MPA: Snow and Ice Control

Illustrations	LOS	Description
LOS A 	A	Plowing and chemicals or abrasives applications proactively maintain very high levels of mobility throughout storms (refer to accompanying tables). Snow drifts and localized ice patches are treated quickly to avoid closures and hazards. Proactive avalanche control minimizes traffic interruptions and avoids unanticipated road closures.
LOS B 	B	Plowing and abrasives or chemicals applications maintain high levels of mobility as much as possible (refer to accompanying tables). Snow drifts and localized ice patches may be treated during storm with abrasives or chemicals. Proactive avalanche control minimizes traffic interruptions and avoids unanticipated road closures.
LOS C 	C	Plowing and abrasives or chemicals applications maintain good levels of mobility on high-standard roads (refer to accompanying tables). Snow drifts and localized ice patches are treated as soon as possible at end of storm. Avalanche control focuses on high-priority locations and situations.
LOS D 	D	Plowing and abrasives or chemicals applications are performed on limited basis, and some traffic delays are anticipated on all roads (refer to accompanying tables). Snow drifts and localized ice patches are treated after mainline roads are cleared. Limited avalanche control is performed. Chain station operation may be scaled back.
Living Snow Fence 	F	Plowing and abrasives or chemicals applications are performed on very limited basis, impairing mobility on all roads (refer to accompanying tables). Snow drifts and localized ice patches may not be treated for some time. No preventive avalanche control is performed. Chain station operations are scaled back or suspended.

Maintenance Program Area: Snow and Ice

Survey Item: Snow Removal, Road Condition Budgeted Activities: 402

A	Levels of service for snow removal and application of chemicals and abrasives for traction are based upon highway category, considering functional classification and daily traffic, and weather conditions in a "standard winter." Refer to Tables 1 and 2 on the following pages. LOS A represents the highest level of service, which ranges from proactive efforts to maintain wet (bare) pavement throughout a storm on higher-standard or highly traveled highways to snow-pack or icy but passable conditions on lower-standard or low-volume roads. Traffic speed is consistent with wet pavement and prevailing weather.
B	Levels of service for snow removal and application of chemicals and abrasives for traction are based upon highway category, considering functional classification and daily traffic, and weather conditions in a "standard winter." Refer to Tables 1 and 2 on the following pages. LOS B represents a high level of service, which ranges from targets of wet (bare) pavement as much as possible on higher-standard or highly traveled highways to snow-pack or icy conditions on lower-standard or low-volume roads. Traffic moves at reduced speed, with isolated slowdowns or delays.
C	Levels of service for snow removal and application of chemicals and abrasives for traction are based upon highway category, considering functional classification and daily traffic, and weather conditions in a "standard winter." Refer to Tables 1 and 2 on the following pages. LOS C represents a moderate level of service. On higher-standard or highly traveled highways, LOS C ranges from wet (bare) pavement as much as possible to patches of snow or slush. On lower-standard or low-volume roads LOS C ranges from patches of snow or ice to predominately snow-pack or icy conditions. Traffic moves slowly with isolated to moderate delays.
D	Levels of service for snow removal and application of chemicals and abrasives for traction are based upon highway category, considering functional classification and daily traffic, and weather conditions in a "standard winter." Refer to Tables 1 and 2 on the following pages. LOS D represents a marginal level of service, which ranges from patches of "oatmeal" snow, packed snow or ice on higher-standard or highly traveled highways to predominately snow-packed or icy conditions on lower-standard or low-volume roads. Traffic moves slowly with delays.
F	Levels of service for snow removal and application of chemicals and abrasives for traction are based upon highway category, considering functional classification and daily traffic, and weather conditions in a "standard winter." Refer to Tables 1 and 2 on the following pages. LOS F represents a poor level of service. Patches of snow or ice exist even on the highest-standard roads, and these conditions may degenerate to predominately snow-packed or icy conditions throughout, with accompanying slowdowns or delays. On lower-standard or low-volume roads the surface is snow-covered and may be blocked in locations, with substantial traffic delays.

Levels of service for activity 402, snow plowing and sanding, are developed in two steps:

- Step 1 identifies a range of condition levels that define various levels of snow and ice control, and their likely impacts on traffic movement. Condition levels are described in Table 1.

- Step 2 assigns condition levels to the various categories of highways. These assignments define the different levels of service on each highway category. Levels of service are indicated in Table 2.

TABLE 1. CONDITION LEVELS, ACTIVITY 402

Condition	Descriptions
1	Maintain wet (bare), tractive surface through proactive anti-icing prior to the storm and de-icing and application of abrasives during and after the storm. Objective is to keep a wet road surface as much as possible during the storm period. Traffic moves smoothly at a speed consistent with wet pavement and as weather conditions allow. (Note: anti-icing and de-icing are used predominantly in non-windy areas.)
2	Maintain wet (bare) surface as much as possible throughout the storm. Anti-icing is applied prior to the storm, and abrasives (with or without deicers) may be applied during the storm, possibly at lesser frequency than for Condition 1. The road may be de-iced after the storm, or only abrasives may be used. Traffic moves relatively smoothly, though at reduced speed.
3	Patches of “oatmeal” snow, slush, or packed snow may exist. Anti-icing, de-icing, and application of abrasives may be done on a limited basis. Traffic may experience isolated slowdowns or delays, but movement is otherwise unimpeded, although at reduced speed.
4	Icy or packed snow conditions prevail. Abrasives may be applied to improve traction. Traffic moves slowly and is delayed.
5	Road is snow-covered and may be blocked in locations. Traffic flow will be impeded at these locations and motorists may encounter substantial delays. On highways designated for seasonal closure (currently Mt. Evans, Independence passes), the snow cover is left untouched until the spring.

NOTE: Storms vary widely in their characteristics, and road conditions may deviate temporarily from the descriptions above based upon the timing, intensity, and duration of the storm, temperature and wind conditions, nature of the precipitation, and so forth. While storms may sometimes temporarily overtake snow and ice operations, the conditions above describe the objectives that the crews continue to strive to meet.

TABLE 2. LEVEL OF SERVICE, ACTIVITY 402

Highway Category	A	B	C	D	F
Interstate, > 75,000 AADT	Cond. 1	Cond. 1	Cond. 2	Cond. 3	Cond. 3
NHS, >75,000	Cond. 1	Cond. 1	Cond. 2	Cond. 3	Cond. 3
Interstate, 15K < AADT < 75K	Cond. 1	Cond. 1	Cond. 3	Cond. 3	Cond. 4
NHS, 15K < AADT < 75K	Cond. 1	Cond. 1	Cond. 3	Cond. 3	Cond. 4
Other, >50,000 AADT	Cond. 2	Cond. 3	Cond. 3	Cond. 3	Cond. 4
Interstate, < 15,000 AADT	Cond. 1	Cond. 2	Cond. 3	Cond. 4	Cond. 5
NHS, < 15,000 AADT	Cond. 1	Cond. 2	Cond. 3	Cond. 4	Cond. 5
Other, 5K < AADT < 50K	Cond. 4	Cond. 4	Cond. 4	Cond. 4	Cond. 5
Other, <5,000 AADT	Cond. 4	Cond. 4	Cond. 4	Cond. 5	Cond. 5
Mountain Passes	Cond. 3	Cond. 3	Cond. 4	Cond. 5	Cond. 5
Seasonal Highways	Cond. 5	Cond. 5	Cond. 5	Cond. 5	Cond. 5

Note: Level of service definitions may be adjusted based upon importance of the route to one or more of the following travel purposes: commuting; medical and emergency transport; commercial, economic, tourist, and recreational activities, and school bus, mail routes, and defense routes. The level of service may also be adjusted to compensate for the alignment and grade of the highway itself.

For purposes of performance budgeting, the demand for winter maintenance activities is based upon storm conditions in a "standard winter." A ***standard winter*** is estimated by taking the most recent five-year averages of plow-mile accomplishment units and of total expenditures for activity 402, and using the composite of these averages to adjust the most recent fiscal year expenditures and conversion factors (ratio of backlog work to inventory quantity) for each winter activity in each maintenance section. Before the five-year expenditures are averaged, however, an adjustment to materials costs is made to reflect the current percentage of materials costs to total costs (for fiscal 1999, this was 35 percent). The reason for this adjustment is to update historical data to reflect current environmental requirements that call for application of CMA in lieu of sand or other abrasives in air quality non-attainment areas.

Maps Illustrating Geographic Distribution of Snow and Ice Conditions Corresponding to LOS A through F, Respectively

Maintenance Program Area: Snow and Ice

Survey Item: Ice Control, Hand Work **Budgeted Activities: 403**

A	Ice is removed from all spot locations quickly after its formation, resulting in minimal effect of ice on traffic and maintenance of proper highway and bridge drainage. (Spot locations include bridge drains, bridge wheel guards, and walkways; culvert drains; and susceptible locations such as tunnel walls and road surface areas in protracted shade.)
B	Ice is removed from most spot locations quickly, resulting in minor effect of ice on traffic and maintenance of proper highway and bridge drainage in most if not all locations. (Spot locations include bridge drains, bridge wheel guards, and walkways; culvert drains; and susceptible locations such as tunnel walls and road surface areas in protracted shade.)
C	Ice is removed from many spot locations quickly, but with some delays at others, resulting in moderate effect of ice on traffic and varying levels of highway and bridge drainage among affected locations. (Spot locations include bridge drains, bridge wheel guards, and walkways; culvert drains; and susceptible locations such as tunnel walls and road surface areas in protracted shade.)
D	Ice is removed from spot locations after some delay, resulting in widespread effect of ice on traffic and impeded highway and bridge drainage. (Spot locations include bridge drains, bridge wheel guards, and walkways; culvert drains; and susceptible locations such as tunnel walls and road surface areas in protracted shade.)
F	Ice is removed from spot locations only after significant delay if at all, resulting in a widespread and sustained effect of ice on traffic and impeded highway and bridge drainage. (Spot locations include bridge drains, bridge wheel guards, and walkways; culvert drains; and susceptible locations such as tunnel walls and road surface areas in protracted shade.)

Maintenance Program Area: Snow and Ice

Survey Item: Snow Fence **Budgeted Activities: 404**

A	Snow fence is erected and removed on schedule. Damaged areas of snow fence are fully repaired on a timely schedule. Living snow fences are maintained effectively.
B	Snow fence is erected and removed mostly on schedule. Damaged areas of snow fence are repaired at key locations (e.g., high-volume routes, routes subject to major drifting, major intersections). Living snow fences are maintained effectively at key locations.
C	Snow fence is erected and removed on schedule at key locations (e.g., high-volume routes, routes subject to major drifting, major intersections). Instances of major damage in snow fences, including living snow fences, are repaired in timely fashion at key locations, and on a prescribed schedule at other locations.
D	Snow fence is erected and removed on an as-can basis with no governing schedule. Instances of major damage in snow fences, including living snow fences, are repaired as schedule and resources permit.
F	Snow fence maintenance is performed erratically if at all, and receives low priority.

Maintenance Program Area: Snow and Ice

Survey Item: Snow Removal, Closed Roads **Budgeted Activities: 406**

A	Roads temporarily closed due to drifting are opened quickly and completely, resulting in minimal delay to traffic. Seasonally closed roads are opened on schedule.
B	Roads temporarily closed due to drifting are opened completely with only minor delay, resulting in delays to traffic only on lower-standard highway categories shown in Table 2. Seasonally closed roads are opened on or close to schedule.
C	Roads temporarily closed due to drifting are opened partially or with moderate delay, resulting in impeded traffic for a considerable time on affected routes. Opening of seasonally closed roads is delayed up to a month later than scheduled.
D	Roads temporarily closed due to drifting are opened partially after significant delay, resulting in closure of affected routes for more than 24 hours. Opening of seasonally closed roads is delayed up to two months later than scheduled.
F	Roads temporarily closed due to drifting are opened partially after significant delay, resulting in closure of affected routes for more than 48 hours. Opening of seasonally closed roads is delayed more than two months beyond schedule.

Maintenance Program Area: Snow and Ice

Survey Item: Avalanche Paths

Budgeted Activities: 406.10

A	Avalanche control is effective to a very high degree, in that 1) there are no traffic delays due to naturally occurring avalanches, and 2) the durations of road closures for avalanche control all meet an activity duration guideline. This guideline duration encompasses all tasks needed for avalanche control, including closure and traffic control, setting off charges, and any snow removal and cleanup.
B	Avalanche control is effective to a high degree, in that 1) traffic delays due to naturally occurring avalanches occur at no more than five percent of identified paths in a section during a winter, 2) snow removal and cleanup at these occurrences are within prescribed time limits, and 3) the traffic delays due to avalanche control all meet an activity duration guideline. This guideline duration encompasses all tasks needed for avalanche control, including road closure, setting off charges, and snow removal and cleanup.
C	Avalanche control is effective to a moderate degree. Traffic delays due to naturally occurring avalanches occur at no more than ten percent of identified paths in a section during a winter, and snow removal and cleanup at these occurrences are within prescribed time limits in most instances. The traffic delays due to avalanche control meet an activity duration guideline in most cases, where this guideline encompasses all tasks needed for avalanche control, including road closure, setting off charges, and snow removal and cleanup.
D	Avalanche control is effective at only a fair to marginal degree. Traffic delays due to naturally occurring avalanches occur at more than ten percent of identified paths in a section during a winter, and snow removal and cleanup at these occurrences do not meet prescribed time limits in many instances. Preventive avalanche control is not practiced fully. Traffic delays due to avalanche control do not meet a guideline activity duration in many cases.
F	Avalanche control is poor to nonexistent. Traffic delays due to naturally occurring avalanches occur at many identified paths in a section during a winter. Snow removal and cleanup at these occurrences do not meet prescribed time limits. Preventive avalanche control is rarely practiced.

Maintenance Program Area: Snow and Ice

Survey Item: Chain Stations **Budgeted Activities: 408**

A	Chain stations are fully staffed in all snow emergencies.
B	Most chain stations are staffed at or near full complements for most or all snow emergencies.
C	Many chain stations are staffed near full complements for most snow emergencies.
D	Chain stations are partially or intermittently staffed during snow emergencies.
F	Chain stations are staffed poorly or not at all during snow emergencies.