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**Certified Public Manager (CPM)
Project Analysis**



**South Carolina Work Zone Traffic Collisions
1997 - 2001**

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Annually traffic collisions in South Carolina claim approximately the same number of lives as homicide, suicide and HIV combined. Since the 1990s, traffic fatality rates have not improved as the state continues to rank among the worst in the nation. In 2001 there were approximately 1,060 persons killed. For the first time in state history, over 1,000 people died in traffic crashes four consecutive years. Statistics for 2002 through July 4th showed the state is on track for another 1,000 plus fatality year. This comes during a period when nationally traffic fatalities are leveling off and even declining in many states.

In addition to the high fatality statistics, approximately 50,000 persons are injured every year in South Carolina crashes. Several factors contribute to this high death and injury toll including: drivers who are impaired by alcohol or drugs, restraint usage rates that are too low, distraction by drivers and pedestrians, excessive speed and poorly maintained vehicles. One area of increasing concern is a category of crashes that occur in construction, maintenance or utility work areas. Nationally, approximately 2 percent of all traffic deaths occur in work zones and this has become a rapidly growing problem area. In the report, I will discuss various statistical analyses of these crashes.

The South Carolina Uniform Traffic Collision Report for 2001 has specific data elements that uniquely identify traffic collisions that take place in work zones. Work zone crashes are defined as any traffic crash reported via Form 310 that

the officer checks "yes" in "work zone yes/no" field will be used.

As indicated in Chart#1, in 2001 the number of work zone collisions appears to have increased significantly compared to prior years. However, this is primarily the result of the reporting revision made in 2001.

Table # 1: Work zone Crashes in South Carolina				
1997	1998	1999	2000	2001
711	677	889	946	1954

Trends

For the years 1997 through 2001, there were 5,177-reported work zone crashes in South Carolina. These crashes claimed 54 lives and caused 2,305 non-fatal injuries. In 2001, there were 1,954 collisions that occurred in a work zone. This number has double the report total for 2000 but is based on a different, but more comprehensive reporting methodology. In order to establish a trend, the data for years prior to 2001 will be used for this report. During 1997 through 2000, work zone crashes decreased in 1998 but then increased the next two years. The result is an increase of 33 percent between 1997 and 2000 and an even greater increase of 40 percent between 1998 and 2000. A great deal of this increase is due to an overall increase in work zone activity by the South Carolina Department Transportation's 27 in 7 construction program.

Table #2: Work zone Crashes in South Carolina				
1997	1998	1999	2000	2001
711	677	889	946	1954

5	8	9	10	22
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During the past five years, there were 54 work zone crash fatalities in South Carolina. For the years 1997-2000, the work zone fatality trend indicates a steady increase in work zone fatalities each year.

In 2001, there were 22 persons killed in work zone related traffic collisions. Of the 22, only one was a highway or utility construction/maintenance worker, the remaining 21 were driver's passengers (13), bicyclist (3), motorcyclist (3), and pedestrians (2) killed within the limits of the work zone. The 22 work zone fatalities represent approximately two percent of the 1,060 traffic fatalities that occurred in South Carolina in 2001.

Work Zone Crashes Probable Cause Summary

The primary probable cause for work zone crashes is driver distraction. The leading causes of work zone crashes are very similar to traffic crashes in general. Speeding and driving under the influence, is the primary causes of fatal work zone crashes.

Table #3: Work zone Crashes Leading Probable Causes						
Probable Cause	Type			Total	Person Killed	Persons Injured
	Fatal	Injury	Property Damage Only			
Driver Inattention	4	389	1,184	1,577	4	661
Driving Too Fast for Condition	11	185	430	626	12	293

Driver Failed to Yield Right of Way	2	195	514	711	2	390
Following Too Closely	0	107	296	403	0	161
Improper Lane Usage/Change	2	55	260	317	3	85
Driving Under the Influence	11	84	91	186	11	129
Other	21	372	964	1,357	22	586
Totals	51	1,387	3,739	5,177	54	2,305

Time of Day

After dark, work zone activity usually decreases significantly so the number of crashes involving work zones also drops off sharply during the nighttime hours. As indicated in Chart 4, the greatest number of work zone crashes occurred during the 3:01-6:00 p.m., afternoon rush, period with 1,323. The other daylight periods each had roughly half to three-fourths this total. The nighttime periods all had less than 30 percent of the 3:01-6:00 p.m. total with only 158 taking place during the early morning period, 3:01-6:00 a.m.

Time of day is a factor that South Carolina Department of Transportation will continue to examine as more and more projects include nighttime operations. Due to heavy daytime traffic, more night operations are being conducted. This is reflected in an increase in the percentage of work zone crashes that occur at night. In 1997, 22.4 of the work zone crashes occurred between 6:00 p.m. and 6:00 a.m. This increased to 29% by 2000, and decreased slightly to 26.1 in 2001.

Table # 4: Work Zone Crashes by Time of Day

12:01- 3am	3:01-6am	6:01-9am	9:01-noon	12:01-3pm	3:01-6pm
193	158	697	777	1029	1323

Days of the Week

During the past five years, 969 (18,7%) of the work zone crashes occurred on Friday. Saturday and Sunday had less than half the work zone crashes than Friday.

Saturday had the most work zone fatalities with 11. Friday and Sunday had 10 and 8 fatalities, respectively. Thursday, with 3, had the fewest.

Table #5: Work Zone Crashes by Days of the Week 1197-2001						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
416	814	822	801	826	969	829

Table # 6: Work Zone Fatalities by Days of the Week 1197-2001						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
8	9	6	7	3	10	11

Month

The month of October had the most work zone related crashes of any month during the past five years with 559. August was the second month with 488. February had the fewest with only 324, more than 40% below the October total. Weather considerations probably play a major role in this distribution with the relative long days and moderate weather providing construction workers plenty

opportunities to perform highway and utility work during the month of October. The winter months of January and February have short days and usually cold weather, which reduces the quantity of work zone activity. July had the least amount of work zone crashes. Perhaps this reflects problems related with work during the extremely hot summer months in South Carolina.

Table #7: Work Zone Crashes by Month 1997 - 2001

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
331	324	397	433	664	469	386	488	462	559	451	413

Weather

Overall, traffic crashes tend to occur more frequently during clear weather than during inclement weather. This is simply because of the greater amount of hours when the weather is clear. This is especially true during the drought conditions experienced in South Carolina throughout the past five years. During the past five years, 85% of all traffic crashes transpired during clear or cloudy weather conditions. During the same time frame, 491 (9.5%) of the 5,177 work zone crashes occurred during rainy weather and only 7 during snowy conditions. The figures below reflect the significant reduction of work zone activity during inclement weather.

Table # 8: Work Zone Crashes by Weather Condition

Clear	Rainy	Cloudy	Others*
4,130	491	509	47
* Snow, Sleet, Fog/Smog/Smoke and Severe Crosswinds			

Route Category

US primary routes were the leading route category for work zone crashes during the past five years with 1,411. This was followed closely by the Interstates with 1,279. For crashes in general, interstates have less than half the number of collisions than the US primary routes and less than a third of the number on secondary routes. The high proportion of work zone crashes on interstates indicates a heavy work zone presence on the interstates compared to other route category types as well as higher traffic volumes.

Because of higher travel speeds, interstate work zone crashes are also likely to be more severe. More than one third of all work zone fatalities (19) occurred on the interstates, the leading route category for person killed. South Carolina primary routes were second with 15 fatalities, followed by US primaries and South Carolina secondaries, with 9 each. The high interstate total again reflects the large number of construction projects on these routes.

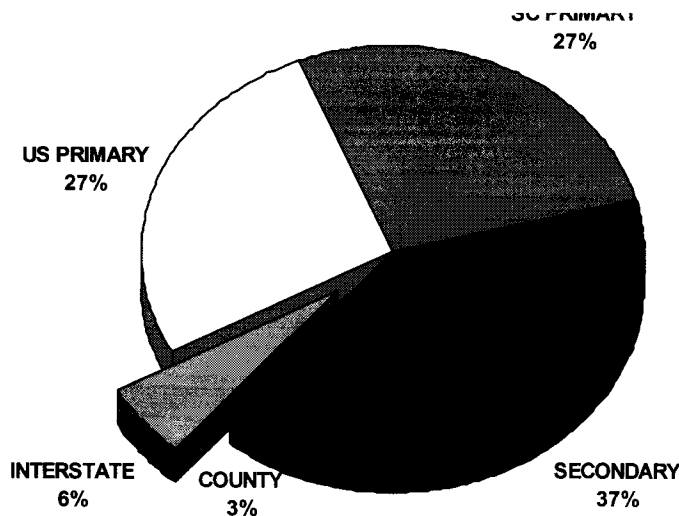


Table #9: Work Zone Crashes by Route Category				
Interstate	US Primary	SC Primary	Secondary	Other
1379	1411	1116	1071	200

Table #10: Work Zone Fatalities by Route Category				
Interstate	US Primary	SC Primary	Secondary	Other
19	9	15	9	2

County Summary

Over the past five years, Greenville County had the most work zone related traffic crashes of any county in South Carolina. During this period, there were 1,079 work zone crashes in Greenville compared to 515 for the number 2 ranked Spartanburg County. Anderson County ranked sixth with 258 work zone crashes. These three counties collective had over 35% of the work zone crashes in South Carolina.

Outside the Upstate, Charleston County had the most work zone crashes with 367. During the past five years, the large number of crashes in Greenville County attributed to the number of construction projects and a high volume of traffic.

Table #11: Top Counties for Work Zone Crashes					
Greenville	Spartanburg	Charleston	Horry	York	Anderson
1079	515	367	346	306	258

Driver Summary

From 1997 – 2001, there were 10,240 vehicles and pedestrians involved in the 5,177 work zone collisions. Male drivers accounted for 6,068 and female drivers accounted for 3,838 of the work collisions. The remaining 334 were not specified by gender.

Table #12: Driver/Pedestrian Gender – Work Zone Crashes		
Male	Female	Not Specified
59.3%	37.5%	3.3%

The leading age group for drivers involved in work zone crashes was in the age range of 20-29 years old. There were approximately 2,511 drivers in this age group accounting for more than ¼ of all drivers involved in these crashes.

Through the age of 70, the number of drivers involved in these crashes declined with each age group. There were 443 drivers age 70 and above involved in work zone crashes.

Table #13: Age of Drivers in Work Zone Crashes						
Under 20	20-29	30-39	40-49	50-59	60-69	70+
1146	2511	2202	1761	1195	611	443

Table #14: Victim Profile						
Gender	Not Injured	Possible Injury	Non-Incapacitating Injury	Incapacitating Injury	Fatality	Total
Male	6,823	724	309	126	42	8,024
Female	4,834	839	225	83	12	5,993
Not Specified	141	1	0	0	0	142
Total	11,798	1,564	534	209	54	14,159

As indicated in Table 14, there were 14,159 "victims" of work zone crashes from 1997 – 2001. Of the 14,159 victims, 11,798 were not seriously injured. The remainder sustained injuries of varying degrees as follows: 1,564 possible injuries (724 males, 839 females, 1 not specified); 534 non-incapacitating injuries (309 males, 225 females); 209 incapacitating injuries (126 males, 83 females); and 54 fatalities (42 males, 12 females).

Table #15: Age of Fatalities in Work Zone Crashes						
Under 20	20-29	30-39	40-49	50-59	60-69	70+
6	10	16	9	7	4	2

Table 15 shows the age breakdown of the fatality victims. The leading age group is 30-39 with 16 fatalities. Only 6 of the fatality victims were under age 20.

During the past 5 years, 54 people were killed in work zone crashes, 33 were drivers of a four or more wheeled motor vehicle; 8 were pedestrians; 4 were on a motorcycle; 2 were on a bicycle; 4 were front seat passengers of a four or more wheeled motor vehicle; 1 was a rear seat passenger, and 2 were in a sleeper berth.

Restraint Usage

Of the 40 occupant fatalities of 4-wheeled motor vehicles, 12 were restrained by a seat belt or shoulder harness, 25 were unbelted and for the remaining 3 restraints usage was specified.

In 2001, three new work zone related data elements were added to the Uniform Traffic Collision Report, Form TR310. These include: (1) the type of work zone involved, (2) where within the work zone the collision occurred and (3) whether workers were present at the time of the collision. These fields are designed to give a more descriptive picture of work zone crashes.

Table #16: Type of Work Zone						
Work Zone Type	Fatal Collisions	Injury Collisions	Damage Only Collisions	Total Collisions	Persons Killed	Persons Injured
Shoulder/Median Work	5	249	669	923	6	402

Lane Shift/Crossover	3	39	116	158	4	75
Intermittent Moving Work	0	79	183	262	0	113
Lane Closure	4	72	183	259	4	98
Other	8	107	237	352	8	198
Totals	20	546	1,388	1,954	22	886

In 2001, shoulder/median work accounted for nearly half of the work zone crashes in the state as indicated in Table 16. The major category for work zone fatalities was "other" which includes any type of construction or maintenance work not captured in one of the other categories.

Workers were "present" in 688 or 35% of the work zone related crashes and 8 (36%) of the work zone fatalities.

Location	Fatal Collisions	Injury Collisions	Damage Only Collisions	Total Collisions	Persons Killed	Persons Injured
Before 1 st Sign	1	20	40	61	1	49
Advanced Warning Area	3	61	151	215	3	120
Transition Area	4	99	215	318	5	144
Activity Area	10	335	927	1,272	11	529
Termination Area	2	31	55	88	2	44
Totals	20	546	1,388	1,954	22	886

The next area in the work zone is the transition area with 318 crashes

representing approximately 1/6 of the total. Five people were killed in the transition area.

National Statistics

Nationally, there were 1,026 fatalities in construction, maintenance or utility work zones in 2000. Of the 1,026, South Carolina had 23 fatalities.

Table #18: Fatalities in Work Zone Crashes (Nationally)				
1996	1997	1998	1999	2000
717	693	681	872	1026

In 1998, there were 681 fatalities in work zones. Within 2 years, 1,026 deaths represents a better than 50 percent increase in fatalities.

Conclusion/Recommendation

During daylight hours, the typical work zone crash involves a young, male driver in clear weather during the weekday. The Upstate has been hard-hit by work zone crashes with three counties, Greenville, Spartanburg and Anderson, accounting for 35% of the total fatalities during the past five years. During the past five years, the emphasis has been in Greenville County. As work activity moves from one part of the state to another, so will the various pattern of

crashes. Alcohol and other drugs is a problem in the work zones ranking it the number 6 probable cause in work zone crashes overall and tied for first in fatal crashes.

Approximately two percent of South Caroline's traffic crashes and fatalities occur in work zones. The increase in work zone related crashes reflects the increase in activity related to both construction and maintenance work on our highway projects. Given the history of our roads, a considerable amount of work is required to maintain them in safe condition. As a result of this increased highway activities, it is important to maintain the most driver friendly operating environment for the welfare of both the motorists and the workers in those areas.

Recommend the agency continue applying for federal work zone grants to fund various work zone actives. The agency should continue to train employees and educate the public through television commercials, radio ads and billboards advertisements, statewide school education briefings and mandatory workplace training for the private and public sector.

“Let'em work. Let'em live.”

The South Carolina Department of Transportation, Safety Office, 955 Park Street, Columbia, SC provided the statistics for this project.