South Carolina Case Study: Systematic Intersection Improvements

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FHWA Safety Program

U.S. Department of Transportation
Federal Highway Administration

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Introduction

In 2007, the South Carolina Department of Transportation (SCDOT) and its safety partners defined the State's "Road Map to Safety" in its formal Strategic Highway Safety Plan (SHSP). The goal was to reduce fatalities on South Carolina's roadways to fewer than 784 by 2010, a 25 percent decrease from 2004. A secondary goal was to lower the number of traffic-related injuries by 3 percent. The SHSP identified 5 key Emphasis Areas and 24 specific targets to be addressed based on an extensive analysis of traffic crash data. Intersections were identified as one of nine target areas within the Serious Crash Type Emphasis Area.

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Background

In 2008, as part of the FHWA's Office of Safety Intersection Focus State Initiative and consistent with the goals of the SHSP, SCDOT began identifying safety improvements to be deployed systematically at intersections across the State to reduce the number of fatalities and serious injuries. SCDOT identified more than 2,200 intersections for improvement in the South Carolina Intersection Safety Implementation Plan (ISIP).

The first phase of construction began in September 2009, and approximately 1,280 intersections have been improved to date, primarily through signing, pavement markings, and signal enhancements. SCDOT is currently in the third phase of the plan and expects completion by early 2013.

Intersection Selection

The foundation of the ISIP is a 5-year analysis of statewide crash data, stratified into six different categories of intersections: signalized, single-lane stop-controlled, or multilane stop-controlled intersections in rural areas and signalized, single-lane stop-controlled, or multilane stop-controlled intersections in urban areas. It was not necessary to differentiate ownership (e.g., State vs. local) since most of the roads in South Carolina are under SCDOT jurisdiction and nearly 95 percent of roadway fatalities occur on State-maintained roads. This analysis revealed that 44 percent of all intersection crashes occurred at 1.3 percent of the intersections in the State, based on a per-intersection threshold of five or more crashes within the 5-year period. A list of 2,204 candidate sites was developed based on these findings and included a variety of intersection types and locations.

Overview of Systematic Improvements

In response to the SHSP emphasis area goal of reducing fatal and serious injury crashes at intersections, those locations appearing within the ISIP were targeted to receive improvements in the form of updated signing, pavement markings, and signal enhancements. In order to address the 2,204 intersections, SCDOT established a streamlined installation process for making modifications using low-cost treatments. SCDOT followed FHWA's Intersection Safety Implementation Plan Process to develop their systematic plan.

Types of Treatments

SCDOT's systematic improvements at stop-controlled and signalized intersections were primarily related to signing and pavement markings. Additionally, signalized intersections were treated with low-cost improvements specifically related to traffic signals and associated infrastructure. The typical improvements applied are listed below by treatment category.

All Intersections

- Signing:
  - Doubled up (left and right) signing
  - Oversized signing with high-intensity fluorescent sheeting
  - Advance Street Name signs (W16-8) on Intersection Warning signs
  - Retroreflective sign post panels
  - Solar–powered, sign-mounted beacons
  - Replacement of additional safety related signs (e.g., Do Not Enter, One Way, etc.) within 500 feet of the intersection

Photo Credit: Joey Riddle, South Carolina Department of Transportation

- Pavement Markings:
  - Properly placed stop bars (4'-8' offset and perpendicular to the mainline)
  - Dashed edge lines to delineate the mainline and turn bays and establish points of conflicting traffic
  - Lane arrows and word messages in accordance with standard drawings, general notes and specifications
  - Addition of crosswalks

Photo Credit: Joey Riddle, South Carolina Department of Transportation

Signalized Intersections

- One signal head per lane
- Supplemental nearside sign heads
- Backplates with retroreflective borders
- 12" LED signal indications
- Pedestrian treatments such as push button indicators and pedestrian countdown signals

Additional information on each of these treatments can be found in FHWA's "Low-Cost Safety Enhancements for Stop-Controlled and Signalized Intersections."[3]

Photo Credit: Mike Farmer, 3M Corporation

SCDOT provided one general template drawing for each of the four intersection types (signalized, four-way stop-controlled, two-way stop-controlled, and T-type stop-controlled) in the bid documents. Figures 1 through 4 show the typical application of these improvements to each specific intersection type. The templates were intended to provide general information to potential bidders about the treatments required by intersection type.

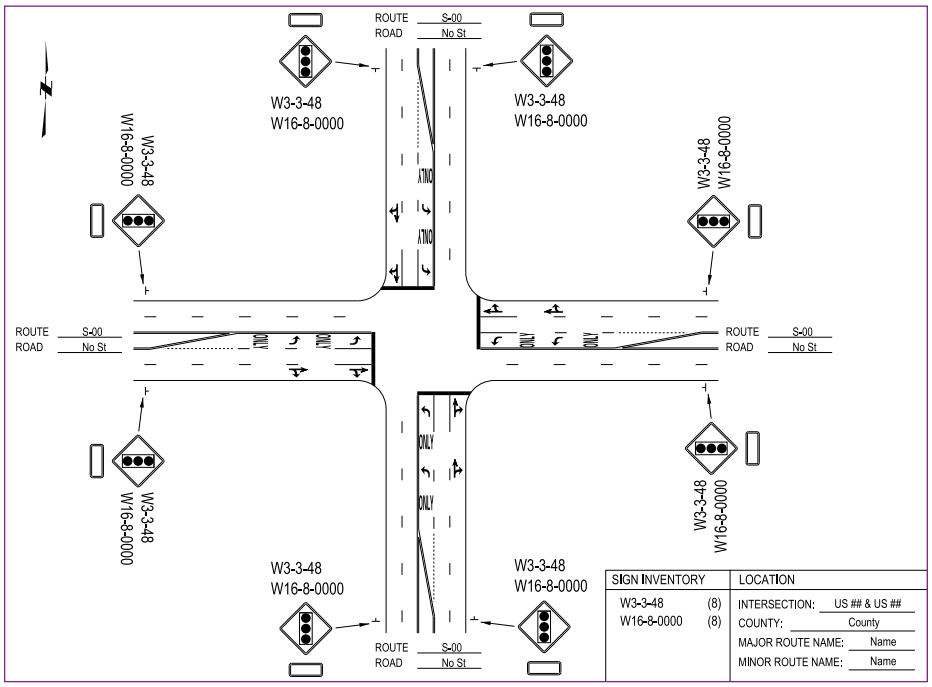

Figure 1. SCDOT's Template for Signalized Intersection

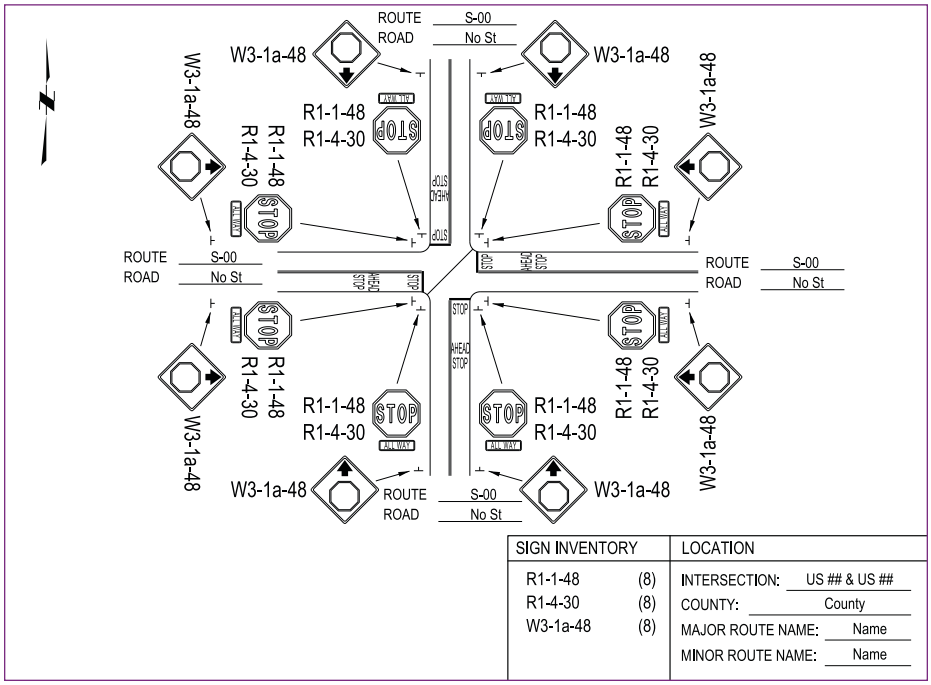

Figure 2. SCDOT's Template for Four-Way, Stop Controlled Intersections

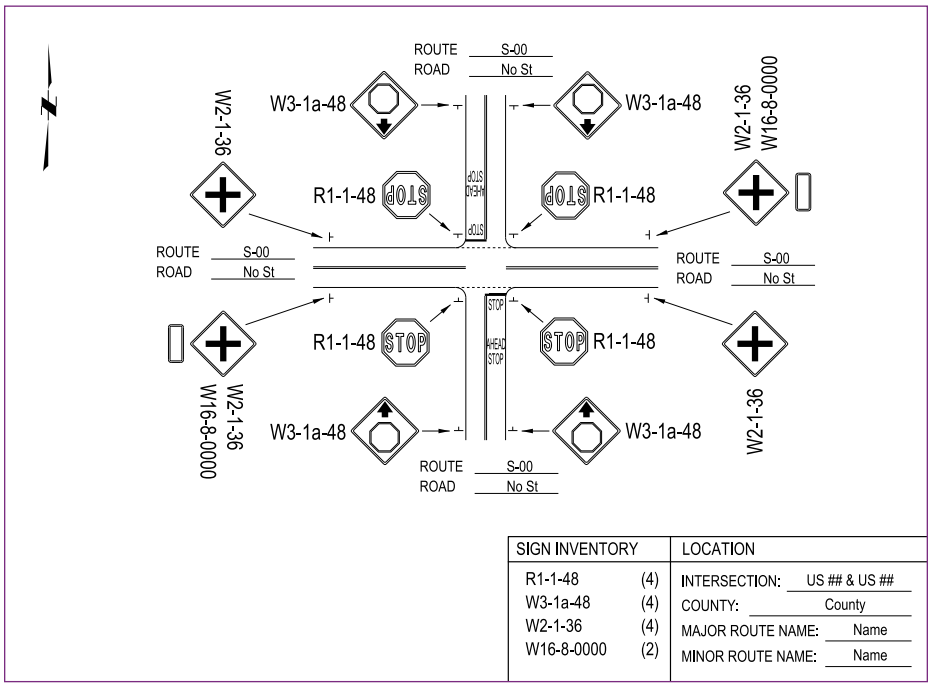

Figure 3. SCDOT's Template for Two-Way, Stop Controlled Intersections

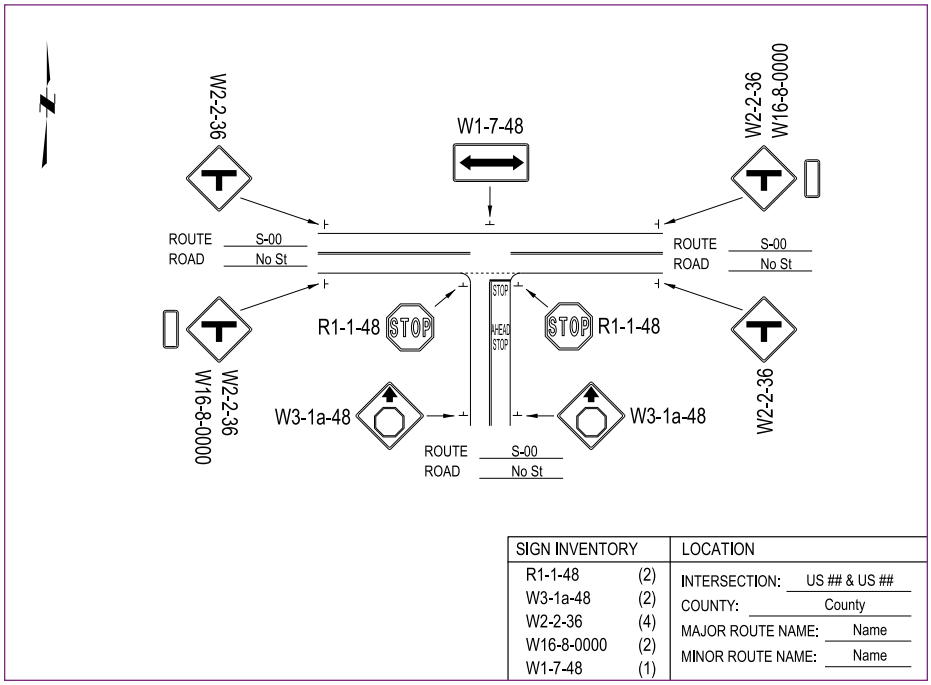

Figure 4. SCDOT's Template for T-Type, Stop Controlled Intersections

Contracting for Systematic Intersection Improvements

Following the identification of intersections through the development of the ISIP, SCDOT developed a contract vehicle structured to accommodate the systematic approach proposed in the ISIP. The contract was a single, statewide, 3-year contract that was renewable each year. It was structured to treat approximately one-third of the intersections identified in the plan each year for 3 years.

Improvements to traffic signals were addressed through four separate, low-bid contracts that SCDOT let for bid. Four different contractors installed the low-cost improvements at the signalized intersections.

For the signing and pavement marking enhancements, SCDOT chose to use a statewide, low-bid contract vehicle versus several smaller contracts for several key reasons:

- Uniformity of implementation statewide;
- Administrative efficiencies of a single contract; and
- Economies of scale realized through lower unit pricing on larger-scale statewide contract.

SCDOT chose not to use in-house maintenance staff on the project due to the magnitude of the project and the time it would take to complete.

Stakeholders

There were four primary stakeholders with roles in crafting the improvement plan, funding the improvements, and installing the treatments: SCDOT Headquarters; SCDOT District Offices; the contractor and subcontractor; and FHWA's Office of Safety, Resource Center, and SC-Division Office.

The four primary SCDOT Headquarters offices involved in this project were the Construction, Maintenance, Traffic Safety, and Contracts departments. SCDOT is a centralized organization where Headquarters controls funding and identifies projects, with input from the Districts. SCDOT has seven District Offices, each with a District Traffic Engineer, who coordinated with the contractor and SCDOT Headquarters on improvements to intersections within their District lines.

The contractor selected by SCDOT was responsible for ground-mounted signs and pavement marking installations at all intersections within the project. The contractor's engineering services subcontractor was responsible for staking all of the intersections, verifying the drawings matched field conditions, and making other professional engineering recommendations and decisions on behalf of the contractor.

FHWA's Resource Center and SC-Division Office provided training to SCDOT on systematic improvement concepts, signing and marking practices, and Highway Safety Improvement program (HSIP) eligibility requirements.

Funding Process

A section in the SCDOT SHSP identifies five key emphasis areas based on an analysis of crash data. One key emphasis area is Serious Crash Types, of which Intersections were one of nine crash types identified. Engineering strategies identified in the SHSP that address serious intersection crashes were also identified in SCDOT's ISIP. The consistency between the ISIP and SHSP and the identification of the projects through a systematic, data-driven process allowed for the projects to be implemented using HSIP funds. Signing and pavement markings were two of several specific treatments proposed in the ISIP. USC 120(c) allows certain safety improvements such as signing and markings to be eligible for 100 percent Federal funding; therefore, SCDOT's 3-year systematic intersection improvement project did not require any State matching funds. The project was included in SCDOT's State Transportation Improvement Program (STIP). The approval of the STIP by SCDOT's Commission allowed for the allocation of Federal appropriations.

Contract Execution and Administration

The SCDOT Offices of Traffic Engineering, Maintenance, and Construction coordinated with the Contracting Office to prepare the contract for bid. The low-bid contract was eventually administered at the Headquarters level through the Construction Office, with the Traffic Safety Office filling the role of project management.

The contract was awarded to the lowest pre-qualified bidder. Prequalification of an SCDOT contractor is based on a verified experience and responsibility record and availability of equipment. The contractor selected was responsible for installing ground-mounted signs and pavement markings at all intersections within the project areas. The engineering services subcontractor was responsible for ensuring that signing and pavement marking plans were tailored to the site conditions present at each intersection and met both State standards and MUTCD requirements, staking the intersections, and adjusting and submitting detailed construction plans on behalf of the contractor following the award of the low-bid contract.

Under a separate contract vehicle, four other contractors supported this effort and were responsible for installation of traffic signal-related countermeasures at signalized intersections under this project.

Implementation

SCDOT Headquarters released work orders to the District Traffic Engineering Offices, with 40 to 50 intersections per work order (for a total of 45 work orders in the project). Most work orders comprised intersections within a single District to minimize coordination complexity across District lines.

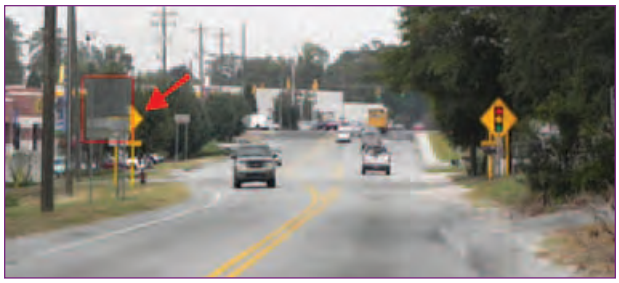

Photo Credit: Joey Riddle, South Carolina Department of Transportation

Example of signing adjustments to be made after field inspection.

During the first year of the contract, SCDOT Headquarters created site-specific drawings for all intersections during the pre-construction development of work orders. During years 2 and 3, SCDOT hired four independent consultants from a pre-qualified engineering services contract to develop site-specific drawings. Site-specific drawings were developed from initial field inspections (year 1 by SCDOT, years 2 and 3 by consultants) and provided to the contractor and subcontractor. Before beginning construction on a given intersection, the subcontractor identified and staked proposed intersections for new signs and pavement markings, verified that specifications within tolerances were met using the initial drawings, and if not, made layout adjustments as necessary. During this staking process, the subcontractor submitted any proposed changes to the design plans to the District Traffic Engineer, who verified the revisions and made recommendations to SCDOT Headquarters for final approval, as shown in Figure 5. The contractor then held a kick-off meeting with the relevant District Office to review the construction plans for intersections within the work order.

Due to the importance of keeping the intersection improvements uniform across the State, a high level of communication between stakeholders was necessary during construction. The contractor and the subcontractor, SCDOT Headquarters, and the District Offices regularly communicated throughout the implementation of the project and kept each other up to date on activities in the field. The subcontractor had a field project representative who traveled between construction sites in a given area to provide oversight. SCDOT District Inspectors were also in the field during installation. District Inspectors either approved work if it was completed per the plan drawings or created a punch list if there were deviations from the plan. The inspectors confirmed the quantity and type of work performed for payment to the contractor.

If during the installation phase it was discovered that an adjustment to the plan was required—for example, if it was found that the proposed location for a new sign post conflicted with underground utilities—the subcontractor would submit recommendations to the District Traffic Engineer. The District Traffic Engineer reviewed and verified recommended changes and

submitted them for approval to SCDOT Headquarters. The contractor and the subcontractor developed a field installation workbook that contained all pertinent information on construction at a particular site, including final approved drawings, installation checklists (Figure 6), and punch list forms. A process flow chart for the project was defined and is shown in the appendix.

In addition, to maintain a record of inventory over the course of the fast-paced project, the contractor and subcontractor developed a reconciliation spreadsheet (Figure 7) to manage multiple crews and to document and verify installed quantities for payment. SCDOT developed a project overview spreadsheet to track the completion status of various phases of each work order, as shown in the appendix.

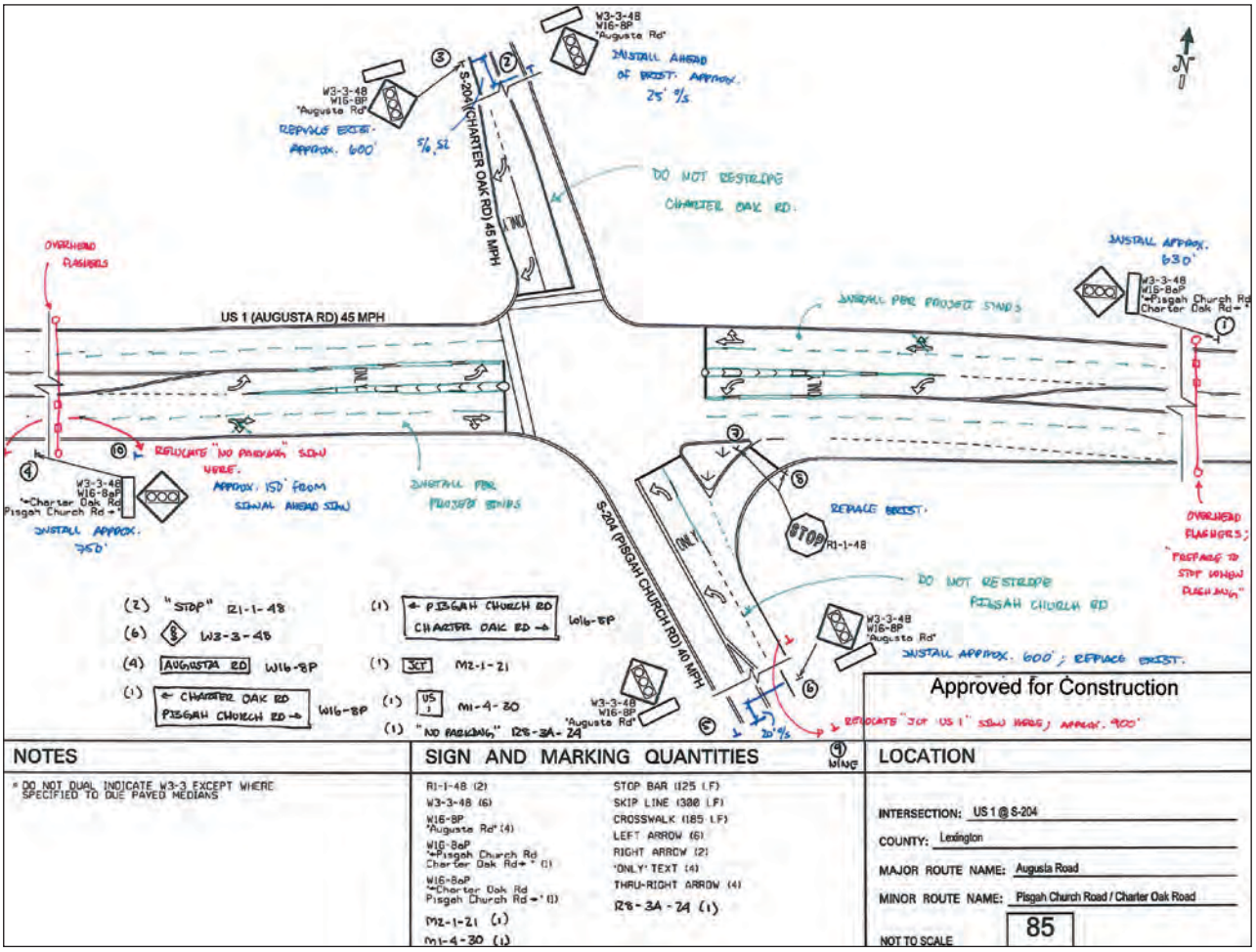

Figure 5. Approved Construction Drawing

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: _____

Figure 6. Sign Installation Checklist

SCDOT Project 47.038390 WO #30 Sign Installation Record

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

Intersn ID	Loc ID	MUTCD	Icon Insert	MUTCD Ext	Width (in)	Height (in)	Hole Space Final	Sign Pay Item (square feet) 6510105	6510106	6510109	6510111	9800500	Sign Installed ?	Anchor (lineal feet) 6551135	Post Length (lineal feet) 6551135	Reflector Strip (lineal feet) 6531500	Post length for D-signs (L.F.) 6551115	Bracing for D-signs RFC #8 (6531205)	Post Coring (each) 9800200 line 520	Beacon (each) 6865700
85	1	W3-3		(blank)	48	48	30			16.00				2	281	192				
		W16-8a	← ELM STREET CHARTER OAK RD →	← PISGAH CHURCH RD CHARTER OAK RD →	54	15	30					5.63								
	2	W16-8	FIRST	Augusta Rd	36	8	30					2.00		2	286	192				
		W3-3		(blank)	48	48	30			16.00										
	3	W16-8	FIRST	Augusta Rd	36	8	30					2.00		2	274	192				
		W3-3		(blank)	48	48	30			16.00										
	4	W3-3		(blank)	48	48	30			16.00				2	282	192				
		W16-8a	← ELM STREET CHARTER OAK RD →	← CHARTER OAK RD PISGAH CHURCH RD →	54	15	30					5.63								
	5	W16-8	FIRST	Augusta Rd	36	8	30					2.00		2	273	192				
		W3-3		(blank)	48	48	30			16.00										
	6	W16-8	FIRST	Augusta Rd	36	8	30					2.00		2	273	192				
		W3-3		(blank)	48	48	30			16.00										
	7	R1-1	STOP	(blank)	48	48	30				16.00			2	206	138				
	8	R1-1	STOP	(blank)	48	48	30				16.00			2	228	150				
	9	M1-4	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								

Figure 7. Reconciliation Spreadsheet

Use of Project Management Web site

The bid documents outlined requirements for a project management internet site that the contractor developed and maintained for the duration of the project. This project management website was a deviation from standard practices due to the project's large size and complex logistics, as compared to contracts typically awarded by SCDOT. The website was primarily used to provide data to SCDOT on a regular basis and to report the progress of work performed on the contract. Contract documents defined the minimum requirements of the website; however, the website developed ultimately included more features.

Table 1 illustrates the Web site data requirements for pavement markings and traffic signs, as specified in the bid documents. Additional requirements can be found in the SCDOT's Proposal, "Contract and Bond for Highway Construction 'Intersection Improvements' for project #: SA09(002)."

Table 1. SCDOT's Data Requirements for Internet 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

Results of Implementation

Realization of Safety Benefits

To date, safety analyses have not been conducted on this 3-year project. An FHWA study will evaluate the safety effects of SCDOT's low-cost systematic intersection improvements—one of several evaluations that will be conducted as part of the FHWA Evaluation of Low Cost Safety Improvements Pooled Fund Study (ELCSI PFS).

Public Reaction/Input

Following the improvements in the first year of the contract, overall public reaction was positive. Some feedback indicated dissatisfaction with certain visual and aesthetic impacts of the improvements, such as larger, brighter signage in close proximity to private property or in historic districts. However, such comments became less frequent over time, especially as citizens began to understand the safety benefits expected from the installation of the treatments.

Lessons Learned

Ability to Adjust the Contract

All stakeholders on the project emphasized that mutual flexibility was an important key to the success of this project. Contract documents cannot account for the myriad of possible variables when dealing with hundreds of individual intersections. It was essential to "expect the unexpected" and be prepared to communicate in a timely and informative manner in order to deal with the inevitable issues that arose (e.g., proposed sign placement conflicted with utilities equipment).

Communication

The unique nature and logistics of a project of this sort, with hundreds of sites spread around an entire state, make communication vital. The contractor and subcontractor, SCDOT Headquarters, and the District offices communicated regularly during the planning and construction phases of each work order. SCDOT District personnel performed site inspections during the installation stage, and both District Inspectors and the in-field contracting team signed off on any required alterations to the plans before routing them to SCDOT Headquarters for approval. Communication between the subcontractor and SCDOT Headquarters became less frequent after the initial months of the project as they developed a relationship of mutual trust and understanding.

Communication to the public was also an important aspect of this project, as it is on any construction project with impacts visible at the community level. Future projects would benefit from more outreach in historic districts to address the concerns of the residents without sacrificing potential safety improvement treatments. In addition, it may be beneficial to use social media outlets to communicate when and where construction is taking place.

Contract Type

For future projects, SCDOT would likely consider issuing a Request for Qualifications (RFQ) or Request for Proposals (RFP) to determine the technical qualifications of engineering services contractors before going through the low-bid process. Because of the complexity of the project and the design-build elements it entailed, SCDOT suggests using a hybrid approach that combines low-bid contracts awarded to pre-qualified contractors with pre-qualified engineering services subcontractors, rather than strictly using a low-bid process. Table 2 lists some of the advantages and disadvantages of the low-bid and qualifications-based contracts cited by the various stakeholders.

Lesson Learned: Communicate early and often…and expect the unexpected.

Table 2. Advantages/Disadvantages of Low-bid and Qualifications-based Contracts

Low-bid		Qualifications-based	
Advantages	Disadvantages	Advantages	Disadvantages
Fast decisionmaking process	Bidders may not have technical qualifications	Technical proposals provide opportunity for contractors to demonstrate technical capabilities	Longer decisionmaking process
Lowest upfront cost to State	Additional costs if winning contractor is not capable	Work is more efficient/reliable and State has confidence in work being conducted	Potentially higher cost due to technical qualifications

The contractor and subcontractor recommended that other States use a qualifications-based approach that focuses on technical capabilities for future projects similar in nature to the systematic approach used in South Carolina. All noted that SCDOT was fortunate to find a very reliable and trustworthy contractor/subcontractor team for this project, but contracts that are strictly low-bid do not necessarily provide an opportunity for the State to understand the technical capabilities of the bidding firms.

Additionally, SCDOT, the contractor, and the subcontractor all suggested that serious thought should be given to determining whether the firm conducting installations should be on the same contract as the firm conducting engineering services, as it provides the potential for a conflict of interest.

Plans Development

Initially, SCDOT provided site-specific drawings for the improvements to be made at each intersection during the first year. Due to the overwhelming quantity of plans to be produced, SCDOT opted to shift this work to four consulting firms, independent from the contractor, for the second and third years.

Over the course of the project, the contractor and subcontractor developed a very strong understanding of SCDOT's expectations for the proper application of the signing and marking treatments and had considerable involvement in the revisions of the drawings provided by the

consultants. However, both the contractor and the subcontractor noted that it would have been easier to either draw the plans themselves or have a single consulting firm draw all the plans to avoid discrepancies between the drawings.

The subcontractor and contractor stated that the drawings, like those provided by SCDOT and their consultants, needed to provide enough detail to be considered a construction drawing. Changes had to be made to the original site-specific drawings based on realities in the field, and revisions were often necessary.

Inspection Responsibility

Rather than dividing inspection responsibilities by District and having many staff members throughout the State, the subcontractor suggested that SCDOT have the same set of inspectors working on sites throughout the State. This would reduce the need for re-education of District staff and would ensure a more consistent inspection process statewide.

Future Steps

For the second and third years of the systematic intersection improvements, SCDOT used consultants to produce site-specific drawings for the remaining intersections identified in the ISIP. SCDOT has also indicated they are considering separating the installation work from the engineering services portion of the contract and using a process to determine the technical capabilities of engineering services subcontractors through an RFP/RFQ process before initiating the low-bid process.

SCDOT is planning to conduct a large, statewide curve improvement project using a systematic approach similar to that used in the intersection improvement project.

References

1. Intersection Safety Implementation Plan Process, FHWA-SA-10-010.
http://safety.fhwa.dot.gov/intersection/resources/intersaf_ipp0709/fhwasa10010.pdf

2. A Focused Approach to Safety Guidebook, FHWA-SA-11-44.
http://safety.fhwa.dot.gov/fas/guidebook.cfm#intersectionhighlights

3. Low-Cost Safety Enhancements for Stop-Controlled and Signalized Intersections, FHWA-SA-09-020.
http://safety.fhwa.dot.gov/intersection/resources/fhwasa09020/fhwasa09020.pdf

South Carolina Low Cost Intersection Improvements Project 3/22/2012
Contract ID: 47.038390

Work Order #	SCDOT District #	No. of Intersections	Original Drawings Received	Field Staking	District Plan Review	SCDOT HQ Review	Sign Fabrication	Sign Installation	Long Line PM Install	Hand Work PM Install	Sign Punchlist Work	PM Punchlist Work	PM Reflectivity Readings
29	1	41	Yes	Complete	Complete	Complete	Complete	Complete	Underway 03/20/12	Underway 03/19/12 (8 Int. left)			
30	1	45	Yes	Complete	Complete	Complete	Complete	Complete	Underway 03/20/12	Planned (start 03/26/12)			
33	5	75	Yes	Complete	Complete	Complete	Complete	Underway 03/14/12		Underway 03/20/12			
34	5	26	Yes	Complete	Complete	Complete	Underway 03/15/12	Planned (start 04/09/12)		Planned (start 04/18/12)			
31	1	42	Yes	Complete	Underway 03/12/12								
24	2	44	Yes	Underway 03/15/12									
32	2	43	Yes	Projected (start 03/29/12)									
35	1	41	Yes										
36	1	42	Yes										
37	1	41	Yes										
38	1	45	Yes										
39	3	45	Pending										
40	3	44	Pending										
41	3	47	Pending										
42	3	43	Pending										
43	6	59	Yes										
44	6	47	Yes										
45	6	59	Yes										

Process Map Flow Chart

A Technical Document to Aid The South Carolina Department Of Transportation (SCDOT), the Contractor, and the Subcontractor During Document Chain of Custody.

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

For More Information:

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