South Carolina Department of Transportation
Traffic Engineering Guidelines

NUMBER: TG-35

SUBJECT: Business Rules for District Traffic Signal Shop Operations

BACKGROUND: The attached Business Rules were developed to establish consistency and accountability for the South Carolina Department of Transportation's (SCDOT) district traffic signal shop operations. These Business Rules have been approved and each district signal shop shall implement these rules effective immediately. This document will be maintained on HQ Traffic Engineering's webpage and future reviews and updates will be coordinated by HQ Traffic Engineering through the Signal Standards Committee.

Engineering Directive 78 outlines guidance concerning district signal shop general responsibilities and inventory control. These guidelines further detail information in support of that Directive but do not replace or override anything contained in that Directive. The following referenced documents also address signal-related issues:

- Engineering Directive 2 - Fiscal and Maintenance Responsibilities for Traffic Signal Installations on the State Highway System
- Engineering Directive 33 - Mast Arm Standards
- SCDOT Maintenance Manual
- SCDOT Procurement Policies and Procedures Manual
- SCDOT Traffic Signal Design Guidelines
- Manual on Uniform Traffic Control Devices (MUTCD)

GUIDELINE:

1. General Responsibilities

Supervision of district signal shops vary from district to district, but for the purpose of these Business Rules, the person responsible for general oversight of operations, contracts and inventory control shall be referred to as the "District Electric Supervisor (DES)."

2. Staff and Training

The DES will be responsible for the safety and production of signal shop employees and accountable for all signal shop equipment, tools and inventory, including all computers and other IT devices.

Each signal shop employee will be responsible and accountable for all assigned equipment, tools and inventory, including computers and other IT devices.

The DES will reconcile the shop budget/expenditure reports each month.

All signal employees responsible for signal repair shall be IMSA Level 2 Traffic Signal certified within 3 years of employment. All signal technicians shall be encouraged to complete all IMSA certifications.

Each signal shop shall have personnel with expertise in the following areas:

a. Signal construction
b. Signal construction inspection
c. Signal software programming
d. Signal operations
e. Signal troubleshooting/maintenance
f. Communications installation/maintenance
g. Signal equipment procurement methods
h. Basic knowledge of signal timing/design
i. Most "current" approved Work Zone Traffic Control schemes for shoulder closure/lane closure

In addition, signal shops shall ensure each employee that works on traffic signals is trained or is scheduled to obtain the minimum following training:

a. Cabinet training
b. Ethernet training
c. National Electric Code training
d. Fiber Optics training
e. Safety training in accordance with SCDOT policy
f. Work Zone Traffic Control

The DES is responsible for evaluating each shop employee and jointly preparing an annual training program for each employee to achieve and maintain the levels of knowledge, skills and ability noted above.

3. Procurement

All procurements shall be in accordance with SCDOT Procurement Policies and Procedures as defined by the Procurement Policy Manual.

Supply Depot Purchases

All signal items stocked at the Supply Depot must be procured through the Supply Depot rather than district personnel procuring them directly from the vendor. The DEA or designee must approve exceptions when

there is a situation in which the Supply Depot does not have adequate stock on hand.

1. For Federally funded purchases, all district initiated requests for SCDOT furnished equipment must be submitted to the State Signal Engineer, or designated project manager, for approval via email. The request must include equipment type, quantity, and charge code. The State Signal Engineer, or designee, will order equipment for delivery to the district signal shop through SCEIS.

2. For Federally funded purchases, all HQ initiated requests for equipment must be approved by the State Signal Engineer, or designated project manager. The request must include equipment type, quantity, and charge code. The State Signal Engineer, or designee, will order equipment for delivery to the district signal shop through SCEIS.

3. For State funded purchases, the DES will order equipment directly by creating a shopping cart under SRM in SCEIS.

Non-Depot Stock Contract Purchases

1. For Federally funded purchases of equipment and items on contract but not stocked at the depot, all district initiated requests for equipment must be submitted to the State Signal Engineer, or designated project manager, for approval via email. The request must include equipment type, quantity, and charge code. The State Signal Engineer, or designee, will order the equipment through SCEIS.

2. For State funded purchases of equipment and items on contract but not stocked at the depot, the DES is responsible for making purchases directly from the vendor. Signal shops will be responsible for paying invoices through SCEIS.

Non-contract Purchases

For equipment and items that are not on contract, the DES will initiate procurement using SCDOT Procurement Policies and procedures.

4. Multi-vendor On-Call Traffic Signal Maintenance Contract Management & Inspection

Definitions:

a. Type 1Signal Activities - signal operations improvements, retiming, responsive or adaptive

b. Type 2 Signal Activities - signal installation or upgrades (rebuilds)

c. Type 3 Signal Activities - signal communications improvements (fiber, etcetera)

d. Type 4 Signal Activities - signal maintenance including repairs to equipment, detection, heads

e. Emergency Work - Emergency work is defined as unplanned work that must be done immediately for safety reasons, such as an intersection knock down.

f. Planned work - Any signal work, Type 1, 2, 3 or 4 Signal Activities that is not emergency work.

g. Work Order - consists of work type, quantities, plans, scope including schedule per signal. For fiber work, a work order consists of the amount of work to connect two signals.

h. Contractor Assignment - consists of one or more work orders, reasonably grouped by location or work type

Procurement will provide each District a list of those contractors who have expressed an interest in working in the specific District. Procurement will also identify the type of work each contractor is qualified to perform. Quotes from three contractors shall be obtained for planned work >$50,000. For planned work <$50,000 a best effort shall be made to obtain quotes from two contractors.

The DES will obtain the services of an on-call contractor who is able to perform the emergency work immediately. The DES shall inform the District Traffic Engineer (DTE) of these activities as soon as possible. A Purchase Order (PO) must be issued prior to, or as soon as possible in accordance with the Policies and Procedures Manual. An Emergency Justification must be submitted to Deputy Secretary for Engineering for approval before if possible or as soon as possible following the repairs.

The DES may recommend and the DTE approve the use of the multi-vendor on-call contractors to perform state funded planned work consisting of Type 1, 2, 3 or 4 signal activities.

The State Signal Engineer, or designee, may recommend and the DTE approve the use of multi-vendor on-call contractors to perform federally funded Type 1 or Type 3 signal activities.

The DES and DTE, or designee, shall prepare preliminary work orders including schedule, scope of work, plans (mark ups are acceptable for work assessment) and quantities. The DTE, or designee, shall determine how many work orders shall be included per Contractor Assignment.

The DES shall email the Contractor Assignment to two contractors for quotes. The contractor shall respond by email within five working days; the contractor that is prepared to perform the Contractor Assignment within the schedule and at the best price should be assigned the work.

The Contractor must agree to quantities and schedule in advance of SCDOT issuing the Contractor Assignment. SCDOT shall issue a PO in SCEIS and reference the contract number prior to assigning the work. The PO shall note that the contractor must submit an itemized invoice upon completion of the work. Each Contractor Assignment shall be issued with a PO prepared for that specific work. Blanket POs are not acceptable.

If multiple contractors indicate that they can comply with the schedule and their pricing is equal, the DES and DTE, or designee, shall choose the contractor within the closest proximity to the job site.

Contractors that do not respond within five business days shall be deemed non-responsive and three non-responsive occurrences may be cause for the contractor to be removed from the contract.

Right of Refusal - the CONTRACTOR may refuse a Contractor Assignment (work order) without prejudice within 24 hours of notification.

The contractor assigned the work shall identify any subcontractors that will perform 10% or more of the work for SCDOT approval.

The DES, or designee, will be responsible for ensuring that all work performed on the Multivendor On-Call Traffic Signal Maintenance Contract meets all Traffic Signal Specifications according to the latest version of specifications found on the SCDOT website:
https://www.scdot.org/business/traffic-signals.aspx

The DES must be contacted for approval prior to any quantity changes or additional work items being performed. Any change orders shall be reviewed and approved by the DTE, or designee, and appropriate justification shall be provided and attached to the PO. The PO will be adjusted prior to beginning work.

Once the project is complete, the Contractor shall submit an itemized invoice for the work performed. The DES will initiate payment upon final acceptance of work and receipt of an itemized invoice from the Contractor. A goods receipt shall be created in SCEIS for payment.

The DES is responsible for processing payments for work performed under the Multivendor On-Call Traffic Signal Maintenance Contract. Invoices shall be reviewed by DES and DTE, or designee, prior to processing payments.

5. Maintenance Work Order Items:

TEAMS (Traffic Engineering Asset Management Software) – electronic inventory of traffic signal installations on the state highway system

The district signal shops are responsible for maintaining electronic inventories of SCDOT maintained signal locations and equipment. All equipment in the field or stored at the District signal shop/warehouse shall be entered into TEAMS. TEAMS shall be updated upon completion of signal work at an intersection.

Preventative Maintenance

a. Signal shops shall perform annual preventative maintenance reviews for all stop and go signals they maintain.

b. Signal shops shall perform annual preventative maintenance reviews on all flashing beacons associated with school zones.

c. All other flashing beacons shall have a preventative maintenance review every two years.

d. All reviews shall be documented in TEAMS.

New Installs/Repairs

a. New signals shall be installed as soon as possible upon approval by the District Engineering Administrator (DEA), based on budget availability. The DTE/DES shall maintain a listing of pending approved installations and current status toward completion of work.

b. Defective loops shall be repaired as soon as possible upon notification, based on budget availability, and prioritization determined by DES and/or the DTE.

c. For stop and go signals, upon notification of a signal in flash or not operating, signal technicians will respond as soon as possible to repair signal to operating condition. For emergency repairs of damage to signal span, cabinet, or poles, the DES or technician shall respond as soon as possible and begin making repairs. The responding employee shall coordinate with other shop employees or inform the DES if contractor assistance is needed to place the signal back into operation as quickly as possible. The signal shop supervisor or responding technician will coordinate with the appropriate SCDOT maintenance unit for other traffic control devices that may be needed to provide direction until repairs are completed.

Signal LED/lamp maintenance

Any burned out signal indication on a given approach movement shall be replaced as soon as possible after notification.

Coordination w/ Local Government Signal Maintenance

As Intergovernmental Agreements for Traffic Signal Maintenance are developed or updated (Signal Maintenance Agreements [SMA]), the DES shall be responsible for adding, removing or reassigning signals to and from local governments within the TEAMS database. Additionally, the DTE and DES will coordinate with the local governments participating in SMAs within their District on signal rebuilds, maintenance, and other issues as necessary to assist in oversight of the agreements.

Work Requests

All work requests received for signals maintained by SCDOT shall be logged into HMMS. The responsible supervisor will ensure the Daily Work Reports are completed in accordance with HMMS business rules. Work requests received for signals maintained by a local jurisdiction as part of a maintenance agreement shall be forwarded to the appropriate jurisdiction.

6. Projects with Traffic Signals

The responsibility of construction management for traffic signal projects will be assigned at the discretion of the DEA/DCE.

Inspection for all signal related work in a non-signal construction contract shall be performed by the district signal shop and Resident Construction Engineer (RCE) designated inspector in conjunction with the assigned RCE. The signal shop will provide expertise and direction to the RCE concerning any deficient items. At the end of the work, the signal shop will provide a punch list for items

that must be corrected prior to final acceptance of the work. The DES must approve direction to the RCE, or designee, concerning any signal work.

Signals added by encroachment permit to be coordinated and inspected through the District signal shop.

7. Signal Shop Inventory Control

The following information further details the guidance contained in Engineering Directive 78 regarding signal inventory control.

TEAMS User Accounts

The following TEAMS roles are granted to signal personnel based on their duties once approved by the Director of Traffic Engineering, or designee.

a. Administrator – limited personnel within the Signals office with the purpose of standardization and overall maintenance of the electronic inventory as well as coordination with the program vendor.

b. District Administrator – person assigned in each District, with no access to the physical signal inventory, to oversee District TEAMS data and make any corrections necessary to ensure adherence to standards, accuracy, and consistency; permissions include the ability to add, edit and delete all location and warehouse information, documents and inventory.

c. District Engineering – personnel assigned to District traffic engineering positions focused primarily on signal design and provides view access for all areas with additional permissions to add/delete locations and modify/delete documents to include: AADTs, counts, images, notes, permits, plans, project information, studies, and timings.

d. District Technicians –personnel assigned to District traffic engineering positions focused primarily on maintaining signal equipment (signal shop personnel) and provides view access for all areas with additional modify permissions for location images, inspections, inventory, notes, tasks and work history.

e. Guest –all personnel not specified for other roles and provides view access to location AADTs, counts, images, inventory, studies, and timings.

f. Municipal Engineering – personnel assigned to SMA municipality traffic engineering positions focused primarily on signal design and provides view access for all areas with additional permissions to edit

locations and modify documents to include: AADTs, counts, images, notes, permits, plans, project information, studies, and timings.

g. Municipal Technicians – personnel assigned to SMA municipality traffic engineering positions focused primarily on maintaining signal equipment (signal shop personnel) and provides view access for all areas with additional modify permissions for location inspections, inventory, notes, tasks, and work history.

h. Other users – consultants and other similar personnel and provides view access for location AADTs, counts, images, inventory, permits, plans, project information, studies, and timings.

i. SCDOT Other – all other SCDOT personnel and provides view-only access for all areas.

j. SCDOT TE – personnel assigned to Traffic Engineering within the SCDOT Headquarters. The role provides view access for all areas with additional modification permissions for documents to include: AADTs, counts, images, notes, permits, plans, project information, studies, and timings.

k. Warehouse Manager – personnel assigned to positions responsible for maintaining the physical signal equipment inventory in SCDOT or SMA municipalities and provides modify permissions to warehouse inventory, reconciliations and reorder levels.

Access requests are accomplished via the SCDOT TEAMS User Request form ("contributing" or "view-only"). This form is filled out and signed by the user, reviewed and signed by the agency lead, and forwarded to the TEAMS Administrator in the Signals office for Director of Traffic Engineering, or designee, approval and signature. The TEAMS Administrator will then add the user to TEAMS and ensure login information is provided to the user and agency lead. Agency leads are responsible for ensuring the TEAMS Administrator is kept apprised of all TEAMS account changes (adds/removals) as they are identified. Additionally, agency leads will coordinate with the TEAMS Administrator annually to confirm all current user accounts' status.

TEAMS Location Information

To the maximum extent possible, all locations will be entered with a unique Custom ID consisting of a 6-digit alphanumeric format. The first two characters will identify the type of location ("TS" for traffic signals, "SF" for school flashers, "F-" for all other flashers) and the last four characters will consist of a 4-digit number that will match ATMS.now and other

systems when able. Number blocks are assigned by District (1000-1999 for District 1, etc.) and SMA municipalities will use numbers within these blocks when able; but will be assigned other unique blocks when numbers aren't available within the District block.

Locations will be created based on their purpose and will include all equipment associated with that purpose.

a. All flashers associated with a signal location (ex: advanced warning flashers) will be added to the signal location.

b. All school flashers for a single school and/or school zone will be added as a single school flasher location regardless of the number of flashers or streets encompassed.

c. Multiple intersections controlled by a single cabinet/controller will be entered as a single location at the intersection where the signal cabinet resides; all equipment from all associated intersections will be added to the location and the location "Comment" block will annotate the additional intersection(s).

Locations under construction will have a note added to the location "Comment" block to indicate the construction status, project, and estimated completion date.

Signals coordinated with adjacent signals into a system to facilitate directional traffic flow should be annotated as a system. Do not add locations to a signal system if they are simply connected and communicating with a central management system unless they are also coordinated with adjacent signals to facilitate traffic flow.

TEAMS Equipment Information

Ensure serial numbers (S/N) are added to all Accountable Equipment in TEAMS. Do not create duplicate S/Ns and do not edit S/Ns once created. Ensure S/Ns on equipment remain legible. If equipment does not contain a legible S/N and the S/N is not known, create a unique serial number and annotate both on the equipment and in TEAMS. When updating equipment information at a location, do not edit the serial number field in order to correct the data; instead, transfer the equipment to the warehouse or other location, as appropriate to ensure a proper equipment history is maintained.

When maintaining equipment in TEAMS, utilize the following equipment states:

a. Operation – TEAMS indication when equipment is added to its operating location.

b. Available – equipment physically located at the signal shop and is available for use.

c. Reserved – equipment physically located at the signal shop and held for a specific project or use; this prevents it from being inadvertently moved to another location within TEAMS.

d. Repair – equipment that has been sent for repair.

e. Transport – equipment physically removed from the signal shop but not yet installed at a location; this can be used when equipment is stored on a vehicle and intended to be used whenever the need arises.

f. Missing – equipment identified as not residing in its annotated location (typically during warehouse reconciliation); this state removes the item from an available status in TEAMS but enables easy return if found. Items should not remain in missing status for more than a year.

g. Salvage – equipment physically discarded via a scrap bin, trash, or dumpster; disposal must be IAW SCDOT disposal procedures and SC Regulation 19-455.2150, Surplus Property Management.

h. Surplus – equipment awaiting or has been picked up by the state Surplus Property office; disposal must be IAW SCDOT disposal procedures and SC Regulation 19-445.2150, Surplus Property Management.

i. Spare Parts – when equipment physically located at the signal shop but used solely for spare parts.

Equipment Transfer

An appropriate entry/update is required in TEAMS every time signal equipment is received, used, transferred, or installed. Signal shops should be especially attentive to equipment going into and out of their storage warehouse for projects and daily maintenance to ensure all equipment is correctly annotated in TEAMS at least daily in order to ensure inventory accuracy is maintained. In addition to TEAMS updates, any time equipment is transferred to/from an outside agency (different District, municipality, contractor, etc.), completing the Traffic Signal Equipment Transfer Form is also required. Whether accomplished electronically or in ink, this form shall be maintained at the signal shop with other related signal inventory documents as a record of the equipment transfer (exception: the form is not

required when receiving purchased equipment directly from the selling vendor as the shipping/purchasing documents satisfy this requirement).

Approved: Brent S. Dillon — October 5, 2023

Director of Traffic Engineering — Date

Original Guideline Signed on May 28, 2015