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From the Desk of the Director



By Khaled Ksaibati

Hello all,

2020 is almost gone and it will be remembered for generations to come. The COVID-19 pandemic has impacted all of us in various ways and forced us to operate differently. Despite the challenges, we have been operational and fully engaged in training, technical assistance, and various research studies. The two articles in this newsletter describe one study which will be

of interest for those of you maintaining two lane paved roads. The device that we are developing for WYDOT will help you all identify passing and no passing zones. Stay tuned, the T2 center might make this device available for you to check out in the future. The second article demonstrate the need to do speed studies and how we can help your jurisdiction get the job done.

We have received several requests to do more online training. As a result, we started the process of providing you with the opportunity to register for the Transportation Learning Network (TLN). The events are free but you need to register on our website so that we can send you the participation link. In addition, we will be offering a six-session Asphalt Maintenance series online. These six sessions are tailored specifically for Wyoming and the cost to attend will be minimal. Please keep an eye on our website for all of these training opportunities.

We worked with three counties this year on various safety projects. These safety projects were approved by WYDOT for funding. We will be working closely with WYDOT to develop the announcement of another round for a statewide sign program. This program will provide all counties with the opportunity to identify sign needs on high risk roads and then WYDOT will provide the signs, posts, and hardware to the counties for installation. We will be sending the announcement for this program soon.

I'd like to wish you all happy holidays and I am looking forward to having more interaction with all of you soon.

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COVID 19 Safety Tips:

- Wear a mask that covers your nose & mouth in public**
- Wash or sanitize hands after being in public spaces, before touching your face or after coughing/sneezing**
- Avoid close contact and stay home if you're feeling sick**
- Clean and disinfect common areas**
- Monitor symptoms & take your temperature daily**

Developing an Advanced Apparatus for Designating Passing and No-Passing Zones for Two –Lane State & County Roads

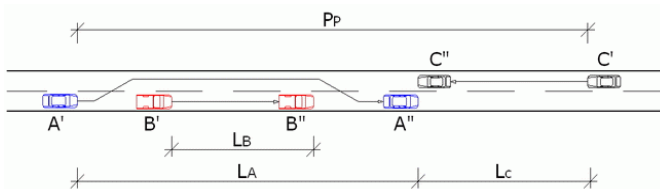
By: Ahmed Farid

One of our T2 Center on-going projects involves the electrical engineering department of the University of Wyoming (UW). In this study, we will be developing a cutting-edge apparatus for designating passing/no-passing zones of two-lane state and county roads. This apparatus is referred to as the No-Passing Zone System (NPZS).



No-passing zone.

While overtaking a slow-moving impeding vehicle ahead on a two-lane road, drivers would have to encroach on the opposing travel lane. More importantly, they would have to confirm that the opposing lane is clear of any oncoming vehicles up to a certain distance before passing. This distance is the Passing Sight Distance (PSD), which varies by posted speed limit.



The passing maneuver.

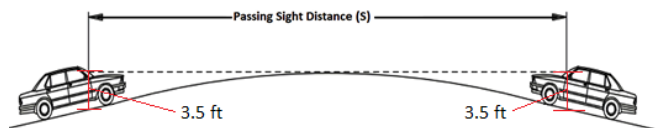
The PSD may be restricted by sight obstructions, such as hills and/or trees around roadway curves.



No-passing zone along a hilly curve.

If the available PSD is less than the minimum acceptable distance, a no-passing zone is marked.

There are a variety of methods for gauging the PSD in the field and WYDOT implements the two-vehicle method. It involves a lead vehicle and a following vehicle traveling at the highway speed. The gap distance between both is the PSD. It is 800 ft, 900 ft, 1,000 ft, 1,200 ft and 1,200 ft for speed limits of 50 mph, 55 mph, 60 mph, 65 mph and 70 mph respectively. The two vehicles are equipped with Global Positioning System (GPS) devices to record their coordinates at a certain frequency, radio communication devices to transmit data between both vehicles and a laptop to record the data. In the following vehicle, a switch is installed to signal when a target object on the lead vehicle, positioned at 3.5 ft. from the ground, disappears by traveling behind a hill or any other sight obstruction. This is the location of the starting point of the no-passing zone. Similarly, when the target object on the lead vehicle reappears after being invisible, the switch is activated to signal the end point of the no-passing zone. In our case, the lead vehicle's taillights were measured to be 3.5 ft from the ground's surface and thus served as the target object. In addition, as per local and federal standards, the eye height of the following vehicle's driver should also be 3.5 ft. Hence, we selected a sedan as the following vehicle to satisfy this requirement.



Eye height requirements for passing sight distance measurements.

WYDOT's old NPZS, namely the Range Tracker System, needs to be replaced. Its software was developed using Microsoft Disk Operating System (MS DOS) and is no longer operational. Hence, our immediate goal is to provide WYDOT with an up-to-date, accurate, cost-effective, easy-to-use, durable NPZS.

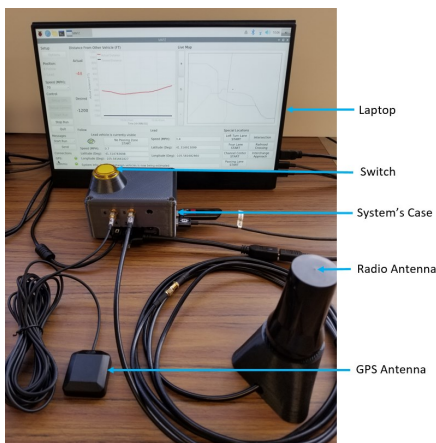
CONTINUED: Apparatus for Passing and No-Passing Zones



Range Tracker System.

WYDOT is establishing no-passing zones across the state. This is not only attributed to the construction of new two-lane roads but also to changes in speed limits, development of sight obstructions, roadway realignments, accidents and complaints from citizens. With the new NPZS, WYDOT will be able to evaluate their existing zone striping plans, continuously re-establish accurate plans and relieve itself from liability in case passing related accidents occur due to inadequate PSDs. In addition, other jurisdictions in the state such as counties can utilize the newly develop NPZS on their network.

We've developed our first version of the NPZS, which includes the GPS devices, the radio communication devices, the laptops, with touchscreens, and the switch.



No-Passing Zone System's critical components.

It took months of development and hard work to design the NPZS such that communication between both vehicles is not affected by humidity. We've also ensured that lapses in data collection do not occur as was the case of a research team in Missouri.

The NPZS is used to collect the GPS coordinates data, no-passing zone endpoints data and timestamp data

in real-time. The radio communication devices, installed in both vehicles, are used to exchange the data between them. Also, an algorithm was implemented to accurately compute that gap distance between both vehicles using the timestamp and GPS data. Both vehicles' speeds are also computed. The software was designed to display the data via a Graphical User Interface (GUI). It features an array of buttons. One allows the user to select whether he or she is operating the lead vehicle or the following vehicle. Another is a drop-down button with a list of speed limits. Once the speed limit is selected, the software automatically sets the desired gap distance between both vehicles. More importantly, a button is featured to signal whether the lead vehicle is visible or not. This is to designate the no-passing zone terminal points. Either way, the GUI displays the status of the lead vehicle's visibility (visible versus not visible).

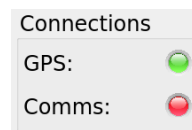
Lead vehicle is currently NOT visible



No Passing Zone
END

Real-time display of lead vehicle visibility status.

We've also installed another switch on the system's case that fulfills the same function as the button. It is provided to alleviate the burden on the operator. Instead of having to look at the screen and push the button, the operator may instantly operate the switch and thus reduce the delay in signaling the no-passing zone's terminal point. Other buttons included are those that are used to initiate the GPS data collection and communication devices. Both have color coded schemes that indicate whether they are functioning well or not.

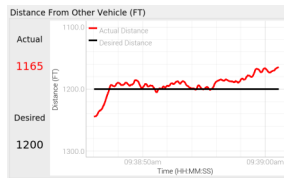


Global Positioning System and radio communication status indicators.

In addition, we've incorporated Wyoming's road map

CONTINUED: Apparatus for Passing and No-Passing Zones

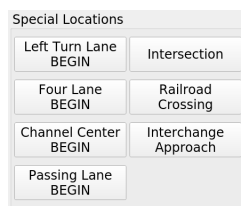
shapefiles, each of which represents one of the state's districts. A live map is incorporated to plot the locations of the no-passing zones. The GUI also includes displays of both vehicles' speeds and a chart depicting the comparison between the computed distance between both vehicles and the desired distance in real-time.



Computed and desired gap distances between both vehicles.

When it comes to adjusting vehicle speeds, we used the vehicles' cruise controls and ensured that the lead vehicle traveled at the speed limit while the following vehicle would adjust its speed to maintain the desired gap distance.

It should be noted that the PSD is not the only criteria demarcating no-passing zones. Locations such as intersections, two-way left-turn lanes, transitions into/out of four-lane highways, passing lanes, railroad crossings and interchange approaches warrant the striping of no-passing zones. For those locations, we've incorporated special buttons marking their coordinates on the map.



Buttons for marking no-passing zones at special locations.

Since a considerable proportion of Wyoming's two-lane roads are situated within areas with no network coverage, we've included a special button with a drop-down list of prescribed messages for the operators to communicate with each other. Such messages include "stop run" and "pull over" to name a few. Finally, the live map may be saved in either shapefile or KML format for post processing.

We've demonstrated our NPZS on Happy Jack Road (WY-210), which is characterized by hilly terrain and horizontal curves that restrict the PSD, to WYDOT personnel to receive their feedback in addition to testing it along US 287 and Snowy Range Road (WY-130). WYDOT traffic engineers were impressed by the NPZS and provided their suggestions. The most important one was to convert the GPS coordinates to road and milepost information. Another was to take into account the minimum lengths of passing zones. That is, designated passing zones that were shorter than their minimum lengths as per the WYDOT Traffic Program should automatically be marked as no-passing zones in our software. We've addressed their concerns and delivered our NPZS to them for official use. After utilizing it for a few months, they commented that they are happy to have it. By the same token, we were told that they will soon provide us additional feedback since we will retrieve the system, upgrade it and deliver it to them once more.

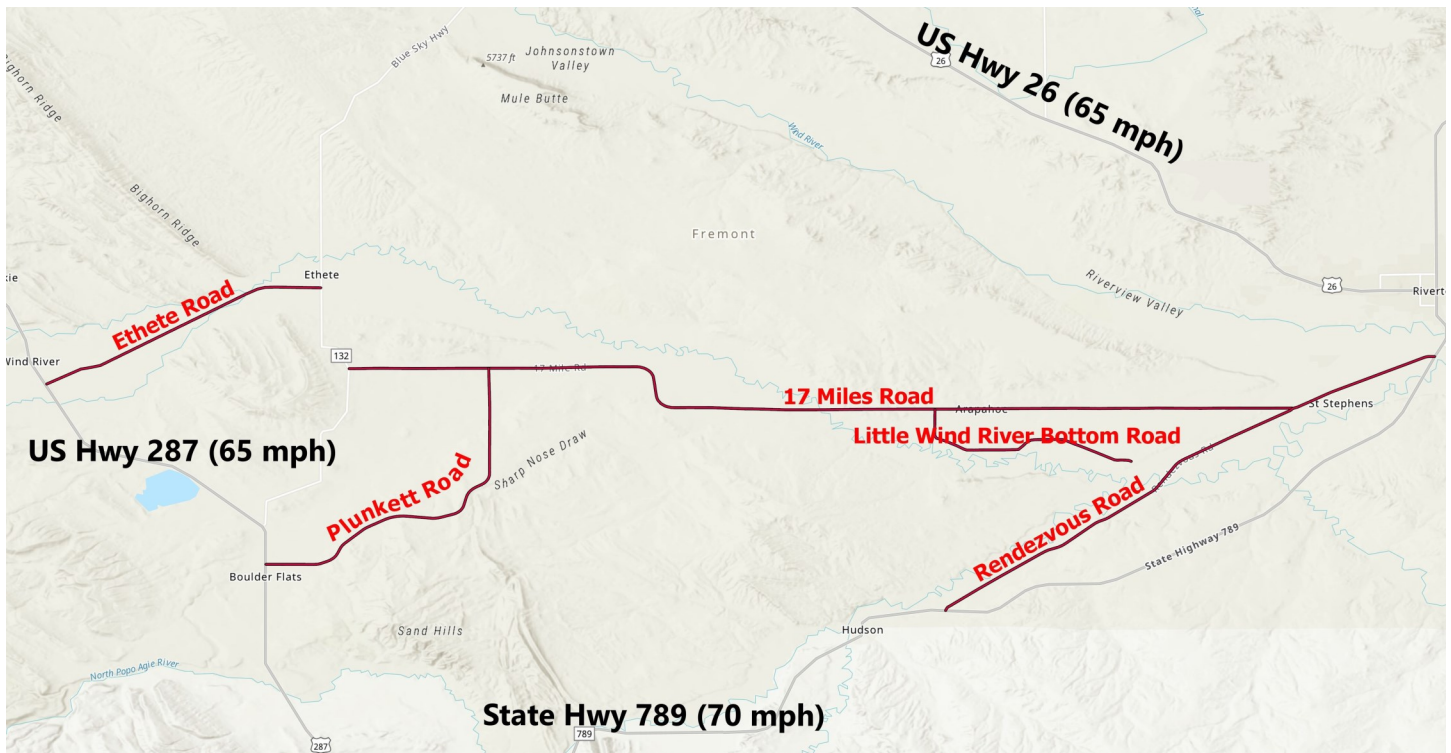
The next phase of the project involves developing another prototype of the apparatus with cutting-edge equipment. It will be designed to automate the switch's functions, namely the signaling of the boundary points of the no-passing zones. This will require video cameras with machine vision systems installed in the following vehicle. The project is a technology transfer agreement between us and WYDOT. The outcome of the project is a package of two patented state-of-the-art no-passing zone systems belonging to WYDOT. The systems are beneficial for not only WYDOT but also local jurisdictions in the state, such as counties and the Wind River Indian Reservation. Any county in Wyoming that plans to conduct two-lane highway passing and no-passing zone studies, whether to evaluate existing zone markings or stripe new markings, will have access to either NPZS.

The Wyoming Technology Transfer Center would like to thank Ryan Shields, Joel Meena and Jeffery Mellor of WYDOT for funding this study and providing the technical information to develop the NPZS.

Managing Speed to Create Safer Tribal Roads on the Wind River Indian Reservation

By: Austin Woody & Ahmed Farid

Over the summer of 2020 the Wyoming T2 received a request from the Northern Arapahoe and Eastern Shoshone Tribes to assist on spot speed limit studies for five different paved tribal roads on the Wind River Indian Reservation. These roads include: 17 Mile Road, Rendezvous Road, Little Wind River Bottom Road, Plunkett Road and Ethete Road. These roads range from some of the most heavily traveled routes on the Wind River Reservation (Rendezvous and 17 Mile Roads), to low-volume rural roads (Little Wind River Bottom Road).



These spot speed limit studies help transportation authorities establish legal speed limits by collecting data relating to average daily traffic, average daily truck traffic, free-flow traffic speed, route signage, appropriate speeds for curves, intersections, adjacent land use, accident history and any other relevant information relating to the safety of the road in question. These data are compiled into an easily digestible report which includes photographs and GIS maps identifying specific locations and concerns. These studies recommend a 10 mph range of appropriate speed limits, allowing local government and transportation officials to make the final decision of what the posted speed limit will be.

The Tribal Transportation Authority was hoping to address several different speed-related issues with these studies. On the busier thoroughfare routes, such as 17 Mile, Ethete and Rendezvous Roads, there are currently posted speed limits of 55 mph on free-flow rural sections of the routes. US Highway 287 and State Highway 789 are adjacent to, and connect, several of the tribal routes in these studies. These state and federal roads have posted speed limits of 65mph and 70 mph. It appears that this inconsistency in speed limits may contribute to the high numbers of speeding drivers on the tribal roads. As per preliminary

CONTINUED: Speed Management on Tribal Roads

analyses of our studies, on average, 85% of the drivers traversing the tribal roads in this study exceeded the posted speed limits by almost 10 miles per hour. This data suggests that traffic is travelling at highly differential speeds on these tribal routes, creating dangerous situations such as increased rates of passing. Hence, one goal of these speed studies was to process the collected speed data and suggest appropriate speed limits which may be more consistent with surrounding roads.

Two of the roads included in these studies provide access to public schools and include school speed zones along the routes. At its eastern end, Little Wind River Bottom Road provides access to the Arapahoe School, and Ethete Road provides primary access to the For Washakie school. School zones are areas of critical concern in transportation safety, and these studies help the Tribes to ensure strict adherence to statutes and design standards relating to school zone safety.



Additionally, these speed studies assisted the Tribes in establishing a speed limit on Little Wind River Bottom for the first time. With the exception of the Arapahoe School at the eastern end of the route, this very low-volume rural route provides access to several homes and farmyards along its length. The school zone has a posted speed limit of 20 mph, but the remainder of the route lacked a posted speed limit. Providing a detailed summary of conditions and traffic along this road provides the Tribes with the information needed to determine an appropriate speed limit for the route.

As this collaborative project between the Wyoming T2 Center and the Wind River Indian Reservation demonstrates, there are many instances when appropriate speed limits must be considered on a system-wide basis in order to ensure consistency in the establishment of speed limits. The speed studies resulted in speed limits that are more consistent with other roads in the same geographical area. This project also shows how speed limit studies can assist transportation managers to address a variety of issues on their road systems. The Wyoming T2 Center is available upon request to assist other local road officials throughout the state with this technical assistance.

Winter Road Safety & Checklist

Before You Drive

Before driving your vehicle in winter months, you want to make sure that your vehicle is prepared for travel. Scrape/brush all ice and snow off of your vehicle. Frequently check tire pressure, keep your fuel tank full, and check windshield wiper blades work and have fluid. Clean off the snow from the bottom of your shoes before you begin to drive to ensure your foot will not slip when accelerating or breaking. Keep car lights free of snow and ice and use low beams when driving in snow.

Call 511

For updates on weather conditions affecting travel, you can call the number 511 for accurate information on road closures. If you want to call the hotline from outside the state of Wyoming you can call (888) 996-7623.

You can download the 511 app in the Apple Store or Google Play, which gives updated travel information, maps and photos of the road conditions.

<https://apps.apple.com/us/app/wyoming-511/id107>



Wyoming 511

You also have the option to sign up for email and text notifications about road closures and other highway information by signing up at <https://www.wyroad.info/511/511announcement.html>

Road Closures

Law enforcement may close roads if they are unsafe for travel. This could be because of winter weather, high winds, snow on the road or due to car crashes. Watch for signs indicating where it is safe to drive. Driving on a closed road could result to a fine of up to \$750 and 30 days in jail.

Chain Laws in Wyoming

There are levels of restriction regarding the chain law for travel in Wyoming. Level 1 restrictions come into play when roads are hazardous. In level 1, only vehicles with tire changes, snow tires, all-wheel drive, or emergency vehicles are allowed to travel. If roads are considered extremely hazardous, a level 2 restriction will be in effect. Roads will only be accessible to drivers with tire chains, all-wheel drive with snow tires, or emergency vehicles.

Penalty for violating these chain laws could result in a fine from \$250-\$750.

Check off the items you already have and make a list of things you need to purchase:

	Already In My Car	Items To Get
Snow brush, small shovel & ice scraper	<input type="checkbox"/>	_____
Tire chains (good for icy roads)	<input type="checkbox"/>	_____
Blankets/sleeping bags	<input type="checkbox"/>	_____
Flashlights with batteries	<input type="checkbox"/>	_____
First aid kit	<input type="checkbox"/>	_____
Small bag of sand/kitty litter (provides traction if your car gets stuck)	<input type="checkbox"/>	_____
Non perishable food & water	<input type="checkbox"/>	_____
Jumper Cables	<input type="checkbox"/>	_____
Windshield Wiper Fluid	<input type="checkbox"/>	_____

Upcoming Workshops & Certification Courses

- ◆ **Asphalt I: December 9th -11th, 2020**
- ◆ **TLN Risk Management Webinar: December 9th, 2020**
- ◆ **Aggregate I: December 14th -16th, 2020**
- ◆ **Concrete II: January 6th -8th, 2021**
- ◆ **Aggregate II: January 11th -13th, 2021**
- ◆ **Asphalt II: January 13th -15th, 2021**
- ◆ **OSHA 10-Hour Training: January 26-27, 2021**
- ◆ **Asphalt Six-Part Webinar Series: Dates Coming Soon**

For more information and to register for upcoming workshops, please follow the link below.

<http://www.uwyo.edu/wyt2/workshops/index.html>

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