the situation is critical enough to warrant closing of the road.
   2. Immediately notify the Colonel of the decision reached and keep him informed on the progressive conditions.

CHAPTER 9 ROADSIDE VEGETATION MANAGEMENT

The success of the roadside vegetation management program depends upon the Supervisor's efforts to communicate with the employee(s) doing the vegetation management activities. Employees should receive both instruction and hands-on training on maintaining vegetation on the right-of-way. For more detailed information, consult the NDOR Roadside Chemical Usage Guidelines, Seeding Manual, and Mowing Guidelines.

9.1 MOWING GUIDELINES

In order to keep the Mowing Guidelines as current as possible, it will be updated and distributed by the Roadside Stabilization Unit Manager in the Planning and Project Development Division. Any questions or requests for additional Mowing Guidelines should be directed to the Roadside Stabilization Unit Manager.

9.2 MAINTENANCE OF PLANT MATERIAL

Newly planted trees and shrubs are under the contractor's care for a period of time after installation. Generally this is one year, but can vary based upon the contract or permit requirements. After this period, responsibility is transferred to the area Maintenance Superintendent. NOTE: It is the District Engineer's responsibility to inform the area Maintenance Superintendent of the date of responsibility transfer.

The Landscape Architect in the Environmental Section of Planning and Project Development Division is available to assist with questions and concerns regarding all aspects of the maintenance of plant material.

9.2.1 Tree and Shrub Watering (Newly Planted)

Watering newly planted trees and shrubs is important to their survival. The plant material should be well watered during the first year after installation to assure survival and vigor. Additional watering may be necessary during the summer months in subsequent years to ensure the future success of the plantings.

9.2.2 Tree Staking

All newly planted trees are staked and guy wired. The contractor will remove the stakes and wires from the majority of the trees before the project is turned over to maintenance, stakes may be left on trees at the end of the contract for various reasons. Any remaining wires and stakes shall be removed the following year by maintenance forces.

9.2.3 Shrub Pruning

Pruning means

(1) cutting out of all dead and diseased wood and
(2) cutting out or clipping back of any live wood considered necessary for environmental reasons or for shaping the shrub into a desired form.

The pruning out of dead or diseased wood is important for both the health and appearance of the plant. Dead limbs only serve as breeding places for insects and focal points for organisms that cause decay.

9.2.4 Tree Pruning

Proper pruning is essential to keep trees healthy or repair damage from accidents or weather.

Larger trees that are too big to be pruned using no more than a step ladder, should be pruned by a certified arborist. There are many certified arborists across the state. If you need help finding a qualified, certified arborist, you should contact the Nebraska Forest Service or visit their website at www.nfs.unl.edu. The Nebraska Arborist Association also maintains a list of Certified Arborists on their website at www.nearborists.org. Additional information about the care of trees is also available on the Nebraska Forest Service website.

9.2.5 Treatment of Cuts and Wounds on Trees

The latest treatment recommendation is no painting or covering of the wound. Trim any jagged edges and let the wound heal itself or hire a certified arborist to do the work.

9.2.6 Treatment of Insects and Diseases on Trees and Shrubs

Trees and shrubs should be inspected periodically for insect pests and diseases. Occasionally, various insect pests may attack the plant material. When an infestation of insects or dying branches is observed, proper identification is necessary before it can be treated. The local County Extension Office or District State Forester can assist in identifying the problem and recommending proper treatment. Refer to the Roadside Chemical Usage Guidelines for treatment recommendations associated with some of the most common roadside issues.

Several pine diseases are spreading across the state that has no control with chemicals. Of particular concern is Pine Wilt killing mostly Scotch Pine, but can also kill other types of pine when they have been stressed. This disease is spread by sawyer beetles and can kill a tree in a matter of weeks. If pines are seen on the Right-of-Way that have browning needles and continue to worsen over several weeks, the District State Forester should be contacted to verify the disease. Trees infected with Pine Wilt should be cut down and removed as soon as practical to limit the spread of the disease. Trees may be chipped, burned, or disposed of in a proper landfill. DO NOT use any wood from infected trees for fireplace or home heating. Beetles will, over winter, under the bark and lay eggs that will hatch when the weather warms in the spring, so disposal needs to be done before the first spring warm spell.

9.3 CHEMICALS, FERTILIZER, HERBICIDES, AND INSECTICIDES

READ ALL LABELS BEFORE USING ANY CHEMICALS

According to the Nebraska Pesticide Act, §2-2638(2), http://statutes.unicam.state.ne.us/Corpus/statutes/chap02/R0226038.html, “Any person who applies lawn care for hire or compensation, shall apply to the Nebraska Department of Agriculture for a commercial applicator license regardless of whether such business applies restricted use pesticides.”

Section 005.02A4 of the TITLE 25 NEBRASKA ADMINISTRATIVE CODE CHAPTER 2 NEBRASKA DEPARTMENT OF AGRICULTURE PESTICIDE REGULATIONS http://www.sos.state.ne.us/Rules/Agriculture/t25-2.pdf defines the Ornamental and Turf Pest Control category as:

"…commercial applicators using or supervising the use of restricted use or general pesticides and non-commercial applicators using or supervising the use of restricted use pesticides to control pests in all lawn care applications, including the maintenance and production of ornamental trees, shrubs, flowers, and turf, including in and around structures, green houses, plan nurseries, golf courses, athletic fields, public or private grounds, and turf farms."

Nebraska Department of Roads' employees who apply pesticides, either general use or restricted use, in the maintenance of ornamental trees, shrubs, flowers, and turf on roadside rest areas, maintenance offices or yards are, therefore, required to be certified as either commercial or non-commercial pesticide applicators in Nebraska. This also applies to any contracted services that apply pesticides on any of our properties.

The increased emphasis upon preventing environmental pollution makes it essential that appropriate chemicals be applied at the appropriate rates by licensed applicators when needed on NDOR property. The most current information and recommendations for the selection of chemicals and fertilizers for roadsides and ornamental turf are available in the Roadside Chemical Usage Guidelines. The current edition of this manual is on the NDOR website at www.nebraskatransportation.org/docs/weeds/chem.-guide-final.pdf. For additional information regarding chemical usage on NDOR Right-of-Way, contact the Roadside Stabilization Unit in the Environmental Section of Planning and Project Development Division.

9.3.1 Application Methods

There are numerous methods of applying agrichemicals, each of which has unique advantages. Commonly used methods are: (1) Foliar spray; (2) cut stump; (3) basal bark; (4) broadcast bark; and (5) pellets. Each of these techniques has particular advantages for use at different seasons or on different types of plants. Chemicals must be applied by certified applicators during proper weather conditions with concern for environmental stewardship.

1. Foliar Application
   Sprays directed on a plant's foliage, coating them with chemical substances, which may protect or destroy them, are foliar sprays. To achieve the maximum effectiveness, a spray must "wet" the plant, but not run off. The addition of a wetting agent enhances the effectiveness of such sprays. Plants that are actively growing under conditions of high-soil moisture will absorb more chemical and be more severely injured than plants that are growing slowly. A thorough coverage of the foliage is a must.
2. Cut Stump Application
   Once a stump has been cut, chemical application must be done immediately to stop re-growth. The longer application is delayed, the less effective it will be on killing these stumps. Minutes count! In non-freezing weather, use undiluted 2-4-D Amine with a color dye of 2 oz. per 5 gallons of 2-4-D Amine. Brush or spray this mixture on the stump immediately after cutting. This should produce at least a 90 percent kill. If this work is done during the normal growing season, the stump may grow a sprout 2 to 3 feet tall before the plant dies. See the current chemical guide for other cut stump chemicals.
3. Pellets
   Pellets are available for summer brush and Leafy Spurge control. These pellets can be carried on the mowers for immediate control while the operator is in the area. If these chemicals are being used by mowers that are contracted, remember that they must be properly licensed to apply them on our Right-of-Way.

9.3.2 Spraying Conditions

Ideal spraying conditions are seldom found. Therefore, precautions are necessary to avoid damage to the environment and desirable plant life while insuring elimination of problem species.

The recommendations listed in the Roadside Chemical Usage Guidelines increase chemical activity and minimize chances of injury to adjacent properties or to the applicator. If the spraying is done by contract, the applicator must have the appropriate licenses and follow similar good practices.

1. Spray on a sunny day with temperatures between 40° and 85° F, DO NOT spray when temperatures exceed 85° F.
2. Spray weeds when they are young and actively growing and with high-soil moisture.
3. Spray when the wind velocity is less than 8 miles per hour. Particular attention should be paid to wind direction so susceptible plants won't be damaged by drift or vapors.
4. Spray with operating pressures of 15 to 35 lbs per square inch. Drift danger may be further reduced by increasing the nozzle size, lowering operating pressures, and lowering the nozzle height.
5. Spray when it is probably that the spray solution will remain on the plants at least four hours. Don't spray when rain is imminent and do not mow shortly after spraying.
6. When spraying, use the proper chemical at the recommended rate. Use low volatile formulations.
7. Do not spray when foggy conditions exist.

9.3.3 Wetting Agents, Surfactants, and Spreaders

Wetting agents, surfactants, and spreaders all enhance the toxic activity of agrichemicals. They accomplish this by altering aspects of a plant's natural defenses. A plant's leaves are a major organ of absorption and often are covered with a thick, waxy material, cuticle, thick hairs, or numerous fine, hair-like appendages. These physiological features retard leaf surface absorption. If these natural defenses can be overcome, increases in absorption of a chemical's toxic effect will be accentuated. Use of wetting agents in spray solution will accomplish the following actions:

1. Increase absorption of the spray solution.
2. Increase the area contact between the chemical and the leaf.
3. Cause better "sticking" of the spray solution to the leaf.
4. Reduce the amount of chemical needed to kill the target species.

To gain the desirable benefits of a wetting agent, add the amounts as directed in the Roadside Chemical Usage Guidelines.

When spraying, remember the following:

1. Ensure that sufficient agitation has occurred to mix the wetting agent and solution prior to applying.
2. Wet the vegetation to the point of runoff.
3. Apply the recommended rate of chemical.
4. Do not use more water than is necessary to cover the vegetation.
5. Do not add more chemical than required.

9.3.4 Proper Mixing of Spray Solutions and Wettable Powders

To protect spray equipment and insure complete mixing of herbicides with solvent, the following procedures should be followed.

1. Solutions
   Fill the tank 1/3 full of water with the agitator operating before adding any agrichemicals. Add ½ of the amount of agrichemicals required and one pint of

wetting agent per 100 gallons of solution. Continue filling the tank until it is 2/3 full and then add the remainder of the agrichemical and wetting agent.

2. Wettable Powders
   Fill the tank 2/3 full of water and all the wetting agent that will be required with the agitator operating before adding any agrichemicals. Prepare a thick "slurry" of the material to be added and slowly add ½ of it to the tank. Continue filling the tank with water and add the remaining ½ of the slurry when the tank is ¾ full.
3. Wetting Agents
   Wetting agents should be added to the tank as directed above. Insure that sufficient agitation has taken place to mix the wetting agent and solution prior to applying.

9.3.5 Safety

Agrichemicals are safe IF they are used in accordance with the recommended practices. It is the Supervisor's responsibility to insure the chemicals are being used properly. The Supervisor must impress upon the spray crews the serious consequences of carelessly handling toxic materials. All personnel handling agrichemicals should observe the following precautions:

1. Follow all directions on the container labels. THE LABEL IS THE LAW.
2. Avoid direct contact with herbicides and pesticides. Do not breathe the vapors of such products. If agrichemicals come in contact with the eyes, flush thoroughly with water for a minimum of 15 minutes and immediately transport the victim to a physician. If the chemicals come in to contact with the skin, thoroughly wash the affected area with soap and water to remove chemicals that have contaminated it. If no water is available, wipe off the chemical and then wash as soon as possible. DON'T leave chemicals on your skin because your body will absorb them. Remove and wash contaminated clothing separately from other laundry before reusing. Take care to wash your hands thoroughly before smoking or eating. Don't smoke or eat while spraying.
3. If you must come in contact with agrichemicals, wear all appropriate safety equipment. Remember, leather shoes also absorb chemicals and must be decontaminated.
4. If a person working with agrichemicals complains of headaches, nausea, dizziness, or other symptoms of possible poisoning, immediately contact a physician.
5. Use every precaution to insure that chemicals do not contaminate streams, lakes, or groundwater and ensure that all environmental requirements are being followed.
6. Store chemicals only in original labeled containers and as required by environmental regulations. Keep out of reach of children, livestock, and irresponsible personnel.
7. Do not use empty chemical containers for other purposes. Triple rinse the container and put the rinse water into the spray tank. Follow the instructions for destroying the container.
8. Clean up all spills immediately and dispose of cleanup materials, contaminated soils, or absorbents properly to prevent environmental contamination.

9.4 VOLUNTEER TREE AND SHRUB CONTROL PROGRAM

NDOR strives to create a highway roadside landscape through natural and designed re-vegetation that is appropriate to the landscape regions as defined in the NDOR manual “Plan for the Roadside Environment.” The roadside landscape must also conform to NDOR roadside safety policies. Selective removal of roadside hazards, such as trees and shrubs, will occur when the vegetation does not conform to these standards. Eastern Red Cedar is one species that must be controlled on the Right-of-Way.

A landscaped roadside is part of the total design of a highway and because of the expanse of the highway system, it is impossible to contract for all of the landscaping that is necessary. Therefore, in many locations, the natural re-vegetation method for trees and shrubs is the most practical means to accomplish this segment of the landscaping outside the required lateral obstacle clear area.

When removing trees and shrubs, the Environmental Section of Planning and Project Development should be consulted to ensure that the planned activity is in compliance with the Migratory Bird Treaty Act.

9.4.1 Quality and Workmanship

1. Trees and shrubs selected for removal may be cut and then stump sprayed. All fresh-cut stumps shall be treated to prevent re-growth. Cedar tree stumps do not need to be treated. (Exhibit 10-1)
2. Drainage areas shall be kept free of shrubs and trees.
3. In order to keep fences that are our responsibility in good repair, they shall be kept free of trees and shrubs. Vines are to be left undisturbed.
4. Trees that shade the road and create an icy condition in the winter may be removed.
5. All debris resulting from the tree and brush cutting work shall be chipped and/or removed from the Right-of-Way and taken to a pre-determined location. In as much as possible, all material that is cut in a day shall be disposed of in the same day. Wood chips may be saved for mulching around any plantings.
6. Groupings of trees growing in areas designated to be retained may be selectively thinned to stimulate growth and development, if necessary. Contact the Landscape Architect in the Environmental Section of the Planning and Project Development Division for guidance on the thinning procedure.

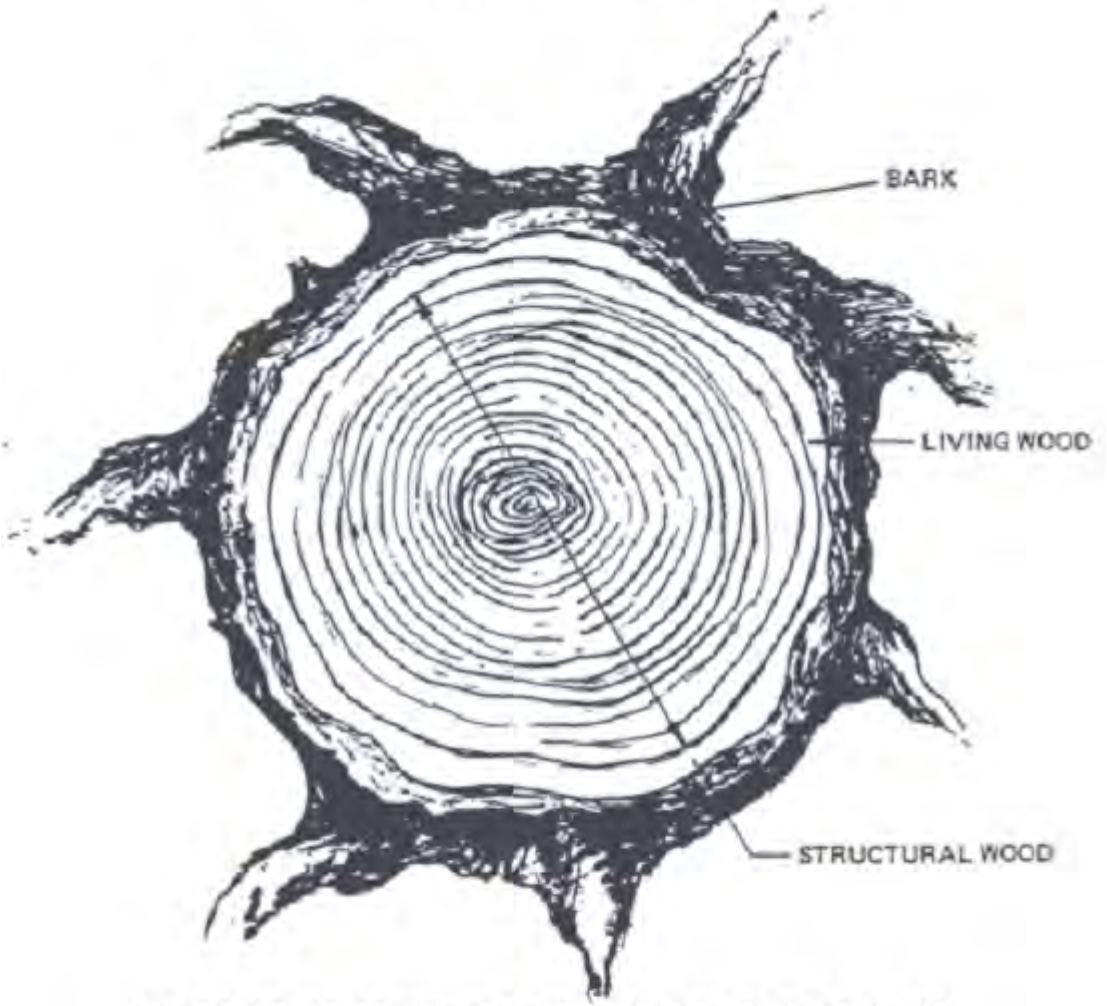
9.4.2 Scheduling and Inspection

1. Volunteer tree and shrub control work that is not creating an emergency scenario shall be scheduled accordingly.
2. Routine roadside inspections will identify areas that require this type of work.

9.4.3 Procedure

1. The Supervisor will inspect the area and instruct the crews as to which trees and shrubs are to be removed.

CUT STUMP TREATMENT
For Stumps Over 3" in Diameter



TREAT THE LIVING WOOD ONLY - TREAT IMMEDIATELY AFTER CUTTING - USE 2-4-D AMINE STRAIGHT. SEE THE CURRENT CHEMICAL GUIDE FOR ADDITIONAL CHEMICALS

FOR THOSE STUMPS UNDER 3" IN DIAMETER, COAT THE ENTIRE STUMP

Exhibit 10-1

9.5 TREE SPADE OPERATIONS

There may be occasions when good, quality trees or special significant plantings need to be relocated for some specific work. There are commercial tree spades available across the state that can be contracted to dig and relocate these trees or shrubs, when necessary. In the event that there are planting that may warrant being moved, contact the Landscape Architect in the Environmental Section of the Planning and Project Development Division for consultation and recommendations on a case-by-case basis.

The Department also has two T-44 Vermeer tree spades. The tree spades are trailer-mounted and are easily moved from project to project. Arrangements must be made in advance with the Fleet Manager's Office in Lincoln to obtain a tree spade. The T-44 tree spade was designed to move deciduous trees up to 4" in diameter and coniferous trees up to 6" in diameter. Check the tree care chart (Exhibit 10.2) for the exact times and kinds of trees that can be moved. THE LOCATION OF BURIED UTILITIES MUST BE VERIFIED PRIOR TO THE TRANSPLANTING OF TREES.

9.5.1 Staking and Guying the Trees

All trees moved with the tree spade will be staked and guyed unless they are 1" or less in diameter. Trees shall be staked in a triangular pattern using three (3) "T" posts set at an angle away from the tree. The wire for guying the tree to the post should be brace wire as used in making fence braces. Rubber or plastic hose shall be used to prevent the wire from cutting into the trunk of the tree.

9.5.2 Watering after Transplanting

Transplanted trees require a regular watering regime for the first two (2) growing seasons. Contact the Landscape Architect in the Environmental Section of Planning and Project Development Division for assistance in determining the appropriate watering program necessary for the types of trees being moved.

9.6 SEEDING AND EROSION CONTROL

With Nebraska being a prairie state, grasses and wildflowers are major components of NDOR landscaping objectives as defined in the "Plan for the Roadside Environment". Grasses and wildflowers are selected based upon the characteristics of the region where they are being planted to stabilize the roadside, control erosion, and provide an aesthetically pleasing roadside for the traveling public. To establish a growth of vegetation within the Right-of-Way, a program of seeding or re-seeding, mulching, fertilizing, and the installation of erosion control products is implemented. For additional information in regards to seeding and erosion control, contact the Roadside Stabilization Unit in the Environmental Section of Planning and Project Development Division.

9.6.1 Quality and Workmanship

1. Bare spots and areas on which maintenance has taken place should be seeded and mulched or seeded and covered with an erosion control blanket to prevent soil erosion.
2. Installation of erosion control products should be done only on those areas where previous seeding attempts have been unsuccessful or where steep slopes indicate soil erosion is likely to occur before seeded growth can begin to prevent erosion. Re-seeding should occur prior to replacement of erosion control products.
3. Equipment should not be allowed on newly seeded or erosion controlled areas for six (6) months after repair of the area.

4. Mulching and application of fertilizer will aid in attaining an adequate “stand” of grass to prevent soil erosion.
5. Fertilizer shall be applied at a rate specified for your situation. Refer to the Roadside Seeding Manual for additional information.
6. Seed mixtures are available upon request from the Roadside Stabilization Unit in the Environmental Section of the Planning and Project Development Division. In addition, each spring, the Roadside Stabilization Unit assists with the preparation of seed mixtures for maintenance projects anticipated in the upcoming year.

9.6.2 Scheduling and Inspection

1. Work related to seeding and erosion control is not normally of an emergency nature and should be scheduled. However, restoration work adjacent to water resources must be stabilized immediately upon completion of the project to ensure compliance with environmental regulations.
2. For maximum effectiveness, seeding operations shall be performed only during the periods of March 15 to June 15 and August 1 to September 15. If conditions allow, dormant seeding may occur from November 1 through March 14. Contact the Roadside Stabilization Unit in the Environmental Section of the Planning and Project Development Division for additional information in regards to seeding requirements.

The placement of sod shall NOT be performed between June 1 and September 1, when the ground is frozen, or when the weather conditions are not favorable for growth.

3. Work related to seeding activities will normally be conducted in conjunction with another maintenance activity (ditch cleaning and reshaping, etc.).
4 Needs for seeding and erosion control products will become known through routine inspections of the Right-of-Way.

9.6.3 Procedure

Installing seed mixtures in accordance with the guidelines in the Roadside Seeding Manual will help to improve the germination and growth of the seedings. Generally, the site needs to be graded and shaped, fertilizer applied at the specified rate, and the area seeded and mulched. The Seeding Manual has specific steps and requirements to help ensure a successful stand of vegetation. Contact the Roadside Stabilization Unit for additional information.

9.6.4 Sediment Control Measures

The silt fence and other non-degradable sediment control products are removed either by the contractor at the finish of a project or it will be left in place. Removal or leaving of the silt fence is covered in the contract special provisions. Products that are left in place are the “responsibility” of the maintenance forces for removal at a time when they are no longer functional or needed. The products shall be removed when the grass has developed enough to stop silt deposition. The steel posts and other salvageable materials are to be removed and taken to a maintenance facility for recycling. The black fence material should be removed by cutting it off at ground level and taken to a disposal facility. The silt should also be removed and the area re-seeded. Mulch the area with certified noxious weed-free hay or straw, when available. Any sediment control measures that are determined to be biodegradable, such as coir fiber, silt fence, and erosion checks, may be left in place.

9.6.5 Maintenance of the Department-Owned Wetlands

This maintenance of wetlands is directed by the Environmental Permits Unit in the Environmental Section of Planning and Project Development Division.

CHAPTER 10 COMMUNICATIONS

10.1 INTRODUCTION

Purpose -To establish and operate a system of mobile communication to serve the needs of the Nebraska Department of Roads in accomplishing its mission of highway maintenance and construction.

The intent of this chapter is to acquaint Nebraska Department of Roads personnel with the standard operating procedures of a two-way mobile radio system. Each employee who operates a mobile radio shall become completely familiar with the information contained in this chapter so that the system is used effectively.

Your radio equipment is installed to help you do your job better and easier, and with greater safety to yourself and the public.

10.1.1 General Policies

It is the general policy of the Department to provide mobile two-way radios to employees to improve efficiency and to offer greater convenience and safety to the traveling public. To accomplish this, the Department assigns mobile radios to key maintenance personnel and to selected construction personnel to the extent that it will not interfere with the highway maintenance activities.

Utilization of radio equipment on a seasonal basis is encouraged where justified, as long as it is available in the primary vehicle by the start of the snow season. All changes of this nature are to be coordinated through the Lincoln Electronic Shop.

10.1.2 Federal Regulations

The operation and maintenance of our radio system are governed by rules and regulations set down by the Federal Communication Commission and the Federal Aviation Agency. We are licensed under these rules in the Public Safety Radio Service, which provides that:

1. A current authorization, or a clearly legible photocopy thereof, for each base or station at a fixed location shall be posted at the principal control point. (It is the operator's responsibility to verify the authorization posted is current. The Lincoln Electronic Shop is to be notified in the event the posted FCC authorization is within 30 days of its termination date.)
2. All communications, regardless of their nature, shall be restricted to the minimum practical transmission time.
3. Stations in the Public Safety Radio Service are authorized to transmit only:
    a. Communications directly relating to public safety and the protection of life and property.
    b. Communications essential to official highway activities.
    c. And, are secondarily authorized to transmit communications essential to other official activities of the licensee pertaining to the public safety.
4. All transmitting equipment shall be inaccessible except to authorized personnel. (Obviously, in order to comply with the above and also to prevent theft of the equipment, all compartments, including trunk and cabs must be locked when the vehicle is unattended.

10.2 DESCRIPTION OF SYSTEM

Our highway maintenance radio system consists primarily of eight individual systems. Each system is comprised of remotely located base stations controlled by the District, Construction, and Maintenance Superintendent's offices and local base stations controlled by the Maintenance Supervisors.

The system is designed to provide communications between the offices and radio equipped vehicles operating in the District and to provide the Maintenance Supervisor with the capability of communicating with the District and Maintenance Superintendent's offices and with radio equipped vehicles within the immediate area.

All radio equipped vehicles within range of each other can communicate on a direct vehicle -to-vehicle basis.

10.2.1 District Office

Each District Office is provided with a console, which is capable of controlling base station radios located at distant tower sites. The console is interconnected to the tower sites by either a leased telephone line or a point-to-point radio. Individual base stations are selected at the console by changing switch positions or by dialing the proper code.

10.2.2 Maintenance Superintendent Headquarters

Each Maintenance Superintendent is provided with a console or local base station having the capability of communicating with the District Office, another Maintenance Superintendent, or any radio equipped vehicle in the area.

10.2.3 Mobile Units

Each two-way radio equipped vehicle is capable of communicating with any District Office, Maintenance Superintendent, or other mobile unit within radio range. The standard unit has six transmitting frequencies and three receiving frequencies. Refer to Section 11.3 for specific information on mobile unit operation.

10.3 OPERATION INSTRUCTIONS

10.3.1 Transmitting Procedures

The general effectiveness of a communications system depends largely on the manner in which transmissions are made. Transmit your radio message in a normal conversational tone, holding the microphone about one inch from the lips turned about 600 away from the face, using the following general procedure:

1. Plan your message. Briefly review in your mind what you intend to say.
2. Select proper transmitting frequency. Refer to 11.3.3.
3. Monitor to determine that the frequency is not in use. (Most vehicles require that the ignition be on before the transmitter will operate. The red light on the control head illuminates when the transmitter is operating.
4. Identify your unit or station first then address the unit or station you are calling.
5. Release microphone button and wait a minimum of 10 seconds before repeating step 3. (Remember, if the operator is not in or near the station or unit, it will take time for him/her to reply. Also, if the unit is in standby, there could be a minimum of 30 seconds warm-up before the operator can reply.)
6. Conduct your business in the briefest possible manner, utilizing “plain speech” instead of 10 codes. Break at 30-second intervals any transmission longer than

30 seconds. Use "plain speech" and wait for two or three seconds before resuming transmission. (This permits the station copying to assure you that the message is still being received.)

7. Conclude your message by signing off with the appropriate "call sign." The call sign for all mobile units is KD 5863. The call sign for each base station is unique; it may be found on the station license.

The correct procedure for transmitting a message is:

635—621
621 Location?
Westbound Milepost 138 on 1-80.
--Meet me Ogallala in 10 minutes.
KD 5863
KD 5863

Certain office stations require that a number be dialed in order to alert the operator. Refer to the Mobile Radio Directory for frequency selection and number dialed.

10.3.2 Do's and Don'ts

1. DO:

Plan your message before you transmit.
Select words carefully.
Pronounce words distinctly and rather slowly at a speed of 40-50 words a minute.
Be impersonal. Try not to use the name of the person to whom you are speaking.
Use "plain speech" whenever possible.
Use unit numbers when referring to fellow employees.
Wait until others have completed their message and have signed off before transmitting a message.
Remember that noise heard by the operator will also be transmitted.
Close vehicle windows if necessary to keep out noise. Turn off other radios.
Run vehicle engine when transmitting to minimize battery drain and to increase transmitter output.
Turn set off at night.

2. DON'T:

Use profane or obscene language.
Use nicknames or slang.
Use salutations or thank you, please, etc.
Make transmissions not dealing directly with the business of the Department.
Try to be humorous on the air.
Refer to pay status, classifications, assignment, or discharge of past, present, or proposed employees.

10.3.3 Mobile Unit Operation

1. MOTOROLA MICOR

To turn "on" equipment:
Push (1) up. (2) will light (visible only during dim ambient light conditions).
Place (3) in ON position. On multi-frequency models, turn (4) to the desired frequency.

To receive:

Turn (7) clockwise until noise is heard in the speaker.
Turn (6) fully counterclockwise.
Turn (6) slowly clockwise until noise is just squelched (cuts out).
Set (7) to the desired listening level during reception of a signal.

To transmit:

DO NOT TRANSMIT UNTIL CHANNEL IS CLEAR.
Turn "on" the equipment. Turn "on" the vehicle ignition switch (if required).
To conserve the battery, the engine should be running while transmitting.
Perform step (1) of "To receive" to monitor channel. (PL models only--monitoring is continuous with carrier squelch models.)
If channel is clear, squeeze P- T -T switch and speak across the microphone from about one inch.
(8) will light.
Identify mobile or station being called, then yourself. Release P- T -T switch to listen.

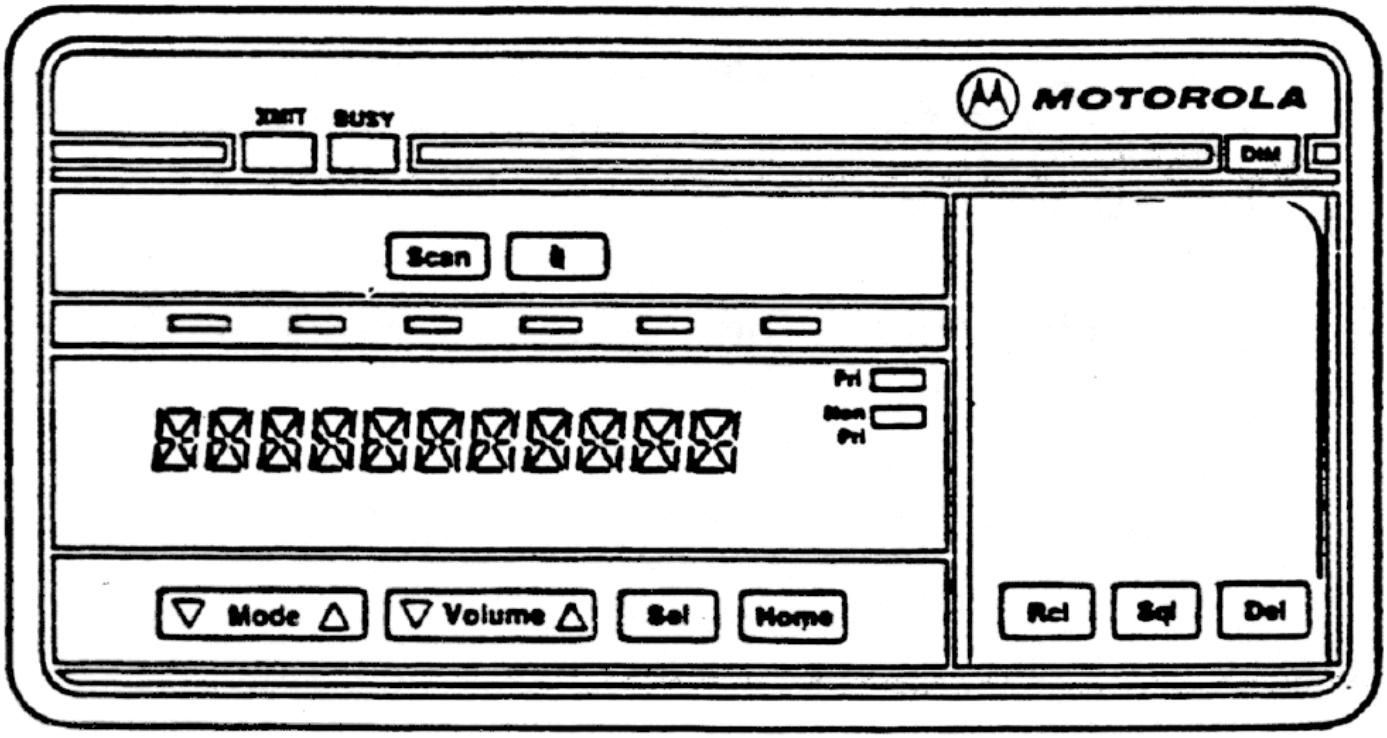
To turn "off' equipment, push (1) down. (2) will go "off."

2. MOTOROLA MITREK

Reception:

Set the control head ON-OFF switch to the ON position.
The receiver operates continuously while the radio is turned on.
Select the desired radio channel.
On "Private-Line" or "Digital Private-Line" radios, remove the microphone or handset from its hang-up box.
The receiver now operates with carrier squelch. All signals on the selected channel can be heard.
Turn the SQUELCH control fully clockwise.
Adjust the control head VOLUME control for a comfortable listening level.

3. MOTOROLA SYNTOR X 900



To turn "on" equipment:

The power switch is on the bottom of the control unit. Slide switch to the left to turn the radio on.

To set volume and squelch:

Hold [Sql] button until beep sounds. Set squelch to zero with [Mode] rocker. Use [Volume] rocker to set volume to desired level. Press [Home]. To change squelch level, hold [Sql] until beep sounds. Use [Mode] to select squelch level. Press [Home]. A squelch level of 2 or 3 and a volume level of 7 through 10 are generally adequate.

To change frequencies:

Press [Mode] rocker to select a desired channel. Use the [Mode] rocker switch to scroll through the list of standard frequencies programmed in your system. During normal operation, the selected mode number and field programmed mode name is shown on the radio's display. When turned on, your radio comes on with the frequency programmed as HOME. During normal operation, the selected mode number and name appears on the display. [Mode] is also used for selecting option choices.

Home:

The radio goes to a preprogrammed home frequency when [Home] is pressed. This is a direct change of frequency, regardless of the number of frequencies between the programmed home and displayed frequency.

Channel Scan:

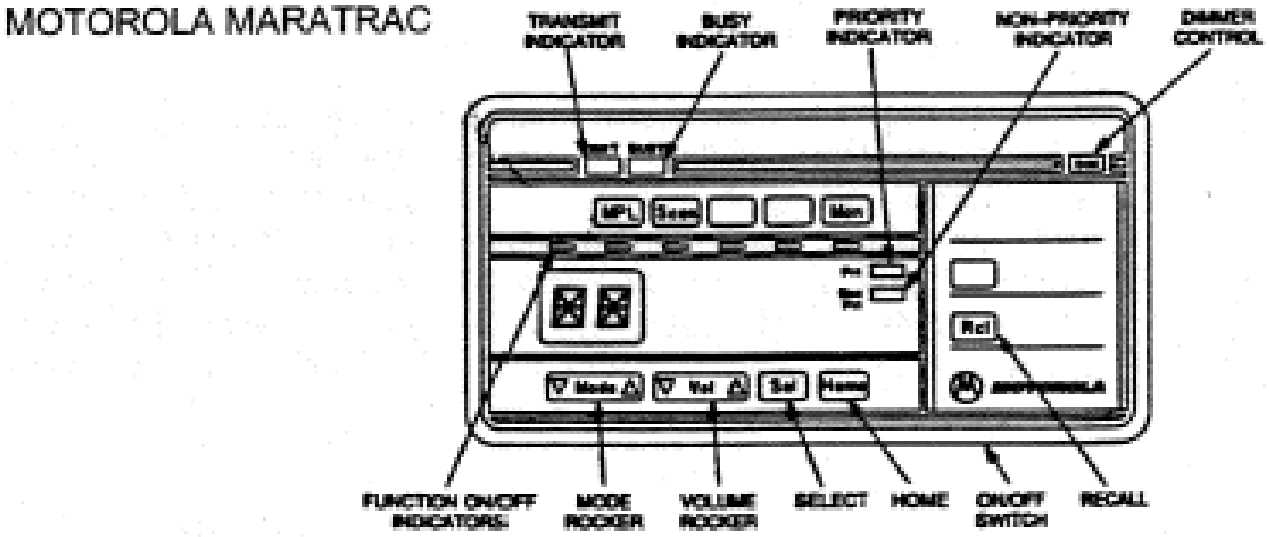
Press the [Scan] button to activate Channel Scan option. A previously selected list of channels is scanned for activity. If no activity exists, the display shows your selected

channel. When a scanned channel becomes active, the display shows the active channel name. The PRI/NON-PRI lights show priority. To delete undesirable (nuisance) frequencies, press [Del] while frequency is active. To restore the scan list, press [Rcl].

Dim:

The [Dim] button adjusts the brightness of the display and button back-lighting to one of four levels. When your radio is turned on, the brightness automatically resets to its highest level. Press [Dim] to lower the brightness. The lowest setting turns the display off.

4. MOTOROLA MARA TRAC



Turning on the radio:

The power switch is on the bottom of the control unit. Slide switch to the left to turn the radio on.

To Receive:

Turn the radio ON. Listen for a tone (or tones) which indicate the radio condition. (See Tone Table.) The display indicates the receive frequency or mode.

To Transmit:

Scroll to the desired frequency using the [Mode] up/down rocker. Press and hold the PTT. When the red XMIT indicator comes on, speak across the microphone in a normal voice. If a tone sounds when you press the PTT, the system is alerting you to a certain condition. (See Tone Table.)

Scan:

Press the [Scan] button to turn on. A "chirp" sounds and the SCAN indicator lights (solid) indicating the system is scanning. Momentarily press [Scan] again to turn scan off.

TONE TABLE

TONE	CAUSE	WHAT TO DO
1 Low-pitched Tone "Bonk"	Invalid Selection.	Select another button.
1 High-pitched Tone "Chirp"	Valid selection.	No action necessary
1 High-pitched Tone at Power-up	Radio passed self-test.	No action necessary.
Series of High-pitched Tones at Power-up	Radio did not pass self-test.	Radio requires service. Notify service personnel.
Low Constant Tone Upon Pressing PTT.	Blank transmit frequency.	Selected mode is receive only.
Low Constant Tone While Transmitting.	Time-out timer has expired	Transmission terminated. Release PTT.

10.3.4 Interference

Interference of one sort or another can be a perplexing problem in some areas of our state. Some interference can be eliminated through technical know-how. Others must be lived with. As an operator of a mobile system, you should be able to recognize the characteristics of the various types of interference so that you know if any action can be taken to alleviate the problem. If you are experiencing considerable interference, please notify the Lincoln Electronics Shop.

1. CO-CHANNEL INTERFERENCE is what causes the greatest share of interference in some areas. This is caused by the fact that all Districts utilize the same channel. This condition is brought about by heavy demand for channels in all areas of the United States. The only possible improvement at the present is through better operational procedures. Radio codes should be used whenever possible to provide for minimum "on air" time through easier understood and more concise message traffic. When contacting a unit, wait 15 to 20 seconds between attempts. It may take that long to return to the vehicle and respond. Base stations should keep dialing to a minimum.
2. SKIP INTERFERENCE is similar to co-channel interference except from a distance of several hundred to thousands of miles away. This type of interference is caused by atmospheric conditions and sun spot activity. Remember, if you hear them, they hear you. Skip interference must be accepted as a temporary nuisance.
3. ELECTRICAL NOISE is generated by a great variety of devices such as signs, vehicle ignition, and power lines. The most destructive of electrical noises is vehicle ignition, which degrades performance of the receiver. This is controlled in the newer units by noise clipping circuits, but the best way is to alleviate the problem. Ignition systems, voltage regulators, generators, alternators, and gauges are frequent sources of noise. A well-tuned, clean engine reduces interference. If you have this problem, contact your District Mechanic and the radio technician. The two will have to work together.

10.4 SYSTEM MAINTENANCE

10.4.1 Tower Site

Maintenance Superintendents are charged with the care and maintenance of base station tower sites within their areas. The Maintenance Superintendent shall personally observe the general condition of the tower, guy lines, anchors, building, and fencing at least once every three months. The operation of the tower lights can be checked by shading the photo cell and observing if the side and top lights illuminate.

The emergency power generator must be inspected monthly. The procedure of this inspection is outlined in Exhibits 11-1 and 11-2.

Much of the Department's radio equipment is battery operated. Batteries located at the transmitter sites are to be inspected monthly.

10.4.2 Tower Lights

Maintenance Superintendents will arrange to observe or have observations made of the tower lights at least once each 24 hours so as to visually ascertain that all lights are functioning properly in accordance with the FCC Rules and Regulations Section 90.443. The time the daily check of proper operation of the tower lights was made must be entered into the station records.

In case of a failure of the "top" light, a report of the failure must be made within 30 minutes to the Columbus FAA Flight Service Station using the toll free number 800-362-0799. Give the Columbus FAA FSS the nature of the failure, such as "top light not operating," the location of the tower relative to the nearest airport or town, the height of the tower and the owner of the tower (the owner is the State of Nebraska, Department of Roads). Make note of the "Notam Number" that the FAA FSS assigns to this report. Then call the Lincoln Electronic Shop and give the same information, including the Notam Number. The Department's Electronic Technician will report to the FAA FSS when the tower lights are back in operation.

Failure of the steady burning side lights should be corrected as soon as possible, but notification to the FAA is not required. The information is forwarded to the Lincoln Electronic Shop.

10.4.3 Radio Equipment

Operators of radio equipment vehicles are responsible for the physical protection of the equipment. The radio unit, whether under the seat or trunk-mounted, must be kept clean and dry with sufficient free air space adjacent and above to allow for adequate heat dissipation.

Radio technicians shall verify the carrier frequency and modulation deviation of each transmitter to be checked to determine that it is within tolerance and the results thereof entered in the station records in accordance with the following:

Technical problems should be directed to the appropriate service facility.

LOCATION	RESPONSIBLE ELECTRONIC SHOP	TELEPHONE NUMBER
Districts 5, 6, 7, 8	North Platte	308-535-8011 Ext 205
Districts 4	Grand Island	308-385-6888 Ext. 120
In District 2	Omaha	402-595-2534. Ext. 237
In District 3	Norfolk	402-370-3479 Ext 211
In District 1	Lincoln	402-479-4344

Modification of radio equipment is not to be accomplished without prior approval of the Lincoln Electronic Shop.

10.4.4 Cost Accounting

All costs incurred in the operation, maintenance, and repair of all radio system equipment, which includes costs for maintaining yards, buildings, towers. And lines, are to be coded to Activity 2908 and the applicable base or mobile radio number. Base and mobile radio numbers are listed in Exhibit 10-3 of this chapter. Refer to the Department Accounting Manual for additional coding requirements.

10.5 PHRASEOLOGY

10.5.1 Word Choice

Choice of words in composing a message determines whether the receiving party will understand it correctly the first time or find it necessary to ask for a repeat. Unnecessary words that do not affect the meaning of a message should be avoided. Select words that are forceful and distinct words whose meaning cannot be mistaken.

Following is a comparative listing showing a few poor and preferred words:

POOR	PREFERRED
Want	Desire
Can't	Unable
Buy	Purchase
Get	Obtain
Send	Forward
Do You Want	Advise If
Left	Departed
Via	En route

Plan your message before you go on the air. This will eliminate both the omission of important details and the repeated injection of II Ah-a-ah" between phrases.

Often it is difficult to distinguish between similar sounding letters. The following is an internationally accepted phonetic alphabet.

PHONETIC ALPHABET

ALPHA	JULIET	SIERRA
BRAVO	KILO	TANGO
CHARLIE	LIMA	UNIFORM
DELTA	MIKE	VICTOR
ECHO	NOVEMBER	WHISKEY
FOXTROT	OSCAR	X-RAY
GOLF	PAPA	YANKEE
HOTEL	QUEBEC	ZULU
INDIA	ROMEO	

EXHIBIT 10-1 Power Plant Inspection

STATE OF NEBRASKA
DEPARTMENT OF ROADS
MAINTENANCE MANUAL

Chapter 10

MAINTENANCE MANAGEMENT SYSTEM

DEPARTMENT OF ROADS

ELECTRIC POWER PLANT MAINTENANCE INSPECTION

MONTHLY

Location_____

Date Inspected	Hour Meter Reading	General Condition	Fuel Level	Oil Level	Battery Water Level	Air Cleaner Change Date	Building Air Vents	Starting (1)	Voltage	Frequency	Hour Meter	Reading	Date of Last 6 Months Check (2)	Hour Meter of Last 500 Hr. Check	Hour Meter of Last 1000 Hr. Check	Other Checks Performed Today	Name

(1) Unit should be run under load conditions for at least 10 minutes.
(2) Oil should be changed each spring and fall SAE 30 (Spring) SAE 20 (Fall)

RADIO AND TOWER FACILITIES

Site No.	LOCATION
District Zero	
00081	Lincoln -Patrol Tower
00082	Lincoln –Tower
00181	Lincoln -5001 S. 14th
00281	Lincoln- 1500 Highway 2
09999	District 0 (Mobile}
District One	
10081	Beatrice -Tower
10181	Lincoln- 1st and Superior
10281	Lincoln -5300 Salt Valley
10381	Adams
10581	Auburn
10582	Tecumseh
10583	Osage
10781	Beatrice
10782	Fairbury
11281	David City
11381	Dorchester
12081	Greenwood
12381	Nebraska City
12481	Pawnee City
12581	Palmyra
12881	Seward
13381	Wahoo
19999	District 1 (Mobile}
District Two	
20181	Omaha
20182	East Omaha -Tower
20380	North Omaha
20581	Blair
20681	Elkhorn
20983	South Omaha
21081	Papillion
21180	Fremont
21181	Fremont –Tower
21481	Plattsmouth
29999	District 2 (Mobile)
District Three	
30081	Norfolk – Tower
30082	Caroll – Tower
30083	Willowdale – Tower
30085	Winnebago – Tower
30086	Cedar – Tower
30181	Norfolk – 408 N. 13th

30281	Norfolk – N. Yard (Elec. Shop)
30481	Albion
30781	Bloomfield
31081	Columbus
31082	Platte Center – Tower
31381	South Sioux City
31681	Hartington
31881	Humphrey
32081	Laurel
32181	Lyons
32581	Neligh
32681	Niobrara
32682	Niobrara – Tower
33481	Plainview
33781	Wayne
33881	West Point
34181	Clarkson
39999	District 3 (Mobile)
District Four	
40081	Phillips
40082	Ayr- Tower
40083	Wolbach
40084	Nuckolls
40085	Buffalo/Pleasanton -Tower
40181	Grand Island -211 N. Tilden
40381	Grand Island -Jct. 281 & 430
40382	Grand Island Shop Radio
40781	Aurora
41581	Central City
41981	Geneva
42082	Greeley
42381	Hastings
42481	Kearney
42482	Kearney- Tower
42503	Kearney I-80 Yard
42781	Loup City
43181	Ord
43281	Osceola
43481	Red Cloud
43781	St. Paul
43881	Superior
44181	York
44781	Hebron
49999	District 4 (Mobile)
District Five	
50081	Angora
50082	Squaw Mound

Site No.	LOCATION
50083	Huntsman
50085	Rushville
50086	Chadron Park
50181	Bridgeport -514 Main
50281	Bridgeport -Maintenance
50381	Alliance
50481	Chadron
50485	Chadron -Tower
50681	Chappell
50881	Crawford
50981	Gordon
50982	White Clay
51481	Kimball
51781	Oshkosh
52081	Scottsbluff
52181	Sidney
59999	District 5 (Mobile)
District Six	
60082	Tryon
60083	North Platte Patrol- Tower
60084	Broken Bow -Tower
60085	Arthur-Tower
60086	Dawson
60087	North Platte South -Tower
60088	Mullen -Tower
60181	North Platte -1321 N. Jefferson
60281	North Platte- W. 14th (Maintenance)
60282	North Platte -W. 14th (Elec. Repair)
60781	Arthur Yard
61381	Gothenburg
61781	Lexington
62181	Ogallala
62182	Ogallala -Tower
62183	Big Springs
62581	Thedford
62981	Mullen
63281	Broken Bow
63583	Whitman
69999	District 6 (Mobile)

Site No.	LOCATION
District Seven	
70081	McCook -Patrol Tower
70082	Bertrand
70083	Wauneta
70181	McCook- 7th and Auditorium
70381	Alma
70481	Arapahoe
70681	Benkelman
71081	Elwood
71281	Franklin
71381	Hayes Center
71481	Holdrege
71681	Imperial
71881	Maywood
71882	Maywood –Tower
72581	McCook -East
72681	Grant
72981	Minden
79999	District 7 (Mobile)
District Eight	
80081	Crookston
80082	Bassett
80083	Merriman ETV
80182	Ainsworth
80382	Bartlett
80481	Bassett
80581	Burwell
80781	Merriman
80881	Naper
80981	O'Neill
81181	Spencer
81381	Taylor
81481	Valentine
89999	District 8 (Mobile)
99999	Statewide

CHAPTER 11 ENVIRONMENTAL

11.1 NDOR STORM WATER (MS-4) PROGRAM

11.1.1 FRCP-Facility Runoff Control Plans-

NDOR has developed plans to control pollutant runoff from construction projects as well as daily operations and maintenance activities. These plans currently apply in communities with ≥ 10,000 populations. Focus lies within 4 target areas/activities at Maintenance Yards.

1. Buildings and Grounds
2. Bulk Storage Tanks
3. Vehicle/Equipment Storage/Repair and
4. Waste and Product Material Management

Documentation Needed: Requires a Monthly Inspection. NDOR documents problems observed and records corrective actions. An annual report is developed by NDOR and submitted annually to the Nebraska Department of Environmental Quality (NDEQ) by April 1st.

11.2 IDDE-ILLICIT DISCHARGE DETECTION AND ELIMINATION

•Currently this part of the storm water permit is in the development phase.

•The first requirement is to map our outfalls along the ROW within the boundaries of the communities with ≥ 10,000 people.

•The second component will require annual, biannual or triennial monitoring of the outfalls along expressways and interstates where NDOR is responsible for the appurtenances associated with the roadway.

If you find an illicit discharge, call Operations for the local storm water contact in your area. 402.479.4656

Documentation Needed: Outfall screening/monitoring results and location.

11.3 TIER II CHEMICAL REPORTING

Facilities covered by Emergency Planning and Community Right-to-Know Act (EPCRA) requirements must submit an Emergency and Hazardous Chemical Inventory Form to the Local Emergency Planning Committee (LEPC), the State Emergency Response Commission (SERC), the Nebraska Department of Environmental Quality (NDEQ), and the local fire department annually (http://www.epa.gov/oem/content/epcra/tier2.htm).

Required Annually by March 1st: NDOR Maintenance Supervisors file the Tier II Forms electronically to NDEQ with a Facility ID and Password. Send a copy of the completed form to the Environmental Specialist in the Operations Division.

11.4 SPCC— SPILL PREVENTION CONTROL AND COUNTERMEASURE

The facility must have an SPCC plan if it has over 1,320 gallons of aboveground storage of petroleum products or 42,000 gallons of underground storage. This plan shows where the tanks are located, and

what preventative measures are in place if a spill occurs. This plan states how the facility will handle that event. Spill reporting information is also included in the plan.

Documentation needed:

- **SPCC plan and 5 year review with signature**
- **P.E. Certification**
- **New Hire Training Requirements (within 30 days)**
- **Diked Area Drainage Form**
- **Monthly Tank Assessment**
- **Annual Tank Assessment**
- **Oil Water Separator Assessment (every 6 months)**
- **Notification to Operations if a tank is moved (Re-certification by P.E. required and updated site map generated at this time).**

11.5 WASTE DISPOSAL

The Waste Manual for NDOR Maintenance Yards describes reporting and disposal techniques for various wastes. The manual should be located at each facility and has detailed directions on what to do with hazardous and non-hazardous materials. Referencing this manual is strongly recommended before throwing away any potentially harmful products, including but not limited to, oil products (PIGS), light bulbs, batteries, paint, and more.

11.6 TITLE 200– UNDERGROUND (AND ABOVEGROUND) STORAGE TANK REMEDIATION

Title 200 is a funding source to remediate contamination found from leaking underground or aboveground storage tanks. Over time this program has helped remediate many NDOR sites that have had leaks. If any new contamination from leaking tanks is found, it is necessary for NDOR to notify NDEQ by June of 2012 to qualify for reimbursement under the Title 200 program. As of the time of this printing, any locations with leaks after this date will not qualify for remediation with the use of federal funds.

Many NDOR maintenance facilities have consultants traveling to their yards performing drilling, monitoring, and remediation activities. Sometimes the consultants send out different individuals that have difficulty in locating the wells on site. The Operations Environmental Unit is encouraging the consultants to contact the site supervisors to notify them of any upcoming visits.

11.7 WATER WELLS

11.7.1 Purpose

To maintain current records on all water wells that are property of the Nebraska Department of Roads.

All new water wells must be registered with the Nebraska Department of Natural Resources (DNR) within 60 days of well installation. Some local Natural Resource Districts (NRD),such as the Central Platte, require permits for new wells before installation. The well contractor should furnish necessary data, aerial photos (from the Farm Service Agency, FSA formerly ASCS office), and boring logs to complete registration. The local NDOR supervisor who is familiar with the information should sign the well registration form (DNR Form 145) as “Agent for NDOR”. Forms are available on the DNR website http://www.dnr.state.ne.us

11.7.2 Policy

Field personnel shall telephone the Operations Division in Lincoln for guidance on any pump replacement or well problem. The phone number is 402-479-4656.

Any change from the original pump size and depth location shall have concurrence from the Operations Division.

11.7.3 Replacement Procedures

Measure the "static water level" prior to calling the Operations Division, if equipment is available for this purpose.

Report any work done on the current "Water Well Data" form and send it to the Operations Division in Lincoln. (Exhibit 14-1.)

11.7.4 Abandonment Procedures

When water wells are no longer needed they must be decommissioned in accordance with the rules and regulations of the Nebraska State Health and Human Services System (HHSS) and the Department of Natural Resources (DNR). The work must be done under the supervision of a licensed well contractor or pump installer. The contractor must complete the "Notice of Water Well Abandonment" indicating the actual method used for abandonment of the well. The form is available at the DNR web Site at http://www.nrc.state.ne.us/docs/wellforms.html. The form must be signed by the Water Well Contractor. The well owner's signature is no longer required on the abandonment form, (DNR ABAN). The completed form must be sent to DNR within 60 days so that their records can be updated. At the present time there is no fee for filing the well abandonment form.

Contact the Environmental Specialist in the Operations Division in Lincoln if you have questions concerning water well registration and abandonment. Additional information can be found at http://www.dnr.state.ne.us.

WATER WELL DATA

Information Requested	**Answer**
Well Location (Legal Description)	
Well Registration Number	
Serial No. or H.P. of Pump	
Diameter of Pump	
Total Depth of Well	
Static Water Level (Measure from Ground Line to Water Level)	
Pump Replaced and Size of Replacement	
Drop Pipe Replaced and No. of Feet	
Depth to Pump	
Length of Well Screen	

Exhibit 12.1

11.8 POLICY ON HAZARDOUS MATERIAL SPILL

Contact the Operations Division for the most current Hazardous Materials Manual. For additional information on the release of hazardous materials, see the NDEQ website at http://www.deq.state.ne.us/RuleAndR.nsf/pages/126-Ch-18.

11.8.1 Department Incident

The Nebraska Department of Environmental Quality (NDEQ) requires reports of releases of oil or hazardous substances, regardless of quantity. The only exemption to this applies to releases of petroleum products of 25 gallons or less, provided the release does not threaten waters of the state (any surface or ground water) or post a threat to human health and safety. In case of such an incident, we must notify the following:

Daytime --
Nebraska Department of Environmental Quality, 402-471-2186 or 402- 471-4230. We shall ask them to assess the material and quantity and advise if we need to notify the Environmental Protection Agency (EPA). Advise the Logistics Division Manager 402-479-4339 of the incident.

Nighttime --
Nebraska State Patrol, 402-471-4545. The State Patrol, in turn, should call the NDEQ or Nebraska Department of Roads' personnel must call. Following up the next day by asking the NDEQ if we need to notify the EPA. Advise the Logistics Division Manager of the incident the next day.

Anytime --
EPA (National Response Center) at 800-424-8802. Call only if advised to do so by the NDEQ. For spills of hazardous substances listed under GERCLA or EPCRA, a call to 911 is required.

A reasonable time for reporting a spill is considered to be "as soon as possible." Federal law requires that ordinary delays in notification should not exceed 15 minutes. A spill is any quantity, regardless of how small, exempting petroleum products as spelled out in the first paragraph of this section.

We must contain any such spill, preferably on our own property. In case of a spill, we must take action to keep such material from any water course, and contain it in whatever manner deemed necessary. If a spill should infringe upon private property, follow the directives of the incident leader and the property owner.

For more information on the material spilled, review the Material Safety Data Sheet (MSDS).

11.8.2 Non-Department Incident

When Department of Roads' employees are the first on the scene of a private vehicle accident involving any cargo (not only regulated hazardous material), they should do the following:

From a safe distance, check the involved vehicle(s) for placards. Normally, motor vehicles and freight containers carrying hazardous materials have placards on the sides, front, and back which identify the type of hazardous material being carried. These materials can be chemicals, explosives, or radioactive materials. Get color, wording and/or number from the placard (visual contact). If the cargo is unlabeled and unknown, report this information.

Immediately notify the closest Maintenance Supervisor or Superintendent's office of the findings. The Supervisor or Superintendent, immediately upon receiving the call from the accident site, shall contact the nearest State Patrol office, giving location, placard I.D., and measures being taken, including traffic control information. This is the only call that need be made in a non-Department spill.

The following information is needed when reporting surface spills:

1. Time of incident.
2 Where--Highway Number, Milepost, Side (North/South, etc.)?
3. What chemical, if known?
4. How much--gallons or pounds?
5. Distance from creek, river, or lake?
6. Company involved (owner of truck)?
7. Has State Patrol been notified?
8. Is local fire department or Hazardous Mat. Team on scene?
9. Does National Emergency Response (NER) Team need to be notified?

The Department of Roads' employee at the accident site shall stay away from the immediate area of the accident until the material is identified and safety precautions are understood. At a safe distance (upwind, if possible), control traffic until law enforcement officers or hazardous materials experts arrive on the scene to take control. **Do not undertake spill control measures on your own. If attempting a rescue operation remember you may be in a life-threatening situation.**

Department of Roads' maintenance employees shall not clean up hazardous materials spills of private shippers involved in accidents. Shippers of hazardous materials are responsible for the cleanup of their hazardous materials which get spilled. Because of equipment availability, the Department may be required to contain the material by building a dike, etc., but employees shall not do this unless they are assured by experts that it is safe do so.

CHAPTER 12 TRAFFIC CONTROL

12.1 POLICY ON TRAFFIC CONTROL FOR MAINTENANCE ACTIVITIES

This chapter is based on and refers to the Manual on Uniform Traffic Control Devices (MUTCD). Additional information and details can be found in the latest edition of the MUTCD that has been adopted by NDOR, including the Nebraska Supplement to the MUTCD and the NDOR Standard Specifications for Highway Construction.

The primary function of Temporary Traffic Control (TTC) is to provide for the reasonably safe and efficient movement of road users through or around work zones while reasonably protecting workers, responders to traffic incidents, and equipment.

No one set of TTC devices can satisfy all conditions for a given project or incident. At the same time, defining details that would be adequate to cover all applications is not practical. Instead, the MUTCD and this chapter of the Maintenance Manual define typical applications that depict common applications of TTC devices. The TTC selected for each situation depends on type of highway, road conditions, duration of operation, physical constraints, and the proximity of the work space or incident management activity to road users.

Maintaining good public relations is recommended. The cooperation of the news media in publicizing the existence of and reason for work sites can be of great assistance in keeping the motoring public well informed.

12.1.1 Fundamental Principles

The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), through a TTC zone shall be an essential part of highway construction, utility work, Maintenance Operations, and the management of traffic incidents.

Before any new detour or temporary route is opened to traffic, all necessary signs shall be in place. All TTC devices shall be removed as soon as practical when they are no longer needed. When work is suspended for short periods of time, TTC devices that are no longer appropriate shall be removed or covered.

12.1.2 Definitions

MUTCD - Manual on Uniform Traffic Control Devices, an FHWA publication.
TTC - Temporary Traffic Control

The five categories of roadway surface work duration and their time at a location shall be:

1. Long-term stationary is work that occupies a location more than 3 days.
2. Intermediate-term stationary is work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than 1 hour.
3. Short-term stationary is daytime work that occupies a location for more than 1 hour within a single daylight period.
4. Short duration is work that occupies a location up to 1 hour.
5. Mobile is work that moves intermittently or continuously.

Component Parts of a Temporary Traffic Control Zone are shown in Exhibit 13-1

12.1.3 Recommended Traffic Control

Reference shall be made to the MUTCD for minimum procedures in traffic control not outlined below.

1. TEMPORARY TRAFFIC CONTROL DEVICES for all interstate, freeways, and rural multi-lane highways.
   - A. Mobile and Short Duration
     - (1) On shoulder (Exhibit 13-2)
     - (2) Shoulder work with minor encroachment (Exhibit 13-3)
     - (3) Lane closure (Exhibit 13-4)
   - B. Short Term Stationary or longer
     - (1) Perform operation in accordance with procedures called for in TTC plans for lane closures (Exhibits 13-5 and 13-6)

Signing:

Use a truck mounted attenuator and flashing arrowboard at work site.
Use a message board where available, especially with a moving operation.
The last sign in the setup should be at least 1,000 feet in advance of the beginning of the taper. The taper shall be at least 900 feet long for 75 MPH limit and 780 feet for 65 MPH limit.

2. TEMPORARY TRAFFIC CONTROL DEVICES for all urban multi-lane (not freeway, interstate, or expressway) highways.
   - A. Mobile and Short Duration
     - (1) Lane closure (Exhibit 13-7)
   - B. Short Term Stationary or longer
     - (1) Perform operation in accordance with procedures called for in TTC plan for urban traffic control (—Standard plan 924).

Signing

Use a truck mounted attenuator and flashing arrowboard at work site.
Use a message board where available, especially with a moving operation.
The last sign in the setup should be at least 100 feet for speeds less than 45 mph, or 350 feet for speeds 45 mph and above in advance of the beginning of the taper.
The taper shall is calculated using the speed limit see the Standard Plan.

3. TEMPORARY TRAFFIC CONTROL DEVICES for all two lane highways with adequate shoulders to park on.
   - A. Short Duration. (Exhibit 13-8) ADT < 2000
     - (1) Crew of two and one vehicle.
     - (2) Vehicle parked on shoulder with beacons and high intensity lights on.
     - (3) One crew member shall be a watcher/flagger and shall be positioned to see both traffic and other crew member.
     - (4) Other crewmember performs work with caution.
   - B. Short Term Stationary
     - (1) Perform operation in accordance with procedure called for on Standard Plan No. 921 and/or 922.
   - C. Intermediate and Long-term Stationary
     - (1) Perform operation in accordance with procedure called for in Standard Plan No. 921 and/or 922

Signing

1. A flashing arrow board may be used at each end of the work zone. Use caution mode only. The sequential arrow or chevron shall not be used.
2. A normal setup should not be more than a mile long.
3. In rural areas, the last sign in the setup should be at least 500 feet in advance of the flagger or the beginning of the work space (except in the case of a shoulder drop-off sign, 300 feet).

Procedures

1. Use trained flaggers where required.. All flaggers shall wear reflectorized vests.
2. Plan roadwork to account for traffic volumes and weather conditions.
3. Check signs and arrow boards regularly.

4. TEMPORARY TRAFFIC CONTROL DEVICES for all two lane highways with narrow or no shoulders and sight distance over 750 feet. Details can be found in Exhibit 9 and on Standard Plan Nos. 921 and 922 .

A. Short Duration. (Exhibit 13-9) ADT < 2000

(1) Crew of two and one vehicle.
(2) Vehicle parked as far off of highway as possible with beacons and high intensity lights on.
(3) A workers symbol sign shall be placed along outside edge of lane partially occupied by the work vehicle and within one mile of work site.
(4) One crew member shall be a watcher / flagger by taking a position to see both traffic and the other crew member.
(5) The other crew member performs work with caution.

B. Short Term Stationary.

(1) Perform operation in accordance with procedure called for on Standard Plan No. 921and/or 922.

C. Intermediate and Long-term Stationary

(1) Perform operation in accordance with procedure called for in Standard Plan No. 921and/or 922. .

Signing

1. A normal setup should not be more than a mile long.
2. In rural areas, the last sign in the setup should be at least 500 feet in advance of the flagger or the beginning of the work space (except in the case of a shoulder drop-off sign 300').

Procedures

1. Use trained flaggers where required. All flaggers shall wear high visibility safety apparel that meets the Performance Class 2 or Class 3 requirements of the ANSI/ISEA 107-2004 publication titled, "American National Standards for High-Visibility Safety Apparel and Headwear."
2. Plan roadwork to account for traffic volumes and weather conditions.
3. Check signs and arrow boards regularly.

5. For long term operations not addressed in Standard Plan Nos. 921 or 922, the work site supervisor shall develop the traffic control plan deemed appropriate for the safety of the workers, as well as the safety of the traveling public.

The above requirements are minimum and additional protection shall be used in accordance with Standard Plan No. 921 or 922 where heavy traffic warrants or sight distances of less than 750 feet exist.

12.2 PAVEMENT STRIPING -TRAFFIC CONTROL

12.2.1 GUIDELINES

The primary function of traffic control for striping operations is to move traffic safely and expeditiously around any striping operation that is either moving down the highway or stopped for emergency repair. For any repair other than that of an emergency nature, the operation shall be moved off the traveled portion of the roadway and onto the shoulder area.

This guideline and plan numbers 42-0-81S(SP) and 43-0-81S(SP) shall be the minimum procedure under which any striping operation shall be performed. (Plans are included in this chapter.)

The "trailing vehicle" (supply truck) as shown on the above mentioned plans shall be an optional vehicle. In the absence of the optional vehicle, the rear vehicle will maintain the designated distance as shown on the signing plans.

12.2.2 PAVEMENT PAINT STRIPING PROCEDURES

The standards in paint striping shall be performed in accordance with the MUTCD, Part 3 and NDOR typical plans. These procedures do not apply to areas marked with durable pavement markings, i.e., tape, epoxy, thermoplastic, polyurea, etc.

A. Interstate System
   1. Lane Markings
      a. Omaha area and I-80 west to N-50—three times annually or as needed.
      b. Lincoln area and I-80 from N-50 Interchange to Colorado border--two times annually or as needed.
      c. Remaining mileage--annually or as needed.
   2. Edgeline
      a. Omaha area--twice each year or as needed.
      b. Remaining mileage--annually or as needed.

B. Primary and Secondary System

TRAFFIC VOLUME--ADT 0-800
1. Centerline--stripe every second year or as needed
2. Edgeline--stripe every second year or as needed.

TRAFFIC VOLUME--ADT 800-3000
1. Centerline--stripe every year or as needed.
2. Edgeline--stripe every second year or as needed.

TRAFFIC VOLUME--ADT 3000 and Over
1. Centerline--stripe semiannually or as needed.
2. Edgeline--stripe annually or as needed.

All centerlines and edgelines will be maintained in a highly reflective condition. This policy is not meant to preclude striping if needed to satisfy this condition. These frequencies can be varied at discretion of District Engineer.

12.2.3 GENERAL CRITERIA TO BE FOLLOWED

A. All centerline and edgeline marking on two-lane highways as set out in the policy shall be of five inch width and a thickness of 10 mils dry. Five pounds of beads per gallon of paint shall be used. There shall be a two inch space between all parallel lines. Interstate and multi-lane highway line widths will remain at four inches.

District 2 will use Type I free-flowing beads and apply six pounds of beads per gallon of paint.

B. Edgelines on two-lane highways shall be placed in the following manner:

Roadway Width	Shoulder Type	Distance From Centerline of Roadway to Outside Edge of Pavement Edgeline
Less than 24 ft	Surfaced	12 ft 0 in
Less than 24 ft	Earth	Pavement Edge
24 ft	Earth	Pavement Edge
24 ft	Surfaced	12 ft 0 in
28 ft	Surfaced	12 ft 0 in
Greater than 24 ft	Earth	12 ft 0 in

Edgelines on Interstate and other multi-lane highways shall be placed in the following manner:

Roadway Width	Shoulder Type	Distance From Centerline of Roadway to Outside Edge of Pavement Edgeline
24 ft	Surfaced	12'-0"

C. Use a 10 foot line -30 foot skip pattern for marking centerline and lane lines in rural areas.
D. Use a 6 foot line -18 foot skip in urban areas for marking centerline and lane lines.
E. Use a 2 foot line -6 foot skip pattern across all Interstate on and off ramps. Gore marking will be a 12 inch wide, continuous stripe.
F. Temporary centerline marking shall be placed on all surfacing, overlay and seal coat work performed by State forces. Temporary tape is available from Purchasing and Supply, Class 85-38400 (yellow), 85-37800 (white). The 4" X 48" pieces of tape shall be placed at 40 foot intervals or the two temporary yellow overlay tabs, 85-38500, shall be placed 5 feet apart at 40 foot intervals. This centerline marking shall be done as work progresses and at the end of the day through the work area completed that day.
G. Centerline marking shall be placed on the "south" side of the center joint on east-west roads and on the "east" side of the center joint on all north-south roads. On Interstate and divided highways, the lane line shall be placed on the left side of the center joint in direction being traveled.

12.3. PROCEDURE FOR ESTABLISHING NO PASSING ZONES

See Appendix 10

12.4. PAVEMENT MARKING FOR STATE PATROL

12.4.1 Authorization

State Patrol shall submit requests for pavement markings on State highways to the District Headquarters.

12.4.2 Procedure

The 3' X 4' painted rectangular area shall be opposite each other on both sides of the road. The four-foot (4') dimension shall be extended from the edge of the roadway toward the centerline, or toward the edge of the surface shoulder. The three-foot (3') dimension is longitudinal with the highway.

12.5. TRAFFIC SAFETY IN UTILITY WORK ZONE

12.5.1 General

Any work performed by utilities on the State Highway System shall use traffic control devices to be consistent with the provisions of Part 6 of the MUTCD.

12.5.2 Procedures

Requests to perform work by utilities on State right of way originates with the District Office. Their requests are reviewed at District Offices and then submitted to the Lincoln Access Control Permit Office with District recommendations. Access Control Permit Office approves or disapproves request after coordinating the request with various divisions. If approved, requests are sent back to the District Office who will coordinate the work to be performed with utility companies and assure it is performed in accordance with the approved request and that all traffic control procedures are followed in accordance with standards on traffic control as published in this chapter.

12.6. STANDARD PROCEDURES AND POLICIES

The NDOR Traffic Engineering Policies & Procedures Manual is provided as a guide for Department personnel traffic studies, operation, and design. It establishes some policy or procedural information and with the application of sound traffic engineering judgment, helps to establish uniform guidelines and procedures for the use of traffic control devices. The Policies & Procedures Manual is not intended to be a substitute for engineering knowledge, experience, or judgment. It should be used in conjunction with the "Manual on Uniform Traffic Control Devices" (MUTCD) issued by the Federal Highway Administration (FHWA) and in conjunction with the "Nebraska Supplement to the MUTCD" to promote uniform statewide application of traffic control devices. The Policies & Procedures Manual provides interpretive guidance, but does not change the requirements of the MUTCD.

The Manual can be found and viewed on-line at the Nebraska Transportation website at the following web address:

http://www.nebraskatransportation.org/intranet/traff-eng/index.htm

12.6.1 CONSTRUCTION ZONE SPEED LIMITS

Refer to Policy 610.1 for guidelines for establishing speed limits through construction and maintenance work areas. This Policy defines the delegation of authority to set speed limits, conformity with the MUTCD, and the limited locations and circumstances to which this applies.

Guidelines to be used in determining the value of the speed limit are presented. Examples of activities are indicated that may not require a short term speed limit change. Details on speed and FINES DOUBLE signing are given.

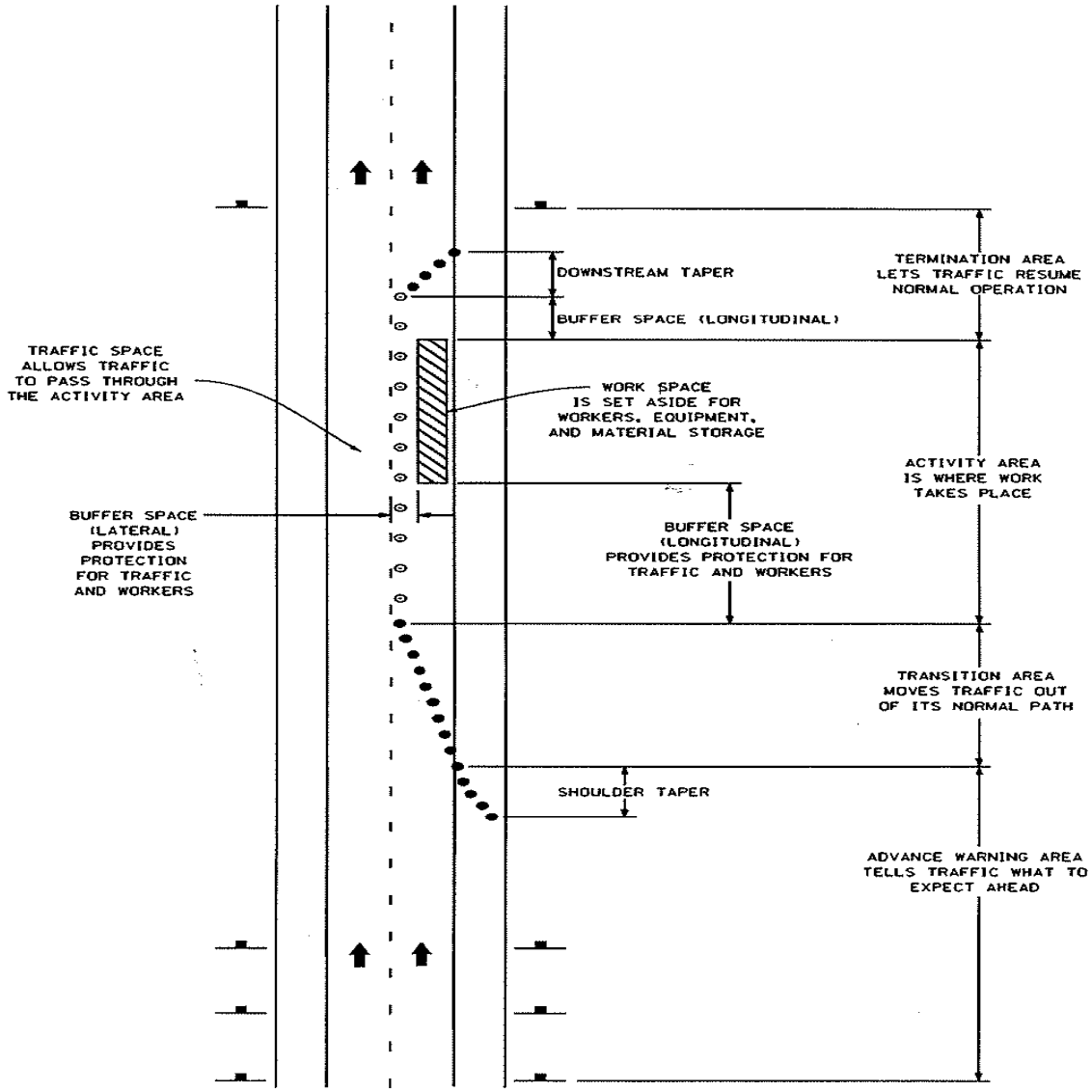
12.6.2 Sign Inspection Policy

The Nebraska Department of Roads requires Annual Visual Nighttime Inspection of all signs on State Right-of-Way that are the responsibility of the NDOR. Policy 201.1 defines the time of year, preparations, and procedures to be followed in the inspection. The documentation that is to be prepared and retained can also be found in this policy.

12.6.3 Signs and Sign Warrants

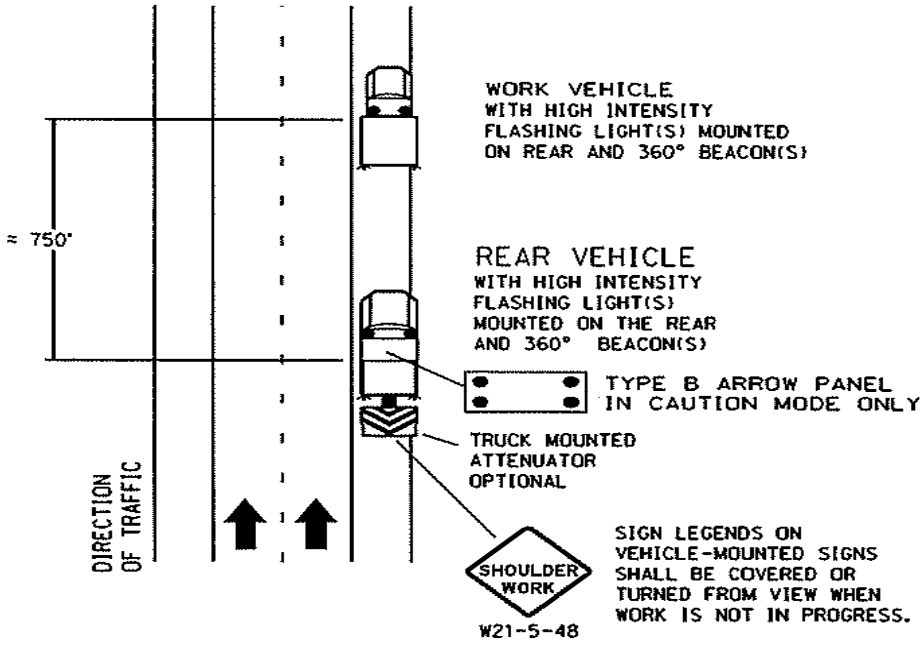
Warrants are used to determine when a specific traffic control device should be installed. There are Traffic Engineering Policies for a variety of signs, ranging from SLIPPERY WHEN WET, to Deer Crossing and BRIDGES MAY BE ICY signs, to campground signs, and others. The conditions that are to be met before signs can be installed are covered in the policies. Many of these are to be based on an engineering study. Traffic Engineering should be contacted if a study is needed.

Exhibit 1



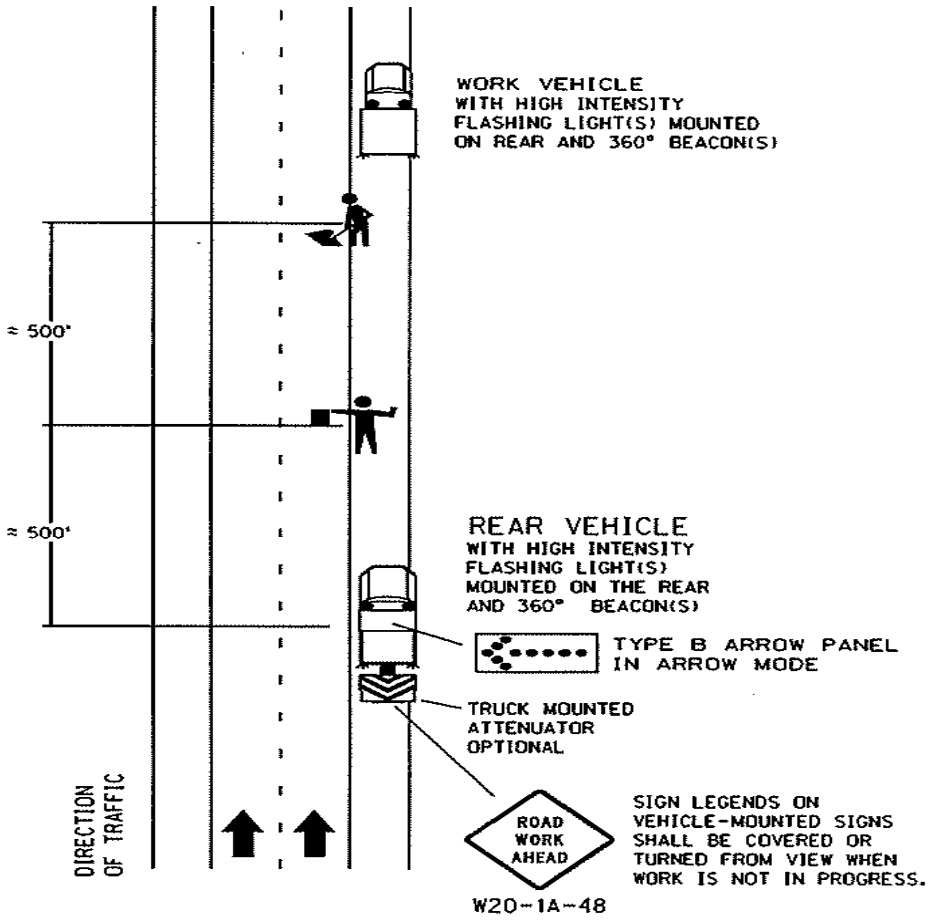
COMPONENTS OF A TTC ZONE

Exhibit 2



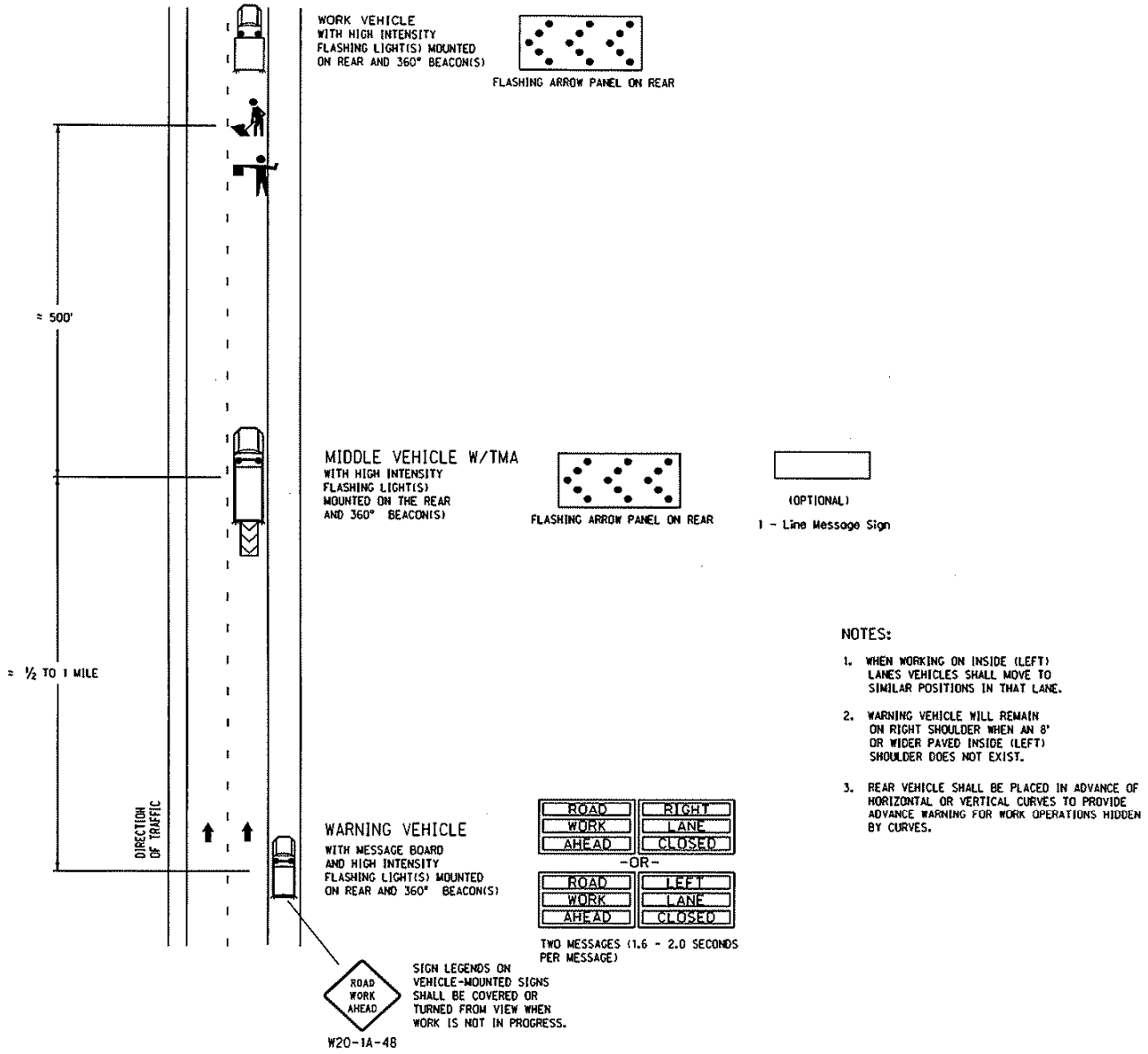
*INTERSTATE, FREEWAY, RURAL MULTI-LANE
*MOBILE OR SHORT-TERM OPERATION ON SHOULDER
*NO ENCROACHMENT INTO TRAVEL LANE

Exhibit 3



*INTERSTATE, FREEWAY, RURAL MULTI-LANE
*MOBILE OR SHORT-TERM OPERATION ON SHOULDER
*WITH ENCROACHMENT INTO TRAVEL LANE

Exhibit 4



*INTERSTATE, FREEWAY, RURAL MULTI-LANE
*MOBILE OR SHORT-TERM OPERATION ON SHOULDER
*WITH LANE CLOSURE

Exhibit 5

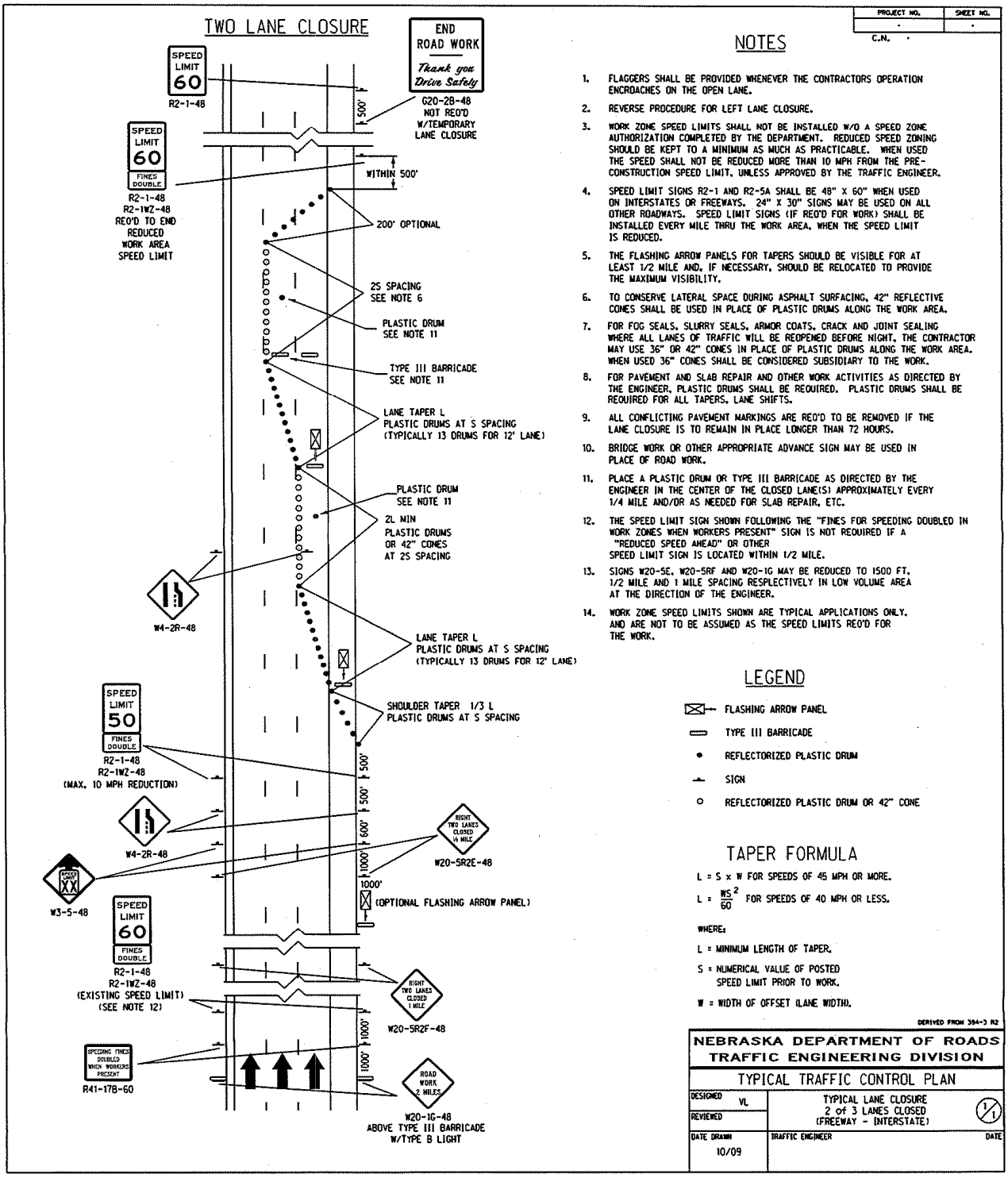

TWO LANE CLOSURE
END ROAD WORK
Thank you Drive Safely
G20-2B-48 NOT REQ'D W/TEMPORARY LANE CLOSURE
SPEED LIMIT 60
R2-1-48
SPEED LIMIT 60
FINES DOUBLE
R2-1-48
R2-1W2-48
REQ'D TO END REDUCED WORK AREA SPEED LIMIT
500'
WITHIN 500'
200' OPTIONAL
2S SPACING SEE NOTE 6
PLASTIC DRUM SEE NOTE 11
TYPE III BARRICADE SEE NOTE 11
LANE TAPER L
PLASTIC DRUMS AT S SPACING
(TYPICALLY 13 DRUMS FOR 12' LANE)
PLASTIC DRUM SEE NOTE 11
2L MIN PLASTIC DRUMS OR 42" CONES AT 2S SPACING
W4-2R-48
LANE TAPER L
PLASTIC DRUMS AT S SPACING
(TYPICALLY 13 DRUMS FOR 12' LANE)
SHOULDER TAPER 1/3 L
PLASTIC DRUMS AT S SPACING
SPEED LIMIT 50
FINES DOUBLE
R2-1-48
R2-1W2-48
(MAX. 10 MPH REDUCTION)
500'
500'
600'
1000'
1000'
W4-2R-48
RIGHT TWO LANES CLOSED 1/4 MILE
W20-5R2E-48
ROAD WORK
W3-5-48
(OPTIONAL FLASHING ARROW PANEL)
SPEED LIMIT 60
FINES DOUBLE
R2-1-48
R2-1W2-48
(EXISTING SPEED LIMIT)
(SEE NOTE 12)
RIGHT TWO LANES CLOSED 1 MILE
W20-5R2F-48
1000'
SPEEDING FINES DOUBLED WHEN WORKERS PRESENT
R41-17B-60
ROAD WORK 2 MILES
W20-1G-48
ABOVE TYPE III BARRICADE
W/TYPE B LIGHT
PROJECT NO.
SHEET NO.
C.N.
NOTES
1. FLAGGERS SHALL BE PROVIDED WHENEVER THE CONTRACTORS OPERATION ENCROACHES ON THE OPEN LANE.
2. REVERSE PROCEDURE FOR LEFT LANE CLOSURE.
3. WORK ZONE SPEED LIMITS SHALL NOT BE INSTALLED W/O A SPEED ZONE AUTHORIZATION COMPLETED BY THE DEPARTMENT. REDUCED SPEED ZONING SHOULD BE KEPT TO A MINIMUM AS MUCH AS PRACTICABLE. WHEN USED THE SPEED SHALL NOT BE REDUCED MORE THAN 10 MPH FROM THE PRE-CONSTRUCTION SPEED LIMIT, UNLESS APPROVED BY THE TRAFFIC ENGINEER.
4. SPEED LIMIT SIGNS R2-1 AND R2-5A SHALL BE 48" X 60" WHEN USED ON INTERSTATES OR FREEWAYS. 24" X 30" SIGNS MAY BE USED ON ALL OTHER ROADWAYS. SPEED LIMIT SIGNS (IF REQ'D FOR WORK) SHALL BE INSTALLED EVERY MILE THRU THE WORK AREA, WHEN THE SPEED LIMIT IS REDUCED.
5. THE FLASHING ARROW PANELS FOR TAPERS SHOULD BE VISIBLE FOR AT LEAST 1/2 MILE AND, IF NECESSARY, SHOULD BE RELOCATED TO PROVIDE THE MAXIMUM VISIBILITY.
6. TO CONSERVE LATERAL SPACE DURING ASPHALT SURFACING, 42" REFLECTIVE CONES SHALL BE USED IN PLACE OF PLASTIC DRUMS ALONG THE WORK AREA.
7. FOR FOG SEALS, SLURRY SEALS, ARMOR COATS, CRACK AND JOINT SEALING WHERE ALL LANES OF TRAFFIC WILL BE REOPENED BEFORE NIGHT, THE CONTRACTOR MAY USE 36" OR 42" CONES IN PLACE OF PLASTIC DRUMS ALONG THE WORK AREA. WHEN USED 36" CONES SHALL BE CONSIDERED SUBSIDIARY TO THE WORK.
8. FOR PAVEMENT AND SLAB REPAIR AND OTHER WORK ACTIVITIES AS DIRECTED BY THE ENGINEER, PLASTIC DRUMS SHALL BE REQUIRED. PLASTIC DRUMS SHALL BE REQUIRED FOR ALL TAPERS, LANE SHIFTS.
9. ALL CONFLICTING PAVEMENT MARKINGS ARE REQ'D TO BE REMOVED IF THE LANE CLOSURE IS TO REMAIN IN PLACE LONGER THAN 72 HOURS.
10. BRIDGE WORK OR OTHER APPROPRIATE ADVANCE SIGN MAY BE USED IN PLACE OF ROAD WORK.
11. PLACE A PLASTIC DRUM OR TYPE III BARRICADE AS DIRECTED BY THE ENGINEER IN THE CENTER OF THE CLOSED LANE(S) APPROXIMATELY EVERY 1/4 MILE AND/OR AS NEEDED FOR SLAB REPAIR, ETC.
12. THE SPEED LIMIT SIGN SHOWN FOLLOWING THE "FINES FOR SPEEDING DOUBLED IN WORK ZONES WHEN WORKERS PRESENT" SIGN IS NOT REQUIRED IF A "REDUCED SPEED AHEAD" OR OTHER SPEED LIMIT SIGN IS LOCATED WITHIN 1/2 MILE.
13. SIGNS W20-5E, W20-5RF AND W20-1G MAY BE REDUCED TO 1500 FT, 1/2 MILE AND 1 MILE SPACING RESPECTIVELY IN LOW VOLUME AREA AT THE DIRECTION OF THE ENGINEER.
14. WORK ZONE SPEED LIMITS SHOWN ARE TYPICAL APPLICATIONS ONLY, AND ARE NOT TO BE ASSUMED AS THE SPEED LIMITS REQ'D FOR THE WORK.
LEGEND
FLASHING ARROW PANEL
TYPE III BARRICADE
REFLECTORIZED PLASTIC DRUM
SIGN
REFLECTORIZED PLASTIC DRUM OR 42" CONE
TAPER FORMULA
L = S x W FOR SPEEDS OF 45 MPH OR MORE.
L = WS²/60 FOR SPEEDS OF 40 MPH OR LESS.
WHERE:
L = MINIMUM LENGTH OF TAPER.
S = NUMERICAL VALUE OF POSTED SPEED LIMIT PRIOR TO WORK.
W = WIDTH OF OFFSET (LANE WIDTH).
DERIVED FROM 384-3 R2
NEBRASKA DEPARTMENT OF ROADS
TRAFFIC ENGINEERING DIVISION
TYPICAL TRAFFIC CONTROL PLAN
DESIGNED VL
REVIEWED
DATE DRAWN 10/09
TYPICAL LANE CLOSURE
2 of 3 LANES CLOSED
(FREEWAY - INTERSTATE)
1/1
TRAFFIC ENGINEER
DATE
DATE$$$$$$$$$$$$$$$$
SCALE$$$$$$$$$$$$$$$$
DGNSPEC$$$$$$$$$$$$$$$$

Exhibit 6

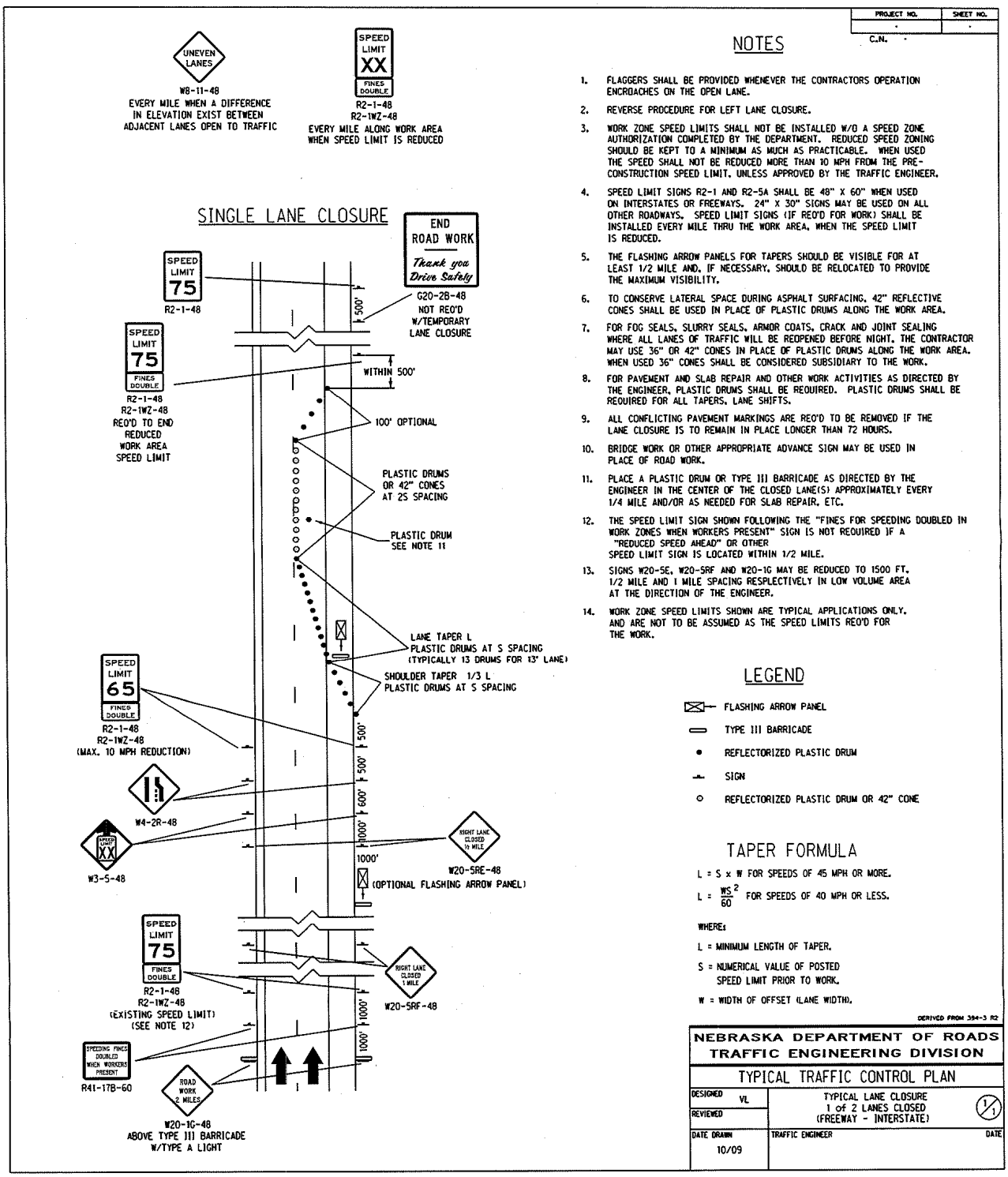
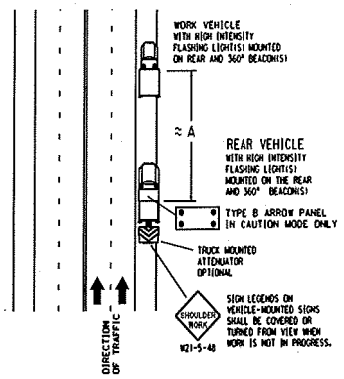
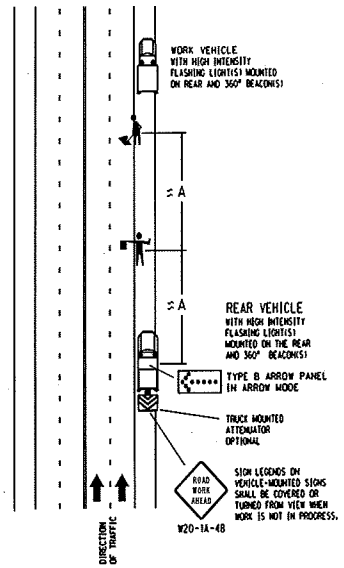

PROJECT NO.
SHEET NO.
C.N.
UNEVEN LANES
W8-11-48
EVERY MILE WHEN A DIFFERENCE IN ELEVATION EXIST BETWEEN ADJACENT LANES OPEN TO TRAFFIC
SPEED LIMIT XX
FINES DOUBLE
R2-1-48
R2-1WZ-48
EVERY MILE ALONG WORK AREA WHEN SPEED LIMIT IS REDUCED
SINGLE LANE CLOSURE
SPEED LIMIT 75
R2-1-48
END ROAD WORK
Thank you
Drive Safely
G20-2B-48
NOT REQ'D W/TEMPORARY LANE CLOSURE
500'
SPEED LIMIT 75
FINES DOUBLE
R2-1-48
R2-1WZ-48
REQ'D TO END REDUCED WORK AREA SPEED LIMIT
WITHIN 500'
100' OPTIONAL
PLASTIC DRUMS OR 42" CONES AT 2S SPACING
PLASTIC DRUM SEE NOTE 11
LANE TAPER L
PLASTIC DRUMS AT S SPACING
(TYPICALLY 13 DRUMS FOR 13' LANE)
SHOULDER TAPER 1/3 L
PLASTIC DRUMS AT S SPACING
SPEED LIMIT 65
FINES DOUBLE
R2-1-48
R2-1WZ-48
(MAX. 10 MPH REDUCTION)
500'
500'
600'
1000'
W4-2R-48
SPEED LIMIT XX
W3-5-48
RIGHT LANE CLOSED ½ MILE
W20-5RE-48
(OPTIONAL FLASHING ARROW PANEL)
1000'
SPEED LIMIT 75
FINES DOUBLE
R2-1-48
R2-1WZ-48
(EXISTING SPEED LIMIT)
(SEE NOTE 12)
RIGHT LANE CLOSED 1 MILE
W20-5RF-48
1000'
1000'
SPEEDING FINES DOUBLED WHEN WORKERS PRESENT
R41-17B-60
ROAD WORK 2 MILES
W20-1C-48
ABOVE TYPE III BARRICADE W/TYPE A LIGHT
NOTES
1. FLAGGERS SHALL BE PROVIDED WHENEVER THE CONTRACTORS OPERATION ENCROACHES ON THE OPEN LANE.
2. REVERSE PROCEDURE FOR LEFT LANE CLOSURE.
3. WORK ZONE SPEED LIMITS SHALL NOT BE INSTALLED W/O A SPEED ZONE AUTHORIZATION COMPLETED BY THE DEPARTMENT. REDUCED SPEED ZONING SHOULD BE KEPT TO A MINIMUM AS MUCH AS PRACTICABLE. WHEN USED THE SPEED SHALL NOT BE REDUCED MORE THAN 10 MPH FROM THE PRE-CONSTRUCTION SPEED LIMIT, UNLESS APPROVED BY THE TRAFFIC ENGINEER.
4. SPEED LIMIT SIGNS R2-1 AND R2-5A SHALL BE 48" X 60" WHEN USED ON INTERSTATES OR FREEWAYS. 24" X 30" SIGNS MAY BE USED ON ALL OTHER ROADWAYS. SPEED LIMIT SIGNS (IF REQ'D FOR WORK) SHALL BE INSTALLED EVERY MILE THRU THE WORK AREA, WHEN THE SPEED LIMIT IS REDUCED.
5. THE FLASHING ARROW PANELS FOR TAPERS SHOULD BE VISIBLE FOR AT LEAST 1/2 MILE AND, IF NECESSARY, SHOULD BE RELOCATED TO PROVIDE THE MAXIMUM VISIBILITY.
6. TO CONSERVE LATERAL SPACE DURING ASPHALT SURFACING, 42" REFLECTIVE CONES SHALL BE USED IN PLACE OF PLASTIC DRUMS ALONG THE WORK AREA.
7. FOR FOG SEALS, SLURRY SEALS, ARMOR COATS, CRACK AND JOINT SEALING WHERE ALL LANES OF TRAFFIC WILL BE REOPENED BEFORE NIGHT, THE CONTRACTOR MAY USE 36" OR 42" CONES IN PLACE OF PLASTIC DRUMS ALONG THE WORK AREA. WHEN USED 36" CONES SHALL BE CONSIDERED SUBSIDIARY TO THE WORK.
8. FOR PAVEMENT AND SLAB REPAIR AND OTHER WORK ACTIVITIES AS DIRECTED BY THE ENGINEER, PLASTIC DRUMS SHALL BE REQUIRED. PLASTIC DRUMS SHALL BE REQUIRED FOR ALL TAPERS, LANE SHIFTS.
9. ALL CONFLICTING PAVEMENT MARKINGS ARE REQ'D TO BE REMOVED IF THE LANE CLOSURE IS TO REMAIN IN PLACE LONGER THAN 72 HOURS.
10. BRIDGE WORK OR OTHER APPROPRIATE ADVANCE SIGN MAY BE USED IN PLACE OF ROAD WORK.
11. PLACE A PLASTIC DRUM OR TYPE III BARRICADE AS DIRECTED BY THE ENGINEER IN THE CENTER OF THE CLOSED LANE(S) APPROXIMATELY EVERY 1/4 MILE AND/OR AS NEEDED FOR SLAB REPAIR, ETC.
12. THE SPEED LIMIT SIGN SHOWN FOLLOWING THE "FINES FOR SPEEDING DOUBLED IN WORK ZONES WHEN WORKERS PRESENT" SIGN IS NOT REQUIRED IF A "REDUCED SPEED AHEAD" OR OTHER SPEED LIMIT SIGN IS LOCATED WITHIN 1/2 MILE.
13. SIGNS W20-5E, W20-5RF AND W20-1C MAY BE REDUCED TO 1500 FT, 1/2 MILE AND 1 MILE SPACING RESPECTIVELY IN LOW VOLUME AREA AT THE DIRECTION OF THE ENGINEER.
14. WORK ZONE SPEED LIMITS SHOWN ARE TYPICAL APPLICATIONS ONLY, AND ARE NOT TO BE ASSUMED AS THE SPEED LIMITS REQ'D FOR THE WORK.
LEGEND
FLASHING ARROW PANEL
TYPE III BARRICADE
REFLECTORIZED PLASTIC DRUM
SIGN
REFLECTORIZED PLASTIC DRUM OR 42" CONE
TAPER FORMULA
L = S x W FOR SPEEDS OF 45 MPH OR MORE.
L = WS²/60 FOR SPEEDS OF 40 MPH OR LESS.
WHERE:
L = MINIMUM LENGTH OF TAPER.
S = NUMERICAL VALUE OF POSTED SPEED LIMIT PRIOR TO WORK.
W = WIDTH OF OFFSET (LANE WIDTH).
DERIVED FROM 384-3 R2
NEBRASKA DEPARTMENT OF ROADS
TRAFFIC ENGINEERING DIVISION
TYPICAL TRAFFIC CONTROL PLAN
DESIGNED VL
REVIEWED
DATE DRAWN 10/09
TYPICAL LANE CLOSURE
1 of 2 LANES CLOSED
(FREEWAY - INTERSTATE)
1/1
TRAFFIC ENGINEER
DATE
DATE
SCALE
DGNSPEC

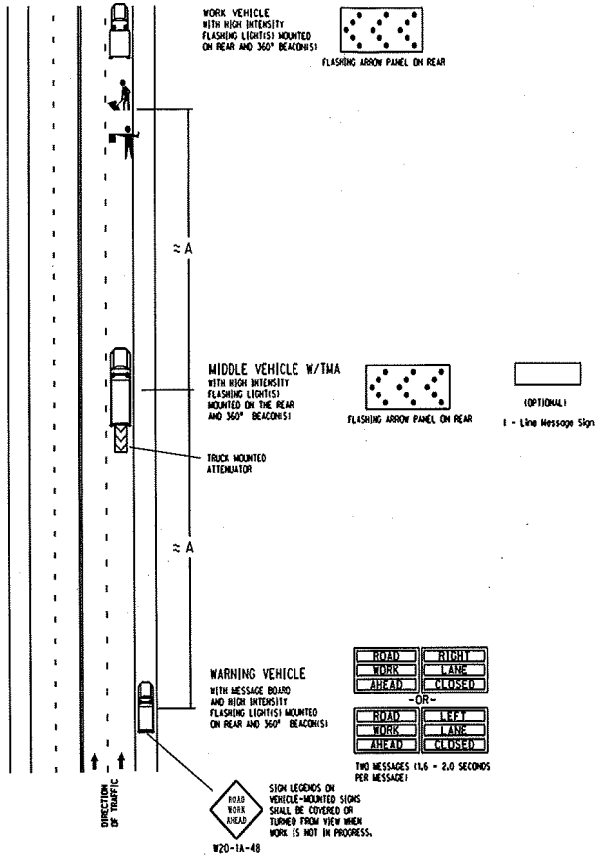
Exhibit 7



*URBAN MULTI-LANE
*MOBILE OR SHORT-TERM
OPERATION ON SHOULDER
*NO ENCROACHMENT INTO
TRAVEL LANE



*URBAN MULTI-LANE
*MOBILE OR SHORT-TERM
OPERATION ON SHOULDER
*WITH ENCROACHMENT INTO
TRAVEL LANE



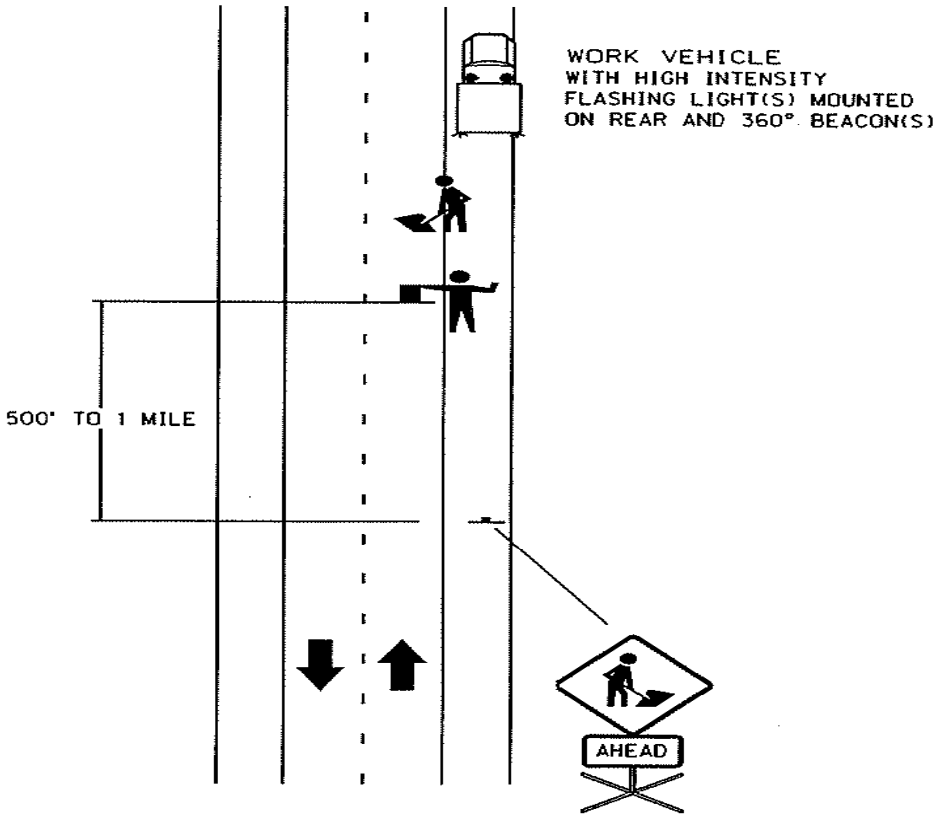
*URBAN MULTI-LANE
*MOBILE OR SHORT-TERM
OPERATION
*WITH LANE CLOSURE

NOTES

1. WHEN WORKING ON INSIDE (LEFT) LANES VEHICLES SHALL MOVE TO SIMILAR POSITIONS IN THAT LANE.
2. WARNING VEHICLE WILL REMAIN ON RIGHT SHOULDER WHEN AN 8' OR WIDER PAVED INSIDE (LEFT) SHOULDER DOES NOT EXIST.
3. REAR VEHICLE SHALL BE PLACED IN ADVANCE OF HORIZONTAL OR VERTICAL CURVES TO PROVIDE ADVANCE WARNING FOR WORK OPERATIONS HIDDEN BY CURVES.

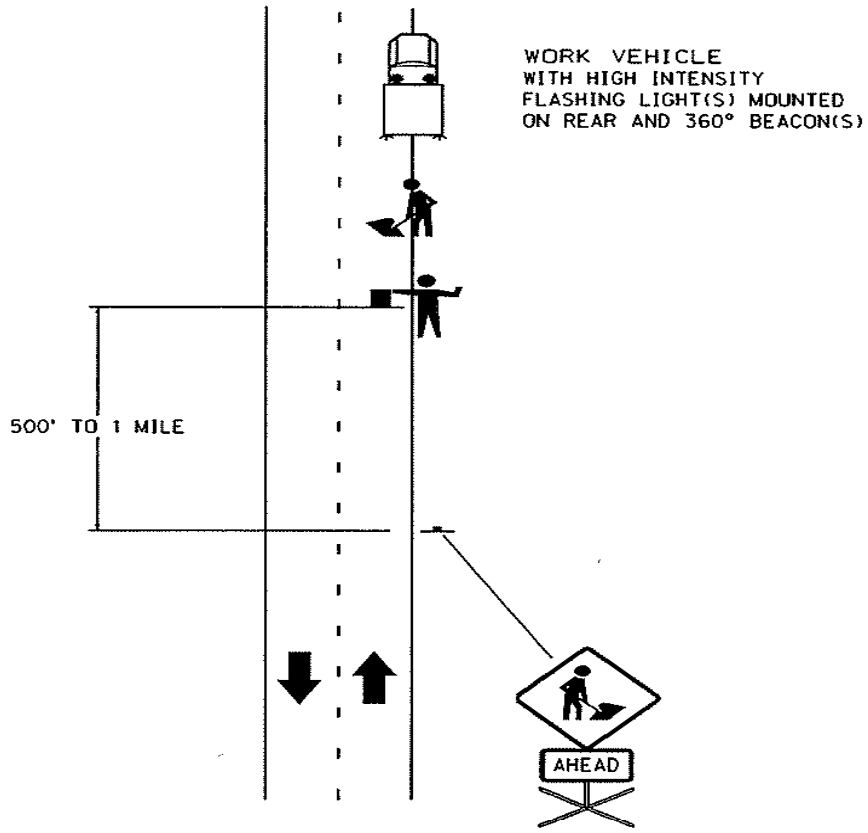
ROAD TYPE	MINIMUM DISTANCE BETWEEN ELEMENTS
	A
URBAN (LOW SPEED - 25 MPH TO 40 MPH)	100
URBAN (HIGH SPEED - GREATER THAN 45 MPH)	350

Exhibit 8



* RURAL 2 LANE
* ADT LESS THAN 2000
* SHORT-TERM
* WIDE SHOULDER USED FOR PARKING VEHICLES
* ENCROACHMENT INTO TRAVEL LANE

Exhibit 9



*RURAL 2 LANE
*ADT LESS THAN 2000
*SHORT-TERM
*NARROW SHOULDER
*ENCROACHMENT INTO TRAVEL LANE

APPENDICES

APPENDIX 1 - COUNTY NUMBERS

1	Adams	32	Frontier	63	Nance
2	Antelope	33	Furnas	64	Nemaha
3	Arthur	34	Gage	65	Nuckolls
4	Banner	35	Garden	66	Otoe
5	Blaine	36	Garfield	67	Pawnee
6	Boone	37	Gosper	68	Perkins
7	Box Butte	38	Grant	69	Phelps
8	Boyd	39	Greeley	70	Pierce
9	Brown	40	Hall	71	Platte
10	Buffalo	41	Hamilton	72	Polk
11	Burt	42	Harlan	73	Red Willow
12	Butler	43	Hayes	74	Richardson
13	Cass	44	Hitchcock	75	Rock
14	Cedar	45	Holt	76	Saline
15	Chase	46	Hooker	77	Sarpy
16	Cherry	47	Howard	78	Saunders
17	Cheyenne	48	Jefferson	79	ScottsBluff
18	Clay	49	Johnson	80	Seward
19	Colfax	50	Kearney	81	Sheridan
20	Cuming	51	Keith	82	Sherman
21	Custer	52	Keya Paha	83	Sioux
22	Dakota	53	Kimball	84	Stanton
23	Dawes	54	Knox	85	Thayer
24	Dawson	55	Lancaster	86	Thomas
25	Deuel	56	Lincoln	87	Thurston
26	Dixon	57	Logan	88	Valley
27	Dodge	58	Loup	89	Washington
28	Douglas	59	Madison	90	Wayne
29	Dundy	60	McPherson	91	Webster
30	Fillmore	61	Merrick	92	Wheeler
31	Franklin	62	Morrill	93	York

APPENDIX 2 – PREMIX SITES FOR COLD MIX

APPENDIX 3 - LOCATION OF MATERIALS

SITE	HIGHWAY	LOCATION	MATERIALS
650	80	(202)	RIP RAP
651	47	(50)	MILLINGS
652	47	(62)	MILLINGS
652	47	(62)	RECLAIMED BASE
653	21	(12)	RIP RAP
653	21	(12)	CRUSHED CONCRETE
653	21	(l2)	FINE CRUSHED CONCRETE
654	80	(223)	RIP RAP
654	80	(223)	RECLAIMED BASE
654	80	(223)	MILLINGS
655	283	(54)	MILLINGS
655	283	(54)	RIP RAP
655	283	(54)	CRUSHED CONCRETE
656	283	(56)	MILLINGS
656	283	(56)	RECLAIMED BASE
657	21	(37)	MILLINGS
658	80	(247)	MILLINGS
658	80	(247)	RIP RAP
659	80	(248)	MILLINGS
659	80	(248)	RIP RAP
660	80	(254)	RIP RAP
665	80	(158)	MILLINGS
665	80	(158)	RECLAIMED BASE
665	80	(158)	RIP RAP
666	80	(165)	CRUSHED CONCRETE
666	80	(165)	MILLINGS
666	80	(165)	RECLAIMED BASE
666	80	(165)	RIP RAP
666	80	(165)	FINE CRUSHED CONCRETE
667	L56G	(0)	MILLINGS
667	L56G	(0)	RECLAIMED BASE
667	L56G	(0)	RIP RAP
667	L56G	(0)	CRUSHED CONCRETE
667	L56G	(0)	FINE CRUSHED CONCRETE
668	S56A	(2)	RIP RAP
669	80	(194)	MILLINGS
669	80	(194)	RIP RAP
681	L51C	(0)	MILLINGS
682	26	(140)	MILLINGS
695	70	(81)	MILLINGS
699	TEMPORARY COLD MIX SITE		

701	83	(44)	COLD MIX
702	23	(104)	COLD MIX
702	23	(104)	MILLINGS
703	23	(131)	COLD MIX
704	283	(24)	COLD MIX
705	283	(20)	COLD MIX
706	136	(24)	COLD MIX
707	136	(50)	COLD MIX
708	23	(159)	COLD MIX
709	83	(10)	COLD MIX
710	6	(81)	COLD MIX
711	34	(34)	COLD MIX
712	6	(58)	COLD MIX
713	61	(24)	COLD MIX
714	6	(181)	COLD MIX
715	10	(47)	COLD MIX
716	23	(12)	COLD MIX
718	23	(36)	COLD MIX
719	61	(24)	COLD MIX
720	6	(9)	COLD MIX
721	34	(50)	COLD MIX
750	34	(30)	MILLINGS
751	6	(10)	MILLINGS
752	S15A	(3)	MILLINGS
753	283	(25)	MILLINGS
754	6	(145)	MILLINGS
755	6	(146)	MILLINGS
756	6	(157)	MILLINGS
757	6	(185)	MILLINGS
758	136	(50)	MILLINGS
759	136	(56)	MILLINGS
760	23	(131)	MILLINGS
761	23		MILLINGS
799	TEMPORARY	COLD MIX SITE	
801	20	(135)	COLD MIX
802	20	(164)	COLD MIX
803	20	(181)	COLD MIX
804	20	(203)	COLD MIX
805	20	(231)	COLD MIX
806	20	(243)	COLD MIX
807	20	(291)	COLD MIX
808	20	(307)	COLD MIX
809	281	(142)	COLD MIX
810	281	(172)	COLD MIX

811	281	(194)	COLD MIX
812	281	(212)	COLD MIX
813	275	(21)	COLD MIX
814	183	(124)	COLD MIX
815	183	(137)	COLD MIX
816	183	(180)	COLD MIX
817	183	(214)	COLD MIX
818	91	(43)	COLD MIX
819	83	(194)	COLD MIX
820	12	(80)	COLD MIX
821	70	(140)	COLD MIX
822	12	(78)	COLD MIX
823	12	(81)	COLD MIX
824	12	(102)	COLD MIX
825	12	(119)	COLD MIX
826	12	(136)	COLD MIX
827	11	(91)	COLD MIX
828	11	(113)	COLD MIX
829	7	(2)	COLD MIX
850	20	(164)	MILLINGS
851	20	(165)	MILLINGS
852	20	(249)	MILLINGS
853	183	(181)	MILLINGS
854	7	(67)	MILLINGS
855	12	(80)	MILLINGS
856	20	(280)	MILLINGS
857	20	(285)	MILLINGS
858	20	(303)	MILLINGS
859	20	(311)	MILLINGS
860	20	(314)	MILLINGS
861	20	(320)	MILLINGS
862	20	(326)	MILLINGS
863	281	(141)	MILLINGS
864	281	(143)	MILLINGS
865	281	(184)	MILLINGS
866	281	(190)	MILLINGS
867	11	(184)	MILLINGS
868	83	(218)	MILLINGS
869	11	(91)	MILLINGS
870	20	(117)	MILLINGS
899	TEMPORARY	COLD MIX SITE	

APPENDIX 4 - MAINTENANCE SUPERVISOR NUMBERS

Number	Person	Headquarters
012	Deputy Director	Operations Lincoln
015		Lincoln
030		Lincoln
032	Highway Electronics Manager	Lincoln
033	Maintenance Mgt. Systems Analyst	Lead Lincoln
037	Highway Fleet Manager	Lincoln
038	Highway Agronomist	Lincoln
044	Cold Milling Supervisor	Lincoln
District 1		
101	District Engineer	Lincoln
103	District Operations and Maintenance Manager	Lincoln
104	District Mechanic	Lincoln
110	Maintenance Superintendent	Lincoln/Sup. St.
111	Maintenance Supervisor	Lincoln/Sup. St.
112	Maintenance Supervisor	Seward
113	Maintenance Supervisor	David City
114	Maintenance Supervisor	Greenwood
116	Maintenance Supervisor	Wahoo
120	Maintenance Superintendent	Lincoln/Salt Valley
121	Maintenance Supervisor (Striping)	Wilber
122	Maintenance Supervisor	Lincoln/Salt Valley
123	Maintenance Supervisor	Dorchester
124	Maintenance Supervisor	Adams
130	Maintenance Superintendent	Beatrice
131	Maintenance Supervisor	Fairbury
132	Maintenance Supervisor	Pawnee City
133	Maintenance Supervisor	Beatrice
140	Maintenance Superintendent	Auburn
141	Maintenance Supervisor	Auburn
142	Maintenance Supervisor	Nebraska City
144	Maintenance Supervisor	Falls City
145	Maintenance Supervisor	Tecumseh
District 2		
201	District Engineer	Omaha
203	District Operations and Maintenance Manager	Omaha
204	District Mechanic	Elkhorn
210	Maintenance Superintendent	Omaha/108th
211	Maintenance Supervisor	Omaha/108th
212	Maintenance Supervisor	Omaha/Mormon
213	Maintenance Supervisor	Omaha/South
220	Maintenance Superintendent	Fremont
221	Maintenance Supervisor	Blair
222	Maintenance Supervisor	Fremont
230	Maintenance Superintendent	Elkhorn
231	Maintenance Supervisor (Striping)	Elkhorn
232	Maintenance Supervisor	Elkhorn

Number	Person	Headquarters
234	Maintenance Supervisor	Papillion
236	Maintenance Supervisor	Plattsmouth
District 3		
301	District Engineer	Norfolk
303	District Operations and Maintenance Manager	Norfolk
304	District Mechanic	Norfolk
310	Maintenance Superintendent	Columbus
311	Maintenance Supervisor	Columbus
313	Maintenance Supervisor	Albion
314	Maintenance Supervisor	Humphrey
320	Maintenance Superintendent	Neligh
321	Maintenance Supervisor	Neligh
322	Maintenance Supervisor	Bloomfield
324	Maintenance Supervisor	Plainview
325	Maintenance Supervisor	Niobrara
330	Maintenance Superintendent	Norfolk
331	Maintenance Supervisor	Norfolk
332	Maintenance Supervisor (Striping)	Norfolk
333	Maintenance Supervisor	West Point
340	Maintenance Superintendent	So. Sioux City
341	Maintenance Supervisor	So. Sioux City
342	Maintenance Supervisor	Lyons
350	Maintenance Superintendent	Wayne
351	Maintenance Supervisor	Wayne
352	Maintenance Supervisor	Hartington
353	Maintenance Supervisor	Laurel
District 4		
401	District Engineer	Grand Island
403	District Operations and Maintenance Manager	Grand Island
404	District Mechanic	Grand Island
410	Maintenance Superintendent	Ord
411	Maintenance Supervisor	Fullerton
412	Maintenance Supervisor	Ord
413	Maintenance Supervisor	St. Paul
414	Maintenance Supervisor	Greeley
430	Maintenance Superintendent	York
431	Maintenance Supervisor	Geneva
432	Maintenance Supervisor	York
433	Maintenance Supervisor	Hebron
440	Maintenance Superintendent	Grand Island
441	Maintenance Supervisor	Central City
442	Maintenance Supervisor	Grand Island
443	Maintenance Supervisor (Striping)	Grand Island
444	Maintenance Supervisor	Aurora
446	Maintenance Supervisor	Osceola
450	Maintenance Superintendent	Hastings
451	Maintenance Supervisor	Hastings
452	Maintenance Supervisor	Superior

Number	Person	Headquarters
453	Maintenance Supervisor	Red Cloud
460	Maintenance Superintendent	Kearney
461	Maintenance Supervisor	Kearney/I
462	Maintenance Supervisor	Loup City
463	Maintenance Supervisor	Kearney
464	Maintenance Supervisor	Ravenna
District 5		
501	District Engineer	Bridgeport
503	District Operations and Maintenance Manager	Bridgeport
504	District Mechanic	Bridgeport
510	Maintenance Superintendent	Chadron
511	Maintenance Supervisor	Chadron
512	Maintenance Supervisor	Crawford
513	Maintenance Supervisor	Gordon
520	Maintenance Superintendent	Scottsbluff
521	Maintenance Supervisor	Alliance
522	Maintenance Supervisor	Bridgeport
523	Maintenance Supervisor (Striping)	Scottsbluff
524	Maintenance Supervisor	Scottsbluff
530	Maintenance Superintendent	Sidney
531	Maintenance Supervisor	Chappell
532	Maintenance Supervisor	Kimball
533	Maintenance Supervisor	Sidney
District 6		
601	District Engineer	North Platte
603	District Operations and Maintenance Manager	North Platte
604	District Mechanic	North Platte
610	Maintenance Superintendent	Lexington
611	Maintenance Supervisor	Lexington
612	Maintenance Supervisor	Gothenburg
620	Maintenance Superintendent	North Platte
621	Maintenance Supervisor	North Platte
622	Maintenance Supervisor (Striping)	North Platte
623	Maintenance Supervisor	North Platte/I80
630	Maintenance Superintendent	Ogallala
631	Maintenance Supervisor	Ogallala
640	Maintenance Superintendent	Broken Bow
641	Maintenance Supervisor	Broken Bow
650	Maintenance Superintendent	Mullen
651	Maintenance Supervisor	Mullen
District 7		
701	District Engineer	McCook
703	District Operations and Maintenance Manager	McCook
704	District Mechanic	McCook
710	Maintenance Superintendent	Holdrege
711	Maintenance Supervisor	Alma
714	Maintenance Supervisor	Holdrege

Number	Person	Headquarters
715	Maintenance Supervisor	Minden
720	Maintenance Superintendent	McCook
721	Maintenance Supervisor	Arapahoe
722	Maintenance Supervisor	Maywood
723	Maintenance Supervisor	McCook
730	Maintenance Superintendent	Imperial
731	Maintenance Supervisor	Benkelman
732	Maintenance Supervisor	Imperial
District 8		
801	District Engineer	Ainsworth
803	District Operations and Maintenance Manager	Ainsworth
804	District Mechanic	Ainsworth
810	Maintenance Superintendent	Ainsworth
811	Maintenance Supervisor	Ainsworth
820	Maintenance Superintendent	O'Neill
821	Maintenance Supervisor	O'Neill
822	Maintenance Supervisor	Spencer
823	Maintenance Supervisor	Burwell
830	Maintenance Superintendent	Valentine
831	Maintenance Supervisor	Valentine
832	Maintenance Supervisor	Merriman

Note: Your manual is assigned according to the town and to the position assigned as shown.

APPENDIX 5 - ASSOCIATED EQUIPMENT KEYS

EQUIP. KEY	MMS KEY	EQUIPMENT DESCRIPTION
A01	A09	TRACTOR, LIGHT DUTY GAS -9-24 HP
A02	A09	TRACTOR, LIGHT DUTY DIESEL -9-24 HP
A03	A09	TRACTOR, LIGHT DUTY DIESEL -4WD
A04	A09	TRACTOR, MEDIUM DUTY GAS -25-44 HP
A05	A09	TRACTOR, MEDIUM DUTY DIESEL -25-44 HP
A06	A09	TRACTOR, MEDIUM DUTY GAS -4WD
A07	A09	TRACTOR, MEDIUM DUTY DIESEL -4WD
A08	A09	TRACTOR, HEAVY DUTY GAS -OVER 44 HP
A09	A09	TRACTOR, HEAVY DUTY DIESEL -OVER 44 HP
A10	A09	TRACTOR, HEAVY DUTY GAS -4WD
A11	A09	TRACTOR, HEAVY DUTY DIESEL -4WD
A12	A12	BULLDOZER, TRACK
B01	B01	TRUCK- W/AERIAL LIFT
B02	B02	TRUCK -AWD W/DRILL
B03	B03	TRUCK -HIGH PRESSURE -SEWER CLEANER
B04	B04	TRUCK- SKID TEST EQUIPMENT
B05	B05	TRUCK -DISTRIBUTOR -2 TON OR OVER
B06	B06	TRUCK- FLATBED -2 TON
B07	B07	TRUCK -HOIST
B08	B08	TRUCK- SEMI-TRACTOR, 1 AXLE
B09	B08	TRUCK- SEMI-TRACTOR, TANDEM
B10	B11	TRUCK- SIGN REPAIR, 11/2 TON
B11	B11	TRUCK SIGN REPAIR, 2 TON
B12	B12	TRUCK- STRIPER
B13	B24	TRUCK -2 TON DUMP , GAS
B14	B24	TRUCK- 2 TON DUMP, DIESEL
B15	B22	TRUCK- AWD W/SNOW PLOW, 3-5 TON -GAS
B16	B22	TRUCK -AWD W/SNOW PLOW, 3-5 TON -DIESEL
B17	B22	TRUCK- AWD W/SNOW PLOW, 7 TON -GAS
B18	B22	TRUCK -AWD W/SNOW PLOW, 7 TON -DIESEL
B19	B22	TRUCK- ROTARY SNOW PLOW, 3-5 TON -GAS
B20	B22	TRUCK- ROTARY SNOW PLOW, 3-5 TON -DIESEL
B21	B22	TRUCK- ROTARY SNOW PLOW, 7 TON -GAS
B22	B22	TRUCK- ROTARY SNOW PLOW, 7 TON -DIESEL
B23	B24	TRUCK -TANDEM DUMP, 7-10 YARD -GAS
B24	B24	TRUCK -TANDEM DUMP, 7-10 YARD -DIESEL
B25	B24	TRUCK -TANDEM DUMP , HEAVY DUTY
B26	B24	TRUCK -TANDEM HOPPER BOX, 7-10 YARD -GAS
B27	B24	TRUCK- TANDEM HOPPER BOX, 7-10 YARD -DIESEL
B28	B24	TRUCK -TANDEM HOPPER BOX, HEAVY DUTY -DIESEL
B30	B30	TRUCK- SPECIALIZED UNITS

C01	C01	MOTOR GRADER, MEDIUM DUTY
C02	C01	MOTOR GRADER, HEAVY DUTY
D01	D01	PICKUP, COMPACT- 1/2 TON
D02	D01	PICKUP, FULL-SIZE -1/2 TON
D03	D01	PICKUP, FULL-SIZE -3/4 TON
D04	D01	PICKUP, CREW CAB -3/4 TON
D05	D01	VAN -UTILITY
D06	D01	CARRYALL/TRAVELALL
E01	D01	AUTOMOBILE, SUB-COMPACT
E02	D01	AUTOMOBILE, COMPACT
E03	D01	AUTOMOBILE, INTERMEDIATE
E04	D01	AUTOMOBILE, FULL-SIZE
EO5	D01	AUTOMOBILE, STATION WAGON
EO6	D01	VAN -PASSENGER
F01	F01	MOWER -GUARD RAIL
F02	F02	MOWER -RIDING -361'-72"
F03	F06	MOWER -BOOM -FLAIL, ROTARY OR BAR
F04	F04	MOWER -PULL TYPE -ROTARY OR FLAI L
F05	F05	MOWER -PULL TYPE -ROTARY 15' OR OVER
F06	F06	MOWER- SICKLE BAR
F07	F07	MOWER -HAND LAWN
G01	G02	LOADER, AWD -CAPACITY TO 3/4 CY
G02	G02	LOADER, AWD -CAPACITY TO 11/2 CY
G03	G02	LOADER, AWD -CAPACITY 2 CY OR MORE
G04	G02	LOADER, RWD -CAPACITY TO 3/4 CY
G05	G02	LOADER, RWD W /BACKHOE -CAP AC I TY TO 1 3/4 CY
G06	G02	LOADER, SKID- CAPACITY TO 1/2 CY
G07	G02	LOADER, TRACK -DIESEL -CAPACITY TO 21/2 CY
G08	G08	DRAGLINE , PNEUMATIC TIRED -CAPACITY TO 5/8 GY
G09	G08	DRAGLINE , CRAWLER -CAPACITY TO 5/8 CY
G10	G10	EXCAVATOR, MULTI-PURPOSE MACHINE
G11	G11	CONVEYOR, FORCE FEED
H02	X04	TANK -GAS (FIELD) -TO 4,000 GALLONS
H03	X04	TANK -GAS (SUPPLY) -OVER 4,000 GALLONS
H05	X04	TANK -DIESEL (FIELD) -TO 4,000 GALLONS
H06	X04	TANK -DIESEL (SUPPLY) -OVER 4,000 GALLONS
H07	H11	TANK W/FLUES -TO 1,000 GALLONS
H08	H11	TANK W/TRAILER & FLUES -TO 1,000 GALLONS
H09	H11	TANK W/TRAILER -TO 1,000 GALLONS
H10	H11	TANK -MISCELLANEOUS -TO 1,000 GALLONS
H11	H11	TANK- MISCELLANEOUS -OVER 1,000 GALLONS

J01	J02	AIR COMPRESSOR, TO 125 CFM
J02	J02	AIR COMPRESSOR, 126-225 CFM
J03	J02	AIR COMPRESSOR, OVER 225 CFM
J04	J04	ASPHALT HEATER -CRACK AND JOINT
J05	J05	ASPHALT LAYDOWN MACHINE
J06	J06	ASPHALT MIXER/DRYER -OVER 225 CFM
J07	J07	MILLING MACHINE -ASPHALT/CONCRETE -SMALL
J08	J08	MILLING MACHINE -ASPHALT/CONCRETE
J09	J09	BITUMINOUS DISTRIBUTOR, TRAILER MOUNTED
J10	J09	BITUMINOUS DISTRIBUTOR, SKID MOUNTED
J11	J11	BITUMINOUS HEATER BOOSTER
J12	J12	BITUMINOUS HEATER, ENDGATE TYPE
J13	J12	BITUMINOUS HEATER, STEAM BOILER -STATIONARY
J14	J12	BITUMINOUS HEATER, STEAM GENERATOR
J15	J12	BITUMINOUS HEATER, TRAILER MOUNTED
J16	J16	BITUMINOUS MIXERS, RECYCLING AND HEATING
J17	J17	BITUMINOUS MIXERS, TRACTOR MOUNTED
J18	J18	KNAPSACK BLOWER
J20	J20	CONCRETE MIXER
J21	X04	GRADER -SCRAPER BLADE -TRACTOR MOUNTED
J22	J22	MUD JACK
J23	X04	PUMP -BITUMINOUS ROAD OIL
J24	J24	ROCK CUTTER
J25	J27	ROLLER, PULL TYPE -STEEL DRUM
J26	J27	ROLLER, PULL TYPE -PNEUMATIC TIRED
J27	J27	ROLLER, SELF-PROPELLED- PNEUMATIC TIRED
J28	J27	ROLLER, SELF-PROPELLED- TANDEM STEEL DRUM
J29	J27	ROLLER, SHEEPSFOOT
J30	J30	ROLLER, VIBRATORY -WALK BEHIND
J31	J31	SAW- CONCRETE
J32	J32	ROUTER FOR JOINTS AND CRACKS
J33	J33	SPREADER -ARMOR COAT
J34	J34	SPREADER- TRENCH FILLER
J35	J37	SWEEPER, FRONT END LOADER TYPE
J36	J37	SWEEPER, MAGNET PULL TYPE

J37	J37	SWEEPER, ROTARY BROOM
J38	J38	SWEEPER, STREET- SELF-PROPELLED
J39	J39	TAR KETTLE
J40	J40	VIBRATOR- CONCRETE
J41	J41	TAMPER -ENGINE DRIVEN
J42	X04	VIBRATOR, CONCRETE -ENGINE DRIVEN
J43	X04	VIBRATOR, CONCRETE -PNEUMATIC
J44	X04	TAMPER BACKFILL, HYDRAULIC
J45	X04	TAMPER BACKFILL, PNEUMATIC
J46	J48	PAVING BREAKER, PNEUMATIC
J47	J48	PAVING BREAKER, HYDRAULIC
J48	J48	PAVING BREAKER, ENGINE DRIVEN
J49	J49	BREAKER/DRILL, CONCRETE -ENGINE DRIVEN
J50	J49	CONCRETE DRILL, PNEUMATIC
J51	J49	CONCRETE DRILL, HYDRAULIC
J52	J52	IMPACT HAMMER, HYDRAULIC
J57	J57	POWER SCREED
J59	J59	ASPHALT CUTTE, ROTARY
J60	J60	CURB MACHINE
J65	J65	AIR COMPRESSOR, HYDRAULIC OR ENGINE DRIVEN
J67	J37	SWEEPER, HYDRAULIC
K01	X04	SNOW BLOWER -HAND OPERATED, SP 24" , 8 HP
K02	X04	SNOW PLOW -ONE-WAY REVERSIBLE
K03	X04	SNOW PLOW -ONE-WAY STRAIGHT
K04	X04	SNOW PLOW -V
K05	X04	SNOW PLOW -ROTARY -LOADER ATTACHMENT
K06	X04	SNOW PLOW -WING
K07	X04	SPREADER -SALT/SAND, BODY MOUNTED
K08	X04	SPREADER -SALT/SAND , TOW -ROLLER TYPE
K09	X04	SPREADER -SALT/SAND, UNDER TAILGATE ROLLER/SP INNER TYPE
L01	L01	BRUSH CHIPPER
L02	L02	CHAIN SAW -ENGINE DRIVEN
L03	L12	DISC -FARM PULL TYPE
L04	L12	HARROW -FARM PULL TYPE
L05	L05	TREE SPADE ON TRAILER
L06	L12	RAKE -FARM PULL TYPE
L07	L07	SEEDERS -GRAIN DRILL
L08	L08	SPREADER- FERTILIZER
L09	L09	SPREADER -MULCH
L10	L10	TILLER- PULVIMIXER

L11	L11	WEED SPRAYERS
L12	L12	MISCELLANEOUS TURF EQUIPMENT
L13	L13	CHAIN SAW -ELECTRIC
L14	L14	LINE TRIMMER
L15	L15	HEDGE TRIMMER -ENGINE DRIVEN
L16	L16	HEDGE TRIMMER -ELECTRIC
L17	L17	POWER RAKE
L18	L18	LAWN SWEEPER -PULL TYPE
L19	L19	LAWN SWEEPER -ENGINE DRIVEN
L20	L20	GARDEN TILLER
L21	L21	LAWN AERIFIER
L22	L22	BROADCAST SPREADER
L23	L23	STUMP GRINDER
L24	L24	POWER LAWN EDGER
L25	L25	GOPHER GETTER
M01	M01	AMPHIBIOUS DRILL
M02	M02	DRILL -CORE CONCRETE
M03	M03	ROUGH ROAD INDICATOR
M04	M04	DRILL- SOIL TESTING
M05	M05	SPECIAL M & T EQUIPMENT
N01	N01	BARRICADE, PORTABLE W/GENERATOR
N02	N06	LIGHT PLANT, PORTABLE
N03	N03	POST HOLE AUGER, ENGINE DRIVEN
N04	N03	POST HOLE AUGER, TRACTOR MOUNTED
N05	X04	SPRAYERS, SIGN WASHERS
N06	N06	GENERATOR -PORTABLE
N07	X04	GENERATOR -EQUIPMENT STARTER
P01	P01	PILE DRIVER -LEADS
P02	P02	SPECIAL BRIDGE EQUIPMENT
P03	P03	SAND BLASTER
R01	R01	POST DRIVER, TRACTOR MOUNTED
R02	R02	POST DRIVER, TRUCK MOUNTED
R03	R01	SIGN POST INSTALLATION SYSTEM
S01	S01	PRESSURE WASHER -CLEANER -SHOP W/STEAM GENERATOR
S02	S02	CONVEYOR -DERRICK YARD
S04	S04	SHOP FORK LIFT
S05	S05	PAINT SPRAYER
S06	S06	WELDER, ENGINE DRIVEN -PORTABLE
S07	S07	STRIPER -PORTABLE
S08	S08	STRIPE REMOVER
S09	S09	PRESSURE WASHER -ELECTRIC

T01	X04	TRAILER, POST TYPE -2 WHEELS
T02	X04	TRAILER, SEMI FOR TANKS
T03	X04	TRAILER, SEMI LOWBED
T04	X04	TRAILER, SEMI PLATFORM
T05	X04	TRAILER, TILTBED -5-20 TON
T06	X04	TRAILER, UTILITY TO 3 TON
T07	T07	TRAILER, SEMI LOWBED- FOLDING GOOSENECK
X01	X04	BUILDINGS -MOBILE
X02	X02	PUMPS, HIGH-PRESSURE WATER
X03	X03	PUMPS, WATER
X04	X04	MISCELLANEOUS
X05	X05	AERIAL LIFT
X06	X06	CLAMSHELL

APPENDIX 6 - CONVERSIONS

Aggregate Conversion of Cubic Yards to Tons = Multiply Cubic Yards by Factor

MATERIAL ID	FACTOR
02010 Gravel	1.35
02030 Crushed Rock	1.25
02040 Sand	1.15
02050 Rip Rap	2.00
02070 Filler	.85
02080 Dirt	.85
02100 Crushed Sand/Gravel	1.20
02120 Recycled Asphalt (millings)	1.15

Propane: 24 Gallons = 100 Pound Cylinder
Hay: Approximately 30 Bales = 1 Ton
Grass Seed: 32 Pounds = 1 Acre
Asphaltic Rubber Cement: 8 Gallons = 60# Box
Road Oil: Approximately 239 gal = 1 ton
Salt (Coarse}: Estimated 1.05 Ton = 1 Cubic Yard

APPENDIX 7 - WORK ACTIVITY AND ROADWAY INVENTORY RELATIONSHIP

Activity Code	Highway Maintenance Activity Description	Associated Roadway Inventory Feature
2002	Road Profiling	Centerline Miles of Bituminous Surfaced Roads
2003	Minor Milling	Centerline Miles of Bituminous Surfaced Roads
2004	Armor Coating Roadway Surfaces and Shoulders	Centerline Miles of Bituminous Surfaced Roads
2005	Fog Seal	Centerline Miles of Bituminous Surfaced Roads
2007	Mudjacking	Centerline Miles of Concrete Surfaced Roads
2009	Maintenance of Highways within City Limits	Zero
2013	Joint Cutting	Lane Miles of Concrete Surfaced Roads
2015	Subgrade Repair	Centerline Miles of Bituminous and Concrete Surfaced Roads
2020	Hauling and Mixing Materials for Cold Mix	Percentage Factor
2025	Machine Patching of Roadway Surface	Lane Miles of Bituminous Surfaced Roads
2026	Spot Patching	Lane Miles of Bituminous Surfaced Roads
2027	Concrete Patching	Lane Miles of Concrete Surfaced Roads
2030	Surfaced Shoulder Maintenance	Surfaced Shoulder Miles
2031	Grade Shoulders	Sod Shoulder Miles
2032	Rebuilding Unpaved Shoulders	Sod Shoulder Miles
2035	Blading Unpaved Roads	Centerline Miles of Unpaved Roads
2036	Major Restoration Unpaved Roads	Centerline Miles of Unpaved Roads
2040	Access Road Maintenance	Special Lane Miles
2050	Unspecified Roadway and Shoulder Maintenance	Centerline Miles of Bituminous, Concrete, and Unpaved Roads
2101	Drainage Structure Maintenance (Less than 20' Span)	Number of Culverts Beneath Roads Including Field Entrance Culverts
2102	Maintaining Miscellaneous Structures	Number of Dikes, Flumes, Lined Ditches, and Unnumbered Field Entrance Bridges

2111	Reshaping Ditches and Filling Washouts	Centerline Road Miles X 2
2114	Channel Cleaning and Reshaping	Numbered Bridges
2201	Structure Painting	Numbered Bridges
2202	Curb and Railing Repair	Numbered Bridges
2203	Deck Repair and Maintenance	Numbered Bridges
2204	Bridge Structural Repair	Numbered Bridges
2220	Other Deck Preservation Maintenance	Numbered Bridges
2301	Machine Mowing	Mowable Acres
2302	Hand Mowing	Percentage Factor
2303	Chemical Control of Insects and Vegetation	Centerline Road Miles
2304	Care and Replacement of Desirable Roadside Trees and Shrubs	Centerline Road Miles
2311	Litter Pickup	Centerline Road Miles
2313	Rest Area Operations	Percentage Factor
2315	Seeding and Sodding	Mowable Acres
2321	Survey and Investigation of Junkyard Sites	Percentage Factor
2323	Outdoor Advertising Control	Percentage Factor
2332	Fence Repair	Feet of R.O.W. Fence
2350	Other Roadside Maintenance	Percentage Factor
2401	Sign Repair or Replacement	Small Signs
2402	Repair of Overhead Signs	
2407	Minor Pavement Marking	Lane Miles of Bituminous and Concrete Surfaced Roads
2408	Centerline and Edgeline Striping	Lane Miles of Bituminous and Concrete Surfaced Roads
2409	Contract Striping	Lane Miles of Bituminous and Concrete Surfaced Roads
2410	Other Pavement Markings	Centerline Miles of Bituminous and Concrete Surfaced Roads
2415	Signal Repair	Percentage Factor
2416	Highway Lighting Maintenance	Percentage Factor
2417	ITS Element Maintenance	
2421	Guardrail Maintenance	Feet of Guardrail
2422	Maintenance of Crash Control Barriers	Number of Crash Barrier Locations
2450	Other Traffic Operations	Percentage Factor
2501	Erecting and Removing Snow Fence	Percentage Factor
2505	Brush Cutting	Centerline Road Miles
2510	Joint and Crack Filling	Centerline Miles of Bituminous and Concrete Surfaced Roads
2511	Snow Plowing and Spreading of Winter Chemicals and Sand	Lane Miles of Bituminous, Concrete, and Unpaved Roads
2514	Loading and Hauling of Snow	Numbered Bridges
2521	Stockpiling Winter Chemicals and Sand	Lane Miles of Bituminous, Concrete, and Unpaved Roads

2601	Repairing Storm Damage	Percentage Factor
2602	Repairing Accident Damage	Percentage Factor
2603	Correct Vandalism of Roadside Features	Percentage Factor
2604	Emergency Assistance to Government Entities	Percentage Factor
2900	Maintenance Administration	Zero
2901	Supervision	Percentage Factor
2902	Real Property Operations (Prorated)	Zero
2903	Maintenance Office Staff	Percentage Factor
2904	Hand Tools and Miscellaneous Unnumbered Equipment and Supplies	Percentage Factor
2906	Salvage and Obsolescence	Percentage Factor
2908	Base and Mobile Radio Operations	Percentage Factor
2909	Numbered Non-Rental Equipment	Zero
2915	Unspecified Labor and Equipment Charges	Percentage Factor
2930	Liquidated Damages Maintenance Contracts	
2950	Special Maintenance	Zero

A-25 Revised 01-2000

APPENDIX 8 - PERPETUAL AUTHORITY FOR EXPENDITURES

Note: use pages 5-17 from Accounting Manual Section 4.03

An Authority for Expenditure (AFE) is assigned to control specific expenditures, to indicate authority has been given to proceed with a specified activity, and to designate that funds have been budgeted to cover the estimated cost of work to be performed. The most current list of perpetual AFEs follows, but as this manual ages, please check Chapter 4 of the NDOR Accounting Manual or visit http://www.nebraskatransportation.org/controller/acc-man/accman6-20/ch0403.pdf , you will need the intranet userid and password.

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NUMBER ASSIGNMENTS

Numbers are assigned according to the series listed below.

User	AFE used
District 1	A with 001-999
District 2	B with 001-999
District 3	C with 001-999
District 4	D with 001-999
District 5	E with 001-999
District 6	F with 001-999
District 7	G with 001-999
District 8	H with 001-999
Maintenance Capital Facilities Restoration External	I with 001-999
Contract Audit - Courtesy Audits	J with 001-999
Capital Facilities Construction	K with 001-999
Controller- Federal-Non Project Billings- Supplies or Services	L with 001-999
Materials & Research	M with 001-999
Project Development	N with 001-999
Transportation Planning & Research & Transit	P with 001-999
Future Capital Facilities	Q with 001-999
Right-of-Way	R with 001-999
Government Affairs	S with 001-999
Traffic Engineering	T with 001-999
Bridge Division	U with 001-999
Human Resource	V with 001-999
Maintenance	W with 001-999
Clearing Accounts (Controller)	X with 001-999
Safety	Y with 001-999
Controller	Z with 001-799
Transportation Technology	Z with 800-999

Although a series of numbers is assigned as stated above, caution should be used not to duplicate an existing AFE.

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The following is a list of perpetual AFE's that have been established within the AFE system for the types of costs or services defined in the AFE description.

AFE	DESCRIPTION	ACTIVITY
A064	Bridge Maintenance - all costs incurred in the repair and maintenance of Highway 159 Bridge #13.89 (Rulo Bridge).	4710
A364	Recreation Road Maintenance - all costs incurred in the repair and maintenance of Recreation Roads in District 1.	4720
A600	Bridge Maintenance - all costs incurred in the repair and maintenance of Highway 2 Bridge #507.13 (Nebraska City Bridge).	4710
B280	Bridge Maintenance - all costs incurred in the repair and maintenance of I-680, Bridge #13.43,westbound lane.	4710
B311	Recreation Road Maintenance - all costs incurred in the repair and maintenance of Recreation Roads in District 2.	4720
B313	Bridge Maintenance - all costs incurred in the repair and maintenance of I-680, Bridge #13.43, eastbound lane.	4710
B592	Bridge Maintenance - all costs incurred in the repair and maintenance of Highway 275, Bridge #190.	4710
B824	Bridge Maintenance - all costs incurred in the repair and maintenance of I-480, Bridge #4.13.	4710
B835	Bridge Maintenance - all costs of lighting fixture maintenance for I-480, Bridge #4.13 provided by Omaha Public Power District.	4710
C081	Recreation Road maintenance - District 3 repair and maintenance costs for Recreation Roads.	4720
D577	Recreation Road maintenance - District 4 repair and maintenance costs for Recreation Roads.	4720
E662	All costs incurred in the construction and maintenance of Gauging Stations for the Department of Water Resources.	4710
E741	Recreation Road maintenance - all costs incurred in the repair and maintenance of Recreation Roads in District 5.	4720
F101	Recreation Road maintenance - all costs incurred in the repair and maintenance of Recreation Roads in District 6.	4720
G569	Recreation Road maintenance - all costs incurred in the repair and maintenance of Recreation Roads in District 7.	4720
H004	Recreation Road maintenance - all costs incurred in the repair and maintenance of Recreation Roads in District 8.	4720
H028	Old Niobrara Bridge Valentine	2220
M019	Inspect steel, cast iron and reinforced concrete pipe for the State of Kansas.	4710
N100	Mitigation Site Monitoring	5095
*P010	Program Administration	
*P011	Road Data	

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*P013	Bridge Data	
*P016	County & City Maps	
*P018	Special Maps	
*P021	Traffic Collection	
*P030	Mileage	
*P037	Traffic collection Equipment	
*P039	By State Forces – Lincoln	
*P040	By State Forces – So. Sioux City	
*P043	Speed & Traffic Services Studies	
*P044	Allocation, Analysis/Projection of Highway Trust Fund	
*P045	Accident Data Collection, Coding and Process	
*P047	Railroad – Highway Grade Crossing Data	
*P048	Accident Data Analysis and Evaluation	
*P051	Bridge Inspection Data Analysis	
*P055	Long Range Program-State Highway System	
*P057	Pavement Management	
*P066	Analysis & Reporting of Highway Statistical Data	
*P068	Planning Courses and Seminars	
*P069	National Highway Studies	
*P070	Trails, Bicycle & Pedestrian Accommodations	
*P091	Classifications	
*P092	By Contract - Omaha	
*P096	By State Forces – Omaha	
*P101	SPR	
*P102	PL	
*P116	Decision Mapping	
*P121	Traffic Analysis	
*P138	Statewide Traffic Assignment Model	
*P139	By Contract – Lincoln	
*P140	By Contract – So. Sioux City	
*P151	Network Maintenance	
*P152	Application Development	
*P154	Six-Year Program Management	
*P222	Digilog	

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*P274	Compliance – Research	
*P275	By State – Forces (Statewide Long-Range)	
*P276	By Consultant Contract(Statewide Long –Range)	
*P277	Statewide Report of Planning Activities & Accomplishments	
*P278	Statewide Report of Performance Measures	
*P589	Pooled Fund Travel Reimbursement	
*P600	By State Forces(Non-MPO)	
*P601	Non-MPO-Grand Island By Contract	
*P602	Non-MPO Columbus	
*P603	Non-MPO Kearney	
*P604	Non-MPO Blair	
*P607	Non-MPO Lexington	
*P608	Non-MPO Crete	
*P609	Non-MPO Beatrice	
*P610	Non-MPO Seward	
*P699	Non-MPO Urban Areas by Contr State-Small Urban Coop Comp Planning	
*P700	Transfiguration, Inc.	
*P701	Immanuel Affordable II	
*P702	Cirrus House Inc.	
*P703	Region V Foundation - Wahoo	
*P704	Region V Foundation – David City	
*P705	Region V Foundation - Fairbury	
*P706	Skyline Retirement Community, Inc.	
*P707	Blue Valley Lutheran Homes Society, Inc. - Hebron	
*P708	Christian Homes, Inc.	
*P709	Region V Foundation – Lincoln	
*P710	Region V Foundation – Crete – Wilber	
*P711	Friendship Programs, Inc.	
*P712	Greater Omaha Community Action, Inc. – Omaha	
*P713	New Cassel Retirement Center	
*P714	Pender Community Health Care Foundation , Inc.	
*P715	Community Senior Center, Inc. – Ainsworth	
*P716	Kearney County Medical Foundation	
*P717	Mid-Nebraska Lutheran Home – Newman Grove	

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*P718	Mosaic – York	
*P719	South Central Developmental Services – Cozad	
*P720	Tabitha	
*P721	St. Joseph Retirement Community	
*P722	Prairie Pioneer Center – Broken Bow	
*P723	Garden County Health Services	
*P724	Good Samaritan Communities of Southeast Nebraska	
*P725	Good Samaritan Communities of Southeast Nebraska – Wymore	
*P726	Bloomfield Good Samaritan Center – Bloomfield	
*P727	Care-A-Van-Valley	
*P728	Liberty Center	
*P729	Panhandle Developmental Disabilities Services, Inc.	
*P730	South Central Behavioral Services - Hastings	
*P731	Senior Foundation – Lincoln	
*P732	Madonna Rehabilitation Hospital - Lincoln	
*P929	Transit Aid-Cash	
*P930	Transit Aid-General	
*P931	Transit Aid & Intercity Bus-Federal	
*P941	Section 5311 Program Administration	
*P942	Section 5310 Program Of Projects	
*P943	Travel-Conference Registration Instate and Outstate	
*P944	Travel-Salaries, Lodging	
*P945	Staff-Drug Testing	
*P946	System-Drug Testing Costs	
*P947	Staff-Intercity	
*P948	AASHTO MTAP Payment	
*P950	Transit-Capitol-Federal Earmarked	
*P961	Staff-Drug and Alcohol	
*P962	System-Drug and Alcohol	
*P963	Staff-Pat (Salary, Travel and Assoc. Expenses)	
*P964	Systems-Pat (Wages, Travel, Meals, Etc)	
*P965	Systems-Expenses Workshop	
*P966	Systems-Expenses Rodeo	
*P967	Systems-Expenses Expo	

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*P968	Systems-Expenses Regional Driver Training	
* P980	Transit-Capitol-Federal	
*P981	NATP Executive Director and Office Costs	
*P982	Regional Driver Training-6 Sessions by UNK Safety CTR	
*P983	NACO Trade Show Booth	
*P984	Rodeo and Driver Training Day	
*P985	Scholarships For NATP Dir/Out of State Conferences	
*P986	Scholarships For TRB Rural Conference In Roanoke, VA	
*P987	Scholarship For NATP Expo-Registration	
*P988	Newsletter	
*P989	Promotional	
*P994	Intercity Bus-General	
*P995	Intercity Bus-Cash	
R292	Lease sign sites to Department of Economic Development.	4710
*T001	Traffic Signal Equipment	6925
T950	Signs Department of Economic Development	4710
T951	Signs & Decal Dept of Agriculture	4710
V001	New employee orientation	4802
V002	Maintenance, Trades and Technical	4802
V003	Engineering, Science & Resources	4802
V004	Administrative Support	4802
V005	Supervisory	4802
V006	Administrative Professional	4802
V009	Skills Assessment	4802
V010	Tuition Assistance	4802
V100	Interaction management	4802
V101	Interaction (employee program)	4802
V200	Equipment operator training (trucks, loaders, etc.) District use for training equipment operators, both maintenance and construction personnel.	4802
V250	Fleet management sponsored training	4802
V300	Plan reading & highway engineering math courses	4802
V301	Project managers conference	4802
V302	Concrete/asphalt schools	4802
V400	Computer training	4387

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V401	CADD Training	4802
V402	Roadway Design Computer Training	4802
V403	IT Retraining	1101
V404	Site Manager Training	4802
V405	PDS	4802
V500	Miscellaneous non-safety (training that otherwise does not have its own AFE.)	4802
V501	Wellness Program	4802
V508	AA/EEO (includes Sex Harassment etc.)	4802
V509	Pre-retirement Planning Seminars	4802
V510	Writing for Consequences	4802
V600	NHI/FHWA courses	4802
V601	Bridge Division Sessions	4802
V700	Rewards & Recognition (Other Division & Districts)	1101
V701	Administration of Program	1101
V702	WASHTO Quality Awards Program	4802
V705	Honoree Time for ceremony attendance	4802
V900	Safety training – miscellaneous	4802
V910	Driver improvement	4802
V920	CPR training	4802
V930	Commercial Driver's Licenses (CDL)	4802
W099	All costs incurred for striping for other agencies and political subdivisions.	4710
*W132	The removal of Outdoor Advertising along all Nebraska Highways which do not comply with Federal regulations	6264 & Proj. No.
*W168	Cost incurred in the centerline and edge line striping of Nebraska highways.	6240 & Proj. No.
W170	Repair of traffic signals within the state.	4710
W175	Rechecking of 'No Passing Zones	2410, 6240 & Proj. No.
W185	Fleet Management Study	4112
W304	Vandalism of DOR equipment, roadside features, yards or buildings.	2313, 2603, 4103, 4452
X502	The sale of supplies and materials to other public entities, as well as certain services provided to other political subdivisions.	4710
X508	Printing or duplication (salaries, materials, etc.) for other political subdivisions.	4710

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*X600	The acceptance of costs for materials returned for credit on a construction project	6000-6292 & Proj. No.
X728	Billings for pre-determined amounts of services and supplies.	4710
X900	Costs collected and billable to the State Patrol	4710
X901	Purchase of fuel and oil by other state agencies	4710
Y500	District / Division Monthly safety meetings	1101, 2904, 4112, 5099, 4802,4112
Y501	Hearing and Respiratory Testing	1101
Y505	Dist/Central Safety Committee Meetings	2904, 4112, 5099
Y510	Agency Safety Committee meetings	2904, 4112, 5099
Y515	Statewide Safety/Committee (All Agencies)	2904, 4112, 5099
Y600	Cost of Jackets, shirts, caps and other	1101, 2904, 4710, 5099, 4802
Y605	Hats Summer/Winter	2904, 4112, 5099
Y610	Gloves	2904, 4112, 5099
Y615	Protective Eyewear	2904, 4112, 5099
Y620	Shirts – Tee & Button	2904, 4112, 5099
Y625	Uniforms	2904, 4112, 5099
Y630	Uniforms Cleaning	2904, 4112, 5099
Y635	Rain Gear	2904, 4112, 5099
Y640	Safety Shoes and boots	2904, 4112, 5099
Y645	Safety Vests	2904, 4112, 5099
Y650	Miscellaneous Safety Items	2904, 4112, 5099
Z090	All costs incurred in support of state surplus property sales.	4710
*Z121	All costs incurred in the initial signing of detours around construction projects.	6240 & Proj. No.
*Z122	Used for collection of all direct labor costs.	6000-6299
*Z123	Mailbox supports.	5099, 6240
Z202	Cost study concerning damage to Department of Road's property	1101
Z242	Computer Steering Committee.	5099
Z256	Employee accident records system.	1101
Z295	Training use of IGRDS	5099
*Z300	Legal Litigation	6970
*Z301	Furnish Lighting Materials on Projects	6925

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Z310	(CQT) Continuous Quality Teamwork	4802
Z312	Roadway Design Manual	4720
Z329	Survey Activities	4710
Z334	Digital Aerial Imagery	4710
Z335	Handling/Inventory Used Lighting	4211
Z336	Arial Photography Natural Resource Comm.	4710
Z340	Tire Recycling Statewide	4710
*Z347	LOGO	4710
*Z348	TODS	4710
*Z349	Security & Terrorism	4710
Z350	Toastmasters Program	1101
Z356	NIS Overtime	1101
Z361	Impact Study Lower Platte River	5099
Z380	Field maintenance Application Team (FMAT)	1101
*Z379	Project Finance	6925
Z800	TTS Non-project Operations	8100
Z821	State Patrol Share of 511 System (50%)	4710
Z822	NDOR Share of 511 System (50%)	8100

* Perpetual AFEs Setup for the Projects

All other AFE requests are made through the Controller Division-Cost Accounting Unit.

APPENDIX 9 - ESTABLISHING AND MARKING NO PASSING ZONES

NEBRASKA DEPARTMENT OF ROADS

SIGHT RESTRICTION SYSTEM

May 3, 2000
Bob Malmquist
Lincoln Electronics Shop
402-479-4344
version: alldoc2004 4/27/04

INTRODUCTION

Hills and curves on two lane roads limit visibility. Sight restriction (SR) equipment places a paint mark and keeps a computer record of the location of each "event." An event is the beginning or ending of a sight restriction, or manual reference mark. Hills can be marked automatically. Curves require operator judgment because seasonal vegetation may change sight conditions.

An instrument vehicle and trailer are dedicated to the sight restriction task. An additional vehicle needs a State radio, cruise control and 2" hitch ball. This vehicle pulls the trailer and travels 1200 feet ahead of the instrument vehicle.

8-09 There is an old car dedicated to use as tow vehicle. Paint mark overspray is hard to clean off a nice vehicle.

Strobe lights on the trailer send a coded signal to detectors on the following vehicle. Strobes and detectors are 3'6" above the pavement.

The trailer and second vehicle have wheel sensors to measure distance traveled. Radio telemetry sends the trailer data to the SR computer. The SR computer compares data from the two sensors and adjusts the second vehicle's cruise control to maintain separation.

Paint guns on the trailer and instrument vehicle are controlled by the SR computer. A ~~printer and~~ laptop PC connected to the SR computer records the position of each vehicle at every paint mark. The equipment recognizes a loss of sight while the operator "mark" button is pressed and held. Other vehicles will not interfere unless they are between the survey vehicles at an event. Optional “controlled road mode” marks every change of sight, ignoring the MARK button. 8-09 printer removed for technical reasons.

If separation at an event is correct, paint is sprayed automatically for ½ second. If separation is out of tolerance, no paint mark is made and "Sep err" is included in the PC record. Operator placed reference marks are painted 0.1 second and recorded as "vis ref" if the strobe is visible or "bl ref" if blocked.

The paint striping crew can tell computer determined marks from operator marks by length of the mark, so they know when it is appropriate to consider changing a no passing zone based on judgment.

GENERAL PROCEDURES FOR DETERMINING AND ESTABLISHING NO PASSING ZONES ON ROADWAYS WITH A SPEED LIMIT OF 55 MILES PER HOUR OR HIGHER

When the sight distance available to a motorist on a highway with a speed limit of 55 miles per hour or higher is reduced to less than 1,200 feet because of a hill or a curve, a No Passing Zone is marked.

The problem at hand is to travel a roadway and identify those locations with a substandard sight distance. The AASHTO policies on design and sight restriction stipulate that to measure sight distance, both the observer’s eye and the object shall be 42 inches above the surface of the roadway. Furthermore, the distance between the observer’s eye and the object should be 1,200 feet as consistently as possible.

This is accomplished by the use of two vehicles. Both vehicles are equipped with special measuring devices and the lead vehicle is equipped with a target mounted 42 inches above the surface of the roadway. There is an observer in the rear vehicle who keeps an eye on the target of the lead vehicle as they proceed down the road 1,200 feet apart. When the observer in the rear vehicle loses sight of the target on the lead vehicle, the point marks the beginning of a sight restriction zone. The zone ends when the target comes into view again.

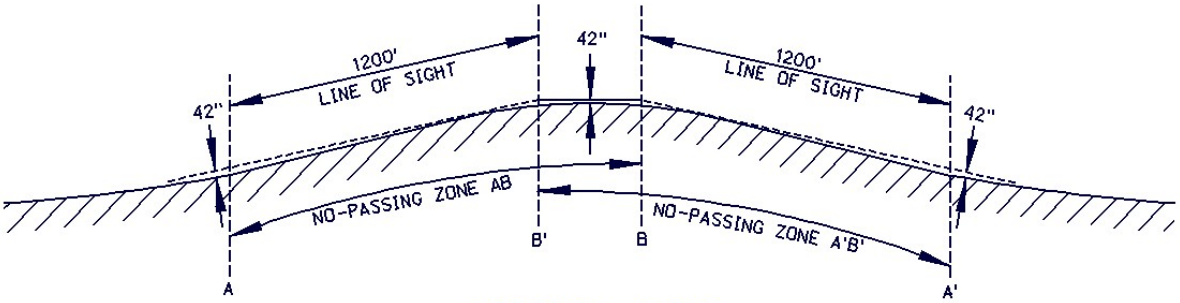
Generally, short zones are undesirable and should be avoided. The minimum length of substandard sight distance to qualify for a zone marking shall be 200 feet; however, the minimum length of a zone shall be 500 feet. If the substandard sight distance is less than 500 feet (but over 200 feet) the additional length in the marking necessary to make the zone 500 feet long shall be added at the beginning of the zone. If the end of one zone and the beginning of the next zone are less than 750 feet apart, the two zones shall be marked as one continuous zone. (Detail sheet is attached).

The paint marks will be applied near the center of the traveled lane. <u>The white spots mark the zones in the opposite lane. The orange spots mark the zones in the lane they are located in.</u>

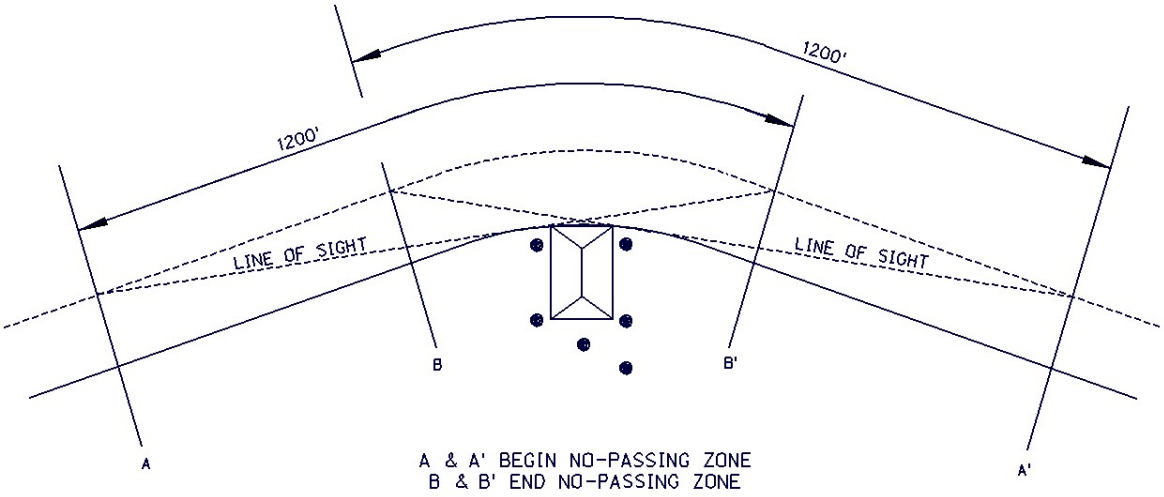
ESTABLISHING NO-PASSING ZONES

A No-Passing Zone shall be denoted by a solid yellow line placed as the right-hand element of a combination stripe along the center line.

REVISED STANDARDS FOR NO-PASSING ZONES



VERTICAL CURVE

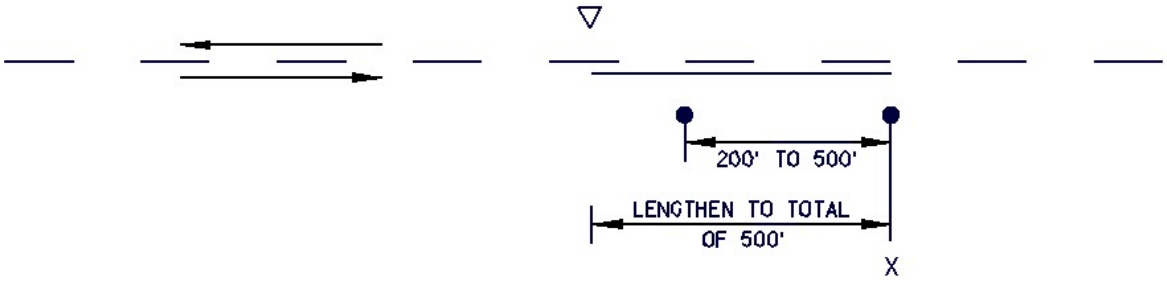


HORIZONTAL CURVE

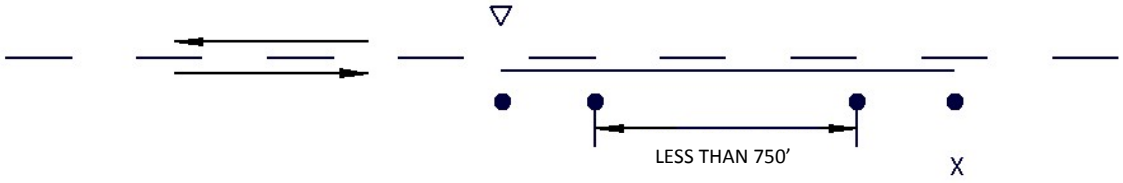
Posts shall be set beside all painted spots on the road except:

1. **Sight restrictions of less than 200’ will not be posted or striped even though the spots are on the pavement.**

2. The minimum length of a marked No Passing Zone shall be 500’. Any sight restriction that is at least 200’ long shall have its beginning lengthened to a total minimum length of 500’.



3. If the end of one sight restriction area is less than 750’ from the beginning of the next restricted area, the two shall be combined into one No Passing Zone.



SIGHT RESTRICTION SAFETY

You must be aware of Department of Roads safety practices for working around traffic. Check with your supervisor to be sure your training is current and appropriate.

Wear a high visibility vest and hat any time you get out of the vehicle around traffic. If you must service the equipment on the road shoulder, one worker should carry a horn and flag and give full attention to watching traffic.

Safety eye wear must be worn when working with paint. Read the precautions on a paint can. Avoid skin contact and wash thoroughly before handling food. Keep clean water in the truck.

Always release pressure with the valve on the paint tank lid and open the lid before servicing the paint system. The lid will not open if there is pressure in the tank. The valve is also the safety over pressure relief for the paint tank. Regular use will ensure that it is not plugged.

Don't ever look directly into the spray nozzle or allow any part of your body in front of the sprayer when it is connected to the line, regardless of whether it is pressurized.

DAILY OPERATING LOG

You must keep a log (record) of your work. Use a bound notebook. At the beginning of each day the equipment operator records the date, their initials and signature. Every subsequent entry should include operator initials.

At the beginning of each measurement run, record the date, mile marker, road designation, direction of travel expressed as A or D (mile markers are Ascending or Descending) and a short description of the road.

For each no passing zone, note if it is caused by hill, curve, or obstruction. Log deliberately placed reference marks for points requiring passing control not due to sight limitation, such as intersections. Be sure to describe the reason for reference marks.

At any point during work that there is an unusual occurrence, log the event and mileage reading. This could be operator error, for instance bad separation at the time sight is lost or regained. It could be interference, if another vehicle gets between the survey vehicles at a critical moment. Equipment difficulty should be logged.

At the end of the measurement run, record both the actual roadside mile marker and the system reading. If the two are not the same, it is particularly important that this be recorded. There may be a problem with the equipment, measurement run or mile marker placement.

HIGHWAY REFERENCE POST LOG

(Reference Log Book)

Mile marker posts may not be at the precise location indicated on the post. The reference post log book has both the nominal and exact location for every marker. See your supervisor for details of using the log book. You will need to know how to use it.

DRIVER INSTRUCTIONS - TOWING VEHICLE

Driver variables can change the accuracy. Longer runs between recalibration can be made, and better data collected, if drivers observe these suggestions:

Accelerate and brake gently. This reduces wheel slip. The computer uses wheel sensors to measure travel.

Stay centered in the lane. In a straight run, weaving from side to side will increase the distance traveled. In a curve considerable error can result if one vehicle hugs the center line and the other stays to the outside edge.

Avoid lane changes when possible. Both vehicles should change lanes if one is forced to so that the path traveled by each will be the same.

Tire inflation of the trailer and instrument vehicle should be checked every morning. Run at or near rated maximum. It is possible to "fine tune" the calibration by varying tire pressure slightly. Tow vehicle tires have no effect on measurement accuracy.

If the front tires of the truck or the trailer tires must be changed, be sure to use the same size tires.

When traveling between jobs, the strobes should be off and the trailer sign folded.

DRIVER INSTRUCTIONS - SECOND (INSTRUMENT) VEHICLE

Separation should be maintained at 1200 feet. The dashboard display shows separation in feet, and has a bar graph that shows separation error. The yellow center LED is on at all times. One to four additional LED's may be on. The LED's light at separation errors of 10, 25, 50, and 100 feet. Green LED's mean go faster, and red LED's mean go slower. If the error is more than 50 feet at the moment that line of sight is lost or regained, the measurement must be repeated. Separation can vary at other times without affecting accuracy.

The computer will be connected to the cruise control when time permits. This part of the system is still under development. You will have to keep separation manually for now.

Driver variables can change the accuracy. Longer runs between recalibration can be made, and better data collected, if drivers observe these suggestions:

Accelerate and brake gently. This reduces wheel slip. The computer uses wheel sensors to measure travel.

Stay centered in the lane. In a straight run, weaving from side to side will increase the distance traveled. In a curve considerable error can result if one vehicle hugs the center line and the other stays to the outside edge.

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Tire inflation of the trailer and instrument vehicle should be checked every morning. Run at or near rated maximum. It is possible to "fine tune" the calibration by varying tire pressure slightly.

If the front tires of the truck or the trailer tires must be changed, be sure to use the same size tires.

When traveling between jobs, the strobe should be off and the truck sign folded.

SELF TEST

This procedure should be followed at the start of each measurement run.

Stop on the shoulder at a mile marker with the instrument vehicle close to the trailer. Turn on the MAIN and AIR dashboard switches. Start the laptop program if it is not already running. Begin a file save to disk. Type control-C to reset the sight restriction program, and type RUN and press the Enter or Return key to begin a measurement run. You will be prompted to enter start-up information. You can accept if correct, or go back through the prompt sequence. Note that the sight restriction system is not able to recognize the backspace key, so if you make a mistake typing you must start over.

The exact distance traveled in the next step is not important. The point is to travel the same distance with both vehicles and be sure they both measure the same, and to confirm operation of the paint guns.

Pull ahead about 1200 feet with the tow vehicle and trailer, and stop. Two-tenths of a mile by the odometer is close enough if the DMI is not extended to the tow vehicle. Press and release the mark switch after the tow vehicle has stopped. Stay in place with the tow vehicle.

Drive ahead with the second vehicle and check the rear view mirror to make sure paint sprayed. As you approach the trailer, observe the paint mark from the trailer paint gun. Stop close to the trailer. The separation display should go to zero, and the DMI readings in the two vehicles should match.

If everything checks out, you can begin the measurement run. Don't reset the SR program between self test and measurement.

Pull up 1200 feet with the tow vehicle and stop. Start driving with both vehicles at the same time. You should always start with correct separation any time the vehicles are stopped.

See the troubleshooting pages if the separation display has errors.

COMPUTER OPERATOR INSTRUCTIONS
SECOND (INSTRUMENT) VEHICLE

Both vehicles must be stopped when the program is started for the first time or reset after a measurement run. They must not move until the message "Ready to begin measurement run" is displayed on the PC ~~and printer~~. Traveling too soon can confuse the computer. If one unit moves too soon it may be necessary to turn off dashboard MAIN and the electronics on the trailer. This will force a system reset when power is turned on again.

Turn on the MAIN and AIR dashboard switches and trailer power. Start the laptop program if it is not already running (see next page). Begin a file save to disk. Type control-C to reset the sight restriction program, and type RUN and press the Enter or Return key to begin a measurement run. You will be prompted to enter start-up information. You can accept if correct, or go back through the prompt sequence. Note that the sight restriction system is not able to recognize the backspace key, so if you make a mistake typing, you must start over.

The computer in the truck has no error checking on what you type in. Please be very careful about the information entered at this point. Another computer will be using these files and if your information is not exactly as expected, the other computer will not be able to use the file.

Highways must be identified with three place numbers. Example: 002 for highway 2. Do not type US or NE, the numbers are never duplicated between State and US roads so there is no need.

Link or spur roads are identified with four place designations. Examples: L07E is a valid link, S66A a valid spur.

The operator name should be your full name, example: Robert W. Malmquist not Bob Malmquist.

The mile marker is entered as XXX.XXX. Example: The mile marker your are stopped at is 28, you enter 028.000.

The date must be entered as DD-MM-YYYY (day-month-year). Use two digits for day and month, four for year. Example: 02-04-2000

Perform the self test and begin traveling with 1200 feet separation.

As you approach a sight restriction, press and hold the MARK button. The computer will operate the paint guns on both units when line of sight is lost, and the distance reading of both vehicles and their separation will be saved to the laptop and ~~printer~~. Release the button when ~~you hear the printer~~. The laptop display shows the event.

When sight is regained, paint will be sprayed and another record saved. No button press is required.

At the end of a measurement run, with both vehicles stopped together at a mile marker, press MARK twice. Identical mileage records at the end of the file will show later that this run ended normally. Ending at a known point verifies that the distance traveled is measured accurately. Make a log entry for end-of-run.

End the disk file storage for this measurement. Start a new disk file. Make a log entry for the next run. Type Control-C to reset the sight restriction computer. Type RUN and press the Enter or Return key to begin the new measurement. Answer the prompts on screen. A new measurement run can now begin.

CLOSED ROAD MODE

During the 1997 operating season, users reported that obstacles interfered with measurement runs. Example: A series of small hills that broke line of sight momentarily. The operator could not press MARK in time to start a new zone, and the obstruction would be missed.

“Closed road mode” does not use the operator MARK button. Every change in sight conditions is painted and recorded (saved to file). Use this mode on a closed road or one with very little traffic. Under most traffic conditions cars will pass the test vehicles and break the line of sight, and later these events may be confused with valid “no passing” zones.

At the beginning of a test run, the program asks if mile markers increase or decrease in the direction of travel. Enter 3 for increase or 4 for decrease instead of 1 or 0 to start the program in closed road mode.

When running in closed road mode, the operator must stay alert for false obstructions and log each false event. These will usually be cars passing the second vehicle and pulling back in, blocking visibility of the strobe trailer.

LAPTOP COMPUTER OPERATION

Use a Department laptop with the equipment. You will use Hyperterminal to save sight restriction data to disk. Click the sight restriction shortcut icon on the desktop, or go to Start-Programs-Accessories-HyperTerminal-sight restriction. To begin a file save, click Transfer-Capture Text. Type in the name of the data file, and click Start. At the end of the measurement run, click Transfer-Capture Text-Stop.

8-09 Because there is no longer a functioning printer in the system, it is very important that the files be saved to the computer. Paint marks are not durable. Be sure you know how to do this before you do long distances. Your work can be wasted if the file is not saved.

DATA FILE NAMES

The files are named according to the road and mile marker where the measurement begins. The first four digits will be the highway number, the next three the miles, then after the period the tenths, hundredths, and direction of travel expressed as A or D (Ascending or Descending mile marker numbers). Examples: highway 77 mile 123.45 Southbound would be filename 0077123.45D, highway 136 mile 27 Eastbound would be filename 0136027.00A.

SUBSTITUTE COMPUTER

Any computer with a serial port and communications program can be used if circumstances require. Set the serial port for 9600-N-8-1.

A USB to serial adapter should work to allow use of more modern computers. Make sure this does work before you have a crew waiting and paint mixed.

COMPUTER MESSAGES

Every time the button is pressed and released, the laptop ~~and printer~~ will show the position and separation, and the event description. Here are examples:

lead	123.4501	trail	123.2345	sep	1138	vis ref
lead	125.0321	trail	124.8765	sep	822	s.err blocked

The six possible events are: vis ref, bl ref, blocked, visible, s.err blocked, s.err visible. Reference events are painted for 0.1 second, BLOCKED and VISIBLE events are painted for 0.5 second.

VIS REF means that a reference mark was placed by the operator, and that the trailer was visible at the moment the button was released. This can also show up if the button is released too soon when approaching a hill or other sight restriction.

BL REF means that a reference mark was placed by the operator, and that the trailer was not visible (BLocked) at the moment the button was released. This can also show up if the button is pressed too late when approaching a hill or other sight restriction, or if there is some problem with the strobes or detectors.

BLOCKED means that the detector just lost sight of the trailer strobes and the separation is within tolerance (separation is 1150 to 1250). This is the message you want to see as you approach a hill with the button held. A long paint mark is made by both vehicles.

S.ERR BLOCKED means that the detector just lost sight of the trailer strobes but the separation is out of tolerance.

VISIBLE means that the detector just regained sight of the trailer strobes and the separation is within tolerance. This will happen automatically following BLOCKED or S.ERR. BLOCKED. This is the message you want to see as you clear the hill or obstacle. A long paint mark is made by both vehicles.

S.ERR VISIBLE is the same as VISIBLE but the separation is out of tolerance.

DATA SUBMISSION TO CENTRAL OFFICE

Updated 8-09

If working for a number of days, you will be expected to send your data files to your supervisor on a regular basis. This can be done by modem from the motel room, or by carrying the laptop in to a Department of Roads' office and using their network.

Burn an archive CD regularly to make sure the data is secure.

Do not use the State computer on a motel or other "foreign" network unless you have consulted with BTSD to be sure you are safe doing this.

Data will be checked for problems so that you will know before leaving an area if there are any sections that have to be run again. Your supervisor will provide more details of data communications to the main office.

PAINT SYSTEM PREPARATION

Wear eye protection when working with the paint system!

Keep all paint system components clean. Thickened paint will plug the paint nozzle or cause the solenoid valve to stick. There is a "clean box" in the back of the truck for storing paint parts and filters.

Use exterior latex paint diluted 1:1 or 1.5:1 with water. Do not use “Traffic Marking Paint”, it is difficult to clean the strobes and valves. Mix paint and water in 5 gallon plastic buckets and strain, using a disposable painter's funnel or a filter bag. Good quality paint from fresh containers may still have contaminants that will plug the system if not strained out. Paint thickness will vary with temperature and some experimentation may be helpful to get the best paint marks.

The paint spray tanks should be no more than 2/3 full of paint at the beginning of work. The paint will stay mixed better if it has room to slosh around. Use white in the lead vehicle and orange in the trailer. Other colors may be substituted if road conditions cause poor visibility. **Record any alternate colors in the daily operating log.**

The instrument vehicle has an electric air compressor, wired so that it will only run when the engine is on. A storage tank on the trailer is filled from the truck to about 100 PSI at the beginning of work. It is reduced by an adjustable regulator.

On a smooth surface, 40 PSI is adequate. More pressure should be used if the marks are not readily visible, but higher pressure increases airborne paint mist and may get paint on following vehicles. The trailer strobe heads and sign will have to be cleaned often if high pressure must be used.

PAINT CLEANUP

Wear eye protection when working with the paint system!

When done, release pressure and put the remaining paint in clean buckets. Close the buckets firmly using a rubber hammer. If paint is left in the tank overnight, it will form a surface "skin" of thickened paint from exposure to air. The valve and nozzle will get plugged up with thickened paint. While in use the paint stays fluid due to constant agitation caused by driving.

Rinse out and brush the tanks. Hot water will do a better cleaning job. After the tank is clean, fill it with water, reassemble and pressurize. At each paint coupler, disconnect and reconnect numerous times until all paint is rinsed out of the coupler.

Clean the paint solenoids by operating with water. The truck has a manual switch near the paint tank. The trailer has a manual switch on the bottom of the strobe box and another in the control cabinet. Spray until the line and head are clean.

Operate the solenoids many times. Empty the tank and blow the line dry. Disconnect couplers and spray WD40 into the solenoid valve and couplers. Operate the valve so that the WD40 is worked in. It will drip out the spray nozzle when enough has been used. The moving parts of the solenoid run in paint and need to be moved many times to get all the paint rinsed out. Refer to the drawing of the valve to see the places paint residue can stick and keep the valve from working.

The couplers have some steel parts and must have a generous application of WD40 to prevent rust. WD-40 will also dissolve paint residue.

OPTICAL

Use lens tissue and cleaning solution if the lens is dirty. The detector must point straight ahead and have the center of the lens at 42" above level pavement. Dirt and bugs will interfere with detection.

Lens tissue and solution should also be used to clean the strobe heads on the trailer. The strobe heads are made of precision optical plastic, just like eyeglasses. Don't use ordinary paper towels to clean the strobe heads. Alcohol is OK instead of lens solution. Don't use petroleum based solvent (toluene, carbon tetrachloride, brake cleaner, mineral spirits, etc.) because it will attack the plastic lens. Several strobe heads have been ruined by cleaning with harsh chemicals and abrasives.

Paint mist from the spray gun will stick to the strobe heads and reduce light output. This will show up as false dropout of detection. Detection range will be short. Tilt up or down, and rotation left-right will break the beam sooner than normal if the strobe lenses are contaminated or scratched.

DISTANCE MEASUREMENT

If the readings of the vehicles do not agree when you perform the self test, check the calibration of each over a known distance. A thirty mile run on the Interstate will ensure that the limit of the calibration is instrument accuracy rather than course measurement. Tire pressure on the right (passenger side) trailer wheel or right front wheel of the instrument vehicle will affect calibration.

The pickup and trailer each have sensors mounted near one wheel and sensor targets (similar to balancing weights) clipped on the wheel rim. A red LED on the sensor shows target detection. The sensor can be checked by jacking up the axle and spinning the wheel.

Nu-Metrics brand DMIs (Distance Measurement Instrument) are used as confirmation of distance traveled. The DMI's are wired to the same sensor as the sight restriction computer and should always show the same distance traveled as the computer. The pickup has a permanently mounted DMI. The trailer uses a telephone type wire to connect a DMI in the tow vehicle. A "beeper" indicating paint mark is mounted on the trailer DMI.

If a sensor is intermittent or a wheel target is missing, the DMI will detect irregular pulses on its input and flash "AEC" (Automatic Error Correction). The DMI will try to replace the missing pulses. The DMI reading will be higher than the computer reading if AEC is active.

Calibration is determined by tire size, inflation and the number of wheel targets. It should not change more than one or two percent unless the tires are replaced. It is important that the same size be used if a tire is changed. If there is a large change in calibration, it probably means a wheel target has fallen off. Targets should be spaced uniformly on the measurement wheel. There are spare targets in one of the compartments. These are installed with a wheel weight tool.

There should be no need to re-calibrate the DMI's as long as they are used in the correct vehicle. The trailer and truck have different size wheels, so they have different "calibration numbers". If calibration has changed, the new value must be put into the RTC52 (SR computer) BASIC program. This can be done in the field. Contact the Electronics Shop for details. This should normally never be required.

TOWING VEHICLE SETUP

The trailer must be level. Park on a level surface and adjust the trailer hitch to match your truck or add weight to the truck to match the trailer.

The DMI (Distance Measuring Instrument) for the towing vehicle is stored in the second vehicle. A long cord for the DMI is in the cabinet on the trailer. The towing DMI is for convenience and test purposes, installation in the towing vehicle is optional.

Beginning summer 2000, there is a car (#53755) dedicated to towing the strobe trailer. It has permanently connected power leads from the battery to the trunk and DMI wiring from the trunk to the dashboard.

If the car #53755 is not available, any vehicle with a trailer hitch can be used.

For short runs the battery on the trailer can supply power. Be sure it is charged overnight before use. If the system will be used all day, connect to the electrical system of the tow vehicle. There are magnets and cable ties stored in one of the tool compartments of the instrument vehicle. Feed the wire through the grill or under the front of the vehicle. Don't drive with the hood part way open.

Clean the strobes if they get paint on them. Use lens tissue and cleaning solution or soft cloth and alcohol.

TRANSPORTING THE SIGHT RESTRICTION EQUIPMENT

Always use the protective caps on the green "mil spec" type connectors when the cable is not attached to the trailer.

Protect the detector with a plastic pipe cap when not in use. Use a lens brush or lens tissue and cleaning solution if the lens is dirty. Lens tissue and solution should also be used to clean the strobe heads on the trailer.

If the instrument vehicle is towing the SR trailer, you can compare calibration. In a turn the trailer follows a slightly shorter path than the tow vehicle. This will show up on the separation display. The separation software ignores negative numbers for separation and will read zero if the trailer "gets ahead of" the instrument vehicle.

STORING THE EQUIPMENT

All paint system components should be thoroughly cleaned before storage. Disassemble couplers and spray liberally with WD40. Spray into the paint valve with the manual control turned on so that the oil can get into the valve mechanism.

Click the valve on and off many times to distribute the WD40.

The units are meant to withstand storage outdoors. Lock all the tool compartments and the trailer cabinet when in storage outdoors.

Because of its value, the laptop computer must be kept in a secure location when the equipment is not in use.

OPERATION HINTS

The following suggestions are from users of the equipment:

Lane position: If the sight restriction is caused by a hill, you can move the vehicles to the left or right of normal travel lanes so that a car in-between does not spoil the measurement run. Drivers have moved over the center line or onto the shoulder to keep sight of each other. Don't use this trick on curves, only hills.

Paint: Instead of 1:1 paint to water, try 1-1/2 paint to 1 water for more visible marks. Other colors can be used. Some concrete roads have an orange tint, (perhaps iron oxide from snow plows?) that tends to hide the orange mark. Some unusually white concrete poses a similar problem for white paint marks. Red and blue have been used with success on various surfaces. Be sure to note any non-standard colors in the operating log.

Initial position: On short spurs there may not be a way to start at a mile marker or known point at the beginning of the run. Use the DMI to find your location by measuring from a known point, or use the paint mark at the end of run in the opposite direction as the reference for beginning the new run.

The gas gauge on the truck doesn't work right. Fill up before every use. Figure 10 miles per gallon and 20 gallon capacity.

Feedback: Problem reports, questions and suggested improvements should sent to Bob Malmquist, DOR16004, 5001 So. 14th St., Lincoln.

TRAVEL SIMULATION

Simulation is useful for test, training, and demonstration purposes. Simulation can be used while traveling or parked. Long duration simulation runs can be used to test for poor telemetry range and telemetry interference and for computer stability. If there is a problem in the computer system due to vibration from travel, simulation will allow this to be isolated from wheel sensor variables.

The trailer has a built-in pulse generator to replace the normal wheel sensor. It is controlled by a toggle switch on the front of the plastic box containing the electronics. The switch positions are NORMAL(up)-OFF(center)-TEST(down).

In the instrument vehicle, unplug the wheel sensor cable and plug in the blue plastic box. Its toggle switch positions are RUN-STOP. Unplug the optical detector cable and plug in the black pushbutton switch with red button. Don’t worry about unplugging these cables, each is a different type and cannot be plugged in to the wrong place when restoring normal operation.

The pulse generators used to simulate travel are sufficiently accurate to allow many hours of testing. No error in separation due to difference in simulated speed of the two vehicles should occur.

To run in simulation mode, turn the toggle switches to OFF and STOP. On the laptop PC type control-c to begin a new run, and type 2 when it asks for 0 or 1. The computer skips the rest of the questions and begins a measurement run.

Turn the pulse generator ON at the trailer and watch the separation display on the dashboard of the instrument vehicle. When the desired value (usually 1200 feet) is displayed, set the switch on the blue box to ON in the instrument vehicle. Both are now “traveling” at about 45 MPH and will keep separation. The separation can be changed by turning one or the other pulse generator off briefly.

To simulate a no passing zone measurement, press the detector button so that the detect light and LED on the dashboard display are lit. Now press and hold the operator MARK button and press the detector button. The detect light goes out. A printout, computer display and paint mark will occur. This is the same as if the trailer had just gone over a hill or around a curve. Now press the detector button again. The indicators turn on. There will be another print, display and paint mark. In actual use this would be the moment the trailer was visible again.

You can experiment with the separation and simulate loss or regain of sight to see the different computer messages. Put water in the paint tanks to observe marking operation without making a mess.

To check the telemetry radios, first make a test with the vehicles within 50 feet of each other. After this is confirmed to work, gradually increase the actual distance between the vehicles to about 2000 feet. Displayed separation should stay constant because the computer is counting simulation pulses instead of wheel pulses. If errors occur, drive several miles, reset the system and try the test again. It is possible for a strong nearby transmitter to jam the equipment. If the problem persists in the new location, there is probably an antenna or coax problem. A spare antenna with attached coax is included in the on-board spares.

To test for computer stability, make a long term simulation run. Park the vehicles close to each other so that possible telemetry range errors will not add another variable to the test. It should be possible to go many hours with no errors. Try wiggling connectors, pulling gently on wires, and tapping lightly on equipment.

When simulating for several hours, you need to provide electrical power. The vehicles should not idle for a long time. A small charger can be moved between the vehicles, charging each for about an hour at a time and running on battery while the other is charged.

If the charge voltage goes over 15 Volts the inverter (12 V to 110 V converter) in the instrument vehicle will go into protection shutdown. The ~~printer~~ and telemetry radio are powered by the inverter. The laptop is powered by the inverter but will continue to run on its internal battery. The SR computer uses vehicle 12 V power.

To end protection shutdown, turn off the inverter. Disconnect the charger and turn the headlights on for one minute. Turn the inverter on and normal operation will resume.

LOAD NEW PROGRAM IN SR COMPUTER

Any changes to the operating code must be approved in writing by Operations Division and Electronics. Do not change the program without authorization! Note any changes in operating log!

The code beginning at 10000 is from a manufacturer's application note and is used to load the working code into NOVRAM (NO*n*-V*olatile* R*am,* battery backed CMOS static memory). The new program must include the same NOVRAM loader code as the existing program, beginning at 10000.

The program must be ASCII text. NT's Notepad program produces ASCII text files. Word can save files as ASCII but you must use "Save As" and specify save as file type "text only".

To change the sight restriction program, type CTL-C, then type the BASIC-52 commands **RAM** and **NEW,** then upload the desired program. The new program is stored in RAM on the RTC52 (SR computer).

After the program is transferred to the RTC52, type **GOTO 10000** to move the program from RAM to NOVRAM. Type **P** in response to the first prompt. Some time is required before the next prompt appears. Answer **2** to the PROGX question. After controller power down or reset the program stored in NOVRAM will run.

PROGRAM LOAD

Code is converted ("tokenized") when CR is received. Some time is required to tokenize and store the line and if the next line is sent too soon, it will lose one or more characters from the beginning of the line. If your communications program supports it, the best configuration is "wait for > prompt". The RTC52 sends > when it is ready for the next line.

If "wait for >" is not supported, use character pacing. Character pacing is the addition of idle time between characters or lines. Settings of 500 mS for line and 50 mS for character will work. This value could probably be reduced to speed transfer but there is a risk of program corruption.

TROUBLESHOOTING DATA PROBLEMS

Perform the “self test” in the main instruction book.

Problems addressed in this section are:

I. Separation display does not show motion of trailer.

II. Separation display does not show motion of second vehicle.

III. Separation display shows motion of trailer at beginning of self test but does not show trailer motion as distance increases or shows wrong travel value for lead vehicle when both are stopped 1200 ft apart during self test.

IV. Separation does not go to zero at end of self test.

V. No DMI reading.

VI. Computer trouble.

BACKGROUND INFORMATION:

Both vehicles must be stopped when the program is started for the first time or reset after a measurement run. They must not move until the message "Ready to begin measurement run" is displayed on the PC and printer. Traveling too soon can confuse the computer. If one unit moves too soon, it may be necessary to turn off dashboard MAIN and the electronics on the trailer. This will force a system reset when power is turned on again.

Sensor problems and bad or loose cables cause most difficulties. The wheel sensors must be close, but not touching, the wheel targets. Wheel targets can come off, check that they are uniformly spaced, a gap means a missing target. An LED on the sensor shows detection. It should blink each time a target passes the sensor, and go dark between.

The DMI instruments sense the same pulse source as the computer equipment. The DMI's are a separate means of measuring travel as a confirmation of distance measurement by the computer.

Park the truck and trailer near each other at the beginning of these tests. Most antenna problems will be overcome by the strong signal of a nearby radio. Antenna problems will be addressed later in this procedure.

I. Separation display does not show motion of trailer:

I.1. Tests in towing vehicle: Set the small toggle switch on the tan plastic box to "test". This substitutes electronically generated pulses for the normal pulse source on the trailer wheel, and simulates travel.

I.1.a. Does the DMI show distance traveled? If not, go to section V.

I.1.b. Check for a blinking red light on the trailer telemetry radio when simulating motion. This shows that data is being sent to the radio. If the DMI shows travel but the radio LED does not blink, try a spare telemetry radio cable. These are interchangeable between the two vehicles.

I.1.c. If simulated travel shows on the separation display but actual travel does not, inspect the sensor and targets for damage or poor alignment. A coin or tool may be used as a handheld target to test the sensor. A spare sensor and targets are stored in one of the storage compartments of the truck.

I.2. Tests in second (instrument) vehicle:

I.2.a. If the telemetry radio on the trailer blinks but the radio in the second vehicle does not, one of the radios or an antenna has a problem. There is a spare antenna. Turn the radio or whole system off before changing antennas.

I.2.b. If the telemetry radio in the truck blinks in response to simulated trailer travel, try a spare data cable to the radio.

II. Separation display does not show motion of truck (second vehicle)

II.1. Does the DMI in the second vehicle show distance traveled? If not, go to “No DMI reading”.

II.2. Unplug the wheel pulse sensor at the SR computer and replace it with the "blue box" travel simulator. When the simulator switch is set to "run" the computer will see pulses that duplicate travel at about 45 MPH.

II.3. If the simulator pulses show on the DMI but do not change the separation and position measurements, the SR computer has failed. Try turning off power.

III. Separation display shows motion of trailer at beginning of self test but does not show trailer motion as distance increases or shows wrong travel value for lead vehicle when both are stopped 1200 ft apart during self test.

This problem is probably caused by antenna trouble or failure of the connector on the coax where it attaches to the radio. There is a spare antenna with cable. If the range of the telemetry system is reduced, information will pass when the units are close together and fail when far apart. The lead travel indication (and separation, if trail is stopped) will "freeze" when the radios are out of range. As they get closer, communication resumes. The trailer constantly sends its new position. When data flows, there will be a "jump" in readings. When the units are close at the end of self test, the telemetry will be good and final values will be accurate.

IV Separation does not go to zero at end of self test:

IV.1. Both vehicles have traveled the same distance but the DMI readings do not agree.

IV.1.a. Check tire inflation. If a tire has been changed, it must be the original size.

IV.1.b. Check for sensor or target problems.

IV.1.c. Check DMI calibration. See SRDMICAL.DOC or read the instructions in the NuMetrics DMI book. The calibration numbers are 967 for the GMC tool truck and 805 for the trailer. These calibration numbers mean 0.967 ft and 0.805 ft per pulse. They are hard coded into the SR program. Contact Electronics if there is a calibration problem. These values should not change, they are determined by the tire diameter and number of wheel targets

IV.2. DMI readings agree at the end of the self test but separation is not zero.

IV.2.a. Watch the DMI closely during self test. If AEC (Automatic Error Correction) shows on the DMI display it means the DMI computer has determined that pulses are missing and is substituting generated pulses for missing or defective pulses. The SR computer cannot perform this automatic error correction, and will show a shorter distance traveled than the DMI under these conditions. Look for sensor or target problems.

IV.2.b. There may be interference on the radio frequency. If several self tests fail, drive a few miles and try again. A strong local interference source can jam the telemetry.

V. No DMI reading:

V.1. Is the display completely blank? If it is, press the ON/OFF button.

V.1.a. If pressing ON/OFF makes a beep but there is no display, the DMI is bad.

V.1.b. If pressing ON/OFF has no effect, try another DMI cable.

V.1.c. Try the suspect DMI in the working vehicle, or try the good DMI in the vehicle having trouble. Calibration and setup will not be right but will be OK for test purposes.

V.2. Press the DMI RUN/HOLD button and watch the display. If the DMI status window says COUNT HOLD press RUN/HOLD again. The DMI ignores input pulses when in count hold.

V.3. Press the DMI DISP/HOLD button and watch the display. If the DMI status window says DISPLAY HOLD, press DISP/HOLD again. When in display hold, the DMI continues to count and send pulses but the display is frozen with the reading at the moment the button was pressed.

V.4. Try the travel simulator instead of the wheel pulse sensor. If simulation shows travel on the DMI, there is a wheel pulse problem.

VI. Computer trouble:

VI.1. Blank screen. The contrast may need to be adjusted. The computer may have gone into power saving mode, press enter or tap the mousepad.

VI.2. Laptop PC does not turn on.

VI.2.a. Check the power switch on the PC.

VI.2.b. Check that power from the inverter is connected to the laptop power supply.

VI.2.c. Try another laptop computer. Any PC with a serial port and terminal program can be used. Set the serial port for 9600-N-8-1.

VI.3. Mouse pointer does not move. The laptop computer was placed in "suspend" mode, then turned back on with the power button. The mouse will resume normal function in one or two minutes when the computer is ready.

VI.4. No message from SR computer on PC screen at startup. Printer output normal. Separation display is lit.

VI.4.a. Type Control-C (Press and hold Ctrl, press C, release both). This resets the SR program. Type RUN to start the program. The startup message should display and the printer should show the same information as the computer screen.

VI.4.b. Turn the main dashboard switch off and on. This resets the SR computer. Leave the laptop turned on, its battery will keep it active while system power is off. Press the spacebar. This starts "autobaud", the SR computer senses the beginning of communication and adapts so that the two computers use the same serial baud rate (data speed). Be sure that space is the first key pressed or autobaud will fail.

VI.4.c. Try another cable between the SR computer and the laptop.

VI.5. No output from SR computer to printer or laptop display when system is turned on with dashboard MAIN switch. Separation display is dark. This is probably no power to the SR computer.

VI.5.a. Check that all cables are plugged in at the SR computer.

VI.5.b. Check the fuses under the hood, there are two fuse holders at the battery protecting power to the computer and to the paint control valve.

VI.5.c. Check the screw terminal barrier strip below the SR computer, using the test light from the tool kit. There should be twelve volt power when the dashboard switch is on. If there is no power go to a State shop and ask the mechanic for help with the problem. The dashboard MAIN switch controls a relay under the hood.

VI.6. PC has normal behavior, separation shows on laptop, but dashboard separation display is bad.

VI.6.a. Separation display is dark. Change the power cable to the display.

VI.6.b. Display is frozen or has strange characters. Change the 25 pin data cable to the separation display.

VI.7. Computer shows error messages. Examples: STOP - IN LINE 201 ERROR: BAD SYNTAX - IN LINE 2650. The line number varies. These messages are from the SR computer and have been reported several times. The problem has not been found. So far the system has always recovered when power was turned off and on again. If cycling the truck power is not enough, unplug the trailer power lead as well to force reset of the computer on the trailer.

It has been reported that sometimes the error messages show up several times in a row, and that the fix was to unplug the trailer, turn off the dashboard MAIN switch and wait several minutes before restoring power.

The error messages do not really mean that there are bad commands in the program. Line 2650, for instance, has no syntax error. It is a program instruction that is executed many times a second and normally all is well, the program goes on to the next instruction. Line 201 does not contain a stop instruction. Apparently the computer does not read the instruction correctly every time.

8-09 COMPUTER "LOCKED UP" Changes in printer characteristics caused incompatibility with the SR computer (brown box). If a printer is connected to the system the SR computer will lock up the first time a printer output occurs.

Unplug the data cable to the printer. If a printer is not in the vehicle do not attempt to put one back in without consultation with Lincoln Electronics.

TROUBLESHOOTING PAINT PROBLEMS

Problems addressed in this troubleshooting guide are:

I. Trailer paint gun sprays as soon as pressure is applied.
II. Trailer will not paint with manual switch.
III. Trailer does not paint automatically.
IV. Paint gun on instrument vehicle sprays as soon as pressure is applied.
V. Instrument vehicle will not paint with manual switch.
VI. Instrument vehicle does not paint automatically.
VII. Stuck Solenoid.

I. Trailer paint gun sprays as soon as pressure is applied.

1. Disconnect wire at paint solenoid (electric valve). If paint still sprays the solenoid is stuck open. Release pressure and replace the solenoid. See Section VII, "Stuck Solenoid".
2. If paint does not spray when the wire is off at the solenoid, connect a test lamp instead of the solenoid. If there is an electrical failure, the lamp will be lit constantly.
3. Disconnect the rectangular white nylon plug from the controller inside the equipment cabinet. If the test lamp stays on there is a wiring defect. If it goes out, the controller may be bad. Reconnect.
4. If the problem goes away on reconnection it was probably a "stuck" computer program. Please report!

II. Trailer will not paint with manual switch on trailer. The switch is on the panel in the main cabinet, and is marked "ON-OFF-TEST/CLEAN". The solenoid should click when operated.

1. Check for tank pressure. Briefly open the release valve and listen. The gauge may be stuck and show pressure when there is none.
2. Disconnect the wire from the paint solenoid (electric valve) and connect a test lamp instead. Test with the manual switch.
   a. If the light turns on when the switch is held, the paint solenoid is stuck shut. Release pressure and replace the solenoid. See Section VII, "Stuck solenoid".
   b. If the test light does not turn on with the manual switch, check that the trailer strobes work. This shows that there is power to the control box. Check the fuses inside the control box.

III. Trailer does not paint automatically. Paint sprays when the manual switch on the trailer is operated. The SR program is running normally, a message is sent to the laptop PC every time the mark button is pressed and released.

1. Check TX light on GINA data radio in the truck. It should flash at every paint mark. If not, check cable between the main unit and the data radio. There is a spare.
2. Check RD light on GINA radio in the trailer equipment cabinet. It should flash at every paint mark. Check cable between radio and control unit.

3. Disconnect the trailer power, wait about one minute, and reconnect. This resets the computer and may correct the problem. If this happens please report the incident to Electronics.

IV. Paint gun on instrument vehicle sprays as soon as pressure is applied.

1. Disconnect the wire from the paint solenoid (electric valve). If paint still sprays, the solenoid is stuck open. Release pressure and replace the solenoid. See Section VI, "Stuck solenoid".
2. If paint does not spray when the wire is off at the solenoid, connect a test lamp instead. If there is an electrical failure, the light will be lit constantly.
   a. Disconnect the paint gun wire at the round yellow coded connector on the main unit. If the test lamp is still on, the vehicle wiring or control box near the paint tank is bad.

V. Instrument vehicle will not paint with manual switch at back of truck.

This switch is on the control box near the paint tank. The solenoid should click when operated.

1. Check for paint tank pressure. Open the release valve momentarily and listen. The gauge could be stuck and indicate pressure when there is none.
2. Connect the alligator clip of the test light to ground and probe the left (red) contact on the control box above the paint tank. It should have 12 volt power. If not, check the fuses under the hood near the battery.
3. Disconnect the wire to the paint solenoid and connect a test lamp. Operate the manual switch.
   a. If the light comes on when the switch is operated, the solenoid is stuck closed. Release pressure and replace the solenoid. See Section VII, "Stuck solenoid".
   b. If the light does not come on, check the fuses under the hood at the battery. Check for power on the terminal strip of the paint control box. Power is relay controlled at the battery by dashboard MAIN.

VI. Instrument vehicle does not paint automatically. The SR program is running normally: a message is sent to the laptop PC every time the mark button is released. The manual switch on the control box above the paint tank works normally, paint sprays when the switch is operated.

1. Connect the alligator clip of the test light to the "hot" (+12) terminal on the control box above the paint tank. This is the left terminal, coded red. Touch the probe to ground to verify, it should light. Ground is the far right terminal.

2. Touch the probe to the white painted screw terminal on the control box. This is the control input and should turn the solenoid on. The control terminal is a low power circuit and should not light the test lamp.
   a. If the test light is full brightness on the white terminal, there is a short. Remove the wire and test again to see if the short is in the control box or the wire.
   b. If the test light turns on the solenoid when you touch the white terminal, the control box is OK. Go to the front of the vehicle.
3. Disconnect the yellow coded round connector from the main unit. Connect the clip lead to +12 and probe each contact on the connector attached to the wire. Be careful that you don't spread the contacts with the probe tip. One wire should turn the solenoid on. If the solenoid came on by touching the white terminal above the tank but stays off when touching the terminals on the end of the wire, the wire is damaged.
4. If the solenoid operates with the test light on the connector, the main unit paint output is bad.

VII. Stuck solenoid. If possible, rinse the stuck solenoid with hot running water. Flush with WD-40. Operate the solenoid with the manual control many times. This will usually clear the problem if the paint has been drying for a few hours.

If the solenoid is still stuck, replace it with the spare. Notify Electronics so that another solenoid can be ordered. Soak the paint path with WD40. Allow several days for the paint to soften and try again. Other solvents may destroy plastic parts.

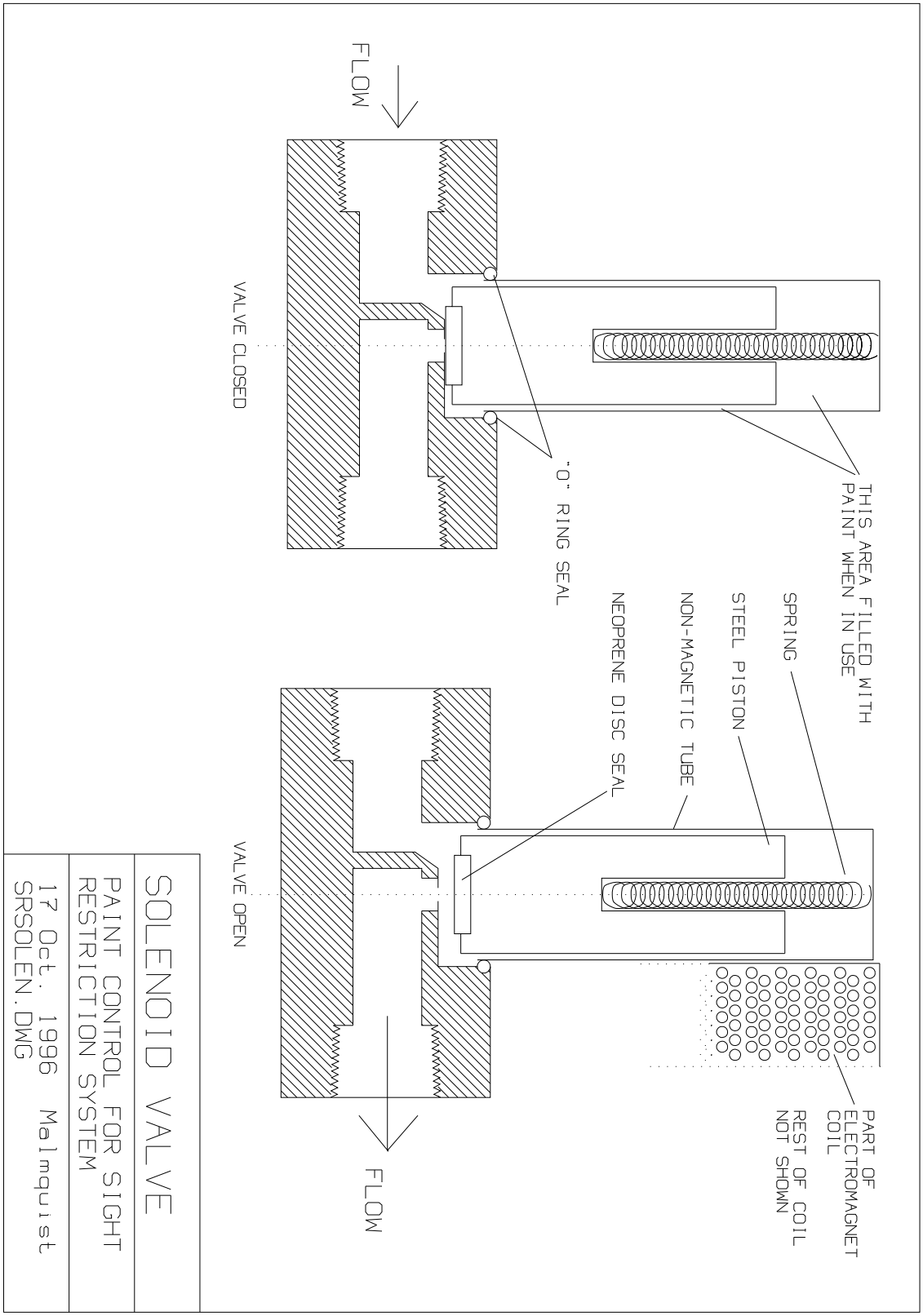
Disassemble for cleaning as a last resort only.

When changing solenoid, please observe the following manufacturer's instructions:

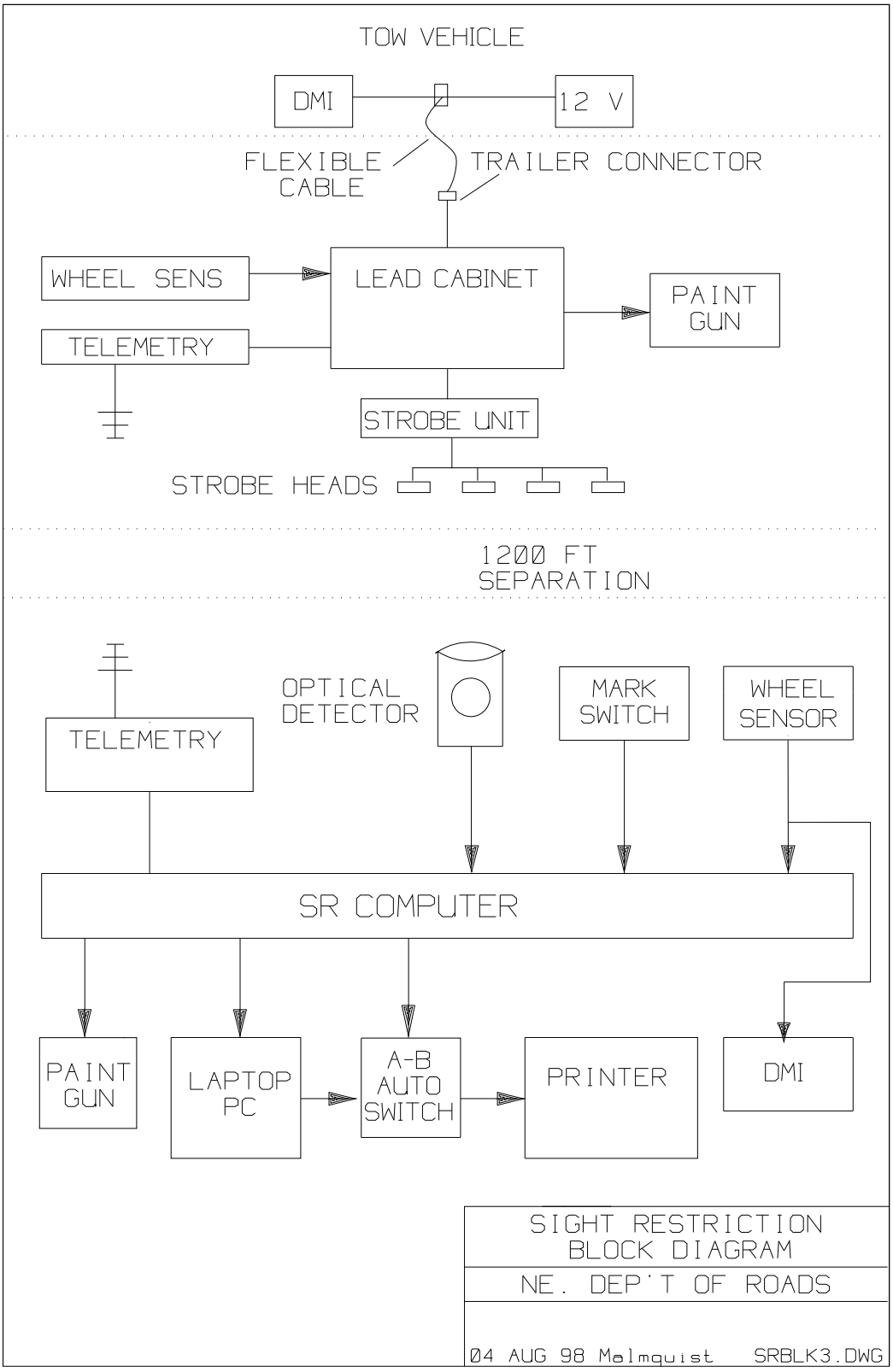
> "Engage thread by hand tightening TWO TURNS. Finish by wrench tightening ADDITIONAL three to three and a half turns. This is a maximum of FIVE to FIVE AND ONE HALF TOTAL TURNS. Pipe compound may be used if desired."

Be sure that pipe compound is compatible with plastic threads. If in doubt assemble dry. Teflon tape or paste may be used but extreme caution is required, it is very easy to over tighten and break the body when Teflon lubricates the threads.

PAINT VALVE CROSS SECTION



SYSTEM BLOCK DIAGRAM



MANUAL SURVEY OF NO PASSING ZONES

SAFETY FIRST!! The observer will have his back to traffic when checking for line of sight. Someone should be nearby to watch for cars.

YOU NEED: Three people (observer, target, safety), white and orange marking cans, two measurement wheels, portable radios, some lath or 1-by-2, and an engineer-type notebook with bound pages.

CALIBRATION: Both people walk together 1000 ft and stop. Compare the reading on the measurement wheels to be sure they are the same.

MEASUREMENT AID: Cut two sticks to 42". Nail or glue a crossways stick at the top of one and paint it a bright color. This is the target the first person carries. The plain stick is the second person's reference for eye height.

PROCEDURE: Two workers start together at a known point (mile marker, bridge abutment, etc.) with distance measurement equipment. Log the beginning in the notebook. The first worker walks 1200 feet along the road and stops. The second worker, still at the starting point, looks with his eye 3'6" above the pavement at the first worker's target, also 3'6" above the paving. Visual path or "line of sight" is confirmed. Safety man stays near the second person and watches traffic.

Both workers move ahead 50 ft. and stop, and check sight again. When a hill or curve obstructs vision, paint whi***t***e at the ***t***arget and ***o***range at the ***o***bserver with a handheld paint can, or mark T and O with any color. The location of each person (wheel counter) is recorded in a notebook.

When sight is regained, paint marks and notebook entries are again made.

MARKS: The ***o***range mark, ***o***bserver, is the beginning of the no passing zone for traffic going the same direction as the survey team. The whi***t***e mark, ***t***arget, is the end of the no passing for traffic going the opposite direction. If you go through the area twice, once each direction, the marks from the second pass should be right across from the first marks but will be opposite color.

Error tolerance is 50 feet. If you stop every 50, you can go back 10 at a time if you find you have overshot the exact spot you lose or regain sight.

APPENDIX 10 – MINIMUM DESIGN STANDARDS

See the latest manual from Roadway Design Division

APPENDIX 11 - CAPACITY AND VERTICAL CLEARANCE LIMITATIONS ON NEBRASKA HIGHWAYS

See the latest manual from Right-of-Way Division

APPENDIX 12 - POLICY FOR ACCOMMODATING UTILITIES ON STATE RIGHT-OF-WAY

See the latest manual from Right-of-Way Division