IBTTA Annual Operations and Maintenance Conference
May 19-21, 2013 Portland, Maine

Low Cost Safety Countermeasures and Streamlined Contracting Methods

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3M Roadway Maintenance Services

Agenda

- Statistics
- Safety Countermeasures
- Examples and Case Studies
- Procurement Methods for Streamlined Implementation

Statistics – Lane departure fatalities are a critical problem

- Roadway departure are frequently severe type crashes:
- In 2009, 53% of the fatal crashes were roadway departure crashes
  - *24% were run off the right side of the roadway*
  - *17% were Crossovers to another lane*
  - *10% were run off the left side of the roadway*
  - *2% were unknown roadway departures*
- Other related issues to Lane Departure Fatalities:
  - *Pavement Safety*
  - *Nighttime Visibility*
  - *Horizontal Curves Safety*
  - *Clear Zones*

Safety Countermeasure Options

- Pavement Safety Measures
  - *Safety Edge*
  - *Rumble Strips and Rumble Stripes*
    - *Overall crash reduction of 16% and injury reduction of 17% on multi-lane divided highways*
    - *Reduction in run-off-road crashes of 38% on freeways*
  - *High Friction Surface Treatments*
- Signage and Pavement Markings – Night Visibility Improvements
- Median Barriers
- Horizontal Curve Safety
- Clear Zone Management
- Relatively low cost with high cost/benefit ratio for crash/fatality reductions

Traffic Signs

Traffic Signs – Enhanced Delineation for Horizontal Curves

- Installing **Chevron** signs, **Curve Warning** signs, and/or sequential **Flashing Beacons**, can result in a **38 to 43 % reduction** in all fatal and injury crashes
- Installing **Chevron** signs on **Horizontal curves** can produce a **16% reduction** on Non-Intersection fatal and injury crashes
- Installing **new Fluorescent Curve Warning** signs or upgrading existing Curve signs to Fluorescent sheeting, can result in **25% reduction** in Non-Intersection fatal and injury crashes
- Providing static combination **Horizontal alignment/Advisory speed** signs can generate a **13% reduction** in all injury crashes
- Refinishing pavement with **micro-surfacing treatments** can generate a **43% reduction** in all fatal and serious injury crashes

Rhode Island DOT – Interstate 95 Curve Improvements

Home > Press Releases

RIDOT enhancing highway safety on I-95 curves in Providence and Pawtucket

10-26-2011

The Rhode Island Department of Transportation (RIDOT) has started a project to increase motorist awarene
curves at three locations on I-95 in Providence and Pawtucket. A recent study of these areas showed that
improvements could be made to decrease crash rates.

Through a $256,000 contract with RoadSafe Traffic Systems, Inc., RIDOT will be installing numerous reflectiv
markers on I-95 North and South in the area of the Thurbers Avenue curve in Providence (near Exit 18), as w
the Pawtucket "S" curve (near Exit 29) and the Lonsdale Avenue curve (near Exit 26) in Pawtucket. The wor
finished in mid-November.

One of the most visible improvements is the placement of the words "Curve Ahead" in each lane of the highw
into each curve, both northbound and southbound. These reflective pavement markings will be complemente
reflective markers embedded in the driving surface, delineating the lanes of travel. Other reflective markers o
attached to the top of Jersey barriers and affixed to the side of others barriers, will further illuminate curves a

Pawtucket "S" Curve

Rhode Island DOT – Interstate 95 Curve Improvements

- Three Locations
  - *Thurbers Avenue Curve, Lonsdale Avenue Curve, and Pawtucket "S-Curve"*
  - *Providence and Pawtucket, Rhode Island*
- Historically high number of "curve-related" crashes at all three locations
- Targeted for improvements - Implementation during Fall 2011
- Improvements on Interstate 95 in Providence and Pawtucket cost $250,000

Rhode Island DOT – Interstate 95 Curve Improvements

- Countermeasures Installed
  - *Oversized SPEED LIMIT Signs*
  - *Curve Warning Signs*
    - *Improvements included the placement of the words "Curve Ahead" in every lane of the highway leading into each curve, both northbound and southbound*
  - *Chevron Signs*
  - *High Visibility Linear Delineation Systems*
    - roadside delineator markers were placed on both sides of the road to complement pavement markings and better define the edges of the roadway
    - *Other reflective markers on posts, attached to the top of Jersey barriers and affixed to the side of others barriers, further illuminate curves and show how the highway changes direction*
  - *Snowplowable Raised Pavement Markers*
    - *reflective pavement markings were complemented by reflective markers embedded in the driving surface, delineating the lanes of travel*

Source: VHB Report, Interstate 95 Curves, Evaluation of Short Term Improvements, May 2012

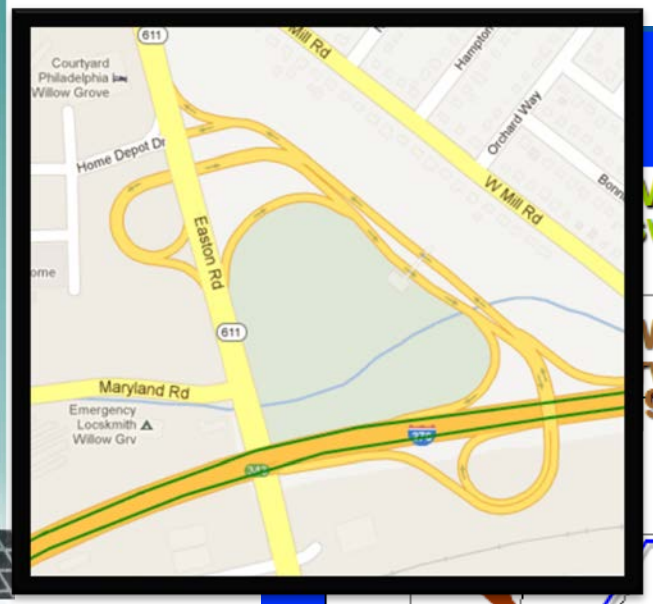
Rhode Island DOT – Interstate 95 Curve Improvements

- Safety Program Results:
- Accidents on the three curves happened almost daily before improvements
- Less than a year and a half after roadway improvements
  - *Serious, injury crashes, the focus of the improvements, were down 49 %*
- More than $4 million has already been saved due to the highway improvements due to money that would have been spent on medical bills, car repairs and other damage
- "For every one dollar spent, it's an $80 return on investment,"

Source: VHB Report, Interstate 95 Curves, Evaluation of Short Term Improvements, May 2012

Pennsylvania Turnpike Case Study – Improved Signage

Eastbound deceleration ramp at Willow Grove Interchange (Exit 343)



Project Location

Pennsylvania Turnpike Case Study

- Problem – high incidence of truck rollovers at ramp location (Exit 343)
- May 2011 – added chevron signs and advanced warning ramp curve signs
  - *Type XI sign sheeting, wooden posts, larger size panels*
- April 2012 – added additional enhancement of reflective sign post panels on wooden sign posts
  - *Also Type XI sign sheeting*
- Result – no truck rollovers since signage improvements were implemented
- Improvements added at two additional ramps and sign post panels will be added on future chevron sign installation locations

Median Barriers

Median Barriers – Various Methods

- Separate traffic along the median and prevent cross-median crashes
- Significantly reduce severity of median-related crashes
  - *W-beam Guardrail*
  - *42-inch Concrete F-shape or Constant Slope Barriers*
  - *High-tension cable median barriers*

Missouri DOT – Interstate 70 Safety Improvements

- MoDOT embarked on a statewide cable barrier program – over 550 miles installed across Missouri on US or Interstate Routes
- Interstate 70 was a primary target for safety improvements
  - *Cable installation reduced cross-median fatalities from 24 to two, a 92% reduction*
- Statewide fatalities were reduced by nearly half

RESEARCH PAYS OFF

MoDOT

Eliminating Cross-Median Fatalities

Statewide Installation of Median Cable Barrier in Missouri

BRIAN CHANDLER

Another Cable Barrier example - Oregon

- The Weak-Post Three-Cable Guardrail Median Barrier System
  - *Suggested by AASHTO where irregular terrain exists on wider medians (>7m) and the need is to prevent infrequent 'cross-median accidents'*
- ODOT installed two test locations in the median of I-5, (14.5 km) to reduce the incidence of serious injuries and fatalities. Source of six fatalities and 14 serious injuries in a nine year period
- There were 21 potential crossovers stopped by the cable barrier in an 18 month period following implementation
- The fatality rate dropped form 0.6/yr to zero, associated to the cable barrier, in the same time frame
- Annual repair cost reported by ODOT is approx. $2,014/km/year.

Source: Three-Cable Median Barrier Final Report #OR-RD-99-03, Brett Sposito

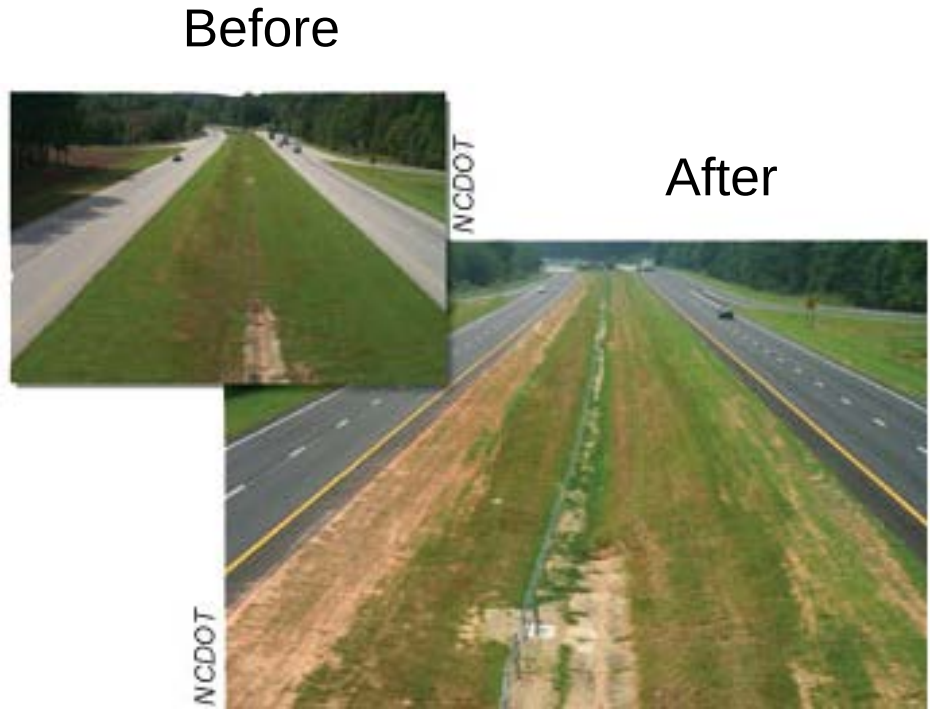
Cable Barriers - North Carolina Study

- NCDOT installed protective median barriers
- The State has reduced its cross-median crashes dramatically, **cutting the number of fatalities from these crashes nearly in half** after installation of the median barriers
- Additionally, this Safety measure resulted in the savings of hundreds of millions of dollars in fatal crash costs
- NCDOT research demonstrated cross-median crashes are difficult to correlate
  - *During a specific time of the day or day of the week*
  - *Does not appear to be a well-defined season of the year for these crashes.*
  - *Cross-median crashes take place on both horizontally and vertically curved sections of highways, as well as along straight and flat sections*

Source: FHWA Report - **Publication Number: FHWA-HRT-05-003**

Results in Dollars Spent And Lives Saved – In North Carolina

- NCDOT estimates that 96 lives were saved from in a single four year period alone, resulting in an estimated crash cost savings (injuries and fatalities) of more than $290 million
- In addition, results yielded:
  - *An estimated 90-percent reduction in freeway cross-median crashes*
  - *Approximately 25 to 30 lives saved each year*
  - *Hundreds of injuries prevented or reduced in severity*
  - *Counter issue - Property damage cost has increased as a result of barrier placement activity*



Source: FHWA Report - **Publication Number: FHWA-HRT-05-003**

Audible Systems

Rumble Strips and Rumble Stripes

- Rumble Strips
  - *Raised or grooved patterns on the roadway that provide an audible warning (rumbling sound) and a physical vibration to alert drivers that they are leaving the driving lane*
- Rumble Stripes
  - *Rumble strips that coincide with centerline or edgeline striping*
- DELDOT installed centerline rumble strips and reported a 90% decrease in head-on collisions

Source: FHWA Nine Proven Crash Countermeasures

Rumble Strips & Rumble Stripes

- 11 States and one national study concluded that **Centerline rumbles** reduced **crossover crashes** by **18 to 64 percent**, with most studies showing **40 to 60 percent reductions**
- 14 States and two multistate studies concluded that **Shoulder rumbles** reduced **single-vehicle run-off-road freeway crashes** between **14 to 80 percent**, with most showing **30 to 40 percent reductions**
- Three States that restricted crash analysis to **crashes caused by distracted or drowsy driving** (the true target crashes for rumble strips), reported **40 to 80 percent reduction in those crash types**

Source: FHWA Nine Proven Crash Countermeasures

Connecticut DOT – Rumble Strip Study

- Safety impacts derived from the installation of rumble strips on CT roadways
  - *Data collected 3 years Before and 3 years After the installation of rumble strips*
  - *Targeting 'single-vehicle, fixed-object, off-shoulder' and 'asleep' accident reduction*
    - *The Before and After Accident totals for the roadways with rumble strips, had a 22% reduction*
    - *CT roadways showed a 50% decrease in fatal accidents after the installation of rumble strips*
    - *CT roadways in scope showed a 12% decrease in injury accidents*
    - *Overall CT roadways similar to in scope roadways, not having rumble strips, showed a 10.9% accident increase*
- Potential issues:
  - *Effects on exiting pavement: Wear, Drainage and Durability of pavement cuts*
  - *Noise – adjacent residents – reduced by moving right should strips from 6" to 12" off edge line*

Source: Before/After Analysis of Safety Benefits – CT-902-F-04-3 Julie Annino

Alternative – Audible Thermoplastic

- Markings in combination with the audible “bump” - Improves nighttime visibility
- Enhanced visibility in wet conditions
- Option for non-snowplow locations
- No degradation of pavement due to surface application
- Less costly to apply and manage
- Similar benefits to ‘ground in’ rumble strips

Safety Countermeasure Considerations

- Cable Median Barrier
  - *Width of median, frequency of crossover crashes – Due to cable repair time table*
- Traffic Signs/Delineation
  - *Brighter and larger signs receive more driver attention and response*
  - *Advance warning signs provide a low cost safety improvement*
- Rumble Strips and Rumble Stripes
  - *Available funds, available shoulder width, edge and centerline benefit options*
  - *Wet and nighttime – contributing factors to accidents*
- Maintenance Costs vs. Savings

Procurement Methods

Procurement Methods – Best Practices

- Optimize budgets for safety improvements
- Streamline the design and procurement process
- Implementation of countermeasures on fast track results in lives saved
- Utilize a Qualifications-based procurement process whenever possible, to provide the Agency with the ‘Best Value’ approach to roadway improvements
- Methods can be utilized for typical point-based, field located roadway features
- Pre-design and develop quantities based on typicals and standard details, refine and approve locations and design in the field

Innovative Contracting Methods – Mn/DOT

- Warning Signs and Flashing Beacons
- Feasibility –
  - *Point defined safety features*
  - *Can be described through typicals and details*
  - *Field locate and verify*
- Fast-Track approach
- Field design methods with oversight to streamline installation and gain benefit quicker

Contract Language – Safety Improvements Project

1.3.2 General Description

The Contractor shall not rely on the physical description contained in this Section 1 to identify all Project components. The Contractor shall determine the full scope of the Project through thorough examination of the RFP and the Project Site(s), or as may be reasonably inferred from such examination.

All of the intersection conflict warning systems will be designed to provide drivers with warnings that range in complexity from gap and speed to simple presence detection of approaching vehicles as determined by the proposed system.

MnDOT has identified 4 Concept Layouts, as shown in Exhibit 1A-D, that encompass the range of intersection configurations and depict the intent of RICWS signing and detection zones. Work at each site will consist of three primary elements with appurtenant (pavement removal for loops, railroad borings, trenching, etc.) work required depending on the system installed:

Installation of warning signage
Installation of and integration of system
Installation of roadway lighting (at select sites as specified in this RFP).

Contract Language – Safety Improvements Project

3 INFORMATION SUPPLIED TO CONTRACTOR; RESPONSIBILITY FOR DESIGN; DISCLAIMER

3.1 Information Supplied

MnDOT has made available to Contractor information which is described in the Contract Documents and certain Reference Information Documents regarding the Project, and has allowed Contractor access to the Site for purposes of inspection and testing.

3.2 Responsibility for Design

Contractor agrees that it has full responsibility for the design of the Project and that Contractor shall furnish the design of the Project, regardless of the fact that certain conceptual design work occurred and was provided to Contractor prior to the date of execution of the Contract. Contractor specifically acknowledges and agrees that:

(a) Contractor is not entitled to rely on and has not relied on (i) the RID or (ii) any other documents or information provided by MnDOT, except to the extent specifically permitted in the Contract Documents.

(b) Contractor's Warranties and indemnities hereunder cover Errors in the Project even though they may be related to Errors in RID.

Contract Language – Safety Improvements Project

4.5 Prerequisites for Start of Construction

Contractor shall not start construction (or recommence construction following any suspension) of any portion of the Project, except Work specifically authorized under NTP1, until all the following events have been fully satisfied with respect to the Work proposed to be constructed.

(a) MnDOT has issued a Notice to Proceed authorizing such Work.

(b) Contractor has furnished the Released for Construction Documents to MnDOT and has received MnDOT's Acceptance thereof in accordance with Book 2relating to such portion of the Project, unless waived in writing by MnDOT.

(c) All Governmental Approvals necessary for construction of such portion of the Project have been obtained and all conditions of such Governmental Approvals or the application to the Government entities which allow construction to proceed during the application process, that are a prerequisite to commencement of such construction, have been performed.

(d) All necessary rights of access for such portion of the Project have been obtained.

(e) Any additional conditions for construction set forth in the Contract Documents.

Contract Language – Safety Improvements Project

2.4.2.3 Design Coordination Meetings

Prior to submitting plans for MnDOT Acceptance, the Contractor must schedule and participate in in-progress design review meetings and has the option of participating in over-the-shoulder reviews, as described below. The Contractor shall work with MnDOT, FHWA and the appropriate Cities and Counties that form the design oversight team. Together the Contractor and oversight form the RICWS design team. The RICWS design team shall meet as described below.

MnDOT will provide meeting space for regularly scheduled design meetings, including in-progress design review meetings and over-the-shoulder reviews, at the MnDOT Waters Edge OTST Office located at 1500 W County Road B2, Roseville, MN 55113. The Contractor shall provide individuals with the knowledge, responsibility, and authority to represent all areas of Work including design, construction, quality, and administration, at each meeting. At a minimum, this will include the Contractor's Project Manager, Design Manager, and Traffic Engineer.

MnDOT will provide meeting space for regularly scheduled construction meetings, at the same location. These meetings will be held weekly or bi-weekly at a minimum. However due to the location of the Project sites these meetings can be held through telephone conference, or through web-conferencing. At a minimum, in person meetings will be held monthly throughout the construction phase of the contract. In person meetings will be held at the OTST offices unless prior arrangements are made by the Contractor and accepted by MnDOT.

Contract Language – Safety Improvements Project

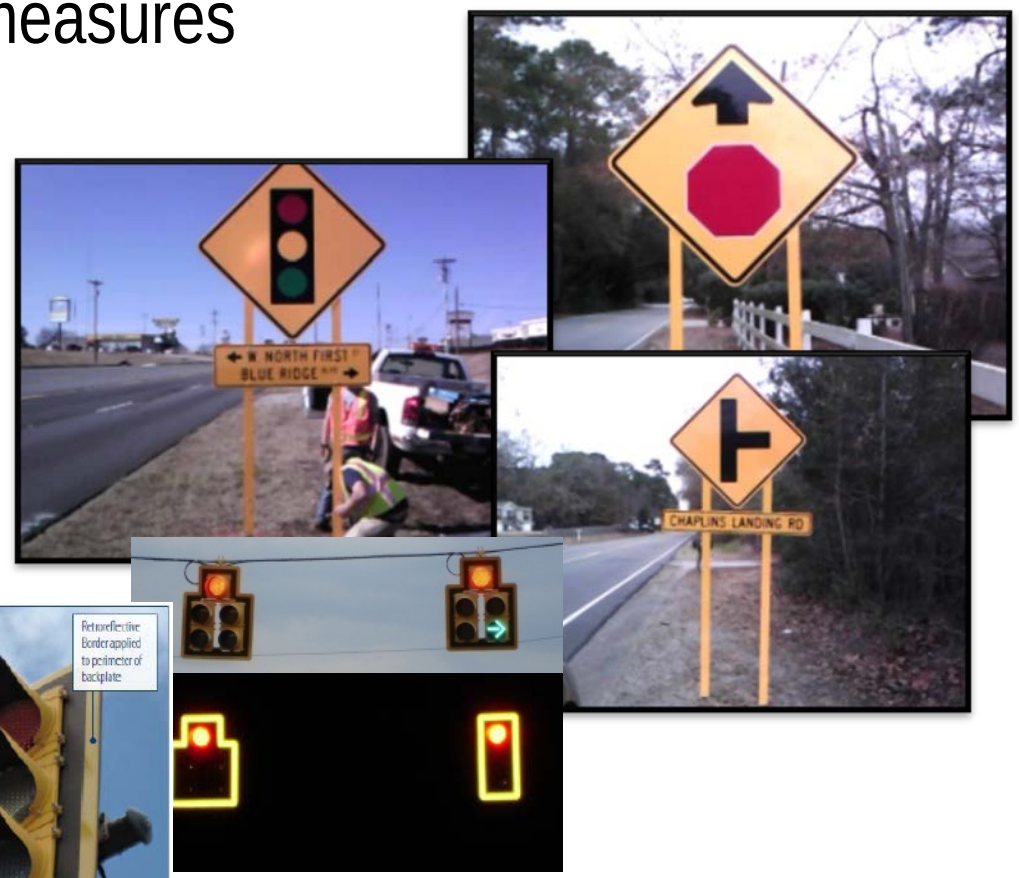
2.4.2.3.2 Over-the-Shoulder Reviews

Over-the-shoulder reviews are informal examinations by MnDOT of design documents during the Project design process. Over-the-shoulder reviews are beneficial to assess whether the requirements and design criteria of the Contract Documents are being followed and whether the Contractor's design quality management plan activities are being undertaken in accordance with the Approved Quality Manual.

Each design package may have multiple over-the-shoulder reviews at the request of either MnDOT or the Contractor. The reviews may, at MnDOT's discretion, include review of design drawings, electronic files, calculations, reports, specifications, progress prints, computer images, draft documents, draft specifications and reports, other design documents, and any other relevant design information as requested by MnDOT.

South Carolina DOT Example – Streamlined Delivery Method

- Project included several low-cost countermeasures
  - *Advanced warning signs*
  - *Beacons*
  - *Reflective Post Panels*
  - *Traffic Signal Enhancements*
  - *Durable Pavement Markings*



Quantities – Indefinite Delivery Contract

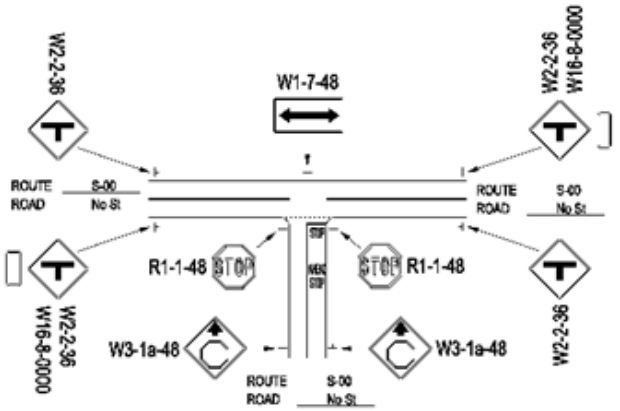
- Construction Stakes, Lines & Grades
- *Encompasses all aspects of design, coordination, review, adjustments and approval of specific safety features prior to final acceptance*

PROPOSAL ITEMS AND QUANTITIES

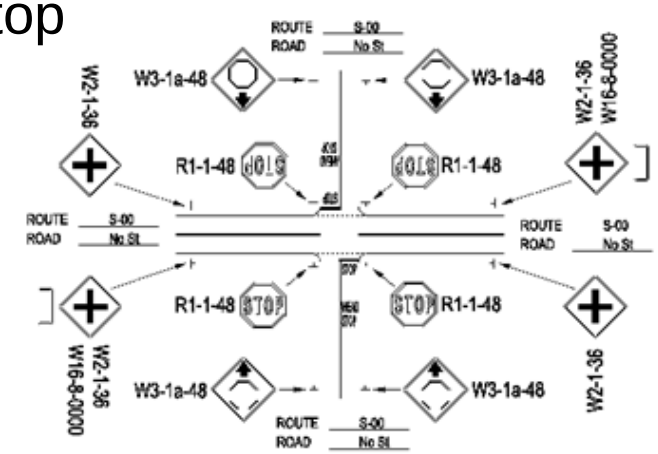
ITEM NO.	DESCRIPTION	UNIT	QUANTITY
1031000	MOBILIZATION	LS	1
1050800	CONST. STAKES, LINES & GRADES	EA	1
1071000	TRAFFIC CONTROL	LS	1
6271005	4" WH.BRKNLINE THERMO -90 MIL.	LF	35000
6271007	6" WH.BRKNLINE THERMO -90 MIL.	LF	7000
6271010	4" WH SLD LNE PVT EL TH-90 ML	LF	2000
6271012	6" WH SLD LNE PVT EL TH-90 ML	LF	1000
6271015	8" WH. SLDLNES THERMO.-125 MIL	LF	40000
6271020	12" WH.SLDLNES THERMO-125 MIL.	LF	5000
6271023	12INX18IN WH.TRIANG.YIELD BAR THERMO125M	LF	2000
6271025	24" WH SLDLNES THERMO-125 MIL.	LF	40000
6271030	WHITE SGL ARROWS THERMO-125MIL	EA	2500
6271035	WH.WORD MESS"ONLY"-THERMO-125M	EA	1000
6271036	WH.MESS"STOP AHEAD"THERMO-125M	EA	100
6271039	WH.WORD MESS"STOP"-THERMO-125M	EA	100
6271040	WH.COMBO.ARROWS THERMO-125MIL.	EA	250
6271043	WH.LANEDROP ARRW THERMO-125MIL	EA	50
6271045	R.R.CROSS.SYMBOLS-THERMO- 125M	EA	10
6271064	4" YEL.BRKN.LINES.THERMO.90MIL	LF	5000
6271066	6" YEL.BRKN.LINES.THERMO.90MIL	LF	1000
6271074	4"YEL.SLD.LNES.- THERMO. 90MIL	LF	30000
6271076	6"YEL.SLD.LNES.- THERMO. 90MIL	LF	5000
6271079	12"YEL.SOLID LNE THERMO-125MIL	LF	1000
6271080	24"YEL.SOLID LNE THERMO-125MIL	LF	1000
6319505	REMOVAL OF PAVEMENT MARKINGS	LF	20000
6510106	FLAT SH,T-3,SIZE DETER.BY MSG.	SF	3500
6510109	FL.SH,8,9,T FLUOR.FIX.SZ&MSG	SF	73000
6531205	U-SEC.POST FOR SGN SUPP. - 2P	LF	4000
6531500	REFLECTIVE SIGN POST PANELS	LF	48000
6551110	SQ.TUB.POST 12 GAUGE (1 3/4"X1 3/4"X8')	LF	135000
6551115	SQ.TUB.POST 12 GAUGE (2" X 2" X 8')	LF	6000
6865700	SOL.POWER.FLASH.-SINGLE BEACON	EA	40

General Template Drawings

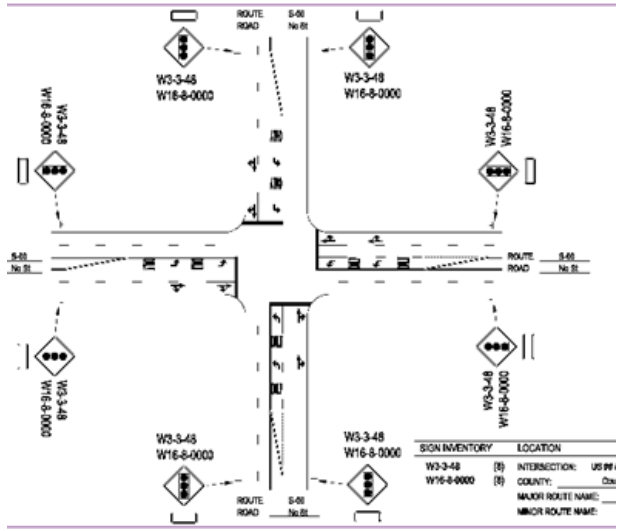
T-Type Stop Controlled



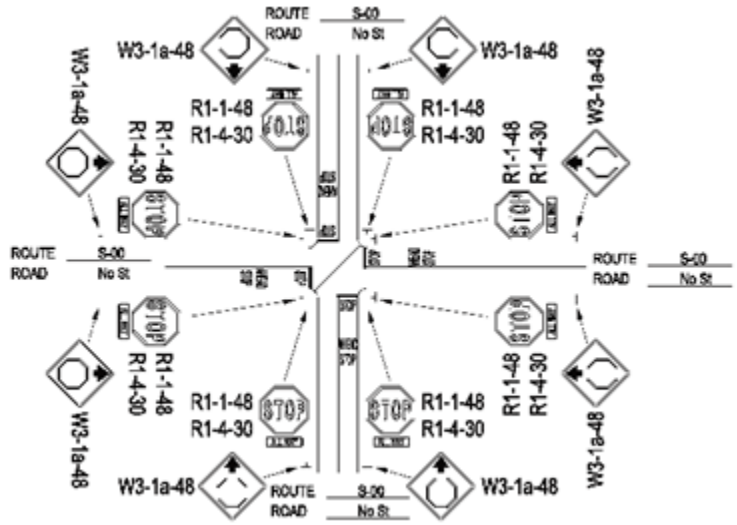
Two-Way Stop



Signalized Intersection



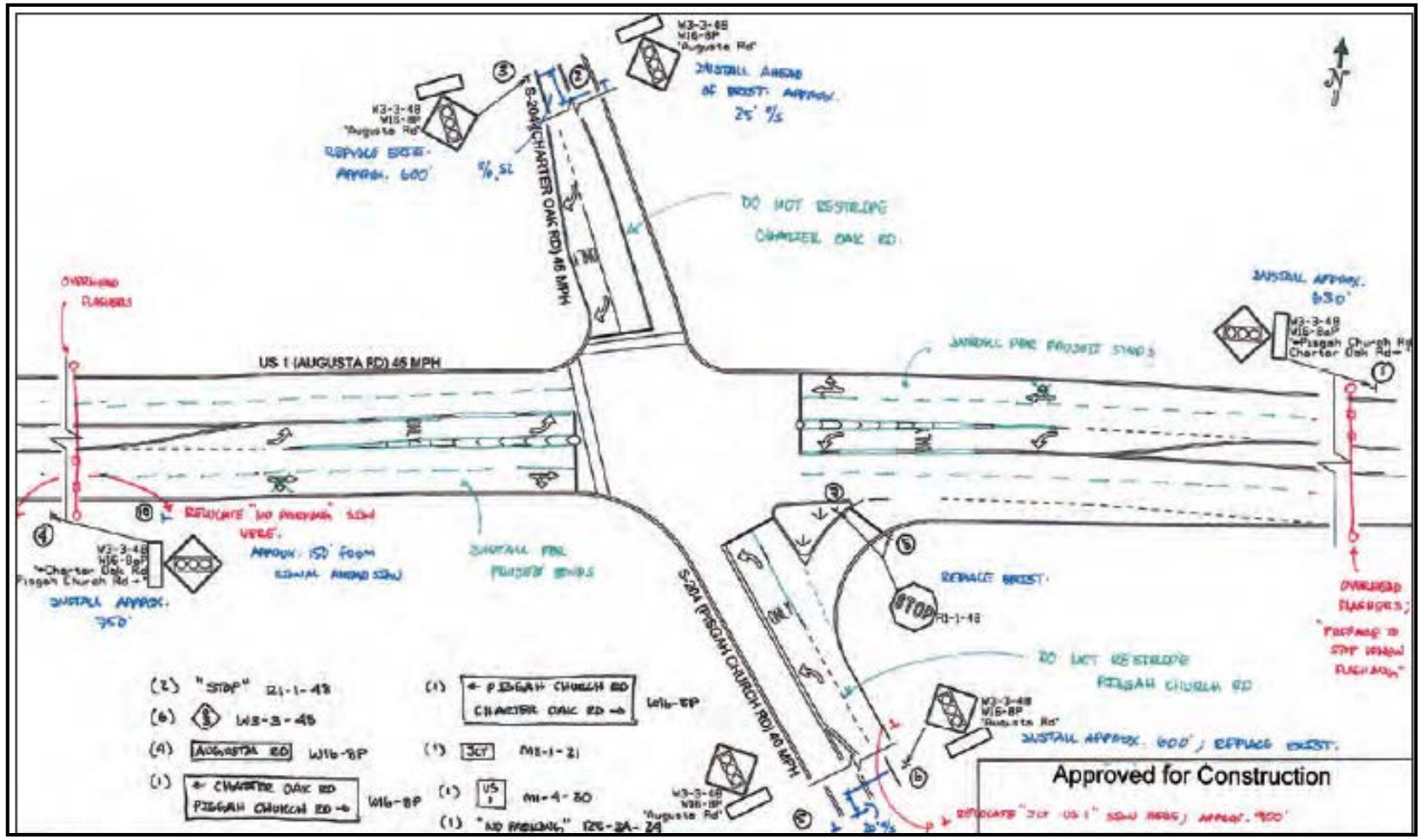
Four-Way Stop



SCDOT Data Requirements for the Internet Project Mgmnt Website

Pavement Markings	Traffic Signs
Road name/Highway # (intersections)	Road name/Highway # (intersections)
Work Order #	Work Order #
Quantities of material installed	GPS coordinates of each traffic sign location
Type of material used	Sign ID # (bar code of new signs)
Field Supervisor name	Sign ID # (bar code – removed signs/posts) Ex. Signs had ID # and posts have an Assembly #
Status of work – planned or completed	MUTCD code for each sign type
Start Date	Sign dimensions (width and height)
Finish Date	Sign face substrate
Date Evaluated	Post type/style
Evaluation results – durability and retroreflectivity (PDF file download option)	Date of sign installation
	Sheeting type
	Sign face direction
	Field Supervisor name
	Status of work – planned or completed
	Approval date – utility locates
	Start Date of Work Order
	Finish Date of Work Order

Work Flow Process: Approval, Intersection Upgrade, Verification Inspection, Submission for Payment



Written sign off by all stakeholders on preliminary design and final field installation for all point-located features

SCDOT Low Cost Intersection Improvements
Project # 47.038390
Intersection Sign Installation Work Checklist

Intersection ID: 85	Route: US 1	Crossing: S- 204	Date: 3/1/12

SCDOT Inspector: _____

Omitted Signs from DOT Approved Construction Drawing
[** Indicate whether e-mail or phone approval and Date & Time]

Install Loc ID	MUTCD	Reason for Omitting Sign (i.e. utilities conflict)	** Joey Riddle Approved	SCDOT (initial)	Contractor (initial)

Signs Installed at Locations other than as Staked (greater than 50 foot deviation)
[** Indicate whether e-mail or phone approval and Date & Time]

Install Loc ID	MUTCD	Reason for Moving Sign (i.e. utilities conflict)	** District Traffic Engineer Approved	SCDOT (initial)	Contractor (initial)

Installation Checklist	Yes	Punch List Item
1. Installation in accordance with Construction Drawing	✓	
2. Existing/ Old signs have been removed		✓
3. If new Beacons, existing electrical has been removed	✓	
4. New signs free from obstructions (vegetation trimmed if req'd)	✓	
5. New signs free from conflicting existing signing	✓	
6. New signs DO NOT BLOCK visibility from existing drives	✓	
7. Date stickers installed and fully dated	✓	

Punch List Items:

Install Loc ID	MUTCD	Description of Problem
		Plans called for Augusta Rd.
		actually Augusta Hwy had to order new signs
		KAC Completed 3/1/12

Final Inspection Passed (Punch List 100% Completed)

Date: 3/1/12 Time: _____ Inspector/Representative: _____

Verification Inspection (Sign Installation Record)

SCDOT Project 47.038390 WO #30 Sign Installation Record

Installed: 2/7/12 SCDOT: Inspected: 3/1/12

Intersect'n ID	Loc ID	MUTCD	Icon Insert	MUTCD Txt	Width (in)	Height (in)	Hole Space Final	Sign Pay Item (square feet) 8598105	8598106	8598108	8598111	8603509	Sign Installed ?	Anchor (lineal feet) 8851135	Post Length (lineal feet) 8851138	Reflector Strip (lineal feet) 8851509	Post length for D-sigms (LF.) 8851115	Bracing for D-sigms RFC #8 (8131205)	Post Coring (each) 8800260 Bid 520	Beacon (each) 8853700
85	1	W3-3		(blank)	48	48	30			16.00				2	281	192				
		W16-8a	← PISGAH CHURCH RD CHARTER OAK RD →		54	15	30					5.63								
	2	W16-8		Augusta Rd	36	8	30					2.00		2	286	192				
		W3-3		(blank)	48	48	30			16.00										
	3	W16-8		Augusta Rd	36	8	30					2.00		2	279	192				
		W3-3		(blank)	48	48	30			16.00										
	4	W3-3		(blank)	48	48	30			16.00				2	282	192				
		W16-8a	← CHARTER OAK RD PISGAH CHURCH RD →		54	15	30					5.63								
	5	W16-8		Augusta Rd	36	8	30					2.00		2	273	192				
		W3-3		(blank)	48	48	30			16.00										
	6	W16-8		Augusta Rd	36	8	30					2.00		2	273	192				
		W3-3		(blank)	48	48	30			16.00										
	7	R1-1		(blank)	48	48	30				16.00			2	206	488 138				
	8	R1-1		(blank)	48	48	30				16.00			2	228	488 150				
	9	M3-4	17	1	24	24	none		4.00					1	138					
		M2-1	JCT	White	21	15	none	2.19												
	10	R8-3A	-	(blank)	24	24	none	4.00						1	138					
85 Total								6.19	4.00	96.00	32.00	19.25								

PROCESS MAP
Tasks by Stakeholders

Order	Entity	Description
Step 1	SCDOT HQ	Post Work Order
Step 2	Contractor	Publish Work Order To Project Website
Step 2A	Subcontractor	Conduct Field Engineering Review & Stake Sign Locations
Step 3	Contractor	Prepare Intersection ID Document Labels
Step 3A	Subcontractor	Prepare Work Order Plan And Staking Review Document
Step 4	Subcontractor	Schedule District Work Order Planning Meeting – Communicate Review Requirements And Approval Process
Step 5	SCDOT	District Review & Edit Work Order Plan And Staking Document
Step 6	SCDOT	HQ Review & Approve Or Deny Culmination Of Field Engineering And District Edits Post Approved Final Work Definition Document
Step 7	Contractor	Build Sign Detail Sheet And Order Traffic Signs
Step 8	Subcontractor	Correct Sign Staking (As Necessary)
Step 9	Contractor	Prepare Detailed Work List For Installation Crews
Step 10	Contractor	Produce And Distribute Field Workbooks
Step 11	Contractor	Publish Approved Work Order Diagrams To Project Web Site
Step 12	Contractor	Publish Work Schedule To All Parties And On Project Web Site
Step 13	Contractor	Mobilize Installation Contractors
Step 14	SCDOT HQ	Review And Approve Fields Corrections. (Real Time)
Step 14A	SCDOT District	Identify Potential Field Corrections
Step 14B	Subcontractor	Identify Potential Field Corrections
Step 15	SCDOT District	Inspect Work As It Occurs
Step 15A	Subcontractor	Inspect Work As It Occurs
Step 16	Contractor	Maintain Punch List And Publish To Project Web Site

Lessons Learned

- Ability to Adjust in the field -
  - *Stakeholders recognized that MUTUAL FLEXIBILITY was a CRITICAL element to the success of the project*
  - *"EXPECT the UNEXPECTED" and be prepared to communicate in a timely and informative manner, in order to deal with the inevitable issues that occur (e.g. proposed sign placement with utilities or other existing structures conflicting at location)*
- Communication is Vital to Success -
  - *Communicate regularly during Planning and Construction phases of each Work Order*
  - *Good initial communications result in less frequent contact after stakeholders have developed a good working relationship*
  - *Streamlined approach is possible with successful outcomes*

Thank you

IBTTA

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