
TII492 Intelligent Transport Systems (ITS) - Equipment Supply and Installation Framework - Generation 2 - Lot 1

Volume A: Works Requirements

Part 3: Technical Specification Section 10: Automatic Number Plate Recognition Cameras

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1. Introduction

1.1 General

This specification defines the requirements of the Employer for the supply, installation, testing and commissioning of new Automatic Number Plate Recognition (ANPR) cameras.

The Contractor shall design, supply and install ANPR cameras and ancillary equipment in accordance with this specification.

The Contractor shall test and commission ANPRs in accordance with this specification and Volume A - Part 4: Testing and Commissioning Specification.

The Contractor shall refer to the following documents which are referred in this document.

- Volume A - Part 2: Works Specification
- Volume A – Part 3: Technical Specifications Section 13 Power Requirements
- Volume A - Part 4: Testing, Commissioning, Documentation and Training.

The document outlines the following for the ANPR camera equipment:

- Scope of Works;
- ANPR Requirements;
- Design Requirements;
- Supply Requirements; and
- Install Requirements.

1.2 Scope of Works

The scope of works includes, but is not limited to the following:

- The Contractor shall design all ANPR equipment in accordance with the requirements of this specification.
- The Contractor shall supply and install ANPR equipment on gantries and cantilever structures and verge mounted poles, including all necessary mounting bracketry, power connections and communications interfaces in accordance with the requirements of this specification.
- The Contractor shall support the integration of the ANPR camera equipment with Asset and Fault Management System (AFMS), Network Intelligence and Management System (NIMS) and Associated Services, in accordance with the requirements of this specification.
- The Contractor shall undertake all testing and commissioning of all ANPR equipment in accordance with the requirements of this specification as well as Volume A - Part 4: Testing, Commissioning, Documentation and Training.

2. ANPR Requirements

2.1 General Requirements

The Contractor shall supply, install, test and commission all ANPR equipment, mounting arrangements and power supply equipment.

The Contractor shall supply and install ANPR cameras and equipment in compliance with the requirements of this specification.

The Contractor shall supply all interfaces and elements installed as part of the Works in compliance with industry standards.

All equipment shall comply with the requirements of relevant European Directives and Irish legislation, in particular those related to Product Liability, Safety, Electromagnetic Compatibility, Waste Management and Restrictions on the use of Hazardous Substances, current at the Contract Date.

All equipment shall be designed, manufactured, installed, tested and commissioned in accordance with the latest versions and amendments of all relevant Irish and/or European Standards, Regulations, Rules, Codes of Practice, Guides, Legislation and Directives.

National and international codes and standards shall be those published by the NSAI, BSI, CENELEC, IEC and ISO. Where there is a conflict between standards, standards shall take precedence in the following order: Irish and/or European. Where there is a conflict between ETCI and IET rules and regulations, ETCI regulations shall take precedence.

The Contractor shall carry out all Works in compliance with the recommendations and requirements set out in the current edition of the following:

- DN-STR-03018 Design of Support Structures for Roadside Furniture plus relevant TII publications (standards);
- Environmental Tests for Motorway Communications Equipment and Portable and Permanent Road Traffic Control Equipment TR2130;
- Safety, Health and Welfare at Work (Construction) Regulations 2021;
- Safety, Health and Welfare at Work (General Application) Regulations 2023;
- All appropriate European Union (EU) Health and Safety legislation;
- EU Waste Electrical and Electronic Equipment Regulations 2019; and,
- All publications as detailed within these requirements.

The Contractor shall carry out all Works in accordance with the Safety Health and Welfare at Work Act 2013 and any other Acts, Orders, Regulations and Codes of Practice relating to Health and Safety.

All parts of the ANPR equipment shall be designed and manufactured in a modular fashion to facilitate simple maintenance and enhancement activities.

All equipment supplied shall have a design life of not less than 10 years within the motorway environment.

All equipment supplied shall have a Mean Time Between Failure (MTBF) in excess of 40,000 hours (where a failure is defined to be any equipment failure, which leads to the loss of any control, viewing, recording and all other elements).

All equipment must be designed to be vandal-resistant.

The Contractor shall submit all technical literature, information and documentation specified in Volume A - Part 4: Testing, Commissioning, Documentation and Training.

A typical ANPR site shall comprise of the following main items:

- ANPR Camera(s) with integrated Processor;
- Mounting structure supplied by others;
- Pillars, cabinets and enclosures with safety barrier which are supplied by others and maintenance access in compliance with TR1100;
- A method of accessing and connecting into the TII Communications Network via cable infrastructure (both copper and/or optical fibre) or cellular communications to provide a communications link with the Associated Services.

2.2 Design

The Contractor shall comply with all the requirements within this chapter.

2.2.1 ANPR Camera Head & Processor

2.2.1.1 Functional Requirements

The ANPR camera shall possess the capability to accurately capture and interpret any Vehicle Registration Number (VRN) that is visible to the naked eye from its designated location.

The ANPR camera shall read all VRN plates, including retro-reflective plates, from European Economic Area and the UK.

The ANPR cameras shall read VRNs in different formats, such as single line, 2 line and motorcycle.

The ANPR camera shall filter light and control exposure to overcome conflicting lighting conditions, which includes low sun behind or in front of camera, nighttime, partial shade or shade.

The ANPR processor shall identify dirty or clean number plates within the same traffic stream.

The ANPR processor shall timestamp each captured image.

The ANPR processor internal clock shall regularly synchronise to the standard clock time that follows Network Time Protocol (NTP).

The ANPR processor shall trigger an alarm to the instation to review clock synchronisation when a drift from the reference clock is apparent.

In the event that either outstation or instation detect significant clock drift, the pair shall be capable of agreeing and applying the correct time update to their respective clocks.

The ANPR camera shall only be front facing to approaching vehicles, unless otherwise stated by the Employer.

The ANPR camera pixel density shall have different factor limits. This factor shall determine the lane width that the camera can monitor.

The ANPR camera processor shall be able to perform the identification and registration of vehicles that pass in full, within the ANPR camera detection zone, in an ANPR buffer.

The identification and registration of vehicles that pass in full, within the ANPR camera detection zone, shall be recorded in the form of a VRN.

The ANPR processor shall automatically assign additional information to VRN, the following shall be considered as a minimum:

- A confidence level shall be given in form of a percentage to two decimal places for each identification;
- A time stamp shall be given to the identification and shall be accurate to 0.5 second in the format hour : min : second format ; and
- A stamp indication of the ANPR camera site that made the identification.

When a VRN has been captured and identified, a unique label shall be assigned with a time-stamp and issued with a confidence level based on set parameters that include, but not limited to, light and environmental conditions.

Confidence level threshold value shall be configurable and shall be used as one of the factors that regulate whether a journey time is indefinite.

Buffer data for ANPR shall be transmitted to the MOCC via RJ45 socket to socket link using the Employer's telecommunication systems.

Buffer data for ANPR shall have a continuous transmission to instation or MOCC.

Buffer data for ANPR camera shall hold at least 1,000 VRN records before overwriting any records. This shall be designed to allow for temporary communications problems and delay with data transfer to instation or MOCC.

When the data from the ANPR buffer has been sent to the instation or MOCC and a confirmation is received that there are no errors in the completed data transfer, the VRN records shall be copied to an internal file on the ANPR processor and data shall be removed.

Internal files in the ANPR processor shall be capable of holding 10,000 vehicle identifications which shall be available to the instation or MOCC for collection when/if required.

Internal file shall always be able to hold 10,000 records at all times. When this limit is reached, earlier records shall be overwritten, with a continuous retention of the most recent 10,000 records.

All VRN details and records shall be encrypted before being sent to instation or MOCC. For test purposes VRN records shall also be capable of being transmitted to the instation or MOCC.

The ANPR Buffer and the Internal files shall be configurable to allow for the deletion of VRN details after a defined duration.

The ANPR buffer that has been defined above shall be able to discard readings below a configurable confidence limit. This aspect shall be turned off and on when required.

All the ANPR processors shall be able to maintain a total number count of identification read, and an average of the confidence readings.

In the context of monitoring multiple lanes, the ANPR camera system shall be configurable so as to specify the normal direction of travel for each lane independently.

2.2.1.2 Performance Requirements

The ANPR camera shall be able to monitor no less than 3 lanes with each lane spanning at least 3.75 meters.

The ANPR camera shall detect at least 98% of VRNs of the total vehicle flow at the proposed ANPR sites.

The ANPR processor recognition accuracy shall not be less than 95% of the detected VRNs.

The accuracy of detection shall not be affected by conditions such as weather, vehicle speed and ambient light levels. This shall exclude obscuration by mud or snow.

The ANPR cameras shall be able to read all VRNs of vehicles passing 24 hours a day, 365 a year, and shall self-trigger when a registration number is detected with the field of view.

The maximum ANPR camera reading distance shall be at least 35m. This is the distance between the VRN and the base of the mounting structure used for the ANPR camera.

The ANPR camera shall be able to read all VRNs passing regardless of time of the day (day/night), and shall self-trigger when a registration number is detected within the field of view.

No external input shall be required to restart the ANPR camera following a shutdown due to software failure or power.

The time period for restarting ANPR camera shall be agreed with Employer's Representative.

2.2.2 Enclosure & Ventilation

2.2.2.1 Functional Requirements

The ANPR camera enclosure shall have a sunshield installed to shade the lens and protect the enclosure from solar radiation and heat.

The ANPR camera enclosure sunshield installed shall not affect the camera's minimum zoom field of view.

The enclosure of ANPR equipment shall be designed to facilitate flexibility in mounting camera on numerous locations such as gantries, cantilevers or any appropriately deemed structure.

The Contractor shall submit details of proposed enclosure of ANPR equipment arrangements to the Employer's Representative for review.

The enclosure of ANPR equipment shall be designed to allow quick access to all internal components with minimal use of tools.

The environmental closure shall be securely mounted to the ANPR camera.

The enclosure shall be designed to facilitate easy removal of all external cables and shall also be waterproof.

The connection for all cables shall be from below of the enclosure.

A temperature range of -40°C to 60°C shall be suitable for continuous operation of ANPR cameras with relative humidity of 95%.

2.2.2.2 Certificates

The Contractor shall certify that the ANPR cameras meets the requirements of this specification. The ANPR shall be complied with but not limited to the following certifications.

- CE Marking
- The Restriction of Hazardous Substances Directive (RoHS)

2.2.3 Power

2.2.3.1 Functional Requirements

The Camera shall be powered through a Power over Ethernet (PoE) port or a PoE+ port.

The Contractor shall also refer to the Volume A – Part 3 – Section 8: Power Specification for details on electrical cabling.

2.2.4 Communications

2.2.4.1 Functional Requirements

All new cameras shall connect to the Employer's communication network via cable (both copper and/or optical fibre) or cellular communications to provide a communications link with the associated services.

The Contractor is responsible for providing ANPR cameras that comply to the Open Protocol UTMC standards for ANPR, including both UTMC Version 1.1 and UTMC Version 1.2. This entails full compliance with all facets of the UTMC technical specification as outlined on the official UTMC website: <https://utmc.uk/technical-specification>.

Where a fully functional system is loaded, the time for updates received from all ANPR cameras shall not be longer than 10 seconds when an OF or wireless network are in use.

3. Supply

3.1 General Requirements

The Contractor shall supply all equipment new and manufactured from new components.

The Contractor shall supply and install any additional shock and vibration interface to camera mounts to ensure that the camera, lens assembly and recognition rate are not affected by the vibration and wind caused by the motorway environment.

The Contractor shall submit all the materials, software and services necessary to install all ANPR camera equipment that complies with the functional requirements of this specification.

The Contractors shall supply and install all the required cables between the communication cabinet and the camera, in the appropriate ducts.

The Contractor shall supply all brackets and fixtures required to mount the ANPR camera equipment on the existing and new gantry and cantilever structures.

4. Install

4.1 Location

The Contractor shall install ANPR on the following structures:

- New & Existing gantries
- Existing Cantilever VMS
- Existing Cantilever VMS on the opposite carriageway
- Verge mounted roadside pole

The Contractor shall be responsible for ensuring that all ANPR can be mounted to the existing structures prior to the placing of any orders.

The Contractor shall install the ANPR cameras at the designated locations as specified in the Contract Drawings.

The ANPR shall be installed on gantry, cantilever structures, overbridges or poles. The Contractor shall investigate and propose the optimum positioning of the ANPRs on a site-by-site basis.

The Contractor shall position and install ANPR cameras to provide the greatest possible viewing angle.

The Contractor shall position and install ANPR cameras to provide the optimum site recognition rate.

The Contractor shall submit details of ANPR camera positioning on mounting structures with supporting evidence to comply with the above installation requirements 20 working days in advance of the installation to the Employer's Representative for review.

4.2 Mounting Requirements

All mounting brackets and arrangements shall be designed in accordance with DN-STR-03018 - Design of Support Structures for Roadside Furniture and the following contract Drawings.

In accordance with Clause 1537.1AR of Volume A - Part 2: Works Specification, the Contractor shall carry out a dimensional survey of the existing gantries and mounting infrastructure if there is any steel works such as bracket installation etc. The Contractor shall utilise dimensional information in the development of the mounting arrangement solution to mount onto the existing infrastructure.

All ANPR cameras shall be securely fixed to the mounting structure by means of a bracket/clamp system. Drilling or welding of the existing gantry structures shall not be permitted. All cameras shall be fitted with a fall-arrest lanyard fixed to a suitable anchor point on the mounting structure.

The Contractor shall submit details of proposed ANPR cameras mounting arrangements 20 working days in advance of installation to the Employer's Representative for review.

In the event where multiple cameras are used across carriageways to cover kerb-to-kerb; then a minimum of 0.5m (one plate-width) overlap is required between adjacent cameras and field of view.

All equipment shall be securely fixed in place and no opportunity should be provided for tools or equipment to fall to the roadside below.

All bolts, with the exception of high strength friction-grip bolts, shall have locking nuts to prevent loosening by vibration.

All parts shall be manufactured from suitable non-corrodible material. The mounting arrangements for the ANPR equipment shall provide protection against bimetallic corrosion at the contact points with the structure or columns.

Brackets and mounting structures used shall be designed to take into account the maximum supported load, wind factor and the height at which equipment is required to operate.

Brackets and mounting structures used shall be rigid enough to minimise deflection of the camera during high winds of 120km/h allowing the image and recognition rate from the camera to be without vibration or jitter.

Brackets and mounting arrangements shall be installed in accordance with the manufacturer instructions.

Brackets and mounting arrangements shall be installed in a manner that access and maintenance (including the replacement of cameras) is not restricted.

Brackets and mounting arrangements shall be protected against environmental degradation by being galvanised and painted.

All mountings, bolts, screws and any other fixing hardware shall be galvanised as per EN ISO 1461:2022 - Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods.

4.3 Alignment

In scenarios where camera-alignment encompasses an opposing, or unwanted movement of traffic in its field-of-view, the installer should ensure that masks are configured so that only transits in the desired detection-zones are captured.

4.4 Co-ordination

The Contractor shall participate in collaboration meetings with the Equipment Maintenance Contractor, NIMS Contractor and Motorway Operations and Control Centre (MOCC) Operator to agree all matters to support the programming of Works, joint responsibilities and the successful testing and commissioning of all ANPR camera equipment.

As the Contractor shall install ANPR camera equipment on existing gantries, cantilever and poles, the Contractor shall liaise with the structures' designer to confirm the mounting arrangements for each ANPR camera.

Details of the configuration of each site shall be submitted to the Employer's Representative for review prior to commencing site works.

4.5 Integration

The Contractor shall integrate all the ANPR camera equipment with the NIMS and the AFMS.

The Contractor must ensure seamless integration of all ANPR cameras with the interfaces developed for the NIMS. The NIMS interface is designed in accordance with UTMC-TS004.0062:2015 and employs the Plate Read Object to capture recognized passages from ANPR cameras.

The Contractor holds responsibility for ensuring that all ANPR cameras installed in this project align their algorithms with existing cameras and accurately detect passages between the new ANPR cameras and the existing ones.

These cameras must be configured to transmit the hashed Tag value of the license plate to comply with Data Privacy and GDPR regulations.

To monitor the camera's status, the NIMS utilises the MachineDiagnostic and the ANPRDiagnostic Object, as specified in UTMC-TS004.0062:2015. All ANPR cameras supplied must adhere to UTMC-TS004.0062:2015 compliance standards.

The Contractor shall ensure that ANPR camera fault reporting is reported to AFMS via the Employer's existing SolarWinds application.

ANPR shall be able to report, but not limited to, the following faults:

- Power Failure
- Temperature Limits
- ANPR Processor
- Data Storage
- Lens Faults

The Contractor shall collaborate with the Equipment Maintenance Contractor and NIMS Contractors to implement configuration changes as required, including but not limited to:

- Adding new ANPR sites;
- Assigning or changing IP addresses; and
- Updating or amending GIS mapping data.

The assembly of the camera shall be fully integrated for site installation so that, once installed, only communication and power cables required for ANPR camera operation need be connected.

All the assembly connectors and cables required for connections shall be included in the enclosure.

The Contractor shall ensure that all encrypted identifications carried by ANPR cameras shall be correctly matched at the existing systems.

The ANPR camera shall provide for a means of recovering encrypted and un-encrypted files containing all identification records to the NIMS.

4.6 Communications & Power

The Contractor shall leverage the existing communications and power infrastructure for each supplied and/or installed device. Responsibilities include establishing a cabled power and communications connection between the ANPR cameras and the road-side cabinets.

PoE Standard: The Power over Ethernet (PoE) cable shall comply with the IEEE 802.3af (PoE) or IEEE 802.3at (PoE+) standard.

Voltage and Current Ratings: The cabling shall meet the voltage and current requirements specified by the ANPR camera manufacturer, ensuring compatibility with the camera's power needs.

Cable Category: The PoE cable shall be Category 7 (Cat7) for optimal data transmission capabilities.

Cable Length: The cable shall be suitable for the specific distance between the ANPR camera and the PoE power source (injector or switch). The cable length shall comply with the maximum recommended lengths for the chosen cable category. The power delivered to the ANPR camera shall

meet its required operating specifications, without being affected by voltage drop or signal degradation due to cable length.

Shielding: The PoE cable shall be shielded twisted pair (STP) or foiled twisted pair (FTP) to provide protection against electromagnetic interference (EMI) and radio frequency interference (RFI).

Jacket Material: For outdoor installations, the PoE cable shall have a UV-resistant jacket to withstand environmental conditions. For indoor installations, the jacket shall be durable and suitable for the intended environment.

Connector Type: The connectors on the PoE cable shall be RJ45 and shall be compatible with the connectors on the ANPR camera, as well as the PoE injector or switch. Weatherproof or industrial connectors shall be used for outdoor installations.

Furthermore, the Contractor is obligated to adhere to the cable requirements articulated in this section and Volume A – Part 3, Section 13 Power Supplies. Full compliance with these specifications is essential for the successful implementation of the project.

4.7 Testing & Commissioning

The Contractor shall test and commission of all ANPR equipment in accordance with the requirements of Volume A - Part 4: Testing, Commissioning, Documentation and Training.