

STANDARDS AND PROCEDURES FOR ESTABLISHING SPEED LIMITS ON WYOMING UNPAVED ROADS

1.1 PURPOSE

- (1) Title 31, Chapter 5 – Article 3 of the Wyoming Statutes establishes the speed regulations for all public roadways in Wyoming. The limits specified in this subsection or established as otherwise authorized shall be maximum lawful speeds and no person shall drive a vehicle on an unpaved roadway at a speed in excess of 55 mph.
- (2) The statutes include a basic speed law [W.S. 31-5-301 (a)] prohibiting drivers from traveling at a speed greater than what is reasonable and prudent under the conditions and having regard to the actual and potential hazards that may exist, which recognizes that driving conditions and speeds may vary widely from time to time. No posted speed limit can adequately serve all driving conditions. Motorists must constantly adjust their driving behavior to fit the conditions they encounter.
- (3) Speed limits that were set before July 1, 2011 are considered valid as long as they were selected based on engineering studies which were conducted by professional engineers.
- (4) Any speed limit, other than a statutory speed limit that is posted on a Wyoming unpaved road, must be based on an engineering study. That study should include an analysis of free-flow traffic speeds and a general roadway safety evaluation. A Spot Speed Study is used to measure the free-flowing traffic speed characteristics at a specified location under the traffic and environmental conditions prevailing at the time of the study. The general safety evaluation should provide recommendations on roadway features which cannot be addressed by changing the speed limit.
- (5) The main objectives of these standards is to establish proper study procedures for completing the engineering investigation in accordance with the statutes, to provide guidance in setting appropriate speed limits based on the study data, and to establish the documentation and notification procedures when establishing new speed limits on unpaved roads. These standards and procedures summarize the minimum requirements for setting speed limits on unpaved roads. A registered engineer can consider additional information when selecting appropriate speed limits on unpaved roads.

1.2 DATA COLLECTION/ANALYSIS

- (1) All of the spot speed data and other information described in this section shall be collected by engineers or technicians who have been properly trained by the Wyoming T²/LTAP Center to collect field data.
- (2) The data analysis required to make the final recommendations on setting proper speed limits can be conducted by professional engineers only.

- (3) For the engineering studies, vehicle speeds and traffic volumes should be determined using automated traffic counters. Each automated traffic counter should consist of a traffic counter device, two pneumatic tubes, and some additional accessories. The two pneumatic tubes are placed across the road at the recommended spacing. Two ends of the tubes are fixed on the shoulder, while the other two ends are connected to the traffic counter device.
- (4) For most low volume unpaved roads, 7 consecutive days of traffic counts are required. For unpaved roads with more than 200 vehicles per day, 2 days of traffic counts may be adequate. Selecting the spot to take speed measurements—the location, traffic, and weather conditions under which to conduct the spot speed study—is generally a matter of common sense. Since average speeds over the length of a section of roadway are the main interest, speed measurements should be taken at the midpoint of a typical section. The most important aspect of the location is to avoid areas of acceleration and deceleration, such as access points, curves, bad drainage areas, and locations close to roadside hazards. The final layout of the data collection site should be fully described in any report of speed data. The crew should make an accurate sketch of the site, showing the roadway widths and the position of the traffic counters. The crew should record the start time, end time, any downtime, and the conditions prevailing during the study. Such conditions should include a description of any significant road surface distresses. It is essential that speed studies are performed only on roadway segments with average surface conditions.
- (5) A special form was developed to assist with the collection and analysis of the traffic count data and the safety aspects of the road as shown in Figure 1. The form includes five parts: general information, automated traffic count values, roadway characteristics, historical crash data, and range of speed limit values. In the form, the clear boxes correspond to input that trained technicians or engineers are required to obtain. The gray shaded boxes correspond to the calculations and information that the professional engineer is required to provide. An example of a completed unpaved roads speed limit form is shown in Figure 2.
- (6) When collecting speed study data, the general information should be completed before proceeding to the next steps.
- (7) The required automated traffic count values can be obtained from the output file that the automated traffic counters produce. As shown in Figure 3, the output file summarizes the different speed and traffic volumes that the automated traffic counters produce. Four of these values are required in the form and they are: 85th percentile, 50th percentile, the Average Daily Traffic (ADT) and the Average Daily Truck Traffic (ADTT).

Figure 1: Unpaved Roads Speed Limit Form

| GENERAL INFORMATION | |
|----------------------------|--|
| LOCAL JURISDICTION: | |
| ROUTE: | |
| LOCATION: | |
| DATE: | |

| AUTOMATED TRAFFIC COUNT VALUES | |
|---------------------------------------|--|
| 85th PERCENTILE: | |
| 50th PERCENTILE: | |
| UPPER BOUND OF THE PACE SPEED: | |
| AVERAGE DAILY TRAFFIC: | |
| AVERAGE DAILY TRUCK TRAFFIC: | |

| ROADWAY CHARACTERISTICS | |
|--------------------------------|--|
| ROADWAY LENGTH: | |
| NUMBER OF ACCESS POINTS: | |
| ACCESS POINTS PER MILE: | |
| ROADWAY WIDTH: | |
| ADJACENT LAND-USE: | |
| TYPE OF TERRAIN: | |

| HISTORICAL CRASH DATA | |
|------------------------------|--|
| FATAL: | |
| INJURY: | |
| PDO: | |
| EPDO: | |
| EPDO PER MILE: | |

| RANGE OF SPEED LIMIT (MAXIMUM = 55 MPH) | |
|--|--|
| PREFERRED SPEED LIMIT: | |
| LOWEST ACCEPTABLE SPEED LIMIT: | |

Figure 2: Example of a Completed Unpaved Road Speed Limit Form

| GENERAL INFORMATION | |
|----------------------------|---------------------------|
| LOCAL JURISDICTION: | Smart County |
| ROUTE: | 700 |
| LOCATION: | MP 16.1 to MP 26.1 |
| DATE: | 7/1/2011 |

| AUTOMATED TRAFFIC COUNT VALUES | |
|---------------------------------------|-------------|
| 85th PERCENTILE: | 43.9 |
| 50th PERCENTILE: | 35.7 |
| UPPER BOUND OF THE PACE SPEED: | 40.4 |
| AVERAGE DAILY TRAFFIC: | 141 |
| AVERAGE DAILY TRUCK TRAFFIC: | 4 |

| ROADWAY CHARACTERISTICS | |
|--------------------------------|-----------------------------------|
| ROADWAY LENGTH: | 10 |
| NUMBER OF ACCESS POINTS: | 23 |
| ACCESS POINTS PER MILE: | $23 / 10 = 2.3$ |
| ROADWAY WIDTH: | 20 |
| ADJACENT LAND-USE: | Recreation/Scenic |
| TYPE OF TERRAIN: | Rolling |

| HISTORICAL CRASH DATA | |
|------------------------------|--|
| FATAL: | 0 |
| INJURY: | 5 |
| PDO: | 8 |
| EPDO: | $9.5*0 + 3.5*5 + 8 = 25.5$ |
| EPDO PER MILE: | $25.5 / 10 = 2.55$ |

| RANGE OF SPEED LIMIT (MAXIMUM = 55 MPH) | |
|--|---------------------------------------|
| PREFERRED SPEED LIMIT: | 43.9 rounded to nearest 5 = 45 |
| LOWEST ACCEPTABLE SPEED LIMIT: | $45 - 10 = 35$ |

Figure 3: Example of the Automated Traffic Counter Output

Station: 4d/Rd70N - W Rd 47

Data From: 09:47 - 09/28/2009 To: 11:37 - 10/15/2009

Vehicle General Flow Report - Grand Totals

Note: ADT and Average are based on total value of all lanes printed (Together Print).

Average Daily Traffic (ADT)

| Weekday | | Weekend | | Total ADT | |
|----------|-----------|----------|-----------|-----------|-----------|
| Cars : | 144 (96%) | Cars : | 115 (98%) | Cars : | 137 (97%) |
| Trucks : | 4 (4%) | Trucks : | 2 (2%) | Trucks : | 4 (3%) |
| Total : | 149 | Total : | 117 | Total : | 141 |

Speed Totals

| | | | | | |
|--------|----------|--------------------|---------------------|-----------------------|----------|
| 50 % : | 35.7 mph | Top Speed : | 72.3 mph | Average Truck Speed : | 28.5 mph |
| 85 % : | 43.9 mph | Low Speed : | 3.4 mph | Average Car Speed : | 35.4 mph |
| Avg : | 35.2 mph | 10mph Pace Speed : | 30.5 - 40.4 (45.9%) | | |

Peak Hour Totals

| AM Peak Hour (Volume) | AM Peak Hour (Speed) |
|----------------------------------|---------------------------|
| Weekday : 07:15 - 08:15 (Avg 11) | 03:15 - 04:15 (38.8 mph) |
| Weekend : 09:15 - 10:15 (Avg 11) | 03:15 - 04:15 (45.1 mph) |
| PM Peak Hour (Volume) | PM Peak Hour (Speed) |
| Weekday : 16:45 - 17:45 (Avg 16) | 22:15 - 23:15 (38.8 mph) |
| Weekend : 12:00 - 13:00 (Avg 10) | 21:30 - 22:30 (45.1 mph) |

Grand Totals

| | | | | | |
|----------------|-----------------|------------------|---------|-------------------|-----------|
| Total Cars : | 2234 (137 ADT) | Average Length : | 11.5 ft | Average Headway : | 545.3 sec |
| Total Trucks : | 69 (4 ADT) | Average Axles : | 2.1 | Average Gap : | 545.0 sec |
| Total Volume : | 2303 (141 ADT) | | | | |

- (8) Roadway characteristics should be collected during the field inspection of the road. The list and description of each characteristic that are included in the form are as follows:

Roadway Length: The length of the road in miles.

Access Points: Total number of access points on the whole roadway length.

Access Points per Mile: Divide the number of access points by the roadway length.

Roadway Width: The total width of the road including both shoulders.

Adjacent Land-Use: Refers to the type of users of the road. The following different types of land-uses were obtained from AASHTO's Guidelines on Geometric Design for Very Low Volume Roads:

- **Rural major access roads** serve a dual function of providing access to abutting properties as well as providing through or connecting service between other local road or higher type facilities.
- **Rural minor access roads** serve almost exclusively to provide access to adjacent property. The length of minor access roads is typically short. Because their sole function is to provide access, such roads are used predominantly by familiar drivers.
- **Industrial or commercial access roads** serve developments that may generate a significant proportion of truck or other heavy vehicle traffic. These roads are classified separately from minor access roads, which they otherwise resemble, because of the consideration for trucks and other heavy vehicles.
- **Recreation and scenic roads** serve specialized land uses, including parks, tourist attractions, and recreation facilities, such as campsites or boat-launch ramps. Their users are often unfamiliar drivers and serve recreational vehicles including motor homes, campers, and passenger vehicles pulling boats and other trailers.
- **Rural resource recovery roads** are local roads serving logging or mining operations. Resource recovery roads are distinctly different from the other functional subclasses of very low-volume local roads in that they are used primarily by vehicles involved with the resource recovery activities and the driving population consists primarily or exclusively of professional drivers with large vehicles.
- **Rural agriculture roads** are used primarily to provide access to fields and farming operations. Vehicle types that use such roads include combines, tractors, trucks that haul agricultural products, and other large and slow-moving vehicles with unique operating characteristics.

Type of Terrain: Refers to the general geometrics of the road. There are three different types of terrain that can be chosen:

- Level
- Rolling
- Mountainous

- (9) The historical crash data can be obtained from the safety division of WYDOT or the Wyoming T²/LTAP Center to get the latest crash statistics. It is recommended that 10 years of crash data be included in the evaluation. The following three types of crashes are required: number of fatalities, number of injuries, and the number of Property Damage Only (PDO). The Equivalent Property Damage Only (EPDOT) is calculated by Equation 1.

$$EPDO = 9.5 * Fatalities + 3.5 * Injuries + PDO \quad (\text{Equation 1})$$

Once the EPDO is calculated, the EPDO per mile is determined by dividing the EPDO by the roadway length.

- (10) The preferred speed limit is the 85th percentile speed rounded to the nearest 5 mph. The lowest acceptable speed limit may be up to 10 mph less than the preferred speed limit.

1.3 SAFETY EVALUATION

A general road safety evaluation should be considered when determining speed limits. Such an evaluation should include the following:

- (1) If there is high number of crashes on the roadway under investigation, then a detailed crash analysis should be performed to find the causes of the crashes. Once the causes are determined, then additional steps should be taken to provide safety enhancements for high crash locations. Reducing the speed limits by itself will not automatically reduce crashes.
- (2) The road should be driven at a reasonable and safe speed to determine if any curves require vehicles to slow down. Further safety enhancements such as signage, delineation, shoulder widening, and guardrails should be considered at adverse curves.
- (3) When horizontal curves are signed, they should include either chevrons, delineators or curve warning signs. Speed advisory signs are not required on unpaved roads.
- (4) Speed limits should not be reduced due to the presence of isolated fixed objects such as utility poles, trees, rocks or narrow cattle guards. Consideration should be given to using object markers, removing the hazard or widening of the road at those locations.
- (5) The speed limit should never be lowered to reduce the number of signs needed on a road.

1.4 DETERMINATION OF APPROPRIATE SPEED LIMIT

- (1) Speed limits and speed zoning remain one of the more controversial tasks for the traffic engineering profession. Engineers, public safety officials, and others involved in setting and enforcing speed limits may disagree on the appropriate balance between safety and road-user convenience that should prevail on particular road segments, considering conditions of topography, weather, adjacent activities, and traffic. Motorists, other road users, and roadway

neighbors have their own perspectives on this balance and may or may not abide by the professionals' judgments.

- (2) In order for the regulation of speed to be effective, the posted limit must be generally consistent with speeds that drivers feel are safe and proper. Enforcement is widely recognized to be crucial to the success of speed limits as a means for making roads safer. If law enforcement officers and the courts are confident that speed limits have been developed on a reasonable basis, their enforcement of the limits will be more effective. Generally, speed limits should be set at levels that are self-enforcing so that law enforcement officials can concentrate their efforts on the worst offenders.
- (3) For most cases, the recommended speed limit shall be the 85th percentile speed rounded to the nearest 5 mph.
- (4) A professional engineer can consider the factors described in Section 1.2 to justify a lower speed limit. The recommended speed limit should never be below the lowest acceptable speed limit described in section 1.2 (10).
- (5) The recommended speed limit on unpaved roads shall never be higher than the statutory speed limit of 55 mph.
- (6) Speed limit signs serve to remind motorists that conditions in the area are such that a reduction in speed is reasonable. Proper use of speed limit signs would instill confidence in the minds of drivers that the information on the speed limit sign is accurate and not simply a desire on the part of a policy maker to reduce speed arbitrarily.

1.5 DECLARATION OF SPEED LIMIT

Posted speed limits (other than statutory speed limits) on unpaved roads that have been established by an engineering investigation shall be documented by a Declaration of Speed Limit. A blank declaration of speed limit form is shown in Figure 4 and an example of a completed form is shown in Figure 5.

When declaring a speed limit, the declaration of speed limit form shall be signed and sealed by a professional engineer. The form, with appropriate background information, should be presented to the county commission where a resolution approving the proposed speed limit should be approved. The resolution number should be added to the declaration of speed limit form. The form is then returned to appropriate county officials so that the necessary signing changes can be made. Enforcement of the new speed limit cannot occur until the appropriate signs giving notice thereof have been erected. It is also recommended that copies of the resolution be sent to the local law enforcement agency(ies) for help with enforcement. Counties can modify this declaration form to fit their local needs.

Figure 4: Declaration of Speed Limit Form

DECLARATION OF SPEED LIMIT

LOCATION:

Results of Engineering Investigation

Method Used:

Summary of Results:

Recommendations:

Approved. _____
Professional Engineer P.E. Stamp Date

ORDER TO ESTABLISH RESTRICTED SPEED ZONE

The County Commission approves changing the speed limit to _____ miles per hour on the unpaved roadway section described above.

Resolution number: _____

Date: _____

Figure 5: Example of Completed Declaration of Speed Limit Form

DECLARATION OF SPEED LIMIT

LOCATION: County Road 700, Smart County, MP 16.1 to 26.1.

Method Used: Visual inspection and engineering judgment.
Free flow spot speeds to determine 85th percentile speed and pace.
Standards for establishing speed limits on unpaved Wyoming roads were followed.

Summary of Results: The statutory speed limit is 55 mph. The 85th percentile speed is 43.9 mph with the upper bound of the pace speed at 40.4 mph. There are 2.3 access points per mile and the adjacent land-use is recreational/scenic.

Recommendations: Because of the high number of access points and the recreational/scenic land-use, it is recommended to declare a 40 mph speed limit. Post at least two 40 mph speed limit signs at both ends of the roadway section.

Approved _____
Professional Engineer P.E. Stamp Date

ORDER TO ESTABLISH RESTRICTED SPEED ZONE

The County Commission approves changing the speed limit to 40 miles per hour on the unpaved roadway section described above.

Resolution number: 5555

Date: July 1, 2011