



Australian Government

MSS025016 Perform sampling and testing of stationary emissions

Release: 1

MSS025016 Perform sampling and testing of stationary emissions

Modification History

Not applicable.

Application

This unit of competency covers the ability to collect and test gaseous and particulate components in air pollution emissions from stationary sources. Personnel work in pairs with a senior stack tester or air pollution engineer and use specified sampling points and sampling/test methods. They continually monitor hazards and risks in the work area, apply specified safe working procedures and use prescribed safety equipment.

This unit of competency is applicable to environmental technicians in a range of industry sectors, such as environmental services (e.g. sampling and monitoring of air, odour, and air quality consultancy); environmental compliance, auditing and inspection; management of pollution in chemical, food and by-product, mineral process manufacturing and energy production.

While no specific licensing or certification requirements apply to this unit at the time of publication, environmental monitoring and management activities are governed by relevant legislation, regulations and/or external accreditation requirements. Local requirements should be checked.

Pre-requisite Unit

Nil

Competency Field

Sampling and testing

Unit Sector

Environmental

Elements and Performance Criteria

Elements describe the essential outcomes.

Performance criteria describe the performance needed to demonstrate achievement of the element.

1 **Confirm stack sampling/testing requirements with supervisor**

1.1 Confirm the site location, scope and purpose of stack sampling/testing, relevant standards and data requirements.

1.2 Review available information about the site, its industrial processes, details of sampling/testing locations

- and any previous sampling/testing results for emissions.
- 1.3 Select possible sampling/analyser train configurations to suit type and likely concentration of particulate matter, plant/stack conditions and/or gases of interest.
 - 1.4 Check that selected sampling/test methods are in accordance with statutory, client or workplace requirements, relevant standards and guidelines.
- 2 **Assist with site liaison**
- 2.1 Liaise with site controller to access site.
 - 2.2 Arrange for induction training, clearances and/or permits, as necessary.
 - 2.3 Clarify site health and safety hazards/risks, safe work procedures/methods and availability of safe work platform.
 - 2.4 Negotiate access to stack during suitable process operating conditions for sampling/testing and to minimise impact on normal operations.
 - 2.5 Negotiate access to site equipment, services, materials and support personnel, as necessary.
 - 2.6 Confirm schedule for stack sampling/testing activities.
- 3 **Prepare for stack sampling/testing**
- 3.1 Review site hazards, risks, specified safe work methods.
 - 3.2 Review approved health and safety plan covering site sampling/testing activities.
 - 3.3 Review sampling/testing procedures and methods and equipment configurations with close attention to the sequence of steps and details for each.
 - 3.4 Select sampling equipment and test instruments and check their operation/calibration in accordance with relevant methods, standards and manufacturer instructions.
 - 3.5 Ensure all conditioning reagents, solutions and calibration gases, as appropriate, are obtained and ready for field use.

- | | | | |
|---|--|-----|---|
| | | 3.6 | Prepare and store filters appropriate for the likely physical and chemical nature of the gases and particulates and in accordance with sampling/test method. |
| | | 3.7 | Assemble and safely stow all sampling equipment, test instruments, materials, containers and safety equipment. |
| | | 3.8 | Arrange suitable transport to, from and around site, as required. |
| 4 | Assist with site inspection and preliminary tests | 4.1 | Locate the site controller and re-confirm access and suitability of stack conditions. |
| | | 4.2 | Inspect work platform and check for safe access to existing sampling access holes and electrical services. |
| | | 4.3 | Transport all required equipment and materials to work platform, check they are fit for purpose and rectify, as necessary. |
| | | 4.4 | Record the dimensions of the stack and conduct preliminary determinations of temperature, velocity, pressure and moisture content values using relevant methods. |
| | | 4.5 | Assess suitability/compliance of sampling plane. |
| | | 4.6 | Assess whether the operating environment will impact on safety or reliability of sampling/testing and make modifications or alternative arrangements as directed. |
| | | 4.7 | Confirm numbers of samples, sampling positions and times, sampling/test methods and equipment configurations for sampling and in-situ measurements. |
| 5 | Conduct sampling and in-situ tests | 5.1 | Set up sampling/analyser train with appropriate sensors, probes, nozzle, conditioning components and detectors in accordance with method. |
| | | 5.2 | Allow sufficient time for the system to stabilise. |
| | | 5.3 | Calibrate analyser in accordance with test method. |
| | | 5.4 | Operate equipment with close attention to each method step and to maintaining the isokinetic or required |

- sampling/test conditions for each sampling point.
- 5.5 Conduct regular leak checks, purging and system performance tests in accordance with method to ensure reliable results.
 - 5.6 Carefully collect, label and store each sample to minimise loss or contamination and ensure traceability.
 - 5.7 Accurately record measurements, environmental conditions and any atypical observations that may impact on validity/integrity of samples or test results.
- 6 **Finalise stack sampling/testing**
- 6.1 Safely disassemble, clean/decontaminate and re-stow all equipment and materials for transport to base.
 - 6.2 Transport all samples back to base as soon as practicable and in accordance with workplace procedures, test methods or relevant standards.
 - 6.3 Ensure all field observations, calibration data, measurements, calculations and results are accurately transferred to workplace information database.
 - 6.4 Distribute samples for laboratory analysis within specified holding times, if required.
- 7 **Process and interpret data**
- 7.1 Review test data noting atypical observations.
 - 7.2 Calculate required quantities using relevant test method and ensure values are consistent with expectations.
 - 7.3 Estimate and document uncertainty of measurement in accordance with workplace procedures, if required.
 - 7.4 Record processed results in accordance with workplace procedures.
 - 7.5 Interpret trends in data and/or results and report atypical results promptly to appropriate personnel.
 - 7.6 Determine if obvious procedure or equipment problems have led to atypical data or results.
 - 7.7 Compare results with established air quality standards, statutory environmental quality concentration limits or

similar, if relevant.

7.8 Finalise reporting of results in accordance with workplace requirement.

- | | | | |
|---|---|-----|--|
| 8 | Maintain a safe work environment | 8.1 | Clean all equipment, containers, work area and vehicles according to workplace procedures. |
| | | 8.2 | Check serviceability of all equipment before storage. |

Foundation Skills

This section describes those required skills (language, literacy and numeracy) that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Legislation, regulations, standards, codes, workplace procedures and requirements include the latest version of one or more of:

- federal legislation, such as the Environment Protection and Biodiversity Conservation Act, and National Environmental Protection Measures
- state/territory government legislation and local government by-laws, policies, regulations and plans dealing with land use, acquisition, planning and protection; environmental protection, pollution and contaminated sites
- legislation, standards and codes of practice for work health and safety (WHS)
- Australian and international standards covering environmental management (e.g. AS ISO14000 Basic Set:2007 Environmental Management Basic Set and AS ISO14050 Environmental management - Vocabulary); stationary source emissions (e.g. AS 4323 Stationary source emissions series and ISO 10780 Stationary source emissions); and safe work platforms and services (e.g. AS 1657-2013 Fixed platforms, walkways, stairways and ladders - Design, construction and installation)
- test methods for moisture content of stack gases and stationary source NO_x emissions, such as US Environmental Protection

Authority (EPA) Method 4 and Method 7E

- registration/licensing and/or accreditation requirements
- industry guidelines and manuals, such as National Environment Protection Measure (NEPM) (Ambient Air Quality); air quality standards, statutory environmental quality concentration limits
- site plans, maps and specifications; methods and procedures for air sampling and testing to meet workplace, client and/or regulatory/certifying body requirements
- workplace documents, such as standard operating procedures (SOPs); work schedules; recording and reporting procedures; equipment manuals and warranties; supplier catalogue and handbooks; field notebooks or log books; emergency and safety procedures, safety data sheets (SDS); waste minimisation, containment, processing and safe disposal procedures.

Information about site, industrial activities and emissions include one or more of:

- location of site and nearby buildings, topography and meteorological records
- complaints, previous stack testing at site or odour assessments in nearby locations
- industrial process inputs/outputs, process flowchart, unit operations, batch, cyclic or continuous operation, predictable variations in process conditions, production rates and period of operation
- air emission control systems, such as scrubbers, bag filters, stacks and bio filters
- parameters of emission sources, such as location, geometry, release parameters and weather interaction
- previous emissions data, such as:
 - velocity and temperature of pollutant concentration
 - moisture content
 - expected gas composition and likely interfering compounds
 - high vacuum, high pressure and high temperature gas streams
 - corrosive or very reactive components.

Air pollutants include one or more of:

- inorganic gases, such as:
 - CO and CO₂, NO_x, and SO_x
 - acid gases
 - H₂S, HCl
 - ozone
 - chlorine, fluorine and fluorides
- volatile organic liquids and compounds

- particulates, such as:
 - deposited matter
 - suspended matter (PM10, PM2.5, and PM1)
 - particulate fluorides
 - heavy metals.

Stack tests include one or more of:

- measurement of temperature, pressure, velocity and volume flowrate of gas streams
- gas analysis for determination of molecular weight
- determination of moisture content
- determination of particulate matter
- determination of concentration of specific gases in emissions (e.g. O₂, CO₂, SO₂, NO and NO₂).

Hazards include one or more of:

- working on elevated platforms
- exposure to toxic, corrosive or hot gases
- electrical hazards
- trip hazards from cables
- noise or heat from plant equipment
- objects falling from the work platform or into the duct/stack
- flammability hazards.

Safety procedures include one or more of:

- preparation/approval of site health and safety plan for sampling/testing, and safe work permits/approvals
- use of safe work method statements, site safety induction, risk cards, 'step back' and safety checks
- use of safety harness and personal protective equipment (PPE), such as boots, gloves, safety glasses and overalls; two-way radio and mobile phone
- ensuring two persons are present
- monitoring of atmosphere for hazardous gases
- working upwind of known contaminants
- prohibition of eating, drinking and smoking
- separation of heavy equipment into smaller units/cases for transport
- testing and earthing of electrical services, generators, trip out devices and connectors
- shielding of hot surfaces and exhausts
- careful handling of glass containers
- reporting procedures for safety problems
- regular medical checks.

Stack sampling and testing equipment include one or more of:

- sampling train with in-stack or out-stack collector and components, such as:
 - sampling nozzles
 - probe tubes (e.g. glass and stainless steel)
 - filters, impingers and desiccators for transport of dry filters
 - flexible bags (e.g. Tedlar, Mylar and Teflon)
 - particulate matter collectors, accessories (e.g. cyclones and filter bags)
 - pre-prepared sample containers (e.g. Dioxin and furans), transport containers, eskies and ice
 - instruments to measure static and differential pressure (e.g. manometer and barometer)
 - sampling flow rate control devices
 - pumps
 - sampling flow meters
 - water removal device (e.g. condenser and silica gel)
 - temperature sensors in stack, duct and gas meters
 - gas velocity instruments (e.g. pitot tube)
 - heating/cooling elements to prevent condensation of probe tube or collectors
- gas analysers (e.g. NO_x, CO, CO₂, O₂ and N₂) with components, such as:
 - sample gas manifolds
 - analyte specific, dual range and low concentration analysers
 - data recorder, data logger and/or computer for real-time analysis
 - reagents and standards (e.g. calibration gases, converter efficiency gases, interference checks and demineralised water)
- sample lines, hoses, ropes, bags and winches
- electrical extension cords
- calibrated rod for measuring stack dimensions
- balance, timers and digital camera
- tools and spare access hole plugs
- cherry picker.

Sampling/measurement system performance tests include one or more

- detecting and rectifying leaks (or reducing them to acceptable levels)
- analyser 2 or 3 point calibration tests
- NO₂ to NO conversion efficiency checks

of:

- system bias checks
- system response time check
- interference checks
- post-run system bias and zero/span drift checks
- quality control (QC) runs.

**WHS and
environmental
management
requirements include:**

- compliance with relevant federal/state/territory WHS legislation at all times
- assuming that samples are potentially hazardous and applying standard precautions
- accessing and applying current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and state/territory Departments of Health, where relevant.

Unit Mapping Information

Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=5b04f318-804f-4dc0-9463-c3fb9a3fe998>

Assessment Requirements for MSS025016 Perform sampling and testing of stationary emissions

Modification History

Not applicable.

Performance Evidence

Evidence of competence in this unit must satisfy all of the requirements of the elements and performance criteria, and include demonstration of:

- planning and safely conducting stack sampling/testing to obtain reliable samples and data on at least two (2) occasions
- planning for field activities, including researching and summarising site history and operations, analysing existing emissions data and/or reports, and identifying gases of interest
- interpreting and applying relevant air quality regulatory requirements, stack sampling/monitoring plans, sampling/test methods and standards, and workplace procedures
- selecting sampling/analyser train configurations to suit type and likely concentration of particulate matter, plant/stack conditions and/or gases of interest, and client or workplace requirements, relevant standards and guidelines
- recognising hazards and assessing risks, interpreting and applying health and safety plans and safe work methods, including use of designated safety equipment and personal protective equipment (PPE)
- preparing for field activities, including arranging access to the site, stack and services; arranging induction and permits; conducting reconnaissance; reviewing safety requirements and securing the resources required; and scheduling stack sampling/testing
- communicating effectively with site personnel and negotiating access and support
- selecting and checking that all supplies, equipment and instruments are fit for purpose, and stowing/transporting them to and from the field
- collecting reliable samples in accordance with site sampling plan/methods and paying close attention to any pre-treatment, container, preservation, storage, labelling and traceability requirements
- operating, maintaining and/or calibrating stack sampling and testing equipment with close attention to each method step to obtain representative stack samples and produce consistently valid and accurate test results
- identifying and rectifying basic instrument faults
- accurately recording measurements, site features and environmental conditions, and any observations that may impact on validity/integrity of samples or test results
- calculating required quantities using appropriate units, precision, uncertainties and/or calibration graphs
- interpreting gross features/trends in data, identifying atypical results and/or comparing results with established air quality standards and/or statutory environmental quality concentration limits

- seeking advice when issues/problems are beyond scope of competence/responsibility
- maintaining, cleaning and decontaminating sampling, testing and/or PPE in accordance with workplace procedures
- writing/compiling concise and accurate reports in accordance with workplace procedures
- working safely and follow relevant legislative requirements for the disposal of waste and the preservation of the environment.

Knowledge Evidence

Must provide evidence that demonstrates knowledge of:

- scientific terminology used in job role covering atmospheric science, sampling and testing of stationary source emissions
- overview of specific legislation, policies, standards and codes of practice related to air quality/pollution and monitoring of stationary source emissions
- properties of air pollutants, such as:
 - particulates (e.g. inorganics and organics, and metals)
 - inorganic gases (e.g. CO, CO₂, NO_x, SO_x, ammonia, acid rain and halogens)
 - volatile organics
- localised meteorology and dispersion of air pollutants
- ideal gas behaviour, principles of fluid flow through ducts, and effects of bends and orifices
- principles of stationary source emissions sampling (particles, common gases and compounds) and associated sampling equipment
- stack dimensions, source parameters and the selection of sampling planes, number and location of sampling points
- isokinetic conditions, and effect of fluctuations in source parameters on results
- principles of emission monitoring (particles and common gases) and associated analysers
- function of key components, operating principles of common stack sampling/analyser trains
- common procedure/equipment problems leading to atypical data/results
- common process problems leading to atypical test results (e.g. high oxygen readings may indicate a hole in the stack)
- labelling and traceability of samples and management of large volumes of data
- hazards, health, safety and environment requirements relevant to site activities undertaken, including safe work methods and equipment, requirements for safe work platforms and services, use of PPE and handling of waste.

Assessment Conditions

- Judgement of competence must be based on holistic assessment of the evidence. Assessment methods must confirm consistency of performance over time, rather than a single assessment event.

- This unit of competency is to be assessed in the workplace, or a simulated workplace environment. A simulated workplace environment must reflect realistic operational workplace conditions that cover all aspects of workplace performance, including the environment, task skills, task management skills, contingency management skills and job role environment skills.
- Foundation skills are integral to competent performance of the unit and should not be assessed separately.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.
- Knowledge evidence may be collected concurrently with performance evidence or through an independent process such as workbooks, written assessments or interviews (provided a record is kept in each case).
- Holistic assessment methods include:
 - inspection of stack samples collected by the candidate
 - review of stack measurements, test results, calculations and observations produced by the candidate
 - review of sampling/testing records and reports completed by the candidate
 - feedback from supervisor about the candidate's ability to apply workplace procedures and stack sampling/test methods consistently, work safely and produce results within the agreed timeframe
 - oral and/or written questions to assess the candidate's understanding of the principles of stack sampling/testing, safe operation of stack sampling equipment, set-up and use of test instruments/analysers and processing of data.
- Access is required to all instruments, equipment, materials, workplace documentation, procedures, and specifications associated with this unit including, but not limited to:
 - vehicles, stack sampling/test equipment, analysers, reagents, gases, safety equipment, camera and consumables
 - work program, workplace procedures, codes of practice, site maps, site sampling/testing plans and methods, safety procedures, standards and equipment manuals, logbooks, and data loggers and computers.
- Assessors must satisfy the assessor competency requirements that are in place at the time of the assessment as set by the VET regulator.
- The assessor must demonstrate both technical competency and currency.
- Technical competence can be demonstrated through:
 - relevant VET or other qualification/Statement of Attainment AND/OR
 - relevant workplace experience
- Currency can be demonstrated through:
 - performing the competency being assessed as part of current employment OR
 - having consulted with an organisation providing environmental monitoring, management or technology related services about performing the competency being assessed within the last twelve months.

Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=5b04f318-804f-4dc0-9463-c3fb9a3fe998>