Overview

This standard identifies the competences you need to install electrical/electronic control equipment for prototype vehicle engine/transmission systems, in accordance with approved procedures. You will be required to use appropriate installation drawings, specifications and documentation to install the various types of control equipment, which will include engine management, traction control and gear selection systems. You will be required to select the appropriate tools, materials and equipment to use, based on the operations to be performed and the components to be installed. You will be expected to position correctly, align and secure the components in the correct locations, using the specified or appropriate techniques and bulkhead/panel penetration and fastening devices.

The circuitry will include installing computers, controllers, sensors actuators, plugs and sockets and appropriate screening techniques. In addition, you will be expected to make all necessary electrical connections to the equipment, sensors, actuators and other devices, as appropriate to the equipment installed. The installation activities will include making all necessary checks and adjustments to the installation to check that the installation has been completed to the level of accuracy and quality required.

Your responsibilities will require you to comply with organisational policy and procedures for the installation activities undertaken, and to report any problems with the activities, tools or equipment used that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You must ensure that all tools, equipment and materials used in the installation activities are removed from the vehicle on completion of the work, and that all necessary job/task documentation is completed accurately and legibly.

You will be expected to work with a minimum of supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you carry out. The installation activity may be carried out as a team effort, but you must be able to demonstrate a significant personal contribution to the installation activities in order to satisfy the requirements of the standard. Competence in all the areas required by the standard must be demonstrated.

Your underpinning knowledge will provide a good understanding of your
work, and will provide an informed approach to applying appropriate installation procedures for electrical/electronic engine/transmission control equipment on prototype vehicles. You will know about the equipment being installed, its installation requirements, its correct function and any associated problems. You will also understand the installation methods and procedures used, and their application, in sufficient depth to be able to carry out the installation activities, to identify and correct any faults, and to ensure that the installed equipment is to specification.

You will understand the safety precautions required when carrying out the installation activities, especially those for ensuring the safe isolation of equipment. You will also understand your responsibilities for safety, and the importance of taking the necessary safeguards to protect yourself and others in the workplace.

Note:
This standard does not involve maintenance/repair type activities, such as removal and replacement of existing equipment, or the installation of simple, self-contained items that have minimal installation requirements.
Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
2. follow all relevant drawings and specifications for the installation being carried out
3. use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition
4. install, position and secure the equipment and components in accordance with the specification
5. ensure that all necessary connections to the equipment are complete
6. deal promptly and effectively with problems within your control and report those that cannot be solved
7. check that the installation is complete and that all components are free from damage
8. ensure that work records are completed, stored securely and available to others, as per organisational requirements
9. leave the work area in a safe condition on completion of the activities, as per organisational and legal requirements
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Installing electrical/electronic engine/transmission control units to prototype vehicles

Knowledge and understanding

You need to know and understand:

1. the specific safety precautions to be taken whilst carrying out the activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)
2. the health and safety requirements of the work area and the activities, and the responsibility these requirements place on you
3. the hazards associated with the activities, and how to minimise them and reduce risks
4. the personal protective equipment and clothing (PPE) to be worn during the activities
5. the interpretation of drawings, standards, quality control procedures and specifications used for the installation of prototype engine/transmission control units (current industry standard and code of practice schematics, wiring regulations, symbols and terminology)
6. how to carry out currency/issue checks on the specifications you are working with
7. how to identify prototype engine/transmission control units and components to be installed
8. the basic principles of operation of the prototype engine/transmission equipment/control units and circuits being installed, and the purpose of individual modules/components
9. the assembly and installation techniques to be used, and the importance of adhering to these procedures
10. how to mark out, drill and prepare holes for mounting and securing the components and cables (including fitting cable protection devices)
11. the techniques used to position, align, adjust and secure the components to the prototype vehicle according to their use
12. types of fastening methods (adhesive, cable ties and mechanical fasteners)
13. the use of anti-vibration mountings
14. the different types of cabling and their application (multicore cables, single core cables, screened cables, data/communications cables, fibre optics)
15. the techniques used to terminate electrical equipment and components (such as free plugs and sockets, crimped cable end fittings, soldered fittings, screwed and clamped connections)
16. the importance of applying electrostatic discharge (ESD) procedures when working on sensitive equipment or devices
17. methods of attaching markers/labels to components or cables to assist with identification
18. the tools and equipment used in the installation activities (including the use of cable stripping tools, crimping tools, soldering irons)
19. how to make adjustments to components/assemblies to ensure that they function correctly
20. the quality control procedures to be followed during and after the installation operations
21. how to check that tools and equipment are free from damage or defects, and are in a safe and usable condition
22. the various tests, checks and adjustments to be carried out on completion of the installation activities
23. the importance of ensuring that the completed installation is free from dirt, swarf and foreign object damage, and of ensuring that any exposed components, looms and wiring are correctly covered/protected
24. why electrical bonding is critical, and why it must be both mechanically and electrically secure
25. the tools and equipment used in the installation activities, and their calibration and care procedures
26. how to recognise installation defects, and the procedures to correct them
27. problems with assembly and installation of prototype electronic and electrical systems, and the importance of informing the appropriate people of non-conformances
28. the importance of marking and identifying specific pieces of work in recording documentation
29. the extent of your own responsibility, and to whom you should report if you have problems that you cannot resolve
30. how to access, use and maintain information to comply with organisational requirements and legislation
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Scope/range related to performance criteria

1. Carry out all of the following activities during the installation:
   1. obtain clearance to work on the vehicle, and observe all relevant isolation and safety procedures
   2. obtain and use the appropriate documentation (such as job instructions, drawings, vehicle manuals specifications, planning and quality control documentation)
   3. adhere to procedures or systems in place for risk assessment, hazardous substances, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
   4. provide and maintain safe access and working arrangements for the installation area, and ensure that any appropriate environmental conditions can be met
   5. use approved installation techniques and procedures at all times
   6. where appropriate, apply electrostatic discharge (ESD) protection procedures
   7. ensure that components and surrounding structures are maintained free from damage and foreign objects
   8. return all tools and equipment to the correct location on completion of the activities
   9. dispose of waste items in a safe and environmentally acceptable manner
  10. leave the vehicle engine/transmission electrical control system in a condition ready for testing
  11. leave the vehicle and work area in a safe and suitable condition and free from foreign object debris

2. Install engine/transmission electrical/electronic control units on one of the following types of prototype vehicle:
   1. A class
   2. C class
   3. sport utility vehicle (SUV)
   4. other specific prototype vehicle
   5. B class
   6. C/D class
   7. light commercial

3. Install one of the following prototype vehicle engine/transmission control systems:
1. engine management
2. traction control
3. gear selection systems

4. Install eight of the following engine/transmission control system components:
   1. control devices
   2. sensors
   3. inertial reference unit (IRU)
   4. actuators
   5. microprocessor controllers
   6. detectors
   7. location/positioning system
   8. cable connectors
   9. indication/alarm devices
  10. switches
  11. safety devices/overload protection devices
  12. other specific electrical/electronic equipment

5. Apply appropriate installation methods and techniques, to include twelve of the following:
   1. marking out of location positions for components or modules
   2. making mechanical/screwed/clamped connections
   3. drilling and preparing holes for fasteners
   4. preparing holes in bulkheads or panels for wires/cables
   5. crimping terminations (such as tags and pins)
   6. positioning and securing equipment and components using mechanical fixings
   7. soldering connections
   8. routeing and securing component wires and cables to avoid chafing and damage
   9. carrying out earth bonding
  10. stripping cable insulation/protection
  11. terminating cables to installed components using free plugs and sockets
  12. adding cable end fittings
  13. attaching suitable cable identification
  14. sealing and protecting cable connections (such as heat shrinking, fitting protection devices and boots)
15. carrying out appropriate adjustments to units and components

6. Carry out checks on the engine/transmission control equipment being installed, to include all of the following:
   1. making visual checks for completeness and freedom from damage
   2. checking the security of all installed components
   3. torque setting fasteners (where appropriate)
   4. checking that all installed connectors are secure
   5. checking the integrity of earth bonding
   6. checking for correct polarity of all cables and connections
   7. check for continuity of cables and components
   8. checking that cable routeing is correct and secure

7. Check installations comply with one of the following:
   1. current industry standards, codes of practice and procedures
   2. customer standards and requirements
   3. engineer developed procedures
   4. specific engine requirements
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