



2011 Construction Work Zone Safety Audit Tour Summary Report



Oregon Department of Transportation
Technical Services
Traffic-Roadway Section
Traffic Control Plans Unit

http://www.oregon.gov/ODOT/HWY/TS/traffic_control_plans.shtml



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INTRODUCTION

As part of the statewide Temporary Traffic Control Program, the Traffic Control Plan (TCP) Unit conducts several, multi-day construction Work Zone Safety Audit Tours across the State each year. The 2011 safety audit tour audited forty-three highway construction work zones.

The 2011 construction season provided a wide variety of work zones to review. Projects ranged from multi-million dollar modernization projects on I-5 to smaller projects on low-volume, secondary State highways. Projects also ranged from one or more years, to projects completed in a matter of weeks.

Participants were asked to score the work zones on a wide array of performance measures. Scores and comments are used to focus on and heighten awareness of the many standards, practices and procedures used in the design and implementation of ODOT's Traffic Control Plans. This report provides feedback for statewide Traffic Control Plan Designers, ODOT engineering consultants and the Region Construction Project Management offices. ODOT has benefitted from the safety audit tours and has realized measurable improvements in the discipline of temporary traffic control.

Objective

The purpose of the Work Zone Safety Audit Tours is to:

- Confirm ODOT Temporary Traffic Control Design Standards and Practices are being implemented in the field consistently and uniformly.
- Confirm that the latest Standards and Practices are effective at providing a satisfactory level of safety for the traveling public and construction workers.
- Reveal additional techniques or technologies needed to improve overall safety, traffic flow and construction efficiency.
- Strengthen communication and working relationships between ODOT design and construction staff, consultants, and contractor employees.

Methods

Since 2002, ODOT has been conducting detailed work zone reviews in an effort to strengthen the quality, efficiency and safety of its highway construction work zones. The 'Work Zone Safety Audit Tours' serve as a key element within the Agency's quality control and quality assurance programs. The Audits allow designers, Safety staff, project coordinators and Construction personnel the opportunity to observe strengths and weaknesses within this unique and dynamic discipline.

Each reviewer was asked to evaluate the condition and effectiveness of a variety of devices used within the work zone. Over 30 different "measures" are scored for each project visited. Scores are based on a scale of 1 (low) to 10 (high). A score of 4 or less warrants immediate contact with the ODOT Project Manager's office or an on-site agency representative to discuss the issue and possible mitigation strategies.



The *Work Zone Safety Audit Tour Evaluation Form (Figure 1)* is used by Reviewers on the tours to record scores, notes and comments for each project visited.

Work zone audits were conducted over four separate trips in July and August 2011:

- Region 1 (Portland metro area) night visit
- Regions 1 and 2 (north)
- Regions 2 (south) and 3
- Regions 4 and 5

Evaluation Forms were collected from 43 different construction projects, visited by 16 Reviewers, resulting in over 292 pages of scores and comments.

Not all 16 Reviewers we present for all 43 projects. On average, seven reviewers participated in each of the four work zone tours. An array of various reports can be generated from the same 292 pages of comments. If interested in any of these reports, please contact the Traffic Control Plans Unit in Salem.

This year:

- 43 projects were evaluated spanning all 5 Regions.
- 16 Reviewers helped evaluate the projects, including representatives from:
 - ◆ ODOT Construction Project Management and Inspection
 - ◆ ODOT Traffic-Roadway Section
 - ◆ ODOT Region Tech Centers - Design
 - ◆ ODOT Employee Safety
 - ◆ ODOT Transportation Safety Division—Safety Coordinators
 - ◆ Federal Highway Administration (FHWA)

Note: Measures are scored as applicable for each project. If a device or condition is not present on the project at the time of the visit, a score is not given for all applicable measures. For example, temporary concrete barrier may be included in the contract, but if not in use or located on the project site at the time of the visit, “Temporary Concrete Barrier” (and likely, “Temporary Impact Attenuators”) is not scored for that project.



Each project was evaluated using the following measures:

Temporary Signing – Overall quality, visibility, spacing, legibility, design and compliance.

- Condition
- Placement
- Spacing

Channelization Devices – Overall quality, condition, placement and effectiveness.

- Tubular Markers/Cones
- Drums
- Barricades

Pavement Markings & Markers – Overall quality, visibility and removal (of conflicting).

- Condition
- Placement

Temporary Concrete Barrier – Alignment, crashworthy installations and quality.

- Condition
- Placement

Reflective Barrier Panels – Condition, cleanliness, effectiveness and placement.

Temporary Impact Attenuators – Proper application, quality and maintenance.

- Condition
- Placement

Portable Changeable Message Signs – Good, effective messages.

- Message
- Placement
- Condition

Sequential Arrow Panels – Correct placement, application and quality of device.

- Placement
- Condition

Temporary Traffic Signals – Proper installation, operation, efficiency, maintenance.

- Set-up
- Condition

Bike/Ped/ADA Facilities – Compliance, details, signing, continuity and adequacy.

- Signing
- Continuous route
- ADA compliance

Similar details for Flaggers, Pilot Cars, Mobility and Worker safety apparel.



2011 WORK ZONE SAFETY AUDIT EVALUATION FORM

PROJECT NAME:				DATE:					
HIGHWAY:		MILEPOST:		REGION:		REVIEWED BY:			
PROJECT MANAGER:				OTHER CONTACTS:					
CONTRACTOR:				TCS					
GENERAL NOTES									
Only score Devices you witnessed on the Project. If a certain device was not present, do not score it.									
SCORING									
Notify PM or Field Project Representative!				BELOW AVG.	AVERAGE	ABOVE AVG.	GOOD	VERY GOOD	EXCELLENT
1	2	3	4	5	6	7	8	9	10
CATEGORIES				SCORE		NOTES			
TEMPORARY SIGNING <i>(Signs, Flags, Supports)</i>		QUALITY							
		PLACEMENT							
		SPACING							
CHANNELIZATION DEVICES <i>(Tubular Markers, Cones, Drums, Barricades)</i>		Tubes/Cones							
		DRUMS							
		BARRICADES							
PAVEMENT MARKINGS <i>(Paint, Tape, Reflective & Flexible Markers)</i>		CONDITION							
		PLACEMENT							
CONCRETE BARRIER <i>Reflective Barrier Panels? Y or N</i>		CONDITION							
		PLACEMENT							
		CONDITION							
IMPACT ATTENUATORS <i>(Drum Arrays, Narrow-Site & TMA)</i>		CONDITION							
		PLACEMENT							
PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS)		MESSAGE						Capture message if possible	
		PLACEMENT							
		CONDITION							
SEQUENTIAL ARROW PANEL <i>(Arrow Board)</i>		PLACEMENT							
		CONDITION							
TEMP. TRAFFIC SIGNALS		SET-UP							
		CONDITION							
BICYCLE, PEDESTRIAN & ADA FACILITIES <i>(Score if existing facilities affected by construction)</i>		SIGNING							
		Continuous Route?							
		ADA Compliance							
FLAGGERS		VISIBILITY							
		Performance							
PILOT CARS		Equipment							
		Performance							
MOBILITY <i>Time Stopped At Flagger or Signal (If applicable)</i> <i>Approx. Travel Speed thru the work zone?</i>		Overall Flow							
				<i>min</i>					
				<i>mph</i>					
WORKER GARMENTS & EQUIPMENT		GARMENTS							
		EQUIPMENT							
SITE HOUSEKEEPING		CLEAN, ORDERLY							
POLICE ENFORCEMENT		ON-SITE?		Y or N					
		PAYING OT?		Y or N					
DRIVER-FRIENDLY WORK ZONE		Ease of Navigation				This category for information only. Do not include in Page Total.			
		Consistency							
=				N *		FINAL SCORE			
GRAND TOTAL =				÷		=			
								* N = The Number of Scored Categories	

FIGURE 1—Work Zone Safety Audit Evaluation Form



RESULTS

OVERALL RESULTS

In the statistics that follow, approximately 6,000 scores from the 16 different participants were tabulated for the 43 projects. Project scores were combined and averaged based on the number of participants submitting an Evaluation Form. Overall average project scores were calculated for each Region and are compared to scores collected since 2002 (*Figures 3 through 7*). Average scores for individual projects were ranked in order of highest to lowest (see *Pages 10-14*).

WORK ZONE MEASURE SCORING SUMMARY

Figure 2 shows the statewide average score for each work zone performance measure. Figure 2 can be used to identify measures (devices, practices) needing additional attention at the design and/or implementation phase of the project. It also identifies measures that are meeting or exceeding road user's expectations.

Of the 31 measures, all but three received an average score above 6.70. Five of the measures received average scores above 7.00.

Measures that consistently received the lowest average scores for 2011 were:

Bicycle, Pedestrian & ADA Facilities –
ADA Compliance, **5.99**

Bicycle, Pedestrian and ADA Facilities –
Temporary Signing, **6.26**

Bicycle, Pedestrian & ADA Facilities –
Continuous Route, **6.34**

Measures that consistently received the highest average scores for 2011 were:

Portable Changeable Message Boards
– condition, **7.28**

Temp. Traffic Signal , Condition, **7.19**

Seq. Arrow Panel – Condition, **7.18**

Concrete Barrier – Condition, **7.17**

Temporary Signs – Quality, **7.16**

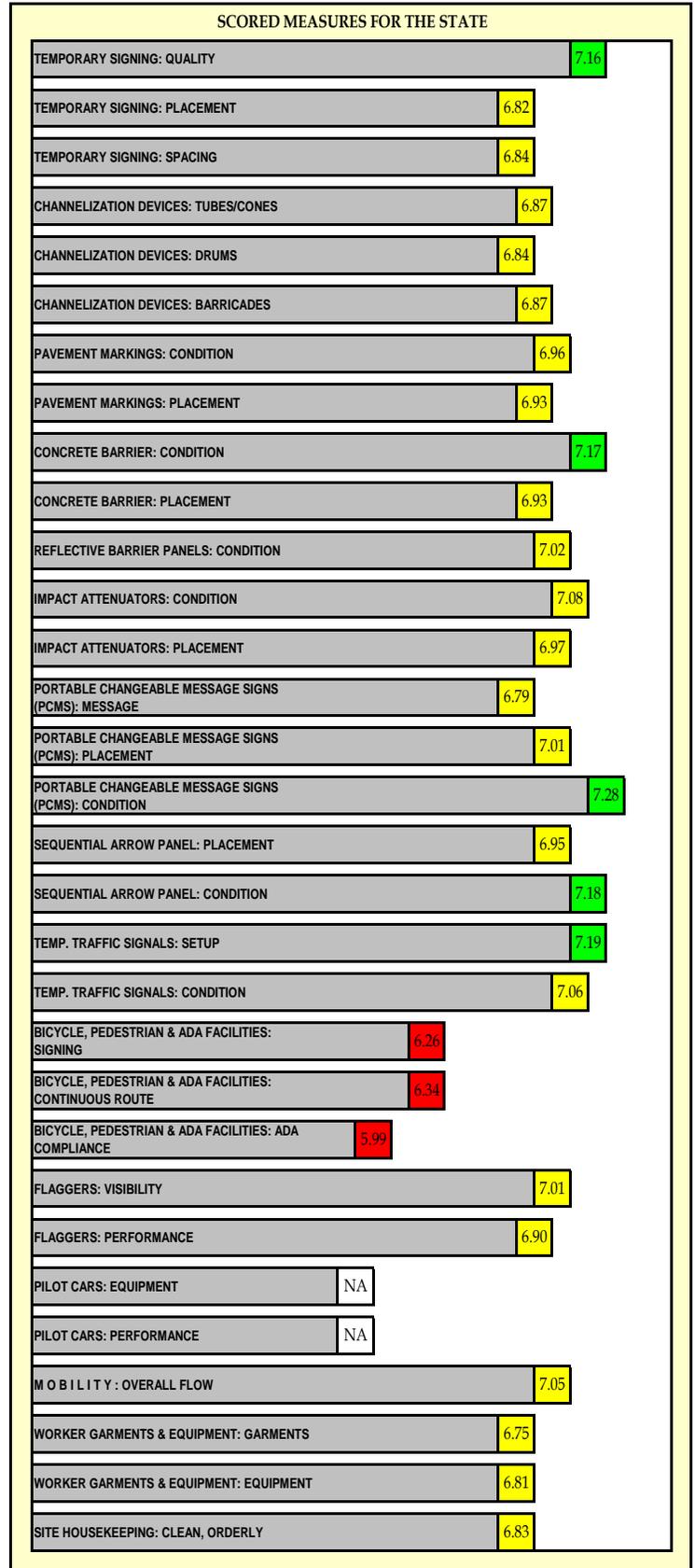


Figure 2 – Average Scores for Measures



STATEWIDE SCORING SUMMARY

The 2011 Work Zone Safety Audit tours reviewed 43 projects, a similar number of projects reviewed in three out of the last five years. The statewide average project score increased in 2011 from 2010, but is the second lowest average score recorded.

However, the average score of 6.9 out of 10 is rated above average based upon the tour scoring system. The above average rating confirms that the TCP Standards and Practices are mostly effective and being implemented a majority of the time.

During the Audits, a few isolated projects needed immediate attention to the traffic control plan. On-site Project Management and Inspection staff was prompt and cooperative in responding to needed or recommended improvements.

After processing over 6,000 individual scores for the 43 projects visited this year, the Measures scored during the tours were averaged and ranked – both statewide and for each Region: See Figures 3 through 6.

2011 WORK ZONE TOUR SUMMARY REPORT		SCORING STATISTICS by YEARS									
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	
TOTAL PROJECTS REVIEWED	22	29	46	54	43	38	43	60	42	43	
HIGH SCORE	89	82	87	82	81	81	94	88	74	75	
AVERAGE SCORE	72	73	73	71	71	75	77	76	67	69	
LOW SCORE	54	63	53	51	59	63	68	62	53	57	

Figure 3 – Annual Scores

REGIONAL SCORING SUMMARY

Three out of the five Regions had a significant increase in scoring, while the other two Regions had similar scoring compared to 2010. Regions 2, 3, and 5 experienced increases in the average projects scores (3-4%).

2011 WORK ZONE TOUR SUMMARY REPORT		REGIONAL YEARLY AVERAGE SCORING					
	AVERAGE SCORE					YEARLY AVERAGE	
	REG 1	REG 2	REG 3	REG 4	REG 5		
2002	69.3	61.3	75.5	76.3	76.2	71.7	
2003	77.7	72.5	72.8	74.0	70.4	73.5	
2004	72.8	72.0	72.3	74.5	75.7	73.5	
2005	73.9	70.9	70.0	69.9	72.0	71.3	
2006	75.6	68.1	70.3	66.7	71.9	70.5	
2007	76.7	74.8	72.8	74.8	73.5	74.5	
2008	82.0	74.0	75.0	78.0	77.0	77.2	
2009	74.3	78.4	75.7	73.8	73.6	75.6	
2010	68.1	67.2	66.1	68.4	64.6	66.8	
2011	68.0	70.2	70.2	68.1	68.0	69.3	

Figure 4 – Annual Scores by Region



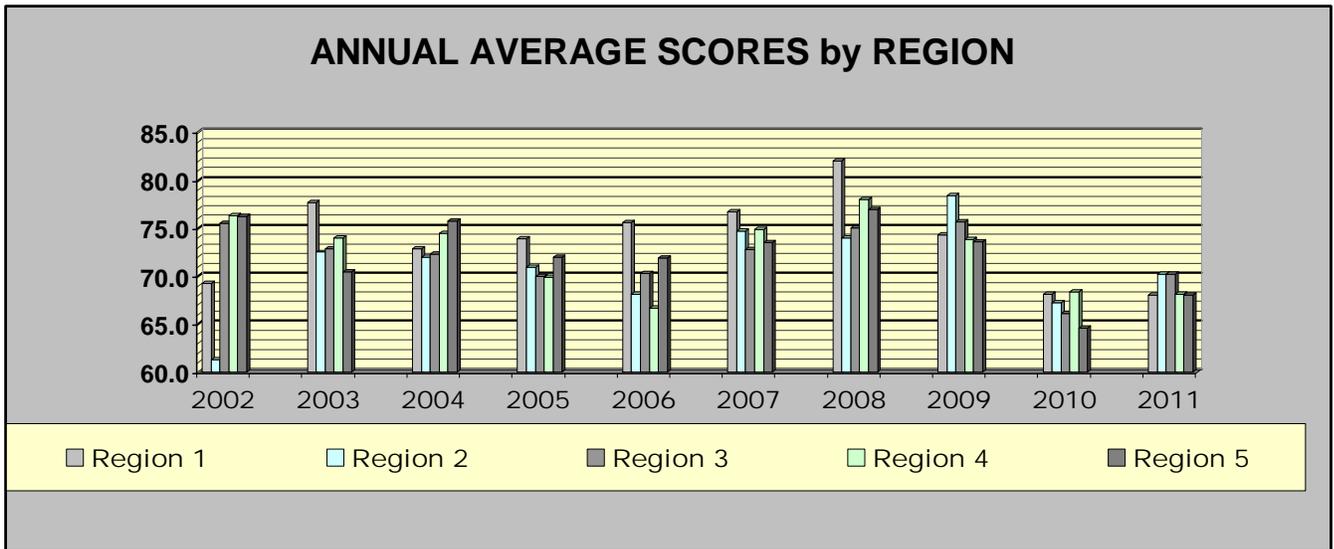


Figure 5 – Annual Scores by Region

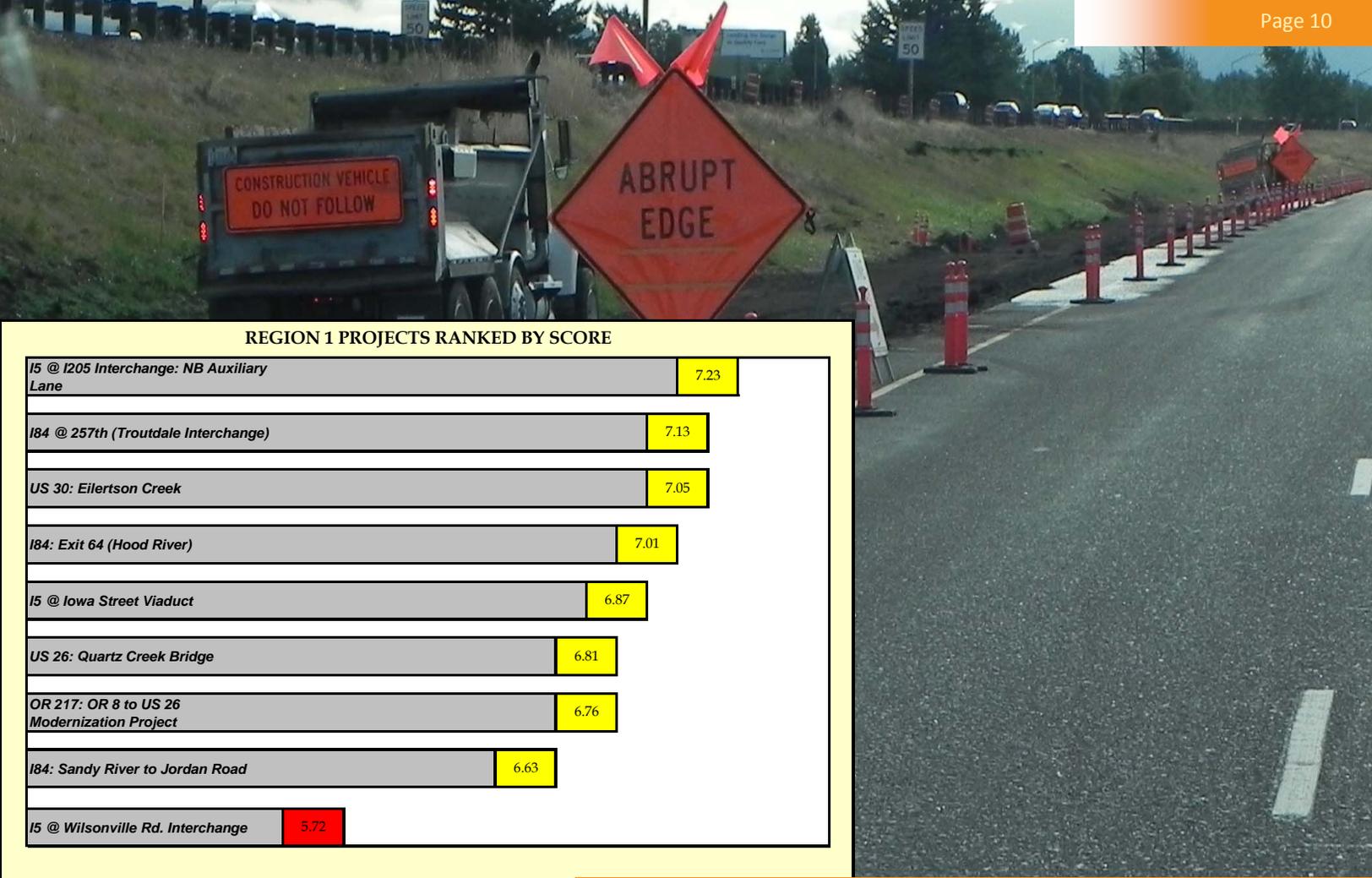
The average scoring between the different regions was very consistent with averages ranging from 6.79 to 7.02.

There was only one project where scores fell below 6 (“Average”). Overall, projects were given a score of “Average” or better. For 2011, average Region scores were closely grouped – varying between a low of 6.79 to a high score of 7.02 from Region 2 and 3. See Figure 6, below.

REGION	# of PROJECTS REVIEWED	AVG. SCORE
1	9	6.80
2	13	7.02
3	11	7.02
4	4	6.83
5	6	6.79

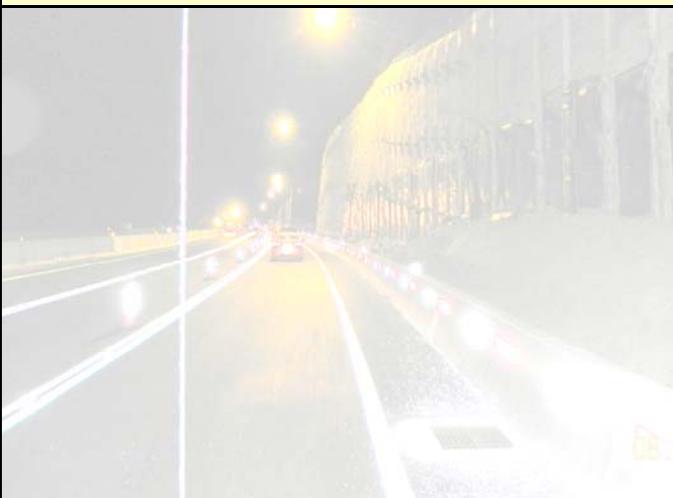
Figure 6 – Average Region Scores





REGION 1 PROJECTS RANKED BY SCORE

I5 @ I205 Interchange: NB Auxiliary Lane	7.23
I84 @ 257th (Troutdale Interchange)	7.13
US 30: Eilertson Creek	7.05
I84: Exit 64 (Hood River)	7.01
I5 @ Iowa Street Viaduct	6.87
US 26: Quartz Creek Bridge	6.81
OR 217: OR 8 to US 26 Modernization Project	6.76
I84: Sandy River to Jordan Road	6.63
I5 @ Wilsonville Rd. Interchange	5.72



REGION 1 MEASURE SCORES

SEQUENTIAL ARROW PANEL	7.13
PAVEMENT MARKINGS	7.08
PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS)	6.90
IMPACT ATTENUATORS	6.90
CONCRETE BARRIER	6.88
CHANNELIZATION DEVICES	6.69
TEMPORARY SIGNING	6.67
SITE HOUSEKEEPING	6.66
MOBILITY	6.65
TEMP. TRAFFIC SIGNALS	6.62
WORKER GARMENTS & EQUIPMENT	6.56
FLAGGERS	6.26
BICYCLE, PEDESTRIAN & ADA FACILITIES	6.19
PILOT CARS (NA)	--



Region 1

Region 1 TCP measure strengths include Pavement Markings and Concrete Barrier. Region 1 measure weaknesses were Temporary Signaling and Mobility. The two figures show individual Region 1 Project scores and measures sorted highest to lowest.

REGION 2 PROJECTS RANKED BY SCORE

OR 222: Willamette River (Jasper) Bridge	7.52
OR 164: Scravel Hill Road (Jefferson)	7.34
OR 200: South Fork Siuslaw River Bridge	7.20
OR 6: Slide Repair @ MP 6.2	7.19
OR 200: Territorial Highway @ Bear Creek Bridge	7.12
15: Willamette River - Martin Creek	7.03
OR 34: Roche Lane to Wilcott Road	7.01
OR 202: Nehalem R. (Bonzer) Bridge	6.99
US 101 : Columbia River (Astoria Megler) Bridge	6.86
OR 22: Willamette River. (Marion St) Bridge	6.84
US 26: Volmer Cr. And Johnson Cr. Bridges	6.84
US 101: Millport Slough Br. Replacement	6.75
OR 131: Happy Camp Slide	6.62



Region 2

Region 2 TCP measure strengths include Concrete Barrier, Flaggers and Impact Attenuators. Region 2 measure weaknesses were Sequential Arrow Panels and Channelization Devices. The two figures show individual Region 2 Project scores and measures sorted highest to lowest.

REGION 2 MEASURE SCORES

CONCRETE BARRIER	7.46
FLAGGERS	7.31
MOBILITY	7.23
IMPACT ATTENUATORS	7.21
TEMP. TRAFFIC SIGNALS	7.19
WORKER GARMENTS & EQUIPMENT	7.11
PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS)	7.10
TEMPORARY SIGNING	7.08
SEQUENTIAL ARROW PANEL	6.96
SITE HOUSEKEEPING	6.91
PAVEMENT MARKINGS	6.91
CHANNELIZATION DEVICES	6.86
BICYCLE, PEDESTRIAN & ADA FACILITIES	6.23
PILOT CARS (NA)	--



REGION 3 PROJECTS RANKED BY SCORE

US199: Dowell Road - Rogue Comm. College	7.51
US 101: Kobernik Slide Complex, Unit 1	7.41
US 101: Davis Slough - 2nd Street Paving (Bandon)	7.36
OR 138W: Dodge / Calapooia Creek Bridges	7.30
I5: Elkhead Road - Sutherlin Paving & Climbing Lanes	7.23
US 101: McCullough Bridge Rehab. (North Bend)	7.14
OR 66: Neil Creek Bridge	6.90
I5: Valley View Road (Exit 19) Interchange	6.77
OR 273: Dollarhide & Steinmann Bridges	6.75
I5: Del Rio Rd / Winchester Interchange	6.48
I5: Green Springs Highway (Exit 14) Interchange	6.40



Region 3

Region 3 TCP measure strengths include Temporary Signage and Channelization Devices. Region 3 measure weaknesses include Pavement Markings. The two figures show individual Region 3 Project scores and measures sorted highest to lowest.

REGION 3 MEASURE SCORES

PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS)	7.25
SEQUENTIAL ARROW PANEL	7.24
MOBILITY	7.22
TEMPORARY SIGNING	7.12
IMPACT ATTENUATORS	7.08
CHANNELIZATION DEVICES	7.07
TEMP. TRAFFIC SIGNALS	7.02
CONCRETE BARRIER	6.96
FLAGGERS	6.93
PAVEMENT MARKINGS	6.88
SITE HOUSEKEEPING	6.82
WORKER GARMENTS & EQUIPMENT	6.70
BICYCLE, PEDESTRIAN & ADA FACILITIES	6.30
PILOT CARS (NA)	--





REGION 4 PROJECTS RANKED BY SCORE

I84: Fifteen Mile Creek (Bundle 207)	6.95
US97: Lava Butte - South Century Drive	6.90
US97: Spanish Hollow Creek (Wasco)	6.81
US 97: OR31 Junction - Crescent Ranger Station	6.66



REGION 4 MEASURE SCORES

TEMP. TRAFFIC SIGNALS	8.00
SEQUENTIAL ARROW PANEL	7.25
MOBILITY	7.25
WORKER GARMENTS & EQUIPMENT	7.16
SITE HOUSEKEEPING	6.98
FLAGGERS	6.93
CHANNELIZATION DEVICES	6.92
CONCRETE BARRIER	6.83
PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS)	6.71
TEMPORARY SIGNING	6.69
PAVEMENT MARKINGS	6.60
IMPACT ATTENUATORS	6.30
BICYCLE, PEDESTRIAN & ADA FACILITIES	6.11
PILOT CARS (NA)	--



Region 4

Region 4 TCP measure strengths include Temporary Traffic Signals and Site Housekeeping. Region 4 measure weaknesses include Pavement Markings and Impact Attenuators. The data shown right show individual Region 4 Project scores and measures sorted highest to lowest.



REGION 5 PROJECTS RANKED BY SCORE

I84: Tower Road - Stanfield Section	7.04
I84: Balldock Slough - S. Baker Interchange	6.98
OR 82: Grande Ronde River & Indian Creek Bridges (Elgin)	6.94
US 26: Bridge Creek (Mitchell Access)	6.93
OR82: Minam Viaduct & Wallowa River Bridges (Minam)	6.50
US30: Grande Ronde River & Orendell Bridges (LaGrande)	6.35



REGION 5 MEASURE SCORES

TEMP. TRAFFIC SIGNALS	7.38
IMPACT ATTENUATORS	7.15
PAVEMENT MARKINGS	7.14
FLAGGERS	7.11
CONCRETE BARRIER	6.87
TEMPORARY SIGNING	6.87
MOBILITY	6.84
PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS)	6.80
CHANNELIZATION DEVICES	6.70
SITE HOUSEKEEPING	6.67
SEQUENTIAL ARROW PANEL	6.30
WORKER GARMENTS & EQUIPMENT	6.25
BICYCLE, PEDESTRIAN & ADA FACILITIES	5.00
PILOT CARS (NA)	--



Region 5

Region 5 TCP measure strengths include Temporary Traffic Signals and Pavement Markings. Region 5 measure weaknesses include Bicycle, Pedestrian & ADA Facilities and Sequential Arrow Panels. The data shown right show individual Region 5 Project scores and measures sorted highest to lowest.

PERFORMANCE MEASURE SCORES vs. TRAFFIC CONTROL SUPERVISOR (TCS)

For 2011, evaluation scores were examined to determine if a performance measure's average score was higher if a TCS was included in the contract. Based on Figure 7, it is marginally conclusive that the inclusion of a TCS results in higher performance measure scores. Over the three year period from 2009 to 2011, 56 out of 93 (60%) measure scores were higher when a TCS was included in the project. The data also doesn't take into account that TCS's are generally used on more complex projects.

For key measures involving traffic control devices, the results shown in Figure 7 were extracted from the results of the Evaluation Forms and the participants' scores.

TCS's in 2011 were less effective than they had been in previous years. TCS impacts on Concrete Barrier, Impact Attenuators, and PCMS's all were negative for 2011.

Based upon general trends, a TCS appears to have a positive impact on Pavement Markings, Sequential Arrow Panels, Temporary Traffic Signals, and Bicycle Signing. TCS's appear to have no impact or a negative impact on Temporary Signs, Flaggers, and Worker Garments.

TCS IMPROVE MEASURE SCORE	2009	2010	2011
TEMPORARY SIGNING: QUALITY	N	Y	Y
TEMPORARY SIGNING: PLACEMENT	N	Y	N
TEMPORARY SIGNING: SPACING	N	Y	N
CHANNELIZATION DEVICES: TUBES/CONES	N	Y	Y
CHANNELIZATION DEVICES: DRUMS	N	Y	Y
CHANNELIZATION DEVICES: BARRICADES	N	Y	Y
PAVEMENT MARKINGS: CONDITION	Y	Y	Y
PAVEMENT MARKINGS: PLACEMENT	Y	N	Y
CONCRETE BARRIER: CONDITION	Y	Y	N
CONCRETE BARRIER: PLACEMENT	Y	Y	N
REFLECTIVE BARRIER PANELS: CONDITION	Y	Y	N
IMPACT ATTENUATORS: CONDITION	Y	Y	N
IMPACT ATTENUATORS: PLACEMENT	Y	Y	N
PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS): MESSAGE	Y	Y	N
PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS): PLACEMENT	Y	Y	N
PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS): CONDITION	Y	Y	N
SEQUENTIAL ARROW PANEL: PLACEMENT	Y	Y	Y
SEQUENTIAL ARROW PANEL: CONDITION	Y	Y	Y
TEMP. TRAFFIC SIGNALS: SETUP	Y	Y	Y
TEMP. TRAFFIC SIGNALS: CONDITION	Y	N	Y
BICYCLE, PEDESTRIAN & ADA FACILITIES: SIGNING	Y	Y	Y
BICYCLE, PEDESTRIAN & ADA FACILITIES: CONTINUOUS ROUTE	Y	N	Y
BICYCLE, PEDESTRIAN & ADA FACILITIES: ADA COMPLIANCE	Y	N	N
FLAGGERS: VISIBILITY	N	Y	N
FLAGGERS: PERFORMANCE	N	Y	N
PILOT CARS: EQUIPMENT	-	Y	-
PILOT CARS: PERFORMANCE	-	Y	-
M O B I L I T Y : OVERALL FLOW	-	Y	N
WORKER GARMENTS & EQUIPMENT: GARMENTS	N	N	N
WORKER GARMENTS & EQUIPMENT: EQUIPMENT	N	Y	Y
SITE HOUSEKEEPING: CLEAN, ORDERLY	-	Y	N

Figure 7 – TCS Comparison per Measure



RECOMMENDATIONS

The annual Work Zone Safety Audit Tours again revealed a number of consistencies, improvements and positive comments. However, substandard quality control issues were also witnessed – some new, some recurring. Work Zone Safety Audit Tour comments, measure scores and comparative 2011 rankings for performance measures were used to identify this year TCP strengths and weaknesses.

MEASURE	Statewide Ranking			+/-
	2009	2010	2011	
TEMP. TRAFFIC SIGNALS	2	8	1	+
SEQUENTIAL ARROW PANEL	4	12	2	+
MOBILITY	3	1	3	
CONCRETE BARRIER	6	3	4	
IMPACT ATTENUATORS	11	9	5	+
PCMS	9	11	6	+
FLAGGERS	5	13	7	+
PAVEMENT MARKINGS	13	5	8	-
TEMPORARY SIGNING	7	6	9	-
CHANNELIZATION DEVICES	12	7	10	-
SITE HOUSEKEEPING	10	4	11	-
APPAREL	8	10	12	-
BICYCLE/PED/ADA	14	14	13	
PILOT CARS	1	2	NA	

Figure 8 – Measure Ranking Comparison

TCP Strengths for this year's audits included Temporary Traffic Signals, Sequential Arrow Boards, Mobility, Flaggers, Pavement Markings, and Channelization Devices. Weakness's included Bicycle/Ped/ADA, Apparel, Site Housekeeping, Temporary Signing, and Concrete Barrier.



Work Zone Traffic Control “Strengths”

- 1) **Temporary Traffic Signals** – Temporary traffic signals setup and operations were well received. Signals in use had proper timing intervals and several used presence detection to detect vehicles. Temporary Signals not in use were properly covered. Improvements to temporary signals setups include properly locating the stop bar and designing a smooth transition to temporary alignments.



- 2) **Sequential Arrow Panel** – Sequential Arrow Panels were in good condition throughout the state. The placement of Sequential Arrow Panels at the beginning of lane closure was consistent. Delineation of Sequential Arrow Panels was also completed a majority of the time. Improvement to Sequential Arrow Panels include making sure the panels are rotated to face incoming traffic and too make sure that they are used for all lane closures where traffic is uninterrupted.



3) Mobility – Similar to the last couple of years, in 2011 the amount of delay experienced over the course of the work zone safety audits was minimal. No abnormal or unanticipated queuing or delays were felt that Reviewers would not normally expect when encountering a highway construction work zone.

Travel speeds through the majority of the work zones were near posted speeds. Delays encountered were due to situations or conditions that could be reasonably expected within a construction work zone including:

- Merge areas or temporary alignments
- Additional temporary signing (some using inadequate spacing)
- Roadway surfaces that are rougher than usual
- Flagging operations or temporary traffic signals
- Traffic affected by the “gawk effect” of curious drivers

For flagging and signal operations statewide, the Audit participants experienced a maximum stop of 13 minutes, with an average of 3 minutes.

4) Flaggers – Noteworthy improvements were made by Flaggers compared to 2010. Improvements included Flaggers using correct hand signals, choosing ideal locations for flagger stations, and using lights on flagging paddles. Several projects successfully used advance flaggers. Improvements could still be made in the choice of flagger stations, too many projects had hard to see flagger stations locations.



- 5) **Pavement Markings** – Smooth continuous pavement markings that were in good bright condition received much praise on the tour. Pavement markings in good bright condition better delineate the roadway in day and night conditions and better safely guide traffic. Negative comments regarding pavement markings revolved around faded markings and locations where pavement markings were omitted.



- 6) **Channelization Devices** – Channelization devices are one of the most common items used for temporary traffic control in work zones. The setup of channelization devices to appear uniform more efficiently moves traffic through a work zone. A majority of projects used channelization devices in good condition and spaced uniformly and at the correct spacing. While a positive this year, all projects should be set up with channelization devices in good condition and spaced uniformly. Other improvements include placing channelization devices for abrupt edge on the pavement, using blue business access devices, and using barricades in closed lanes at uniform spacing.



Work Zone Traffic Control “Weaknesses”

1) Bicycle/Pedestrian/ADA Facilities – For the fourth year in a row, the quality and commitment within TCPs regarding non-motorized user facilities has been ranked last in the work zone measures. New pedestrian specific Standard Drawings and pedestrian channelization devices should be used to help improve pedestrian facilities through Oregon work zone. Issues that need attention at both the design and implementation phase of the TCP include:

- Consistent and complete advance warning and detour signing for bicycles and pedestrians
- Improved positive guidance (channelization) for bicycle and pedestrian movement
- Consistent and continuous (ADA-compliant, where applicable) alternate pathways for pedestrians



2) Temporary Signing - Properly designed signs should have pertinent messages, be spaced properly with other temporary and permanent signs and be crashworthy. Properly designed signs should also be coordinated with other nearby projects. The characteristics of poorly designed signs are:

- Not designed to MUTCD standards
- Wrong color sign for message
- Poor sign spacing (among temporary and permanent signs)
- Blocking other signs
- Too much information
- Improper sign installations and supports



- 3) Temporary Concrete Barrier** – Temporary Concrete Barrier use as a traffic control measure is a very effective method of protecting the work area. Barrier in good condition that is placed to protect the whole work area and has protected end is ideal. Generally deficiencies include non protected ends, poor condition or alignment, the storage of barrier within the clear area when not in use, and lack of barrier.



- 4) Worker Garments** - On several projects, workers were not wearing vests or hardhats, or wearing Personal Protective Equipment (PPE) that was too dirty to be effective. PPE is a low cost, highly effective method of helping keep workers safe.

- 5) Site Housekeeping** – Material storage continues to be an issue, with construction materials not in active use either being stored within the clear area with no protection or stored directly behind barrier. All materials should be stored a minimum of 30 feet from the traveled way or protected by barrier. If protected by barrier, the materials need to be typically stored 3 feet behind the barrier to allow the barrier to deflect properly when impacted.



CONCLUSION

The 2011 Work Zone Safety Audit Tours were very successful. During the audits, 43 different construction sites were visited and reviewed. In addition, over 16 different Reviewers helped score the projects and collect over 6,000 pieces of information regarding the safety and quality of our work zones.

A major goal of the audits was continued this year by having every Reviewer who participated in the multi-day tours score projects from multiple Regions. This effort helped normalize the collected data and give us an unbiased look at the work zones. This practice will be continued in subsequent annual audits. The Traffic Control Plan Unit would like to thank each of the Reviewers who helped with this monumental task – especially as your time is so precious. Thank you.

Overall, we witnessed a small increase in the work zone safety audit scores. An important part of the Work Zone Safety Audit Tours are the recurring “Weaknesses”, identified above, that can be analyzed more closely for solutions to make improvements in the design and implementation of our work zone traffic control plans. These lessons learned should be shared by all traffic control designers and implementers to avoid the same weaknesses in the future.

The Traffic Control Plans Unit is confident that the main goals of the 2011 Work Zone Safety Audit Tours were accomplished. The audits confirmed that ODOT Temporary Traffic Control Design Standards and Practices are being implemented properly and effectively a majority of the time. The audits also helped further strengthen communication and relationships between ODOT Traffic Control personnel by providing a medium for personal discussion of standards and practices. The audits also helped ODOT Traffic Control personnel get a look at how traffic control devices and measures are working in the field.

