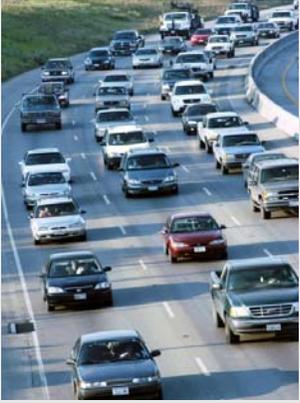


 TEXAS DEPARTMENT OF TRANSPORTATION



WORK ZONE SAFETY

Tracy D. Cain, P.E.
Construction Division Director



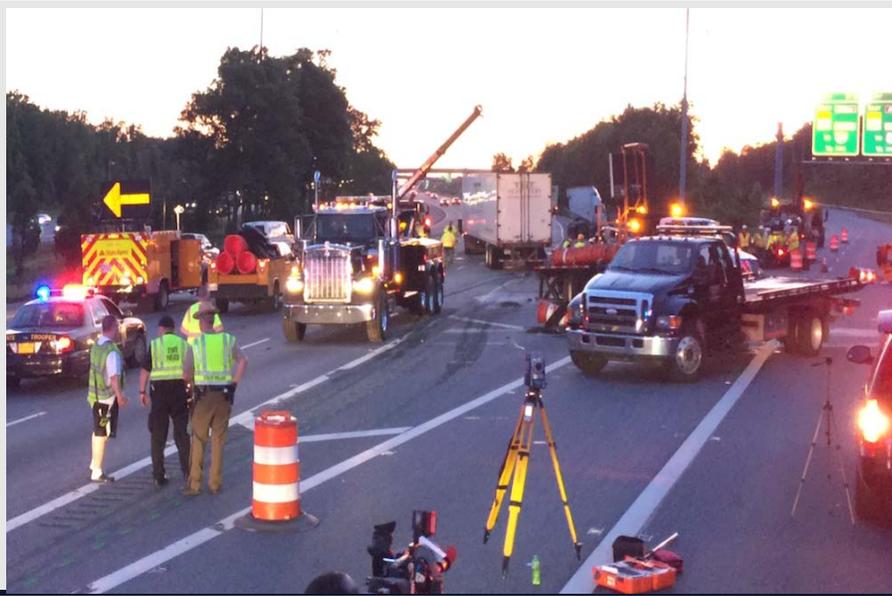
April 2016

Major Delays





Crash Scene Investigation – Fatality



3

Stated Mission

Provide Safe and Reliable
Transportation Solutions

4

Two Safety Initiatives at TxDOT

Temporary Rumble Strips & Safety Contingency in Projects

5

What are Temporary Rumble Strips?

- Creates similar effect as standard edge/center line rumble stripes
 - Driver will feel & hear the bumps
- Portable (no glue or nails)
- Placed in accordance with TxDOT standard WZ(RS)-13
- Currently only approved strip is *RoadQuake 2* by Plastic Safety Systems, Inc.



6

What are Temporary Rumble Strips?



7

Why are they needed?



To ensure drivers are aware of upcoming work zones in order to protect the workers and drivers

8

Why are they needed?

Distracted Drivers

Visual



Manual



Cognitive



9

Why are they needed?

Tired Eyes

Sleepy

Inattentive



10

Why are they needed?

Additional method to warn and protect motorists

11

TxDOT Standard WZ(RS)-12

MEMORANDUM

TO: District Engineers **DATE:** November 12, 2012

FROM: Carol T. Rawson, P.E., Director
Traffic Operations Division

SUBJECT: Work Zone Temporary Rumble Strip Standard Sheet

The Traffic Operations Division has developed the Work Zone Temporary Rumble Strip standard sheet, WZ(RS)-12, for use on temporary lane closures to enhance safety. Temporary rumble strips are to be used on:

- one-lane, two-way flagging operations with a posted speed limit of 70 mph or less
- lane closures on conventional highways with a posted speed limit of 70 mph or less

If Portable Traffic Signals or Automated Flagging Assistance Devices are used in lieu of flaggers for lane closures, this standard sheet also applies.

This standard sheet is required for Construction and Maintenance list projects that meet either of the conditions listed above starting with the May 2013 letting.

The temporary rumble strip standard sheet is to be used immediately by district maintenance crews as soon as the rumble strips become available in the warehouse.

The General Services Division (GSD) has placed a one-time purchase order for the temporary rumble strips and they will be stocked at the Athens and Seguin distribution centers. Attached is a list with the total number of complete sets that has been ordered for each district. Each complete set will comprise of 36 temporary rumble units. A strip is made of 3 units. An array will have 3 strips (9 units). Four arrays will make a complete set of temporary rumble strips. GSD has also ordered 2 "RUMBLE STRIPS AHEAD" signs and portable sign stands for each complete set of rumble strips.

Began with May 2013 Let
Construction and Maintenance project

12

Revised WZ(RS) - 14 Standard Sheet

- New Standard outlines the use of Temporary Rumble Strips
- Standard allows for some TRS to be optional
- Approved for 75 mph or less
- Began with May 2013 Letting

TABLE 1		
Flagger to Flagger (Length of Work Area)	ADT	# of Rumble Strip Arrays
1/8 Mile	< 4,500	1
	≥ 4,500	2
1/4 Mile	< 3,500	1
	≥ 3,500	2
1/2 Mile	< 2,600	1
	≥ 2,600	2
1 Mile	< 1,600	1
	≥ 1,600	2
> 1 Mile	N/A	2

5. Temporary Rumble Strips should not be used on horizontal curves, loose gravel, soft or bleeding asphalt, heavily rutted pavements or unpaved surfaces.

TxDOT Standard WZ(RS)-14

Understanding the Terminology

WZ(RS-1b)-14 1 Complete Set = 3 Arrays = 9 Strips = 27 Units

The diagram illustrates the terminology for rumble strips. It shows a road cross-section with a 'Complete Set' of rumble strips. A green box highlights one 'Array' (three strips). A bracket groups three arrays as one 'Strip'. A further bracket groups three strips as one 'Unit'. An arrow points to a single 'Unit'.

TxDOT Standard WZ(RS)-14

When should a project use temporary rumble strips?

Current Requirement	Optional
<ul style="list-style-type: none"> ▪ One-Lane, Two Way flagging** operation with a posted speed of 75 MPH or less ▪ Lane closures** on a road or highway with a posted speed limit of 75 MPH or less <p>**NOTE: Includes Portable Traffic Signals and Automated Flagging Devices</p>	<ul style="list-style-type: none"> ▪ Freeways ▪ Expressways

15

What We've Learned

Do not place on:

- Horizontal Curves
- Fresh Seal Coat Jobs
- Bleeding Asphalt
- Soft Pavement
- Heavily Rutted Roads




16

What We've Learned

Installation Issues

- Must install properly to be effective and remain in place
- Potential noise complaints
- Weight



17

Safety Contingency

- Webster's Dictionary defines "contingency" as "an event that may but is not certain to occur."
- The Safety Contingency is an amount included in the construction budget to cover the cost of possible enhancements in work zone safety.

18

Establishing The Safety Contingency In Projects

- Needs to be included on all contracts
 - Document reason if not included in a project
- Add it to the Engineer's Estimate as a Contractor Force Account
- Estimate the total amount
 - 2% to 5% Engineer's Estimate
- 9606-2056, Force Account – Safety Contingency (Unit=DOL)

19

How Can It Be Used

- Portable changeable message signs
 - Allows drivers to make informed travel choices
- Dynamic speed message signs
 - Speed reduction
- Drone Radar
 - Speed reduction for vehicles with radar detectors
- Uniformed Law Enforcement Officers
 - Deter speeding or aggressive driving and improve driver alertness
- Temporary rumble strips
 - Alert and re-focus distracted or drowsy drivers

20

How Can It Be Used

- Portable Traffic Signals
 - Removes human flaggers from dangerous roadside positions
- Automated flaggers Assistance Devices
 - Minimize flaggers' direct exposure to traffic
- Reduction of channelizing device spacing
 - Increase driver alertness and possible speed reduction by motorist
- Intrusion alarms
 - Warns work crew and errant vehicle drivers
- Directional Indicator Barricade
 - Directs drivers into the intended travel lane

21

How Can It Be Used

- Traffic or "Gawk" Screens
 - Used in California to block motorist's view of work activities
 - Discourage gawking
- Portable Concrete Traffic Barrier
- Temporary Movable ("Zipper") Barrier
- Additional Truck Mounted Attenuators

22

When to Address It

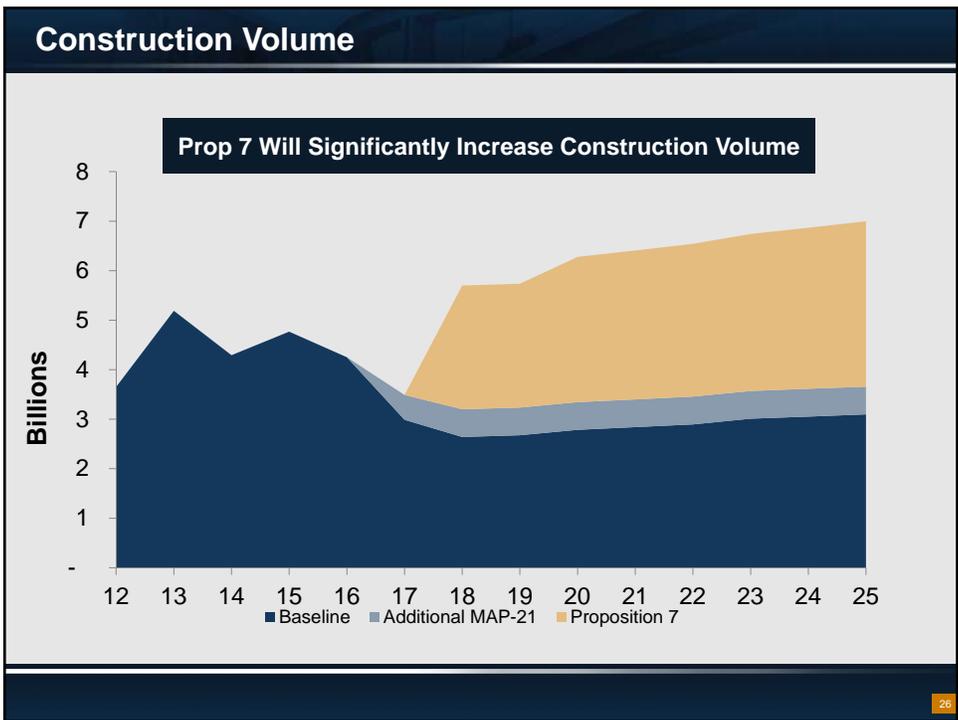
- Preconstruction Safety Meeting
 - TxDOT, prime contractor, subcontractors, utility companies, and law enforcement entities
 - Allows an opportunity to review the traffic control plan
 - Encourage ideas to make work zone traffic control more effective
 - Be open to ideas to enhance safety on project
- Regular scheduled safety meeting
- Contractor safety meeting (Daily/Weekly)

23

Benefits of Safety Contingency

- The Safety Contingency is a great tool to expedite the implementation of safety enhancements on our projects
- Funds are set aside for safety related project needs
 - Eliminates budgetary concerns
- Encourage new ideas
- Encourage new enhancements to traffic control

24



Standard

TABLE 1

Friction Coefficient	Length of Run (ft)	Rate of Friction
1/20	1,000	1
1/25	1,500	2
1/30	2,000	3
1/35	2,500	4
1/40	3,000	5
1/45	3,500	6
1/50	4,000	7
1/55	4,500	8
1/60	5,000	9
1/65	5,500	10
1/70	6,000	11
1/75	6,500	12
1/80	7,000	13
1/85	7,500	14
1/90	8,000	15
1/95	8,500	16
1/100	9,000	17
1/105	9,500	18
1/110	10,000	19
1/115	10,500	20
1/120	11,000	21
1/125	11,500	22
1/130	12,000	23
1/135	12,500	24
1/140	13,000	25
1/145	13,500	26
1/150	14,000	27
1/155	14,500	28
1/160	15,000	29
1/165	15,500	30
1/170	16,000	31
1/175	16,500	32
1/180	17,000	33
1/185	17,500	34
1/190	18,000	35
1/195	18,500	36
1/200	19,000	37
1/205	19,500	38
1/210	20,000	39
1/215	20,500	40
1/220	21,000	41
1/225	21,500	42
1/230	22,000	43
1/235	22,500	44
1/240	23,000	45
1/245	23,500	46
1/250	24,000	47
1/255	24,500	48
1/260	25,000	49
1/265	25,500	50
1/270	26,000	51
1/275	26,500	52
1/280	27,000	53
1/285	27,500	54
1/290	28,000	55
1/295	28,500	56
1/300	29,000	57
1/305	29,500	58
1/310	30,000	59
1/315	30,500	60
1/320	31,000	61
1/325	31,500	62
1/330	32,000	63
1/335	32,500	64
1/340	33,000	65
1/345	33,500	66
1/350	34,000	67
1/355	34,500	68
1/360	35,000	69
1/365	35,500	70
1/370	36,000	71
1/375	36,500	72
1/380	37,000	73
1/385	37,500	74
1/390	38,000	75
1/395	38,500	76
1/400	39,000	77
1/405	39,500	78
1/410	40,000	79
1/415	40,500	80
1/420	41,000	81
1/425	41,500	82
1/430	42,000	83
1/435	42,500	84
1/440	43,000	85
1/445	43,500	86
1/450	44,000	87
1/455	44,500	88
1/460	45,000	89
1/465	45,500	90
1/470	46,000	91
1/475	46,500	92
1/480	47,000	93
1/485	47,500	94
1/490	48,000	95
1/495	48,500	96
1/500	49,000	97
1/505	49,500	98
1/510	50,000	99
1/515	50,500	100

WZ (RS-1a)
75 mph or Less
RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION

WZ (RS-1b)
75 mph or Less
RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

1. RUMBLE STRIPS SHALL BE PLACED AT THE BEGINNING AND END OF EACH LANE CLOSURE AND AT THE BEGINNING AND END OF EACH LANE.
2. THE FIRST SET OF RUMBLE STRIPS SHALL BE PLACED AT THE BEGINNING OF THE LANE CLOSURE AND THE SECOND SET SHALL BE PLACED AT THE END OF THE LANE CLOSURE.
3. RUMBLE STRIPS SHALL BE PLACED AT THE BEGINNING AND END OF EACH LANE CLOSURE AND AT THE BEGINNING AND END OF EACH LANE.
4. RUMBLE STRIPS SHALL BE PLACED AT THE BEGINNING AND END OF EACH LANE CLOSURE AND AT THE BEGINNING AND END OF EACH LANE.
5. RUMBLE STRIPS SHALL BE PLACED AT THE BEGINNING AND END OF EACH LANE CLOSURE AND AT THE BEGINNING AND END OF EACH LANE.
6. RUMBLE STRIPS SHALL BE PLACED AT THE BEGINNING AND END OF EACH LANE CLOSURE AND AT THE BEGINNING AND END OF EACH LANE.
7. RUMBLE STRIPS SHALL BE PLACED AT THE BEGINNING AND END OF EACH LANE CLOSURE AND AT THE BEGINNING AND END OF EACH LANE.
8. RUMBLE STRIPS SHALL BE PLACED AT THE BEGINNING AND END OF EACH LANE CLOSURE AND AT THE BEGINNING AND END OF EACH LANE.
9. RUMBLE STRIPS SHALL BE PLACED AT THE BEGINNING AND END OF EACH LANE CLOSURE AND AT THE BEGINNING AND END OF EACH LANE.
10. RUMBLE STRIPS SHALL BE PLACED AT THE BEGINNING AND END OF EACH LANE CLOSURE AND AT THE BEGINNING AND END OF EACH LANE.

TEMPORARY RUMBLE STRIPS

WZ (RS) - 1.4

Material	Quantity	Unit
WZ (RS) - 1.4		