

SNOW REMOVAL AND ICE CONTROL

05.01 GENERAL POLICIES AND RESPONSIBILITIES

This manual is intended for internal guidance only and is not intended to create a legal or moral duty. Supervisors have discretion, based upon their expertise and the particular circumstances, to deviate from this manual and to conduct additional research or receive input from experts in other areas, as needed.

This chapter discusses all phases of snow removal and ice control operations from the required planning through the necessary post storm clean-up. Established procedures must be followed and each operation must be performed in the approved manner if the snow removal and ice control program is to be effective.

Before a severe snowstorm begins, generally it will have been predicted and advance warnings of its approach will have been issued. On the basis of route priority, the type of treatment to be given a particular road will have been established. Preparations shall be made to have suitable personnel, material and equipment mobilized as soon as snow begins to fall.

05.01.01 OBJECTIVES

Persons traveling the roads in West Virginia are indirectly the employers of the West Virginia Division of Highways. The Division of Highways is in existence to provide good roads and to keep them in safe condition for the traveling public. The public expects the Division of Highways to maintain the roads with a high degree of efficiency. As a Division of Highways employee, you should remember that in the removal of snow and the control of ice, "time is of the essence". Rapid removal of snow and ice lessens the possibility of accidents and reduces the amount of road damage.

It is the intention of the West Virginia Division of Highways to control snow and ice conditions on all State-maintained roads in accordance with established Division policy and priorities, so traffic may continue to move as safely as possible with a minimum amount of inconvenience.

05.01.02 PRIORITIES

The plans of the West Virginia Division of Highways for the removal of snow and ice from roads are based on a system established by the Maintenance Division. All State maintained roads are classified under the following four priority groups:

1) **First Priority Routes:**

Roads of major importance and high traffic volume, which shall be kept open to traffic at all times, regardless of cost. These routes shall consist of all Interstate and APD routes, and those major routes which connect urban areas. While not all roads classified as Expressway, Trunkline and Feeder in the State Highway System will be included in the first

priority group, it may be necessary to assign some Local Service Routes first priority status.

2) **Second Priority Routes:**

Roads of just slightly less importance than the first priority routes, such as all school bus routes not included in the first priority routes. Because of practical limitations of the amount of equipment and personnel available, only a certain number of miles can be assigned for immediate and full-time attention as first priority routes. Second priority routes are covered as quickly and frequently as conditions will permit by the same equipment and personnel assigned to the maintenance of the first priority routes.

3) **Third Priority Routes:**

Roads of lesser importance which, because of low traffic volume, construction and location, are kept open for chain traffic only. These roads receive attention only after all second priority routes have been covered.

Except in an emergency, third priority routes will be plowed after the storm and after the first and second priority routes have been opened for two-way traffic, and then they will be kept open only for chain traffic. All such plowing must be done by equipment which has previously been used on first and second priority routes. The mileage of third priority routes assigned to a particular plow is determined by the total mileage to be covered and the number of plows available. The treatment given these roads often amounts only to equipment knocking down small drifts at the end of the storm. The use of heavy or special snow-fighting equipment may be required to open such a road at times because of the construction, location, amount of snowfall, or severity of drifting.

4) **Fourth Priority Routes:**

Fourth priority routes are those state system roads which have public use, but which are not essential to travel during snowstorms; that is, these roads are not needed to provide food, emergency service or other essential needs to citizens. State Park and Forest roads, which are generally used for access to recreational areas, are examples of fourth priority routes.

Because fourth priority routes may be left blocked for varying periods of time, motorists should be made aware of the conditions.

05.01.03 REGULATIONS

So there may be uniformity in snow removal and ice control, the Division of Highways has certain regulations which must be observed at all times. If any change is

to be made in a procedure given in this Manual, a directive or an addendum will be sent from the Office of the Director of Maintenance. Such a directive or addendum will supersede the Manual and is to be included in the Manual in its appropriate section. Regulations covering specific conditions follow:

- 1) If, because of severe snow, ice and sleet conditions, a tractor, semi-trailer truck or a similar vehicle becomes stalled and blocks the highway, abrasives will be placed under the drive wheels and the driver will be requested to pull to the side of the road and remain parked until traffic has been cleared and abrasives have been spread over the slippery area. The vehicle should then be able to move under its own power. A vehicle should not be towed. If the driver tries to proceed on the road before it has been treated with abrasives and chemicals and becomes stalled and blocks traffic again, the vehicle must be moved from the road as quickly as possible by any means at hand in order to clear the road for normal traffic. When a driver refuses to obey instructions, the license number and the name of the owner (if known) must be reported to the County Headquarters Office and to the nearest law enforcement agency.
- 2) If a privately owned vehicle becomes stalled or stuck because of snow, Division owned equipment should not be used to pull or push the vehicle unless there is an emergency.
- 3) It is permissible to close a section of road temporarily at any time if snow, ice and/or sleet conditions on the sections are so bad that movement of traffic will be expedited by such closure. However, a section should never be closed without notifying the proper local law enforcement agents and obtaining their assistance. If a section of an Expressway, Trunkline, or Feeder must be closed, the road must be properly marked with signs and a flagger must be stationed at each end of the closed section. The barricades must be located where a turn-around for vehicles can be provided and, if possible, where food and shelter can be readily obtained. The closing of any road must be reported to the Maintenance Division Duty Officer by contacting Charleston Control by radio or phone. The subsequent reopening of this road is to be reported by the same means.

Local Weather forecasts must be obtained by all field operating organizations for their respective area. Reports in regard to weather and roadway conditions are made by all Districts to Charleston Control on normal work days beginning November 1 and continuing through March 31.

All routine radio communications must be discontinued during the scheduled transmission of weather and road condition reports. This rule must be strictly observed by all mobile units, as well as by base stations.

In case extremely hazardous weather and road conditions develop, after the first daily report has been broadcast, the new conditions should be reported through the same channels as soon as they become known.

When a snowstorm, flood or other condition seriously interferes with traffic on Expressway, Trunkline, or Feeder roads on a Saturday, Sunday or holiday, or at a time other than regular office hours on a work day, the County or District Office should notify Charleston Control and the District Duty Officer. It is not necessary to report a partial block requiring one-way traffic on an Expressway, Trunkline, or Feeder road.

After receiving a report from a County or District, Charleston Control will evaluate the situation to determine if a proper radio network is in operation to transmit and receive information.

If the radio station in a certain County or District is not properly manned and the services of that station are needed to integrate the network, the Charleston Control operator is authorized to notify all needed personnel to report immediately for emergency duty.

Every District and County Office will record the information given about the weather and road conditions throughout the State to enable them to answer inquiries in regard to conditions in any part of the State.

05.01.04 RESPONSIBILITIES

05.01.04.01 MAINTENANCE DIVISION

The Maintenance Division is responsible for establishing the standards and procedures to be followed throughout the State in removing snow and controlling ice. This Division also coordinates the various operations and evaluates the results of the operation.

The standards and procedures are issued to the Districts, along with directives for performing the necessary operations. During actual operations, the Division Headquarters is kept informed about field conditions and the progress of the storm through routine reports from the District Offices. Special emergency conditions must be immediately reported to assigned Headquarters' personnel. The Maintenance Division Duty Officer will be available to assist the Districts when necessary.

The Division Headquarters will deal with the problems and issue instructions that affect more than one District and with requests or arrangements that involve another Division.

05.01.04.02 DISTRICT HEADQUARTERS

The District Headquarters must prepare for winter work in advance by making plans based on standards and directives issued from the Division Headquarters. These SRIC Plans will be submitted to the Director of Maintenance Division for review and approval by September 15 each year.

The District Headquarters will be in continuous operation as ordered by the District Engineer or District Maintenance Engineer while work is being done on snow

removal and ice control. The District Maintenance Engineer or designated representative will direct district-wide snow and ice operations and will receive all detailed information from the field. The District Headquarters will have supervisory and patrol personnel in the field as necessary. Each of these individuals will be responsible for a certain area. They will keep the District Headquarters informed about conditions, and will insure that instructions issued from the District Headquarters are followed.

The District Headquarters has the authority to transfer equipment from one organization to another within the District and will keep field personnel informed about all changes in equipment assignment or procedures. All field organizations will keep District Headquarters informed of conditions.

05.01.04.03 COUNTY, INTERSTATE & APD HEADQUARTERS

The County, Interstate or APD Headquarters is responsible for making detailed plans that implement the broad advance plans of the District and meet the standards and follow the procedures established by the Director of Maintenance Division.

The plans will be based on the standard procedures described in this chapter. They will include the control of drifts, the assignment of personnel and equipment, the storage and use of chemicals and abrasives, and the use and care of equipment. The plans must be approved by the District before they are put into effect. Changes in the approved plan must have prior approval of the District Engineer.

05.02 PLANNING AND ORGANIZATION

05.02.01 ADVANCED PLANNING

A primary requirement in winter maintenance is adequate preparation before the first storm to prevent undue delays and confusion when the snow starts. This section deals with the planning, preparation, treatment priority, storm warnings and radio procedure at the District and County level necessary to provide an effective program for snow removal and ice control. One part of the program relates to the erection of snow fences to control the drifting of snow. The program for removing snow from the roads and preventing the formation of ice includes the manner in which each road will be treated and the assignment of personnel and equipment for performing the required operations. Another part of this section deals with the important areas of post storm clean-up and reporting.

05.02.02 OPERATIONAL POSTURES

The purpose of this procedure is to describe conditions which will dictate certain operational postures for the various Division of Highways organizations with regard to emergency situations. Further, it is the intent of this procedure to provide uniform guidelines and improve communications for operational activities within each defined posture. An emergency situation could be defined as any situation which requires the Division or any unit of the Division to operate beyond normal planned

and scheduled activities. Common examples of emergency situations are snow and ice storms and flooding.

The operational postures are described by the terms Code Green, Code Blue, Code Yellow or Code Red and are further defined as follows:

1) **Code Green:**

This would be the normal day to day operational code for the Division; planned and scheduled activities being accomplished.

2) **Code Blue:**

The posture is one of anticipating imminent emergency conditions such as predicted snow or flooding. The advance warning which allows for increasing the level of preparedness is intended to assure that appropriate steps have been taken to make the transitions to emergency operations as rapid and effective as possible. Spot treatments, laying back and clean-up operations for snow and ice removal are to be included under this code.

3) **Code Yellow:**

This posture is affected when emergency operations are activated to restore traffic to normal.

It is expected that the nature and magnitude of the emergency under Code Yellow is such that it can be handled with normally assigned resources.

4) **Code Red:**

This code describes an emergency or disaster condition which may be declared by the Governor or Commissioner. Emergency operations are activated on a twenty-four (24) hour basis as required to restore traffic to normal. When the recommendation to initiate Code Red originates with the District Engineer, it must have the concurrence of the Commissioner or his designated representative. The magnitude or nature of an emergency designated as Code Red is one which requires transfers of equipment from other Districts and Divisions or the rental of considerable amounts of equipment from outside vendors and/or the assistance of other State Agencies.

05.02.03 TREATMENT PRIORITY

Four types of treatment or combinations thereof are used for snow removal and ice control: (1) Spreading of pure chemicals, (2) spreading of a mixture of abrasive and chemical materials, (3) spreading of abrasive materials without chemicals, and (4) plowing the snow. The chemicals used are normally sodium chloride and calcium chloride.

The type of treatment to be used on a particular road or section of road should be the minimum necessary to provide for movement of traffic using wintertime precautions, and depends mainly on the priority of the road. At the beginning of the snow storm, all Priority 1 routes, including Interstate and APD sections receive a treatment of straight chemicals or chemical/abrasive mix applied at the rate of approximately 500 lbs. per two-lane mile. Subsequent treatment should consist of plowing and applying chemicals or chemical abrasive mix as necessary, usually a rate of approximately 300 pounds per two-lane mile. The object shall be to keep one lane passable at all times with the other lane/lanes being treated and cleared as soon as possible. Equipment and operators shall remain on these routes throughout the duration of the storm or until the road is passable. Priority 2 routes having a high type bituminous, high type bituminous with seal coat, or Portland Cement Concrete surface will normally receive a treatment consisting of plowing and an application of abrasive/chemical mix being applied to hills, hazardous curves, intersections, railroad crossings and other areas of high accident potential. Low type bituminous pavement, Priority 2 routes, will normally receive a treatment consisting of plowing and the application of abrasives only on hills, hazardous curves, intersections, railroad crossings and other potential high accident areas. Unpaved Priority 2 routes will generally receive plowing only, except that abrasives which contain no chemicals may be added where required for safety on curves and steep grades.

The clearing of Priority 1 and 2 routes shall be accomplished in a Code Yellow operational posture. It will be expected that the supervisor will organize his employees into two shifts each working 12 hours and that work be continuous until Priority 1 and 2 routes are passable.

Priority 3 roads, regardless of pavement types shall generally receive plowing only, except abrasives containing no chemicals may be used as above. This work shall be accomplished under operational Code Yellow.

Priority 4 roads will receive SRIC treatment only in situations where deemed necessary for the safety of the traveling public.

On the basis of standards established by the Director of the Maintenance Division, the District determines the priority and the type of treatment that is generally to be used on each road. The information used in planning the snow removal and ice control operations is then summarized and tabulated for each County. This tabulation includes the route number, traffic count, priority, and type of treatment for each road. The necessary information is shown for each County on a map of the County by using the following color coding:

<u>ROUTE</u> <u>PRIORITY</u>	<u>RECOMMENDED</u> <u>TYPE OF TREATMENT</u>	<u>COLOR</u>
First	Chemical	Orange
Second	Chemical-Abrasive Mix	Blue
Third	Abrasives (Straight)	Yellow
Fourth	Plowing Only	Green

A sample map and legend is shown at the end of this Chapter in Figures 05-5 and 05-6.

Each County will be furnished with sufficient copies of its SRIC plan.

The treatment applied during the early stages of a storm is termed "immediate" treatment, and the treatment applied as the storm continues is called "following" treatment. After the storm, it is usually necessary to maintain a patrol until the roadway is safe for travel. In the spring, there will be a general clean-up. It would be very difficult to give examples of the different types of storms and weather conditions. The supervisor, through his/her experience and knowledge, must determine the best type of treatment to apply with the varying conditions. Training courses are available to aid the supervisor in determining treatment.

05.02.03.01 SPECIAL TREATMENT CONSIDERATIONS

The previously outlined treatments pertain to the most common storms experienced in West Virginia. It must be realized that weather conditions also dictate the type of treatment. For example, since sodium chloride is ineffective below 20° F, a calcium chloride and abrasive mixture should be used.

05.02.04 NATIONAL WEATHER SERVICE (NWS)

The following will serve to clarify the Division's position on the code system and give guidance as to when to initiate such codes.

Winter Storm Watch:

When the NWS issues a "winter storm watch", it means that prevailing conditions are such that a possibility of a winter storm is high. When a "winter storm watch" is issued by the NWS, organizations are to initiate a Code Blue operational posture and initiate a road patrol. Snow plows and spreaders will be mounted to their assigned trucks prior to or at the end of the regular working day. The road patrol will patrol the areas of a county where snow usually begins or in the areas of the county which would be more likely to get the first snow, based on specific conditions at that time. The road patrol and continuous additional weather monitoring will dictate when crews are to be called. *Crews are not to be called for extended periods of time prior to the issuance of a winter storm warning by the NWS or the beginning of inclement weather.*

Winter Storm Warning:

When the NWS issues a "winter storm warning", it means that a winter storm is approaching a particular area and the area will be experiencing a winter storm in due time. When the NWS issues a "winter storm warning", organizations shall initiate a Code Blue operational posture. Prior to leaving work at the end of the regular eight-hour day, plows and spreaders will be mounted and if possible placed in a garage where they will be kept warm and

ready to go. Crews may be given instructions at that time to report to their assigned station at a given hour or be advised to expect a call-out as winter storm conditions warrant. Once crews are in operation, counties are to initiate a Code Yellow operational status. Code Yellow operations will be in effect until all Priority 1 and Priority 2 routes have been cleared and a stable, passable condition has been achieved. The clearing of Priority 3 routes will also be achieved under a Code Yellow operational posture. Post storm clean-up will be achieved under a Code Green posture.

05.02.05 SNOWDRIFT CONTROL

During each snow season, information should be gathered in regard to the following features: The need for snow fence and plantings in locations on Expressway, Trunkline, Feeder and major Local Service Routes where no protection has been provided before; the need for additional fence or plantings in locations that have been partially protected; the advisability of removing or trimming existing obstructions to reduce drifting on the roadway.

While snow fence is being removed and stored in the early spring, each element will be examined carefully. Any minor repairs will be made at that time and the amount of fence that must be replaced will be noted.

All information needed by the County to plan for the coming winter must be compiled and forwarded to the District Office immediately after the deadline for removal of snow fence. This information will be reviewed in detail by the District to determine the amount of fence required to replace broken or worn out fence and how much additional fence is desired for use at locations not presently protected. At this time, requests for additional plantings and removal of obstructions will also be considered by the District Headquarters.

A snow fence should generally be erected after crops have been harvested but before the first freeze occurs. The fence should remain in place until all danger of heavy snow is past, but must be removed before planting time. The dates for erecting and removing snow fence should be determined by the Assistant District Engineer - Maintenance, since he/she is familiar with local climatic conditions. Before a snow fence is erected on private property, the necessary easement must be obtained.

05.02.05.01 OBSTRUCTIONS REMOVAL

When an obstruction within the limits of the right-of-way is found to be causing snow drifts on a roadway, steps must be taken for removal. Usually, the County Maintenance Superintendent will be expected to remove the obstruction. If the removal job is beyond the capabilities of County forces, the Superintendent should request assistance from District Headquarters.

05.02.05.02 SNOW FENCE

05.02.05.02.01 GENERAL CONSIDERATIONS

The use of snow fence is a highly effective and economical method of keeping drifting snow from a highway. The type of snow fence and the kind of supporting posts used in a certain locality must be approved by the Assistant District Engineer - Maintenance. The materials must meet the requirements of the specifications in effect when the materials are purchased.

The County Superintendent will determine when to start erecting snow fences. He/she must coordinate with the farmers so they may complete their harvesting of crops in fields in which fences are to be erected. He/she will prepare a list showing where fencing is to be installed, and the type and amount of fence required at each location. The snow fence should be located by reference to a milepost or other permanent landmark.

05.02.05.02.02 FENCE SITE LOCATION

The distance from the road to the position selected for a snow fence will be measured from the edge of the pavement at relatively level locations or from the top of the cut where there is a deep excavation. This distance will be determined in the following manner:

Step 1:

At a distance of approximately 100 feet from the edge of the pavement or top of the cut, or wherever it appears that the fence should be located, determine the approximate difference in elevation between the road or top of the cut and the selected point on the ground.

Step 2:

Add together the height of the fence, the vertical distance from the ground to the bottom of the fence, and the difference in elevation between the roadway or top of cut and the ground on which the fence will be erected. Then multiply this total by 15.

This will be the correct distance to the fence, regardless of the distance to the point selected in Step 1.

For example, let us assume that the increase in elevation from the edge of the roadway to the approximate location of the snow fence is found to be 2 feet; the vertical distance from the ground to the bottom of the fence will be 6 inches (or 1/2 foot), and the standard 4-foot fence will be used. Then the exact distance from the edge of the line along which the fence should be erected would be found as follows:

$$2 + 4 + 1/2 = 6 \frac{1}{2} \text{ feet}$$

$$6.5 \times 15 = 97.5 \text{ or } 98 \text{ feet}$$

Thus, the fence should be set 98 feet from the edge of the road. This method of locating snow fence is illustrated in Figure 05-1.

05.02.05.02.03 SNOW FENCE ERECTION

When the fence site has been located by measuring the correct distance from the edge of the road or the top of the cut, the posts are driven into the ground to the proper depth. Two methods of erecting snow fence are shown in Figure 05-2. When the top of the fence is to be flush with the tops of the posts, as in Figure 05-2, the exposed height of each post shall be equal to the height of the fence to be attached to it, plus the distance from the ground to the bottom of the fence. This distance should be 6 inches in plowed land or 9 inches where there is stubble or high grass.

Posts are generally driven by hand tools. A sleeve-type cylinder is usually used. If a maul or sledge hammer is used, a driving cap must always be placed over the top of the post before driving is started. All the posts required to support the length of fence to be erected will be placed at 10-foot intervals and in a line parallel to the road.

The fencing must be wired to each post on the windward side of the posts at three points: one at the top, one at the center, and one at the bottom of the post. After all the posts are in place, the first portion of the fence is raised into place by hand and wired securely to the end post. The fencing should be set against the posts and raised into position by hand at each post, pulled taut, and fastened to the post at the top, middle and bottom. When fencing is being pulled taut between posts, it must be remembered that a slight sag is necessary to allow for contraction of the wire in very cold weather; however, there should not be enough sag to allow damaging vibration from the wind.

In some locations, the amount of snowfall is so great and the prevailing winds are so strong that one 4-foot fence is inadequate. In such a location, the following method can be used to prevent excessive drifting of snow onto the roadway. As soon as the original fencing is full of snow, a second row of fencing should be set parallel to the first row 75 to 100 feet on the windward side of the first row, or away from the road. At a location where the overflowing of snow fences is to be expected and it is known in advance that the use of an additional row of fencing will be necessary, it is a good idea to drive the posts for this second row of fencing at the time at which the first row is erected. This practice will solve the problem of driving posts into frozen ground and will make actual erection of the fence, when needed, quick and easy.

05.02.05.02.04 ERECTED FENCE INSPECTION

After all snow fences have been erected, the County Superintendent and a District Maintenance Assistant will inspect each installation to check the condition of the fence, its location with respect to the roadway, the amount of fence, and the method of erection. Any deficiencies found during this inspection must be corrected.

05.02.05.02.05 RECORDS

A record must be kept for each installation of snow fence. The record will show the location, the type, whether it is single or double row, and the distance from the road. Where posts have been set for a second row of fencing, the position of the second

row with respect to the first row must be indicated. The length of each row of fence must be noted. A copy of this record will be sent to the District Headquarters.

The performance record for each fence location must be kept by the County Office. Each year, this information should be used for making location alterations that would improve the effectiveness of the snow fence.

05.02.05.02.06 AGREEMENT REVIEW AND CONDITION INSPECTION

The County Maintenance Superintendent will decide when removal of snow fence should begin. At this time, the Superintendent will review any agreements with property owners to comply with any stipulations for early removal of snow fence. All locations where snow fence can be left in place throughout the year will be noted. This fence will be inspected while other snow fence is being removed to determine if any of it must be replaced, repaired, or tightened to eliminate vibrations and damage from wind. A similar check of fence left all year will be made in the fall at the time snow fence is being erected.

05.02.05.02.07 SNOW FENCE REMOVAL

Care must be taken in removing snow fence since this operation causes the most damage to the materials. If fencing is handled properly, it will last many years. Care must be taken when pulling metal posts from the ground to prevent bending. Each crew will have a post-puller to jack the posts straight from the ground.

05.02.05.02.08 FENCING STORAGE

Each roll of damaged fencing must be marked in some conspicuous manner, so that it can be easily identified at the storage site. The quantity of damaged fence must be recorded so that replacement material can be ordered. Salvageable portions of damaged fence may be used for repair. Snow fence deemed unusable shall be disposed of in accordance with Division policies.

Snow fence and posts will be stored so that the materials will be off the ground and stacked neatly. A covering should be used when available. Whether storing under cover or in the open, the location must be well drained. Suitable supports such as 6 inch by 6 inch timbers must be placed on the ground so that an air space is left between the ground and the fencing or posts. "T" type post may be placed on the stack in any manner as long as they are laid flat. "U" type posts must be stacked so that the "U" face will be down to assure rapid shedding of water. All cleaning and painting of metal posts will be done before storage.

05.02.06 RADIO PROCEDURE

The use of the radio must be reduced to a minimum by each operator to prevent overloading the system. During snow removal and ice control operations, the County Headquarters will act as the traffic control center for the County and will receive and transmit all field radio messages. During a snow storm, the radio will be used to transmit and receive messages between the base station and mobile units.

Except in an emergency, all communications between two County Headquarters or two District Headquarters will be handled by telephone.

The District Headquarters will monitor its radio throughout the storm whenever more than one subordinate organization is in Code Yellow or if directed by the District Engineer.

The radio procedure for snow removal and ice control operations is designed to reduce confusion in transmitting and receiving messages to and from mobile units. All instructions for the field will be transmitted by the County or Expressway Headquarters of the organization in which the action takes place.

All messages between District Headquarters and County Headquarters, or between County Headquarters and Sub-headquarters, should be delivered by telephone, except in an emergency.

05.02.07 POST STORM CLEAN-UP

Crews and equipment must be assigned for clean-up work after the storm. Each unit of snow removal equipment is responsible for cleaning its assigned routes and setting them back; that is, forcing the snow well back on the shoulders. After all the roads have been cleaned and set back, other clean-up work will be performed only during daylight hours. The crews and equipment will be assigned to cleaning and checking all bridges on Expressway, Trunkline and Feeder roads and all railroad grade crossings. Clean-up work by Division forces and equipment must be confined strictly to roads, streets, and other facilities on the State Highway System and to other areas that provide access to a State road or facility. State forces and equipment will never be used to clean entrances to private places of business or private driveways. Critical drainage installations shall be checked and opened as necessary. Where a windrow of snow is on a shoulder that is located on a steep grade, drains must be cut through the windrow at suitable intervals to prevent erosion of the shoulder when the snow melts. Snow will not be removed from a parking lane unless this is necessary for additional snow storage space to keep vehicles moving in travel lanes, or unless a proper reimbursement agreement covering all cost is executed by town or city officials. This work shall be accomplished under operational Code Green.

05.03 EQUIPMENT

05.03.01 ASSIGNMENT

The information issued by the District regarding the priorities and types of treatment will be used to determine the exact road or roads and the mileage each individual unit of spreading and plowing equipment will be required to cover. This actual assignment of equipment by each County will make possible an additional check to be sure the designated mileage for each type of treatment can be covered with the equipment available in the County. If during the snow removal and ice control operations it is determined that the equipment allocated to a County is not sufficient to assure effective operations, the County Maintenance Supervisor should immediately notify the Assistant District Engineer - Maintenance so that the necessary corrective action can be taken.

05.03.02 EQUIPMENT ASSIGNMENT

The following will be used as an aid in obtaining the most efficient assignment of equipment.

05.03.02.01 MILEAGE ESTIMATE

To determine what roads can be given a specific type of SRIC maintenance, the Organization Superintendent must first determine the amount of spreading equipment in good operating condition that is available. A device for spreading may be of the large hopper type, tailgate type, or the small self-contained type which clamps on the tailgate of a truck or pickup. The number of miles of road that can be covered by one spreader to provide SRIC pavement maintenance may be computed in the following manner:

Step 1:

Assume that snow will accumulate on the roadway to an average depth of 1 inch within 90 minutes; therefore, not more than 90 minutes can be allowed for the spreading of chemicals.

Step 2:

Compute the number of miles that can be covered by the particular unit under certain storm conditions, without being reloaded, by dividing the number of pounds in the fully loaded spreader by the number of pounds that will be spread on 1 mile of road under the given storm conditions.

Step 3:

Find out, from previous experience, what safe average speed in miles per hour can be maintained by the unit under storm conditions and divide that number by 60 to get the speed in miles per minute.

Step 4:

Compute the number of miles required to apply the unit's load on the road by dividing the number of miles found in Step 2 by the number of miles per minute found in Step 3.

Step 5:

Estimate the number of minutes actually required for the unit to be returned to the storage pile from the point on the road at which it was emptied, the number of minutes needed to reload it, and the number of minutes required to return to the point on the road at which it will again start to spread. The total time required for the unit to travel from the point on the road to the storage pile and back again is called "deadhead" time.

Step 6:

Add together the time found in Step 4 and the estimated time determined by Step 5.

Step 7:

Compute the number of trips that can be made by the unit in 90 minutes by dividing 90 by the total number of minutes found in Step 6.

Step 8:

Find the total number of miles that can be treated by one unit by multiplying the number of miles that can be covered on one trip, as found in Step 2 by the number of trips found in Step 7.

The total mileage that can be maintained by all the units available is, of course, equal to the number of units times the number of miles computed for each unit.

Detailed descriptions of the proper procedures for locating storage bins for chemicals and for storing and mixing chemicals are in Sections 05.04.02 and 05.04.03.

05.03.02.02 SPREADER CALIBRATION

It is necessary to estimate the amount of chemicals or abrasives that will be applied to each mile of road by a particular spreader under various storm conditions. To assure the application of the correct amount of chemical or abrasive, each spreader must be accurately calibrated in advance. Various methods may be used to calibrate spreaders.

The Assistant District Engineer - Maintenance must decide, based on recommendations of Maintenance Division and the equipment manufacturer, which method of calibration will be used for each type of equipment. Upon completing calibration of each spreader unit an Application Rate Chart similar to Figure 05-8 must be prepared and placed in the vehicle.

05.03.03 ROUTE MAPS AND EQUIPMENT INSTRUCTIONS

As soon as the equipment assignments have been made and checked, the Maintenance Supervisor must prepare a map showing the route assignments for each unit of equipment. This map, with instructions for operators of the assigned equipment must be submitted to the District Office for review and approval. If the District Office desires any changes in either the map or the instructions, the Maintenance Supervisor will be called for discussion.

When the County map and the general instructions have been approved, a partial map and a set of instructions will be placed in each unit of equipment. A sample map is shown at the end of this chapter in Figure 05-6. A map for a particular unit of equipment will show only that portion of the County map covering the roads which are assigned to that unit of equipment. The map will indicate the priority and

type of treatment each road is to receive. The instructions for operators of the equipment will list the numbers of all roads in the order in which they are to be plowed or treated and will include the type of treatment each road is to receive. They will also show the point on each road where work is to be started, the route to be used in going from one road to another, the locations of the material stockpiles to be used, and the routes to travel when going to or returning from material storage yards.

05.03.04 CARE OF EQUIPMENT

Insofar as feasible, the following precautions will be taken in cold weather: all equipment will be sheltered when idle and kept in condition for quick starting; heated quarters should be provided or engine heaters should be used; and if all equipment cannot be protected, at least one unit of equipment must be kept in condition for quick starting so that it can be used to assist a unit that will not start because of the cold.

Other regulations relating to snow removal equipment are as follows:

- 1) An adequate supply of replacement parts will be maintained for normal repairs.
- 2) Tire chains must be promptly repaired or replaced.
- 3) Tires must be kept properly repaired or replaced.
- 4) Ballast (partial) load may be needed on a truck to obtain maximum traction for pushing snow. Depending on the truck body size and condition of the material (wet or dry), the ballast load will be between one-quarter and one-half of the truck's normal capacity.
- 5) Plow moldboards shall be kept waxed or oiled.
- 6) Equipment shall be serviced at the end of each storm and at opportune times during a storm. It should be washed with high pressure hot water before it is lubricated. Chemicals shall not be allowed to remain in spreader hoppers.
- 7) Major overhauling of equipment used for snow removal should be started immediately after the end of the snow removal season. Overhauls will be carried on continuously throughout the summer months so that equipment will be in good condition before the beginning of the next snow removal season.

05.03.05 EQUIPMENT IN COMMON USE

The following list of the types of equipment most commonly used is intended to serve only as a guide to help determine the proper size of attachments that should be used with different sizes and kinds of equipment. This list can also be used as a guide for determining whether a unit of equipment should be assigned and what can be expected of it in snow removal and ice control operations:

- 1) Single axle dump truck (GVW less than 27,000 lbs.) equipped with a small "V" or wing plow or with a large one-way or reversible blade plow, and with or without a spreader attachment.
- 2) Single or tandem axle truck 5 tons or heavier (GVW over 27,000 lb.), equipped with a large "V" or wing plow or with a large one-way or reversible blade plow. It may have front-wheel drive and may also be equipped with a hopper body.
- 3) Motor grader equipped with a "V" plow and with or without a wing plow, or equipped with a one-way plow and with or without a wing plow. It must have a heated cab and adequate lights. It may be fitted with a small rotary plow.
- 4) Rotary type snow plow and blower mounted on an all wheel drive vehicle having heavy chassis and powered by a separate power unit.
- 5) Dozer (angle blade) on tracks or rubber tires, minimum 60 HP. It may be equipped with lights for work after dark.

05.03.06 LOADING EQUIPMENT

Front endloaders shall be used for loading materials onto trucks. Other equipment may be utilized for loading when an endloader is not available or as a replacement for an endloader that is being repaired.

The weight of the material to be loaded will be determined for a normal load in the bucket. At the beginning of the storm, this information will be given to the operator with a list of the hauling equipment to be loaded and the order in which it is to be loaded. Each spreader operator will be given information noting the number of buckets of material that will be loaded on the equipment for each operation, such as spreading aggregate or chemicals or for plowing snow. This will insure that hauling equipment will have enough material to operate efficiently without being over loaded.

05.03.07 SPECIAL SNOW FIGHTING EQUIPMENT

Special snow fighting equipment includes the following: a rotary type snow plow and blower, mounted on an all-wheel drive equipped with a heavy chassis and separate power unit; a heavy duty snow fighter constructed only for removing snow; and dozers and loaders assigned to the District. Special equipment will normally be stationed near locations of higher than normal snowfall, or where winter conditions present unusual problems, or will be kept at the District Headquarters for assignment as needed to various locations throughout the District. All units will be under the control of the District Headquarters at all times.

05.03.08 SNOW FIGHTING EQUIPMENT INSPECTION

A schedule for the inspection of equipment to be used in snow removal and ice control operations will be established by the District. The inspection will be made far enough in advance of the first expected snowstorm to permit the correction of any

defects that may be discovered during the inspection. It may also be necessary to test the operator of equipment to ascertain if he is familiar with the operation of the equipment and with the routes to which the equipment has been assigned.

The pre-season inspection of equipment must be thorough. A check-list of items to be inspected is furnished. One completed copy showing the results of the inspection will be given to the County Maintenance Superintendent, one copy to the Maintenance Engineer and one copy to the Equipment Superintendent. The original is sent to the Director of the Maintenance Division. The checklist will indicate items that need attention, as well as those items which are operative. Unsatisfactory items shall be checked and the necessary corrections shall be made promptly. A written report relating to the corrections will be submitted to the Equipment Superintendent and the Maintenance Engineer by the Maintenance Supervisor for re-checking.

The engine of separate power units used in snow and ice removal will be started periodically during the winter season to insure reliability.

05.03.09 PRIVATELY OWNED EQUIPMENT RENTAL

It is imperative that each District keep a current list of available private equipment which may be rented to aid in snow removal if needed. Private Sector Rental Procedures are set forth in Volume IV of the current Administrative Operating Procedures.

05.03.10 EQUIPMENT PREPARATION

During the snow and ice season, all snow removal and ice control equipment shall be kept ready for use, except for the actual loading of materials for ballast or spreading. Equipment will be parked at its assigned location over weekends and holidays. On a normal work day when a storm has been forecasted for that night or early the next morning, the equipment will be prepared for a storm (i.e., hooking plows and spreaders and putting on chains). It is more desirable to have the equipment prepared and not needed than to have the equipment unprepared when needed. Operations in the first hour or two of a snowstorm will normally determine if the snow removal and ice control operation will be effective.

05.03.11 EQUIPMENT FIELD OPERATION

05.03.11.01 SNOW ROUTE ORDER

At the beginning of a storm, each unit of equipment must go to the route at the top of its list of First Priority routes. It will then proceed to cover all the routes on this list in proper order. No unit of equipment will leave its First Priority snow routes under any conditions without instructions from the Maintenance Supervisor or designated representative. The same conditions will be in effect when equipment is to be transferred from Second Priority routes to Third Priority routes. This approval is necessary because all routes in one area having a certain priority rating may be in satisfactory condition while some routes in an adjacent area having the same priority rating might need additional treatment because of breakdowns or adverse weather conditions. It may be desirable to transfer equipment from the first area to the second.

For a similar reason, it may even be necessary to transfer equipment from one County to another, or from one District to another, when directed by District or Maintenance Division authority.

05.03.11.02 REPLACEMENT EQUIPMENT

If there is a serious breakdown, the Maintenance Supervisor may be required to assign available spare equipment to the uncovered routes. He/she must then make sure that the operator knows what he/she is expected to do and has a copy of the map and the written instructions. In case spare or special equipment controlled by the District must be assigned to an area, the Maintenance Supervisor may assign county personnel who knows the route and has the necessary information to assist the equipment operator.

05.03.11.03 EQUIPMENT REFUELING OR REPAIRING DURING STORM

If equipment must be taken for fuel or repair, the Maintenance Supervisor must be notified. If repairs will require one hour or more, it must be decided whether the routes being covered by the equipment will be safe until it can return, if they can be adequately covered by other equipment in the area, or if additional equipment is needed. As soon as the repaired equipment leaves the shop and is back on the road, the appropriate personnel must be notified.

05.04 CHEMICALS AND ABRASIVES

05.04.01 CHEMICALS AND ABRASIVES TREATMENT

Mixtures of abrasives and chemicals have wide and effective use in snow removal and ice control operations. The chemical prevents freezing of moisture in the abrasives while the material is stored in stockpiles. The abrasives remain free flowing so they can be distributed properly by mechanical spreaders. Abrasives treated with chemicals quickly become anchored to the ice or packed snow. They afford immediate resistance to skidding and provide better traction, and they greatly reduce the amount of "whip off" from wind and vehicles.

05.04.01.01 USUAL ROAD CONDITIONS

Before a mixture of abrasives and chemicals is spread on a road, the road should be plowed.

05.04.01.02 HAZARDOUS LOCATIONS

In planning for treatment with a mixture of abrasives and chemicals, the County Maintenance Superintendent must decide, early in the storm, which locations will need this treatment to prevent any traffic tie-up because of slick pavement. Such locations include hills, bridge decks, and major intersections.

05.04.01.03 STRAIGHT ABRASIVES

Second Priority routes that cannot be treated with a mixture of abrasives and chemicals must be plowed and treated with straight abrasives. The plowing and spreading of abrasives will be done by equipment which has completed its assignment on First Priority routes. The mileage of Second Priority routes that should be assigned to each unit of equipment depends on its capacity for providing adequate maintenance. The governing principle is that all units of equipment should be able to complete assignment on Second Priority routes at about the same time. However, it must be remembered that the number of miles to be covered by a unit of equipment on a certain type of work is determined by dividing the total mileage of that work by the number of units of equipment available.

Second Priority routes will not normally receive immediate attention. Chemicals, or chemicals mixed with abrasives must never be used on an unsurfaced road. In order to prevent possible damage to the road, straight abrasives only should be applied to unsurfaced roads.

05.04.02 STORAGE OF CHEMICALS AND ABRASIVES

05.04.02.01 STORAGE PILE LOCATIONS

The County Maintenance Superintendent or Expressway Maintenance Supervisor, with the aid of the Assistant District Engineer - Maintenance must determine where chemicals and abrasives for snow removal and ice control operations should be stored. The storage places should be located so the spreading equipment will not be required to travel a great distance while empty to reload or a great distance while fully loaded to reach the starting point of the spreading operations.

The storage place will be well drained and easily accessible. Stockpiles should also be located at all sites where snow removal equipment is parked. This practice will expedite loading so that loaded equipment can be on the road as soon as possible.

05.04.02.02 CHEMICALS STORAGE

Chemicals and abrasives must be stored in an approved manner to reduce loss due to caking and water damage. It is Division policy that all SRIC chemicals be covered while stored. A diagram of the type of bin most generally used for storing chemicals is shown in Figure 05-3. The bin may have two or three sides. It must be set on an impervious pad constructed so that water will drain from the center to the outer edge in all directions. Eye bolts placed 12-24 inches apart must be located in the sides at the top for use as ties to hold a water proof cover in position. The cover will be in direct contact with the chemical. It must be securely tied on two or three sides and will be held on the pad at the front or at each of the open ends. Care must be taken to keep all chemicals covered except during actual loading operations. During loading, the cover will be rolled back only far enough to allow the loader to get the necessary amount of material and it will be replaced as soon as loading is completed. Chemicals will never be left uncovered after loading is completed. It is desirable to construct chemical storage buildings at all SRIC chemical storage sites.

05.04.02.03 ABRASIVES STORAGE

Abrasives will be stored in stockpiles on well-drained ground (See Figure 05-7). Where practical, a waterproof cap should be kept in place on a pile of abrasives even though the pile does not include chemicals. A plastic cover is preferred. After each storm, stockpiles should be restored to the proper shape. Each stockpile should be built and maintained in the shape of a cone. A pile of this shape tends to shed water readily. As a result, there is less chance of deep freezing in a pile of straight abrasives.

05.04.02.04 STORAGE SITE INSPECTION

All chemicals and abrasives for snow removal and ice control must meet the requirements of the specifications prepared by the West Virginia Department of Highways. The material will be inspected in accordance with the established policy. Only material that meets these specifications will be accepted. The County Maintenance Superintendent or Expressway Maintenance Supervisor will inspect all storage sites before the snow season begins and after each storm to check on the quantities of materials and their condition. District personnel will also check from time to time throughout the year.

05.04.03 MIXING OF MATERIALS

05.04.03.01 MIXING CHEMICALS

Mixing can be done with the use of a front-end loader or similar equipment. Suitable amounts of salt and calcium chloride are placed into a pile in the desired proportions and the actual mixing is accomplished by rehandling the material with the equipment until a uniform mixture is obtained.

05.04.03.02 MIXING CHEMICALS AND ABRASIVES IN STOCKPILES

It must be remembered that chemicals will not prevent the freezing of moisture in abrasives and will not allow abrasives to become quickly anchored to ice or packed snow, unless the chemical has been dissolved and uniformly mixed with the abrasives. For this reason, 100 pounds of chemical will be added to each cubic yard of abrasives to be stockpiled. No chemicals are to be added to abrasives used on unpaved roads. This initial addition of chemical will keep to a minimum the need for "sweetening" (adding additional chemical) the abrasives at the time of spreading. Before the snow season, ample quantities of abrasives should be on hand and enough chemical should be available for mixing 100 pounds with each cubic yard of abrasives. The chemical added to a stockpile of abrasives should be mixed with the abrasives in the following manner:

Step 1:

A new stockpile will be built by placing alternate layers of the abrasives from the original stockpile and chemicals in the correct proportions. To accomplish this, each layer of abrasives will be approximately 2 feet in depth and the number of cubic yards in the layer will be determined by counting the number of bucketfuls needed to construct the layer. The corresponding amount of

chemicals required can then be determined for each layer and will be spread as evenly as possible over the entire surface of the layer of abrasives. This procedure will be continued until all materials have been proportioned.

Step 2:

The number of cubic yards of straight abrasives delivered to the stockpile will be determined either from the delivery weight slips or from the base dimension of the pile by the use of the Storage Capacity Curves shown on the chart in Figure 05-4. To use this chart, it is first necessary to determine the height of the pile corresponding to the base dimension "B" by considering the proper sloping straight line. For example, a pile of crushed stone with a base dimension of 40 feet should have a height of 17 feet.

The capacity of the cone pile would be approximately 300 tons. The capacity of a tent shaped pile of the same height would equal the capacity of the intermediate section per lineal foot times the length of the intermediate section plus the capacity of a conical pile to allow for the sloping end portions. Thus, if the intermediate section of a tent shaped pile is 50 feet long, the total capacity of the pile would be $(16 \times 50) + 300 = 1100$ tons.

Step 3:

The equipment will be used to move the pile of combined abrasives and chemical to an adjacent place by letting the material sift gradually from the opened bucket.

Step 4:

The final mixing will be performed while the material is being moved to its permanent location by gradually opening the bucket of the equipment and letting the material sift through as before.

Step 5:

The mixed material will be deposited so as to form a pile of the proper shape. A waterproof covering will be used as a cap (see Figure 05-7).

05.04.04 ABRASIVES-CHEMICALS MIXTURE APPLICATION

05.04.04.01 ORDER OF OPERATIONS

Where a treatment of a road is to consist of plowing and the application of a mixture of abrasives and chemicals, the following procedures should be observed. At the beginning of the storm, equipment will be dispatched to cover predesignated locations which become hazardous immediately. These locations will include bridge decks, steep grades, sharp superelevated curves, and major intersections.

05.04.04.02 SPREADING MIXTURE

On a two-lane highway, the rate which a mixture of abrasives and chemicals is spread will be at least one cubic yard of abrasives per lane mile of roadway actually treated. The pattern of spread will be so the mixture will cover the entire roadway, one lane at a time. This spread pattern should reduce damage to on-coming vehicles caused by flying abrasive chips.

05.04.04.03 PLOWING

Plowing of roads that are to be treated with a mixture of abrasives and chemicals should start when a snow accumulation of 2 to 3 inches occurs and will be continued until all the roads have been cleared and set back. The route priority and severity of the storm will also determine when plowing starts.

05.04.04.04 TREATMENT PROCEDURES

The best procedure for treating a road by plowing and applying mixture of abrasives and chemicals depends on the conditions of the particular road, temperature and other factors. Supervisors must call on their experience and training when selecting procedures for the condition at hand.

05.05 PERSONNEL

05.05.01 ASSIGNMENT

Snowstorms are often of long duration and the same people cannot work from the beginning of the storm to its end. When such a storm occurs and prior plans have not been made, the result is, all too often, a drastic curtailment of activities and the "boggling down" of the snow removal and ice control operations. In order that snow removal and ice control may be carried on continuously and efficiently for the duration of a long storm, it is necessary to assign personnel to shifts.

A person should not be required to work without rest for more than 12 hours. To maintain peak efficiency, they should then be allowed to rest for at least 8 hours. When making personnel assignments, this requirement should be uppermost in the mind of the County Maintenance Superintendent or Expressway Maintenance Supervisor. Every effort must be made to conserve manpower. When it is necessary to send crews on snow and ice operations, only those men who are required from the shift on duty will be kept or called. All others will be sent home to stand-by or will be left at home until the relief shifts are needed.

Shifts should be rotated to provide equality of assignment and to promote fairness. The time of shift changes will be in accordance with the latest directives from the Director of Maintenance Division.

05.05.01.01 COUNTY AND EXPRESSWAY HEADQUARTERS

It is important to establish shifts for the personnel assigned to Headquarters, as well as for the personnel assigned to any other phase of snow and ice operations.

Any shift should include adequate personnel to perform the tasks discussed in this section. The number will be determined by the Maintenance Supervisor depending on the size of the operation and on the experience of the individuals.

The Maintenance Supervisor or designee will be in charge of the County or Expressway operation and will either be located at the Headquarters throughout the storm or be available by telephone or radio.

The radio and telephone operator will monitor the radio and will write all messages directed to the Headquarters and will not allow any messages to be sent without proper clearance from the person in charge. This operator will also answer the phone and direct any phone message to the proper person. In addition, the operator may handle all complaints and requests for information from the public.

The Crew Supervisors will see that equipment is quickly and properly loaded, fueled or repaired and returned to work. He/she will also keep the Organizational Supervisor or designee informed of the operational status of all equipment.

As required by the Maintenance Supervisor, runners will be used to pick-up necessary parts for the mechanics, deliver relief equipment operators to the field, and check on particular conditions as directed.

05.05.01.02 EQUIPMENT

When assigning operators to equipment, the person in charge will consider the need for relief crews during an extended storm. He/she will normally assign only one operator to a unit of equipment for a shift. Helpers should be assigned on SRIC units when the safety of the primary operator would be compromised due to hazardous road conditions. Decisions regarding the assignment of helpers must take into account the areas where hazardous conditions exist with due consideration to primary operator input.

When feasible, two-way radios are to be installed in SRIC equipment to enhance the routing of vehicles, report road conditions and provide safety considerations.

05.05.01.03 SHOP

Arrangements for continuous operation of shops throughout a snowstorm will be made by the Maintenance Supervisor and the District Equipment Superintendent. All organization mechanics must be assigned before District shop personnel are used. One mechanic should be kept in the shop at all times and, if possible, one mechanic may be assigned to the shop truck for making minor repairs to equipment on the road.

The District shop must be manned to take care of overflow work from County and Expressway shops and for major repairs. All work possible must be done at the County or Expressway shop. Work should not be sent to the District shop unless it would tie up the County or Expressway shop for an extended period, or it cannot be taken care of quickly because of the workload.

05.05.01.04 OFF DUTY PERSONNEL NOTIFICATION

After the personnel have been given their assignments and the shifts have been established, the procedure to be followed when it becomes necessary for them to report to work during off-duty hours must be determined. The Maintenance Supervisor or designee will notify the proper Crew Supervisors. They, in turn, will notify the employees who are assigned to the shift on call at the time, and who are needed for the type of work that is to be performed. An important rule concerning notification procedure is that no person should be responsible for notifying more than five other people. The arrangements for notifying off-duty personnel will be posted and distributed to personnel assigned to the Maintenance Headquarters or Subheadquarters.

The County Superintendent and/or Expressway Crew Supervisor shall advise the Assistant District Engineer, Maintenance of the proper person to contact in case there is a snow emergency during off-duty hours.

05.05.02 AREA RADIO PATROL

When notification of required personnel has been completed after the plan has been put into motion, each Crew Supervisor will be given the latest weather information, the type of treatment to apply, and any changes in personnel and equipment assignments necessitated by illness or breakdowns. Each Crew Supervisor, when on patrol, will inform the Headquarters of his/her location. Strict adherence to the established radio procedure shall be in effect during the entire operation. Throughout the operation, each Crew Supervisor will remain in contact with every operation in his/her area.

When relief of radio patrol personnel is needed, the replacement person must report to the Headquarters. Arrangements will then be made for the transfer of duty to take place at the Headquarters or some other designated location in the area to be patrolled.

05.05.03 RELIEF OPERATORS

When relief operators take charge of equipment, arrangements will be made to send the equipment to the Headquarters or for the relief operator to meet the equipment in the field at a designated location and time. To prevent lost time in making operator changes, the latter procedure is usually preferred for some specialized units such as graders or snow-blowers.

05.05.04 DISTRICT AND DIVISION FIELD PERSONNEL

Throughout a storm and during the clean-up period, available District personnel should be in the field observing and assisting in the snow removal and ice control operations. Maintenance Division personnel will monitor field operations, coordinate state-wide activities, and assist District personnel as needed.

05.06 OPERATIONAL PROCEDURES

05.06.01 MARKING OF STRUCTURES AND PAVEMENTS

05.06.01.01 MARKERS FOR DRAINAGE AND STRUCTURES

Before the ground freezes, every obstruction which constitutes a hazard or may interfere with snow removal operations should be marked. Such obstructions will include culvert headwalls, gutters, guardrail end, curbs, and structures of any other type that lie in, or very close to the traveled way. Markers for this purpose should conform to the current "Manual on Uniform Traffic Control Devices".

The position of each catch basin, drop inlet and other drainage installation which is located so it does not constitute a hazard and does not interfere with snow removal, will be indicated by a suitable marker to permit the structure to be easily located when it is covered with snow. All markers that interfere with mowing or with the maintenance of ditches and shoulders must be removed early in the spring.

05.06.01.02 EDGE GUIDE FOR SNOW REMOVAL

Portions of our expressways are constructed so that during a heavy snowstorm it is difficult to determine the positions of the paved traffic lanes. Under these conditions, chemicals are often spread on the shoulder or other inappropriate locations and plows may get onto the median or not completely cover the roadway. It is advisable to set guide stakes without reflectors at these locations. Between interchanges, these stakes should be placed 5 feet from the edge of the pavement in the median or on the left-hand side of the road at intervals of 200 feet. At an interchange, they should be on the right-hand side of the single turn-off lane and at 50 foot intervals. These stakes must be placed before freezing occurs and must be removed before the time for mowing or resumption of normal maintenance operations. They should be saved and reused from year to year.

05.06.02 SNOW PLOWING PROCEDURES

05.06.02.01 PLOW ADJUSTMENT AND SPEED

Plowing of a road will begin when the depth of snow or sleet on the road surface begins to hinder the safe movement of vehicles. When plowing an unpaved road, a snow plow will usually be carried about one inch above the surface of the road. If the surface of the road is so uneven that the plow blade will catch in projections in the surface at this height, the clearance should be increased accordingly.

The speed of a snow plow should be great enough to move the snow well onto the shoulder, but it should not be so great that the snow damages adjoining private property or highway signs. Also, when a plow moves at a high speed, the snow that is blown over the moldboard of the plow produces conditions similar to those existing during a small blizzard and tends to obscure the vision of the plow operator and the drivers of oncoming vehicles. Care must also be taken to keep the speed of the plow slow enough so that the windrow of snow is not thrown over the railing of an overpass onto the roadway below.

While a snow plow is traveling to or from an assigned route, the blade should be in plowing position. It may be raised, however, when speed is important or when the road on which it is traveling is bare and properly set back.

05.06.02.02 PLOWING DIRECTION AND PATTERN

A snow plow should travel in the direction of traffic. Ideally, a four-lane road should be plowed by three plows operating in tandem and spaced 600 to 800 feet apart. Where there is a wide median strip, the first plow will be run on the passing lane and will throw snow toward the left onto the median strip. The second plow will be lapping the first by about a foot on the first pass and will move snow to the right toward the shoulder. The third plow will be lapping the second by a foot, and will set the windrow well back on the shoulder. When there is a narrow median strip or an undivided four-lane highway, the first plow will move snow to the right and this snow will be moved across the pavement and onto the shoulder by the second and third plows. A two-lane road can ideally be covered by two plows working in tandem. The plows will be operated so as to clean one lane and set it back in one pass.

05.06.02.03 SETTING BACK

The job of setting snow back will be started as soon as the storm is over and all routes are open. A prompt start is necessary to reduce the amount of water from melting snow that will run onto the traveled way and freeze. It is also important to make room for the storage of more snow in case another storm comes before the present snow has melted. A road is considered to be properly set back when the windrow of snow made from preceding trips of the plows has been shoved beyond the shoulder point. Good equipment for setting back is a grader with an attachment on its moldboard that is designed to roll the snow. The grader blade can be shifted outward so that it will be possible to keep the grader wheels on the paved surface while the snow is being shoved into the ditch or gutter. When setting back is done by truck plows, sufficient speed is required to roll the snow into the ditch. On a fill or an overpass, care must be taken not to roll the snow beyond the edge of the embankment or over a parapet and onto another road, a railroad, or a building.

Immediately upon traffic being restored to normal, all snow and ice stored where its presence constitutes a hazard, such as along parapet walls, in gore areas protected by impact attenuators, and along guardrail in urban areas, is to be removed.

As a snow plow approaches a railroad grade crossing, the plow will be directed to the right onto the shoulder, so any accumulated snow carried in front of the blade will be left on the shoulder to reduce the chance for a windrow of snow to be carried onto the tracks. While the plow is passing over the tracks, the blade will be raised enough to clear the rails. On the other side of the crossing, the plow blade will be dropped to proper plowing position.

Approaches to crossings must be treated to prevent any slippery conditions. Treatment will consist of applications of straight chemicals, abrasives mixed with chemicals or straight abrasives. The choice depends on conditions at the particular location. The material will be spread for a distance of at least 500 feet on either side of

the crossing. When snow plowing operations have been completed and during the clean-up operations, all railroad crossings will be inspected to insure that no hazard to rail traffic exists. Hazards must be immediately removed or reported to rail authorities.

05.06.02.04 USE OF CHAINS

Chains must be on all equipment before it plows snow. Exceptions will be made only at the direction of the Maintenance Supervisor. The Supervisor must be familiar with road conditions and may know that chains are unnecessary on some equipment. Even though an operator may find chains unnecessary for his/her assigned routes the Maintenance Supervisor must authorize the removal. When chains are not being used, they shall be carried on the equipment.

05.06.03 RAILROAD CROSSINGS

Special attention must be given to all railroad grade crossings during and after snow removal and ice control operations. Every precaution must be taken to prevent snow or slush from being carried onto the tracks. It may become packed in the flangeways and create a hazard which could derail a train or cause a malfunction of signals. If necessary, personnel using proper hand tools will be assigned to the task of removing all ice and compacted snow at the rail flanges during plowing operations. Care will be taken to avoid damage to railroad crossings signal installations by snow equipment or heavy windrows of snow.

05.06.04 EMERGENCY REQUESTS

Emergency requests will be received by various employees of the Division and most will be checked and handled by County personnel.

The County Maintenance Superintendent will designate someone in the County Headquarters to receive and record all requests for emergency road assistance. The record of requests will show the time received, the action taken, and the time completed. The designated person must be able to handle all routine requests from the general public. However, unusual requests or unfamiliar situations will be referred to the County Maintenance Superintendent. He/she will check the situation quickly and necessary action will be taken. The person making the request will be told what action is to be taken and when the work will probably be done.

In case a request for special assistance in an emergency is received and the validity of the request is in doubt, further checks must be made. If a person is ill, the attending physician may be contacted for confirming information. If there is a death, a call will be made to the attending physician or the indicated funeral home. A contact within the neighborhood can confirm an emergency request. If there is still doubt after the check has been made, or if no check is possible, the Division will comply with the request. It is far better to spend the extra time and money than to find out too late that the call for help was a legitimate one.

For non-road emergencies, refer to the current Emergency Operations Procedure.

05.06.05 POST STORM CLEAN-UP

05.06.05.01 SETTING BACK

The various roads will be set back properly in the order of priority and the work will be done by the equipment assigned to the road. Setting back will be started and completed as soon as possible, in some cases throughout the night. While a road is being set back, each railroad grade crossing must be inspected again and hazards to highway or rail traffic must be removed. This work will normally be accomplished under operational Code Blue.

05.06.05.02 DAYLIGHT OPERATIONS ONLY

Work on the other parts of the clean-up phase will normally be done only during the daylight hours since the work is not of an emergency nature and may create obstructions to the normal flow of traffic. Another reason for performing this work during normal working hours is to allow other personnel to get much needed rest. The first assignments of personnel and equipment in this phase will be to clean bridges and railroad grade crossings. At the same time, all drainage facilities, such as catch basins, inlets, flumes and culverts will be opened to permit rapid discharge of water from melting snow or rain. Most of this work on drainage facilities will be done with hand shovels; however, proper power equipment should be used where it can be operated efficiently.

Guide stakes and obstruction markers will be repaired if necessary. Snow will be removed at guardrails where it is necessary to make additional room for storage.

If any clean-up operations constitute a hazard to the traveling public or Division personnel and equipment, proper signs will be posted and flaggers will be used.

05.06.06 POST STORM SECURING OPERATIONS

When all First and Second Priority routes have been opened for two-way traffic and all Third Priority routes have been opened for at least one-way chain traffic the District Office will be notified. If the District does not need the equipment to help another area, instructions will be given to start setting back assigned routes.

05.06.06.01 SECURING COUNTIES AND DISTRICTS

As soon as setting back of all routes is complete, the County or Expressway Supervisor will notify the District Headquarters. Upon receiving permission from the District Office, the Supervisor will then secure the County or Expressway from snowstorm operations.

05.06.06.02 NORMAL OPERATIONS RETURN PROCEDURE

As soon as practical, after securing from a snowstorm, personnel and equipment will be assigned to such tasks as the clean-up of bridges, rail crossings, sidewalks, and state maintained parking areas and entrances. This work will be done during normal working hours and will be continued until the job is completed.

After each storm, all snow equipment will be washed, repaired, serviced and prepared for operation as quickly as possible in accordance with established procedures of the Equipment Division.

05.06.07 SPRING CLEAN-UP

At the close of the snow season, it is necessary to remove snow fences, drainage obstructions and guide markers. Other clean-up operations are as follows:

- 1) Removal of abrasives remaining on streets and highways.
- 2) Removal of chemical deposits remaining on bridge decks and bridge seats by washing.
- 3) Removal of abrasives and trash from catch basins, drop inlets, gutters and other drainage facilities.
- 4) Reshaping of shoulders that were damaged during plowing.
- 5) Repairing of areas where material was washed away by melting snow and ice.
- 6) Repairing of slopes damaged by the effects of alternate freezing and thawing.
- 7) Removal or trimming of trees and bushes that were damaged and present a hazard to the road or traveling public.

FOOTNOTE

As more fully set forth in Section 01.01.01, nothing in this manual is intended to create a legal or moral duty and has been created for internal guidance only.