

Specifications for an Infrared-Based Screening System

PURPOSE

The specifications called out in this document establish the type, capabilities, performance, verification, documentation, training, and warranty of an Infrared-Based Screening System (IBSS) to be used for the purposes of commercial motor vehicle (CMV) performance screening and enforcement as allowed by Federal and State law and as determined by the State of Tennessee.

The fully automated IBSS described in this specification will be installed on the entrance ramp at the heavy commercial vehicle weigh and inspection station in Coffee County, Tennessee.

Note: The following specifications as called out in this document must be met by the IBSS being offered by respondent (Offeror) in order for the Offeror's submission to be considered under this solicitation.

ACRONYMS AND DEFINITIONS

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|---------|---------------------------------|
| CMV | Commercial Motor Vehicle |
| Offeror | Respondent to Solicitation |
| IBSS | Infrared-Based Screening System |
| DOS | Department of Safety |

The successful bidder must have proven experience in the successful deployment of an IBSS in a CVE environment. Bidders to have a minimum of one reference from certified law enforcement agency that has deployed the IBSS in CVE operations. The proposed system will be deployed in Tennessee and must have a proven capability to deliver CVE benefits to the Tennessee Highway Patrol (THP). Successful bidders must provide evidence that the proposed system has been used successfully as a pre-screening tool for CVE operations in an equivalent jurisdiction. In order to integrate with current operations, the successful bidder must show that the IBSS has been successfully deployed in field environments that require follow-up NAS inspections and that CMV enforcement violations have been issued on identified vehicles screened using the IBSS (data to be provided to THP prior to bid award).

THP will purchase the most versatile and integrated IBSS that employs fully automated technology available within its budgetary and operational constraints. The IBSS must be able to operate in a variety of weather conditions with no equipment-related delays or restrictions.

The integrated IBSS must incorporate features that address all of these operational issues:

Protected Workstation – The inspection unit must include a workstation that is protected from the outside environment for the safety and comfort of the technicians and the safety of the electronic equipment.

Electronics- All electronics to be placed roadside should be adaptable to required State DOT requirements for enclosures, electrical services, foundations, and setbacks from travel way.

CMV Brake and Equipment Inspection - The IBSS must be a wholly automated system designed and engineered for CMV brake inspection. The IBSS must be capable and versatile enough to be used to inspect passing CMVs while in motion. The IBSS must be capable of being used to functionally inspect for inoperative brakes, overheated brakes, overheated bearings, seized bearings, over/under inflated tires.

Dual Sensor Technology (or equal) – The integrated dual-sensor technology must incorporate Fields of View (FOV) that allow for both adequate ground coverage and optical magnification. Therefore, the IBSS must incorporate a dual-sensing technology and evidentiary documentation system that meets the following criteria:

Sensitivity - The color image sensor must be effective in variable weather conditions, therefore an image sensor sensitivity of at least 5.0 lux @ f / 1.2

Accuracy:

The IBSS shall flag a minimum of 5 percent of the total vehicles screened.

The IBSS shall flag a maximum of 20 percent of wheel ends which do not actually meet or exceed the pre-determined failure criterion.

The IBSS selection algorithm shall be configured such that a minimum of 70 percent of vehicles flagged would be placed out-of-service if subjected to a North American Standard (NAS) Level-1 inspection by a CVSA-certified inspector. Should the system, upon implementation in the field, not meet this specification, the vehicle flagging criteria should be adjustable (by an authorized administrator) such that this percentage can be met

The IBSS shall maintain the minimum accuracy requirement for vehicles traveling up to 15 miles-per-hour. The IBSS is not required to function on static (non-moving) vehicles.

General Specifications of IBSS System

The user interface shall integrate into the License Plate Reader, USDOT Reader, Over height detector, and WIM software into one display and shall include thermal imaging, vehicle identification, defect documentation and alarm functions. The temperature data shall be displayed simultaneously for the brakes, tires and bearings, for the inspector to review.

The system must support data integration with the above ramp sensors when they are not co-located with the IBSS slow speed location ramp equipment and must exceed a 95% accuracy.

The effectiveness of the IBSS depends first and foremost on its ability to identify potential defects on CMVs with high accuracy, and to notify the enforcement personnel of the need to consider a specific vehicle for selection for further inspection.

The system should be able to detect CMVs in any configuration (e.g. straight truck, tractor-trailer, flatbed, multi-trailer, etc.,) including multiple axles and various tire sizes.

The IBSS must be capable of operating under all ambient light conditions, both daytime and nighttime.

Measure thermal characteristics of commercial vehicle tires, brakes, and bearings in vehicle inspection environment

Measure thermal characteristics of both sides of vehicles

Apply a set of empirically derived rules to automatically assess whether a particular vehicle is operating under normal conditions. Vehicles with brake, tire, or bearing flaws should be flagged.

Provide user interface with tools to enable inspector to *manually review flagged vehicles* and easily assess thermal characteristics

Provide a user interface that includes tools to enable *saving past records for review*

All electronics to be placed outside must be enclosed in *appropriate NEMA approved enclosures and should allow for the widest of over-sized permitted loads*

System should be *fault tolerant* without requiring user to have to open hardware enclosures to reset cameras or computers.

User interface should include *means for user to set variable parameters* as necessary but should also *not require user to adjust critical functions* unless specifically trained to do so (should not be required for day to day operations). Critical functions should be password protected.

The user interface shall *allow a user to access past inspection data* while vehicles continue to pass through the system. The inspection data for those vehicles will be processed in the background

Local control system shall offer the following capabilities:

1. *Display real-time information* on passing vehicles including the wheel temperature information
2. *A display of all vehicles inspected and a means for selecting past inspections*
3. *Access to tools for evaluating individual wheel data*
4. *Password protected access to system tools* enabling a user to perform basic system configuration and recovery actions
5. *Access to user definable parameters*

Axle triggers shall be easily configured in road sensors (threshold) that use hardware triggers to obtain wheel images.

System shall include lightning protection

The IBSS shall interface and operate (with no modification required on the part of the State of Tennessee) with the power (voltage and configuration) that is readily available at the Coffee Co. weigh station. The Offeror must verify, understand, and accept the location of feed, voltage, and configuration of power available at the Coffee Co. weigh station. Using this available power, the Offeror must successfully interface and make the IBSS operational.

The IBSS shall be ready for use within 5 minutes of power up for a fixed system. Power off and/or securing of the system shall be possible within 5 minutes of determined end of use for the shift for a fixed system.

The IBSS shall contain failure criteria which lead to the automatic identification of a vehicle for additional screening, based on the number or combination of flags assigned to wheel-ends on the vehicle. Audible and/or visual alarms should be enabled when a vehicle is selected for possible additional inspection. The volume of an audible alarm shall be adjustable by user to allow alarm to be heard in a variety of background noise situations

The IBSS shall uniquely identify the vehicle for which a particular alarm was triggered, and this information (image of vehicle and region of flag) shall be provided on the monitor.

Printouts which identify the vehicle of interest, wheel-ends which were flagged, and the criterion which caused the alarm to be triggered shall be available either as a part of the IBSS, or via third-party publically available software functions.

The IBSS shall be capable of storing past inspections for a minimum of 60 days.

The IBSS shall be able to recall and display past inspections.

This section is to assist the interested jurisdiction with items to consider in anticipation of implementation of the IBSS at a particular location.

The User's Manual shall contain a description of the optimum site characteristics, as well as a full disclosure of the limits of the system. Examples include, but are not limited to:

- a) Lateral distance to center of vehicle lane,
- b) Distance required before crossing sensor line for triggering mechanism (light beam, proximity sensor or drive-over wheel sensing tubes),
- c) Effect of interposing semi-transparent objects, such as chain-link fences, on the sensors or triggers,
- d) Position of sensors with respect to ability to select and detour vehicles for further inspection,
- e) Infrastructure/conduit requirements between trigger device, cameras/sensors, and user interface location,
- f) Monitor location and mounting information,
- g) Location must be such that the vehicle must apply the brakes prior to passing through the IBSS. This is required to cause a thermal signature of the braking system to be created in order for the IBSS to evaluation and report on the vehicles components of interest.

The IBSS should be configured such that interruptions and/or fluctuations in power do not damage the system or its specific components, including: the IR sensors, video, tire pass-over, light beam or triggers, computer and user interface/display. Adequate filtering and/or use of uninterrupted power supplies should be incorporated to the extent possible. The IBSS should be capable of functioning (including display and printer, if equipped) for 15 minutes after loss of primary power.

The system must be functional 95% of the time based on a 24 hour duty day.

The manufacturer shall explicitly document the limits of operation under conditions of inclement weather for which the IBSS cannot provide accurate screening capabilities. Examples of conditions include: Rain at a rate of greater than 2 inches per hour, snow falling at a rate of 4 inches per hour, fog in which visibility of a 100 candle power white light source is reduced to 10 meters, temperatures below 0 °C, etc.

The User's manual shall provide recommendations for protection from damage of the components of the IBSS. It is up to the jurisdiction to implement such protection.

The IBSS software must be designed to be tolerant of input from the hardware which may be out of range for screening purposes, and must not cause the system to require cycling power to the cameras/sensors or re-booting of the computer. Examples include: vehicles passing too quickly or slowly through the sensor/video detection path, voltage surges or drops, software buffer overflow, hardware resource allocation issues etc. The manufacturer shall explicitly document the conditions which may lead to requirement for system re-boot, instructions for re-starting the system, and the means to recognize when the system requires re-starting.

Inspection Software

Production series- The OEM inspection software must be a proven production-series IBSS software platform designed specifically for CVE operations

Proven platform – The OEM thermal inspection software must have a proven track record of deployment in CVE operations.

CVE Design – The inspection software must be designed with user friendly operator controls customized for in-queue inspection operations and enabled with one-touch detail views and an easy to search format for post- inspection follow-up operations.

Data Search – The documentation system should automatically record all documentation in a digital format that is catalogued and easy to retrieve for future reference.

Data Security – The documentation system must include multiple levels of security access to maintain data integrity.

Data Display – The dual sensor real-time data will be displayed on a flat screen monitor at the operator workstation with easy on-screen software controls to maximize efficiency and operator comfort.

Data back- The system shall notify the operator when the data storage of the computer is reaching capacity and have a mechanism for transferring files to long-term or alternate storage to prevent system shut-down. The system has a method of long-term data storage and redundancy to prevent data loss.

Warranty

The functional performance of the IBSS shall be under warranty for a period of at least one year from the date of completed installation and checkout. The manufacturer is responsible for all repair and/or replacement of the IBSS and its components during this one-year period, except for repair of damage caused by accidents or abuse of the equipment. The warrant period begins at the completion of the acceptance test from the Tennessee Highway Patrol.

Deliveries

Training – At the Coffee County Inspection Station during the first week after the system is put in operation, to include two days of training sessions and supervised “exercise”. Vendor will also provide one additional on-site two day training for the system users and the System Administrators.

Acceptance Performance Test- The Acceptance Performance Test period shall begin on the first normal working day following delivery of the completed system. Before acceptance the vendor must demonstrate to the satisfaction of the owner that the system consistently meets the performance requirements of the specifications and will serve as the basis for acceptance or rejection. The vendor must test for flag and OOS rates as stated in the specification and assure the rates can be met.

Documentation – Two copies of each of the following manuals shall be provided with the IBSS. All documentation shall be in English and shall be easily understood by an English-speaking individual with at least a secondary school education.

Operation Manual – This manual shall explain how to properly and safely operate the IBSS. It should explain what the conditions for an individual wheel-end flag is triggered, and the criteria for a failure condition. Trouble-shooting information shall be included covering the most common user-correctable problems

This manual shall specify preventive maintenance procedures and schedules, the tools or equipment required for performing maintenance, diagnostic

procedures, and information for ordering replacement parts such as cables, connectors, lenses, antennae, etc.

The IBSS vendor shall specify in writing the type of technical support which is available after the warranty period, whether at no cost or under a service contract.

Self-Certification Specifications

The following specifications shall be validated by the Offeror or the Offeror's designate.

The system, comprised of the IR sensors and, if so equipped, image analysis and color or gray-scale software, shall be capable of distinguishing differences in temperature of a minimum of ± 1.0 °F (± 0.5 °C).

Environmental/Weather Resistance:

The IBSS shall be capable of functioning as intended in the ambient temperature range of -15 °C and 50 °C.

The IBSS shall be capable of operating in the relative humidity range of 5 and 95 percent over the operating temperature range listed above.

All equipment meant for installation outdoors shall be sealed against water intrusion from wind driven rain (e.g. compliant with NEMA 4 rating)

All controls and computer readouts shall be visible to the operator in direct sunlight. If shading devices are required, they must be included with the unit.

All exposed surfaces shall be resistant to degradation from ultraviolet light.

The IBSS shall be constructed such that it is compliant with applicable regulations for electromagnetic interference (EMI) and electromagnetic compatibility (EMC) found in, for example, FCC Rules and Regulations, Title 47, Part 15, Subpart B, or EMC Directive 2004/108/EC.