

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 re 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 condition allow. (Note: anti-icing and de-icing are used predominately 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, through 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 Mr. 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 ~~eh~~ 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. 2	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. 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

<p>A</p>	<p>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.</p>
<p>B</p>	<p>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.</p>
<p>C</p>	<p>Levels of service for snow removal ad 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.</p>
<p>D</p>	<p>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 either condition 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.</p>
<p>F</p>	<p>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.</p>

Illustrations	LOS	Description
	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.
	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.
	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 situation.
	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.
	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 preventative avalanche control is performed. Chain station operations are scaled back or suspended.

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 the 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 cost is made to reflect the current percentage of materials cost to total costs (for fiscal 1999, this was 35 percent). The reason of 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.

Snow Surveys for LOS

Category 1	Interstate, >75,000 ADT
Category 2	Interstate, 15, 000 – 75,000 ADT
Category 3	Interstate, <15,000 ADT
Category 4	NHS, >75,000 ADT
Category 5	NHS 15,000 – 75,000 ADT
Category 6	NHS< , 15,000 ADT
Category 7	Other, > 50,000 ADT
Category 8	Other, 5,000 – 50,000 ADT
Category 9	Other < 5,000 ADT
Category 10	Mountain Passes (Non-Interstate)
Category 11	Seasonal Highways (Mt. Evans and Independence Pass) No Survey on Cat 11 highways for winter maintenance)

If you want to know the ADT for your roads, go here:

http://www.dot.state.co.us/App_DTD_DataAccess/Downloads/TrafficVolumeMaps/TVMap1.pdf

“<” means ‘less than’ and “>” means ‘more than’

Periodic survey requests will be randomly selected and issued by staff maintenance. The purpose of the survey is to gain a snapshot of the level of service on a segment of road. There will be more than one survey per winter and numerous road segments will be identified for survey. The data will be compiled and an overall performance grade will be assigned to each section rating the level of service provided by that section for a fiscal year.

INSTRUCTIONS FOR COMPLETION OF THE SURVEY FORM

1. Use a single sheet, 2 sided form to report the results.
2. Complete the top header portion
 - a. Maintenance Section number
 - b. Patrol Number
 - c. Select the proper Highway Category from back of form for your road segment
 - d. State Highway number
 - e. Beginning Mile Point – Mile Point provided by M&O Branch
 - f. Ending Mile Point – Add 2 miles to the Mile Point provided by the M&O Branch
 - g. Select whether this is a State force maintained or Contract road
 - h. Print your name in case we have questions about the information
3. Part I – Traction Control Survey
 - a. Check box “Anti/de-icer Treatment” if the road has been treated
 - b. Check box “Sand Treatment” if sand is present
 - c. You should check both boxes if both treatments are in use.
 - d. At least 2 hours or more after the snowfall begins, observe the two mile segment and check only one box that best describes the conditions you see at the time.
 - i. For instance, “50% or More of Emphasis Areas” if that best describes conditions
 - ii. Emphasis areas are bridges, hills, curves and intersections
 - iii. Emphasis are may be entire roadway depending on ADT and type of highway (See PD 1055.2)
4. Part II – Precipitation Event
 - a. Precipitation End Date – what date did it QUIT snowing?
 - b. Precipitation End Time – what time did it QUIT snowing?
 - c. Bare Pavement Date – what date did you get bare pavement on 95% of the driving lanes?
 - d. Bare Pavement Time – what time did you get bare pavement on 95% of the driving lanes?

5. Send the completed – 2 SIDED FORM – to the M&O Branch – We need the 2 Sided Form Back

Appendix B – Levels of Service Survey form for Snow and Ice

CDOT Snow & Ice Performance Measurement Form

TO BE COMPLETED BY SUPERVISOR ONLY

Maint. Section: Patrol Number: Hwy Cat./ADT: Route Number:

Route Number:

(See reverse side)

Begin MP: End MP: ☐ State Forces Maintained ☐ Maintained by Contract

Begin MP: End MP: ☐ State Forces Maintained ☐ State Forces Maintained

☐ Maintained by Contract

Name & Signature of person completing survey:

Part 1 – Traction Control Survey - Sample DURING the storm – at least 2 hours after start of precipitation

Roadway Treatment: Sanding & Anti/Deicing

Treatment Used: ☐ Salt/Sand ☐ Slicer ☐ Mag ☐ Cold Temp Mag ☐ Total Accumulation (in.):

Air Temp: Surface Temp: Wind/Drifting: ☐ None ☐ Light ☐ Moderate ☐ Heavy

Treatment Used: ☐ Salt/Sand ☐ Slicer ☐ Mag ☐ Cold Temp Mag ☐ Total Accumulation (in.):

Air Temp: Surface Temp: Wind/Drifting: ☐ None ☐ Light ☐ Moderate ☐ Heavy

Condition Indicator: Presence of traction due to bare pavement from anti/deicing liquid product application or presence of sand (60% or more of the traveled lane) on an icy surface. **Emphasis areas** are defined in PD 1055.2 to include bridges, hills, curves and intersections and may include the entire roadway on certain classifications of highways.

- ☐ Entire Area Bare Due to: Deicer or Entire Area Sanded ☐ All Emphasis Areas & >50% of Remaining Areas
- ☐ >50% of Emphasis Areas (Curves, Hills, Intersections) ☐ Emphasis Areas Only
- ☐ Entire Area Bare Due to: Deicer or Entire Area Sanded ☐ All Emphasis Areas & >50% of Remaining Areas
- ☐ >50% of Emphasis Areas (Curves, Hills, Intersections) ☐ Emphasis Areas Only
- ☐ <50% of Emphasis Areas

Check One Box Only

Part 2 – Precipitation Event **Precipitation at or below 35°F**

End of Event Indicator: Precipitation has stopped for two hours with clearing skies		
Precipitation Start Date & Time		Precipitation End Date & Time
Bare Pavement Date & Time		Elapsed Time (Hours)
NOTE: Report all time in 24 hour time format		
Comments:		
IMPORTANT: See Reverse Side of this Form for Route Categories		

Time to 95% Bare Pavement for your category of road, from the end of the storm: (if your road never became covered or snow packed during the storm, check the first box for your category road)

Category 1 **Category 2** **Category 3** **Category 4** **Category 5**

☐ Bare Pvmnt Maint ☐ Bare Pvmnt Maint ☐ Bare Pvmnt Maint ☐ Bare Pvmnt Maint ☐ Bare Pvmnt Maint

☐ < 1 Hour ☐ < 2 Hours ☐ < 2 Hours ☐ < 2 Hours ☐ < 2 Hours

☐ Bare Pvmnt Maint ☐ Bare Pvmnt Maint ☐ Bare Pvmnt Maint ☐ Bare Pvmnt Maint ☐ Bare Pvmnt Maint

☐ < 1 Hour ☐ < 2 Hours ☐ < 2 Hours ☐ < 2 Hours ☐ < 2 Hours

☐ Bare Pvmnt Maint ☐ Bare Pvmnt Maint ☐ Bare Pvmnt Maint ☐ Bare Pvmnt Maint ☐ Bare Pvmnt Maint

☐ < 1 Hour ☐ < 2 Hours ☐ < 2 Hours ☐ < 2 Hours ☐ < 2 Hours

☐ < 2 Hours ☐ < 4 Hours ☐ < 4 Hours ☐ < 4 Hours ☐ < 4 Hours

☐ < 3 Hours ☐ < 6 Hours ☐ < 6 Hours ☐ < 6 Hours ☐ < 6 Hours

☐ > 3 Hours ☐ > 6 Hours ☐ > 8 Hours ☐ > 6 Hours ☐ > 8 Hours

Category 6 **Category 7** **Category 8** **Category 9** **Category 10**

☐ < 4 Hours ☐ < 2 Hours ☐ < 4 Hours ☐ < 6 Hours ☐ < 8 Hours

☐ < 6 Hours ☐ < 4 Hours ☐ < 6 Hours ☐ < 8 Hours ☐ < 24 Hours

☐ < 12 Hours ☐ < 6 Hours ☐ < 12 Hours ☐ < 16 Hours ☐ < 48 Hours

☐ < 16 Hours ☐ < 8 Hours ☐ < 16 Hours ☐ < 24 Hours ☐ < 72 Hours

<input type="checkbox"/> > 16 Hours	<input type="checkbox"/> > 8 Hours	<input type="checkbox"/> > 16 Hours	<input type="checkbox"/> > 24 Hours	<input type="checkbox"/> > 72 Hours
<input type="checkbox"/> < 4 Hours	<input type="checkbox"/> < 2 Hours	<input type="checkbox"/> < 4 Hours	<input type="checkbox"/> < 6 Hours	<input type="checkbox"/> < 8 Hours
<input type="checkbox"/> < 6 Hours	<input type="checkbox"/> < 4 Hours	<input type="checkbox"/> < 6 Hours	<input type="checkbox"/> < 8 Hours	<input type="checkbox"/> < 24 Hours
<input type="checkbox"/> < 12 Hours	<input type="checkbox"/> < 6 Hours	<input type="checkbox"/> < 12 Hours	<input type="checkbox"/> < 16 Hours	<input type="checkbox"/> < 48 Hours
<input type="checkbox"/> < 16 Hours	<input type="checkbox"/> < 8 Hours	<input type="checkbox"/> < 16 Hours	<input type="checkbox"/> < 24 Hours	<input type="checkbox"/> < 72 Hours
<input type="checkbox"/> > 16 Hours	<input type="checkbox"/> > 8 Hours	<input type="checkbox"/> > 16 Hours	<input type="checkbox"/> > 24 Hours	<input type="checkbox"/> > 72 Hours