NVQ in Business-Improvement Techniques

Qualifications Handbook

Level 2 – 2257-50

Level 3 – 2257-51

Level 4 – 2257-52

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Introduction - NVQs in Business-Improvement Techniques

This guide aims to provide information to centres and candidates for the administration and assessment of Level 2, 3 and 4 National Vocational Qualifications (NVQs) for Business-Improvement Techniques.

The first section contains information on who will benefit from the awards and the structure and scope of the NVQs. The second section includes the assessment strategy providing specific information on assessment. Further information is available from City & Guilds generic guides, these include information for assessors and verifiers on the general application of assessment and quality assurance, information relating to scheme operation and recording systems for candidates' portfolios.

This Guide does not contain specific details for making centre and scheme approval, this is included in the City & Guilds document 'Providing City & Guilds Qualifications' available free of charge from the Sales Department or their regional/national City & Guilds office.

Details of general regulations, administrative, registration and certification procedures and fees are included in the City & Guilds Directory of N/SVQ Awards. This information also appears on City & Guilds web site http://www.cityandguilds.com.

The following documents also include information on policy and guidance on quality assurance within NVQs and assessors and verifiers should be aware of the contents.

- City & Guilds policy document 'Ensuring Quality' – aimed at those involved in the assessment and verification of City & Guilds awards. Issued 3-4 times a year (available from Sales Department) NB Edition 12 – December 2001 summarises policy from all previous editions)
- *Joint Awarding Body Guidance on Internal Verification of NVQs,* issued November 2001, published by the DfES, also available on City & Guilds web site.

Section 1 National occupational standards for Business-Improvement Techniques

1.1 Scope of the awards

NVQs for Business-Improvement Techniques are work-based qualifications designed for those employed within engineering, manufacturing, processing and other related industries. They are based on the national occupational standards developed by the Science, Engineering and Manufacturing Technologies Alliance (SEMTA). The main objective of the awards is to improve business performance. They are suitable for all staff within an organisation from senior managers down to supervisors and team leaders. The central theme throughout the awards is one of improving business activity by continuous improvement. The aim is to effect improvements to manufacturing and production that reduce costs and improve productivity.

The awards will be well suited to those who may be undertaking a related NVQ or who have already one. Similarly they can support in-house developments by offering a flexible approach that companies can adapt to meet their own needs.

The NVQs in Business-Improvement Techniques are available at levels 2, 3 and 4. There are two pathways at each level, candidates can achieve either a Process pathway or a Quality pathway. The awards are made up of mandatory and optional units. The mandatory units cover those areas which have a common approach such as safety and team working. The optional units offer a choice of techniques and systems that can be combined to meet the needs of organisations and candidates.

The level 2 award has been designed to cover those people who are

- workers involved in business improvement within a team who wish to have their business improvement competencies assessed for certification purposes
- new employees who have undertaken some business improvement training and are now acquiring experience within a team and wish to demonstrate their competencies for assessment purposes
- other people involved in the business at all levels who require a fundamental understanding of business improvement practices.

The level 3 award has been designed to cover those people who are

- employed as supervisors, team leaders or facilitators and are responsible for carrying out business improvement activities
- people who through Continuous Professional Development are being prepared to take on staff responsibilities in a business improvement environment
- other people involved in the business at all levels who require a more in-depth understanding of business-improvement practices.

The level 4 award has been designed to cover those people who are

- people who have overall responsibilities for business-improvements and will probably be middle management with specific responsibilities for achieving business objectives
- people who through Continuous Professional Development are being prepared take on management responsibilities in a Business Improvement environment.
- full time facilitators on Business Improvement delivering improvement training across the business. They may not have specific day to day people responsibilities.

- other people involved in the business who require an in depth understanding of business-improvement practices

The awards have been designed to allow progression through the various levels where appropriate the candidates who have achieved a Level 2 or Level 3 qualification and are progressing to Level 3 or Level 4 do not need to cover units already undertaken. However where candidates are moving from Level 2 to Level 3 they will need to provide additional evidence covering the production and updating of standard operating procedures and visual controls as described in 2.5 Carrying out assessments (see page 14)

1.2 Qualification structure

The certificate structure requires candidates to complete common mandatory units followed by a choice of pathways, these may be either Process improvement activities or Quality improvement activities.
The certificates referred to in this guide are as follows

Level 2 NVQ in Business-Improvement Techniques (Process improvement pathway)
Level 2 NVQ in Business-Improvement Techniques (Quality improvement pathway)
Level 3 NVQ in Business-Improvement Techniques (Process improvement pathway)
Level 3 NVQ in Business-Improvement Techniques (Quality improvement pathway)
Level 4 NVQ in Business-Improvement Techniques (Process improvement pathway)
Level 4 NVQ in Business-Improvement Techniques (Quality improvement pathway)

Level 2 NVQ in Business-Improvement Techniques (Process improvement pathway) – 2257-50

6 Units
Candidates must achieve all **five** mandatory units in Groups A and B (1) plus **one** optional unit from either Group B (2) or Group C.

Mandatory units

Group A
2257-001 Complying with Statutory Regulations and Organisational Safety Requirements
2257-002 Contributing to effective Team Working

Group B (1)
2257-004 Applying workplace organisation (5S/5C)
2257-005 Applying continuous improvement techniques (Kaizen)
2257-009 Creating Visual Management Systems

Optional units

Group B (2)
2257-007 Analysing and Selecting Parts for Improvement
2257-008 Carrying out Lead Time Analysis
2257-011 Applying Set-up Reduction Techniques (SMED)
2277-012 Applying Total Productive Maintenance (TPM)
2257-013 Applying Problem Solving Techniques
2257-014 Carrying out Statistical Process Control Procedures (SPC)
2257-015 Applying Flow Process Analysis
2257-021 Carrying out Potential Failure Modes and Effects Analysis (FMEA)
2257-024 Carrying out Measurement Systems Analysis (MSA)
2257-029 Carrying Out Mistake/Error Proofing (Poka Yoke)
2257-036 Creating Standard Operating Procedures

Group C
2257-018 Applying Six Sigma methodology to a project
2257-019 Carrying out Six Sigma Process Mapping
2257-020 Applying basic statistics

Level 2 NVQ in Business-Improvement Techniques (Quality improvement pathway) – 2257-50

7 Units
Candidates must achieve all FOUR mandatory units in Groups A and C (1). Plus TWO optional units from Group C (2) and B. **One of these units must be selected from C (2).**

Mandatory units

Group A
2257-001 Complying with Statutory Regulations and Organisational Safety Requirements
2257-002 Contributing to effective Team Working
Group C (1)
2257-018 Applying Six Sigma methodology to a project
2257-019 Carrying out Six Sigma Process Mapping
2257-020 Applying basic statistics

Optional units

Group C (2) (**one** unit must be selected from this Group)
2257-014 Carrying out Statistical Process Control Procedures (SPC)
2257-021 Carrying out Potential Failure Modes and Effective Analysis (FMEA)
2257-024 Carrying out Measurement Systems Analysis (MSA)
2257-029 Carrying out Mistake/Error Proofing (POKA YOKE)

Group B
2257-004 Applying workplace organisation (5S/5C)
2257-005 Applying continuous improvement techniques (Kaizen)
2257-007 Analysing and Selecting Parts for Improvement
2257-008 Carrying out Lead Time Analysis
2257-009 Creating Visual Management Systems
2257-011 Applying Set-up Reduction Techniques (SMED)
2277-012 Applying Total Productive Maintenance (TPM)
2257-013 Applying Problem Solving Techniques
2257-015 Applying Flow Process Analysis
2257-036 Creating Standard Operating Procedures

Level 3 NVQ in Business-Improvement Techniques (Process improvement pathway) – 2257-51

9 Units
Candidates must achieve all **six** mandatory units in Groups A and B (1).
One optional unit from B (2), plus TWO optional units from B (3) and/or C.

Mandatory units

Group A
2257-001 Complying with Statutory Regulations and Organisational Safety Requirements
2257-002 Contributing to effective Team Working
2257-003 Leading Effective Teams

Group B (1)
2257-004 Applying workplace organisation (5S/5C)
2257-005 Applying continuous improvement techniques (Kaizan)
2257-009 Creating Visual Management Systems

Optional units

Group B (2)
2257-006 Creating Flexible Production and Manpower Systems
2257-037 Carrying out Problem Solving Activities
Whichever unit is selected from B (2) it cannot then be selected again as one of the five optional units from B (3)

Group B (3)
2257-006 Creating Flexible Production and Manpower Systems
2257-007 Analysing and Selecting Parts for Improvements
2257-008 Carrying out Lead Time Analysis
2257-010 Carrying out Value Stream Mapping (VSM)
2257-011Applying Set-up Reduction Techniques (SMED)
2257-012 Applying Total Productive Maintenance (TPM)
2257-014 Carrying out Statistical Process Control Procedures (SPC)
2257-015 Applying Flow Process Analysis
2257-016 Applying Policy Development (HOSHIN KANRI)
2257-017 Applying Value Management (Value Engineering & Value Analysis)
2257-021 Carrying out Potential Failure Modes and Effects Analysis (FMEA)
2257-024 Carrying out Measurement Systems Analysis (MSA)
2257-029 Carrying out Mistake/Error proofing (POKA YOKE)
2257-036 Creating Standard Operating Procedures
2257-037 Carrying out Problem Solving Activities

Group C
2257-018 Applying Six Sigma methodology to a project
2257-019 Carrying out Six Sigma Process Mapping
2257-020 Applying basic statistics
2257-022 Applying Six Sigma Metrics to a project
2257-023 Producing Characteristics Selection Matrix
2257-025 Carrying out Capability Studies
2257-026 Producing Multi variable Charts
2257-027 Applying Hypothesis Testing

Level 3 NVQ in Business-Improvement Techniques (Quality improvement pathway) – 2257-51

10 Units
Candidates must achieve **all seven** mandatory units from Groups A and C (1) and any **three** optional units from Groups C (2) and B.
One of these optional units must be selected from Group C (2).

Mandatory units

Group A
2257-001 Complying with Statutory Regulations and Organisational Safety Requirements
2257-002 Contributing to effective Team Working
2257-003 Leading Effective Teams
Group C (1)
2257-018 Applying Six Sigma methodology to a project
2257-019 Carrying out Six Sigma Process Mapping
2257-020 Applying basic statistics
2257-021 Carrying out potential Failure Modes and Effects Analysis (FMEA)

Optional units

Group C (2) (**one** unit must be selected from this Group)
2257-014 Carrying out Statistical Process Control Procedures (SPC)

2257-022 Applying Six Sigma Metrics to a project
2257-023 Producing Characteristics Selection Matrix
2257-024 Carrying out Measurement Systems Analysis (MSA)
2257-025 Carrying out Capability Studies
2257-026 Producing Multi variable Charts
2257-027 Applying Hypothesis Testing
2257-029 Carrying out Mistake/Error proofing (POKA YOKE)

Group B
2257-004 Applying workplace organisation (5S/5C)
2257-005 Applying continuous improvement techniques (Kaizan)
2257-006 Creating Flexible Production and Manpower Systems
2257-007 Analysing and Selecting Parts for Improvements
2257-008 Carrying out Lead Time Analysis
2257-009 Creating Visual Management Systems
2257-010 Carrying out Value Stream Mapping (VSM)
2257-011Applying Set-up Reduction Techniques (SMED)
2257-012 Applying Total Productive Maintenance (TPM)
2257-015 Applying Flow Process Analysis
2257-016 Applying Policy Development (HOSHIN KANRI)
2257-017 Applying Value Management (Value Engineering & Value Analysis)
2257-036 Creating Standard Operating Procedures
2257-037 Carrying out Problem Solving Activities

Level 4 NVQ in Business-Improvement Techniques (Process improvement pathway) – 2257-52

13 Units
Candidates must achieve **all seven** mandatory units in Groups A and B (1), **one** optional unit from Group B (2), and **five** optional units from B (3) and C.
At least two of these five optional units must be selected from Group B (3).

Mandatory units

Group A
2257-001 Complying with Statutory Regulations and Organisational Safety Requirements
2257-002 Contributing to effective Team Working
2257-003 Leading Effective Teams
2257-035 Carrying out Project Management Activities

Group B (1)
2257-004 Applying workplace organisation (5S/5C)
2257-005 Applying continuous improvement techniques (Kaizan)
2257-009 Creating Visual Management Systems

Optional units

Group B (2)
2257-006 Creating Flexible Production and Manpower Systems
2257-037 Carrying out Problem Solving Activities
Whichever unit is selected from B (2) it cannot then be selected again as one of the five optional units from B (3).

Group B (3)
2257-006 Creating Flexible Production and Manpower Systems
2257-007 Analysing and Selecting Parts for Improvement
2257-008 Carrying out Lead Time Analysis
2257-010 Carrying out Value Stream Mapping (VSM)
10

2257-011 Applying Set-up Reduction Techniques (SMED)
2257-012 Applying Total Productive Maintenance (TPM)
2257-014 Carrying Statistical Process Control Procedures (SPC)
2257-015 Applying Flow Process Analysis
2257-016 Appling Policy Deployment (HOSHIN KANRI)
2257-017 Applying Value Management (Value Engineering & Value Analysis)
2257-021 Carrying Out Potential Failure Modes and Effects Analysis (FMEA)
2257-024 Carrying out Measurement Systems Analysis (MSA)
2257-028 Carrying out Design of Experiments (DOE)
2257-029 Carrying out Mistake/Error proofing (POKA YOKE)
2257-034 Applying quality function deployment (QFD)
2257-036 Creating Standard Operating Procedures
2257-037 Carrying out Problem Solving Activities

Group C

2257-018 Applying Six Sigma methodology to a project
2257-019 Carrying Out Six Sigma Methodology to a Project
2257-020 Applying basic statistics
2257-022 Applying Six Sigma Metrics to a project
2257-023 Producing a Characteristics Selection Matrix
2257-025 Carrying out Capability Studies
2257-026 Producing Multi variable Charts
2257-027 Applying Hypothesis Testing
2257-030 Carrying out Evolutionary Operations (EVOP)
2257-031 Applying Central Limit Theorem and Confidence Intervals
2257-032 Producing Taguchi Linear Graphs
2257-033 Applying Response Surface Methodolgy

Level 4 NVQ in Business -Improvement Techniques (Quality improvement pathway) – 2257-52

14 Units
Candidates must achieve **all nine** mandatory units in Groups A and C (1).
Plus **five** optional units from Group C (2), C (3) and B.
At least one optional unit must be selected from both C (2) and C (3).

Group A
2257-001 Complying with Statutory Regulations and Organisational Safety Requirements
2257-002 Contributing to effective Team Working
2257-003 Leading Effective Teams
2257-035 Carrying out Project Management Activities

Group C (1)
2257-014 Carrying out Statistical Process Control Procedures (SPC)
2257-018 Applying Six Sigma methodology to a project
2257-019 Carrying Out Six Sigma Methodology to a Project
2257-020 Applying basic statistics
2257-021 Carrying out potential Failure Modes and Effects Analysis (FMEA)

Optional units

Group C (2) (One unit must be selected from this Group)

2257-022 Applying Six Sigma Metrics to a project
2257-023 Producing a Characteristics Selection Matrix
2257-024 Carrying out Measurement Systems Analysis (MSA)

2257-025 Carrying out Capability Studies
2257-026 Producing Multi variable Charts
2257-027 Applying Hypothesis Testing
2257-028 Carrying out Design of Experiments (DOE)
2257-029 Carrying out Mistake/Error proofing (POKA YOKE)

Group C (3) (One unit must be selected from this Group)
2257-030 Carrying out Evolutionary Operations (EVOP)
2257-031 Applying Central Limit Theorem and Confidence Intervals
2257-032 Producing Taguchi Linear Graphs
2257-033 Applying Response Surface Methodology
2257-034 Applying Quality Function Deployment.

Group B
2257-004 Applying workplace organisation (5S/5C)
2257-005 Applying continuous improvement techniques (Kaizan)
2257-006 Creating Flexible Production and Manpower Systems
2257-007 Analysing and Selecting Parts for Improvement
2257-008 Carrying out Lead Time Analysis
2257-009 Creating Visual Management Systems
2257-010 Carrying out Value Stream Mapping (VSM)
2257-011 Applying Set-up Reduction Techniques (SMED)
2257-012 Applying Total Productive Maintenance (TPM)
2257-015 Applying Flow Process Analysis
2257-016 Appling Policy Deployment (HOSHIN KANRI)
2257-017 Applying Value Management (Value Engineering & Value Analysis)
2257-036 Creating Standard Operating Procedures
2257-037 Carrying out Problem Solving Activities

Section 2 Assessment Strategy

2.1 Introduction

The Business-improvement Techniques NVQs are based on the national occupational standards developed by SEMTA and approved by QCA. The assessment system will utilise the assessment strategy also developed by the SSC – SEMTA. This approach is designed to ensure maintenance of the standards and to offer assessment that is appropriate to the engineering industry in terms of relevance and resources. The model to be applied is similar to the strategy used within other NVQs for engineering.

The purpose of the assessment strategy is to
- endorse Awarding Body applications to award the qualification
- assist assessors, internal verifiers and external verifiers
- encourage and promote consistent assessment of the qualification
- promote cost effective assessment strategies
- promote the use of external quality control of assessment methods

The assessment strategy also specifies
- the qualifications and experience required for assessors and verifiers
- the assessment environment and standard of equipment that should be used
- access to the qualification
- the evidence required to support competent performance against the standards
- carrying out assessments
- assessing knowledge and understanding
- the arrangements for External Quality Control of Assessment

2.2 Assessor and verifier requirements

Assessor

Assessment must be carried out by competent assessors who hold, or are working towards, the nationally recognised Assessor units A1 and/or A2 as appropriate to the assessment being carried out. Ideally, Assessors who hold Assessor units D32 and/or D33 will also hold the current assessor qualifications or be working towards them. All assessors of this qualification must apply the assessment principles and practices set down in A1 and/or A2 as appropriate to the assessment being carried out. They must be able to demonstrate that they have sufficient technical competence to evaluate and judge evidence for this award. This can be demonstrated by either holding a relevant technical qualification or by proven suitable experience of the technical areas to be assessed. The assessors competence must, at the very least, be at the same level as that of the candidates to be assessed.

Assessors **must** know the
- content and meaning of the standards against which assessments are to be carried out
- appropriate Regulatory Bodies systems of vocational qualifications
- appropriate documentation and quality assurance systems of City & Guilds.

Verifier

Internal verification must be carried out by competent verifiers who hold, or are working towards, the nationally recognised Internal Verifier unit V1 and would be expected to be familiar with, and preferably hold, the nationally recognised assessor units. Ideally, internal verifiers who hold the verifier unit D34 will hold the current internal verifier qualification or be working towards it. All Internal Verifiers must apply the verification principles and practices set down in V1 as appropriate to the verification being carried out. External Verifiers will hold or be working towards the nationally recognised External Verifier unit V2. Verifiers will also be expected to be fully

conversant with the standards against which assessments are to be carried out, the appropriate Regulatory Bodies' systems of qualifications, and the appropriate documentation and quality assurance systems of City & Guilds.

Witness testimony

Where 'observation of process' is used to obtain the performance evidence, this must be carried out against the standards. Best practice would require that such observation is carried out by a qualified assessor. If this is not practicable then alternative sources of evidence may be used.

For example, the observation may be carried out against the standards by someone else in close contact with the candidate. This could be a supervisor, colleague, mentor or the line manager who may be regarded as a suitable witness to the candidate's competency. However, the witness must be technically competent in the process or skills that they are providing testimony for, to at least the same level of expertise as that required of the candidate. It will be the responsibility of the assessor to make sure that any witness testimonies accepted as evidence of a candidate's competency are reliable and technically valid.

2.3 Assessment environment

Evidence for this award should ideally be obtained from the working environment where work activities or work outcomes assessed are the candidates own work/contribution. However, in certain circumstances, replication of work activities may be acceptable. Where replication is considered necessary assessors must be confident that the work activities undertaken replicate the workplace to such an extent that competencies gained will be fully transferable to the workplace. Assessors must clearly identify those aspects of the work activity that are critical to performance and make sure that they have been replicated satisfactorily. Where replication is involved, assessors must obtain agreement with internal and/or external verifiers before assessing any candidates.

Examples of critical aspects could be
- environmental conditions such as noise levels, lighting conditions and the presence of hazards
- the use of industrial equipment and procedures
- pressure of work such as time constraints
- carrying out work on actual plant/equipment and the consequences of making mistakes
- customer/supplier/departmental relationships

2.4 Access to assessment

There are no entry qualifications or age limits required for these awards unless this is a legal requirement of the process or the environment.

Assessment is open to any candidate who has the potential to reach the standards laid down for this qualification.

Aids or appliances which are designed to alleviate disability may be used during assessment providing they do not compromise the standard required.

2.5 Carrying out assessments

The standard setting body SEMTA strongly recommends that assessment evidence for the mandatory units is gathered during the performance of the optional units. Evidence should be obtained as a whole since competent performance in the optional units may be dependent on competence in the mandatory units. Although it is possible to achieve an Award with the minimum recommended number of optional units, organisations and candidates may wish to be assessed for more than this. Assessors must make sure that the evidence for the mandatory units is sufficient and valid to cover **all** the optional units taken.

Where key or core skills are required, these may be included as additional units and assessed in conjunction with the mandatory and optional units, where this is appropriate.

The standards are designed to cover a range of activities. The evidence produced for this Award will, therefore, depend on the candidate's choice of items within each scope statement in the standard. Where scope items give a choice (for example, 3 from 5), assessors should note that where this applies, candidates do not need to provide performance evidence or knowledge and understanding of aspects of the scope which relate to other activities or methods not chosen.

Unit specific evidence requirements

No	Title	Level 2	Level 3
4	Applying Workplace Organisation	Candidate to provide evidence of individual contributions to the production and/or updating of the Standard Operating Procedures and Visual Management Systems	Candidate to provide evidence of personally producing and/or updating of the Standard Operating Procedures and Visual Management Systems
5	Applying Continuous Improvement Techniques (Kaizen)	Candidate to provide evidence of individual contributions to the production and/or updating of the Standard Operating Procedures or other approved documentation that will sustain the improvements made and Visual Management Systems	Candidate to provide evidence of personally producing and/or updating of the Standard Operating Procedures or other approved documentation that will sustain the improvements made and Visual Management Systems
9	Creating Visual Management Systems	Candidate to provide evidence of individual contributions to the production and/or updating of the Standard Operating Procedures and Visual Management Systems	Candidate to provide evidence of personally producing and/or updating of the Standard Operating Procedures and Visual Management Systems
11	Applying Set-up Reduction Techniques (SMED)	Candidate to provide evidence of individual contributions to the production and/or updating of the Standard Operating Procedures and Visual Management Systems	Candidate to provide evidence of personally producing and/or updating of the Standard Operating Procedures and Visual Management Systems
36	Creating Standard Operating Procedures	Candidate evidence can be three examples of the same activity, e.g. cleaning	Candidate evidence must be from three distinct activities, e.g. cleaning, maintenance, process, etc

2.6 Performance evidence

Performance evidence must be the main form of evidence gathered. In order to demonstrate consistent competent performance for a unit, **_a minimum of three different examples_** of performance of the unit activity will be required. Items of performance evidence often contain features that apply to more than one unit, and can be used as evidence in any unit where they are suitable.

Performance evidence **must** be:

- products of the candidates work such as plans, charts, reports, standard operating procedures, documents produced as part of a work activity, records or photographs of the completed activity

  together with:

- evidence of the way the candidates carried out the activities such as witness testimonies, assessor observations or authenticated candidates reports of the activity undertaken.

Competent performance is more than just carrying out a series of individual set tasks. Many of the units in this qualification contain statements which require the candidates to provide evidence which proves s/he is capable of combining various features and techniques. Where this is the case separate fragment of evidence would not provide this combination of various features and techniques and, therefore, will not be acceptable as demonstrating competent performance. If there is any doubt as to what constitutes suitable evidence the internal/external verifier should be consulted.

2.7 Assessing knowledge and understanding

Knowledge and understanding are key components of competent performance but it is unlikely that performance evidence alone will provide enough evidence in this area. Where the candidate's knowledge and understanding (and the handling of contingency situations) is not apparent from performance evidence, it must be assessed by other means and be supported by suitable evidence.

Knowledge and understanding can be demonstrated in a number of different ways. The standard setting body expects that oral questioning and practical demonstrations to be used as these are considered appropriate to this award. Assessors should ask enough questions to make sure that the candidate has an appropriate level of knowledge and understanding as required by the unit. Where this approach is used the assessor must retain a record of the questions asked together with the candidates answers.

Other methods of assessing under pinning knowledge could include the evidence provided by a candidate who has obtained a Business-Improvement Techniques related vocational qualification, which will supply some but not all of the knowledge and understanding required. Those areas not covered will need to be assessed by alternative methods.

Where oral questioning is used the assessor must retain a record of the questions asked together with the candidate's answers.

2.8 External quality control of assessment

The standard setting body SEMTA has considered the various methods of external quality control of assessment that could be used to assess this qualification, taking into account the complexity and diversity of the work place, commercial acceptability, financial constraints and the criteria of the Regulatory Bodies.

It is considered that enhanced external verification coupled with the introduction of a comprehensive strategy for sampling assessments will give the most reliable measure of assessment judgements. Implementation by the awarding body will use the SEMTA model.

The strategy will be implemented as follows

1   The mechanism for external quality control of assessment will be by applying enhanced verification and the introduction of a comprehensive strategy for sampling assessment using the model.
2   The Sector Skills Council (SSC) will provide external assessment criteria for sampling assessment methods.
3   The SEMTA Awarding Body Forum will agree how the national occupational standards (NOS) are used nationally and in line with the model.
4   External verifiers will use the NOS as a reference when sampling candidates evidence and assessment decisions.
5   Implementation of the Assessment Strategy will be through the assessor and verifier process and will take account candidates with special needs.

The implementation of the Assessment Strategy and its performance will be monitored for future development

2.9 Implementation of External Quality Control of Assessment

The implementation requires the close and continuous involvement of all those involved in assessment. The external verifier however remains the main agent and has three significant points in relation to the centres, these are as follows

- when a centre takes on the qualifications the external verifier will work with the centre to ensure that all key staff are very aware of their roles, duties and competencies to deliver the qualification, this is inherent in the centre approval process
- when the centre has produced an assessment plan for the qualification the external verifier will evaluate this prior to assessments taking place, where plans do not meet requirements the external verifier will work with the centre to effect improvements prior to approval of the plan
- on completion of the assessments the external verifier will sample the candidates evidence using the Critical Aspects of Performance for the particular qualification to ensure that the assessments and internal verifications are to standard and that the candidates have performed and met the requirements of the units.

Within the proposed model, the key to operation is as follows

1   External Quality of Control of Assessment uses criteria extracted from the National Occupational Standards and takes the form of specifications detailing the Critical Aspects of Performance *(see below)* The external verifier must check these during their verification sampling

2   Critical Aspects of Performance are specified in a form that is accessible and understood

3   Centres will be provided with these National Occupational Standards and the Assessment Strategy containing the relevant material and operational requirements. Centres will use this to produce relevant candidate assessment plans for the qualification

4   Each assessment plan must be checked and approved by the internal verifier prior to submission to the external verifier for approval

5   The external verifier will check a representative sample (normally 10%) of the proposed assessment plans, if these are satisfactory the centre will be informed. Where the plans

are unsatisfactory the external verifier will discuss this with the centre to address the situation.

6   The assessor carries out the assessment process in conjunction with the requirements of the award

7   The internal verifier carries internal verification

8   Before the centre can apply for certificates the external verifier must check that the assessment and internal verification are to standard and that the candidates have performed and met the requirements of the units. This will take the form of

- evaluation of the agreed assessment plan against the candidates portfolio
- a quality control check by the external verifier using the Critical Aspects of Performance as a reference, this will also include a sampling of the internal verification sampling will be consistent with recommendations of the Regulatory Bodies.
- the external verification process must involve candidates, this should be to ensure that candidates have completed the full requirements of the standards and have not solely been trained to meet the Critical Aspects of Performance
- evidence to suggest such training as above should be referred back for action as necessary.

9   The external verifier completes process and advises the centre of the outcomes

The External Quality Control of Assessment Model will be reviewed by the standard setting body SEMTA through the Awarding Body Forum. The aim is to allow SEMTA to consider the need for adaptations and refinements. The feed back will allow examples of best practice to be developed and refinement and adaptation to changing circumstances.

The standard setting body considers it is important that this Model is seen as the **confirmation of competence** and not as part of the tool to train and develop the candidate. This being the case it is reasonable to expect that this model will enable the candidate to provide the evidence needed to prove competence and will not be an additional task on top of the assessment process. This approach is seen as having considerable support within the engineering industry as it will be economical with staff and candidate time in the workplace

3.0 Critical Aspects of Performance

Given the above the assessment strategy of enhanced verification requires a national approach to sampling of candidate evidence and assessment decisions. This strategy will focus on critical aspects of skill, knowledge and understanding so that the results gained support and reinforce the normal assessment procedures and demonstrate something of significance about the candidates overall performance.

The external quality control strategy centres around the use of specifications which give details of the 'Critical Aspects of Performance' that the external verifier will look for in the evidence sampled. The specifications have been designed to help verifiers 'home in' on aspects of skill and knowledge that will help to prove competency within a unit. They are a 'tool' to assist in providing a comprehensive and uniform approach being applied nationally within the verification process. They must *NOT* be used for training purposes as condensed National Occupational Standards.

The critical units that contribute to the awards are specified below

Level 2 NVQ in Business-Improvement Techniques (Process pathway) – 2257-50

2257-004   Applying workplace organisation (5S/5C)
2257-005   Applying continuous improvement techniques (Kaizan)
2257-009   Creating Visual Management Systems

Level 2 NVQ in Business-Improvement Techniques (Quality pathway) – 2257-50

2257-018   Applying Six Sigma methodology to a project
2257-019   Carrying out Six Sigma Process Mapping
2257-020   Applying basic statistics

Level 3 NVQ in Business-improvement Techniques (Process pathway) – 2257-51

2257-003   Leading effective teams
2257-004   Applying workplace organisation (5S/5C)
2257-005   Applying continuous improvements techniques (Kaizan)
2257-009   Creating Visual Management Systems

Level 3 NVQ in Business-Improvement Techniques (Quality pathway) – 2257-51

2257-003   Leading effective teams
2257-018   Applying Six Sigma methodology to a project
2257-019   Carrying out Six Sigma Process Mapping
2257-020   Applying basic statistics
2257-021   Carrying out potential Failure Modes and Effects Analysis (FMEA)

Level 4 NVQ in Business-Improvement Techniques (Process pathway) – 2257-52

2257-003   Leading effective teams
2257-004   Applying workplace organisations (5S/5C)
2257-005   Applying continuous improvement techniques (Kaizan)
2257-009   Creating Visual Management Systems
2257-035   Carrying out Project Management Activities

Level 4 NVQ in Business-Improvement Techniques (Quality pathway) – 2257-52

2257-003   Leading effective teams
2257-014   Carrying out Statistics Process Control Procedures (SPC)
2257-018   Applying Six Sigma methodology to a project
2257-019   Carrying out Six Sigma Process Mapping
2257-020   Applying basic statistics
2257-021   Carrying out potential Failure Modes and Effects Analysis (FMEA)
2257-035   Carrying out Project Management Activities

Unit	Unit Title	Level 2 Process	Level 2 Quality	Level 3 Process	Level 3 Quality	Level 4 Process	Level 4 Quality
Unit 1	Complying with Statutory Regulations and Organisational Safety Requirements	M	M	M	M	M	M
Unit 2	Contributing to effective Team Working	M	M	M	M	M	M
Unit 3	Leading Effective Teams			M	M	M	M
Unit 4	Applying workplace organisation (5S/5C)	M	*	M	*	M	*
Unit 5	Applying continuous improvement techniques (Kaizen)	M	*	M	*	M	*
Unit 6	Creating Flexible Production & Manpower Systems			O	*	O	*
Unit 7	Analysing & Selecting Parts for Improvements	O	*	O	*	O	*
Unit 8	Carrying out Lead Time Analysis	O	*	O	*	O	*
Unit 9	Creating Visual Management Systems	M	*	M	*	M	*
Unit 10	Carrying out Value Stream Mapping (VSM)			O	*	O	*
Unit 11	Applying Set-up Reduction Techniques (SMED)	O	*	O	*	O	*
Unit 12	Applying Total Productive Maintenance (TPM)	O	*	O	*	O	*
Unit 13	Applying Problem Solving Techniques	O	*				
Unit 14	Carrying out Statistical Process Control Procedures (SPC)	O	O	O	O	O	M
Unit 15	Applying Flow Process Analysis	O	*	O	*	O	*
Unit 16	Applying Policy Deployment (HOSHIN KANRI)			O	*	O	*
Unit 17	Applying Value Management (Value Engineering & Value Analysis)			O	*	O	*
Unit 18	Applying Six Sigma methodology to a project	*	M	*	M	*	M
Unit 19	Carrying out Six Sigma Process Mapping	*	M	*	M	*	M
Unit 20	Applying basic statistics	*	M	*	M	*	M
Unit 21	Carrying out potential Failure Modes and Effects Analysis (FMEA)	O	O	O	M	O	M
Unit 22	Applying Six Sigma Metrics to a project			*	O	*	Oa
Unit 23	Producing a Characteristics Selection Matrix			*	O	*	Oa
Unit 24	Carrying out Measurement Systems Analysis (MSA)	O	O	O	O	O	Oa
Unit 25	Carrying out Capability Studies			*	O	*	Oa
Unit 26	Producing Multi variance Charts			*	O	*	Oa
Unit 27	Applying Hypothesis Testing			*	O	*	Oa
Unit 28	Carrying out Design of Experiments (DOE)					O	Oa
Unit 29	Carrying out Mistake/Error proofing (POKA YOKE)	O	O	O	O	O	Oa
Unit 30	Carrying out Evolutionary Operations (EVOP)					*	Ob
Unit 31	Applying Central Limit Theorem and Confidence Intervals					*	Ob
Unit 32	Producing Taguchi Linear Graphs					*	Ob
Unit 33	Applying Response Surface Methodology					*	Ob
Unit 34	Applying Quality Function Deployment (QFD)					O	Ob
Unit 35	Carrying out Project Management Activities					M	M
Unit 36	Creating Standard Operating Procedures	O	*	O	*	O	*
Unit 37	Carrying out Problem Solving Activities			O	*	O	*
		6 units All 5 M and any 1 O Optional can include 1 *	7 units All 5 M and any 2 O Option can include 1 *	9 units All 6 M and any 3 O Optional can include 2 *	10 units All 7 M and any 3 O Option can include 2 *	13 units All 7 M and any 6 O Option can include 3 *	14 units All 9 M 3 Oa and 2 Ob Option a can include 2 * Option b can include 1 *

Unit 1 Complying with Statutory Regulations and Organisational Safety requirements

Unit Summary

This unit covers the competencies needed to deal with statutory regulations and organisational safety requirements. It does not deal with specific safety regulations or detailed requirements; these are embedded into the relevant occupational specific units. It does however cover the more general health and safety requirements, which apply to working in an industrial environment. Candidates will be expected to comply with all relevant regulations, which apply to candidates area of work as well as their general responsibilities as defined in the Health and Safety at Work Act. Candidates will also need to be able to identify the relevant qualified first aiders and know the location of the first aid facilities. Candidates will have an understanding of the procedures to be adopted in the case of accidents involving injury and in situations where there are dangerous occurrences or hazardous malfunctions of equipment, processes or machinery. Candidates will also need to be fully conversant with the organisations procedures for fire alerts and the evacuation of premises.

Candidates will also be required to identify the hazards and risks that are associated with their job, typically these will focus on: their working environment, the tools and equipment that they use, materials and substances that are used by candidates, working practices that do not follow laid down procedures and manual lifting and carrying techniques.

Responsibilities will require candidates to comply with all relevant Statutory and Organisational policy and procedures for health and safety in the workplace. Candidates must act in a responsible and safe manner at all times and present themsevles in the workplace suitably prepared for the activities to be undertaken. Candidates will be expected to report any problems with health and safety issues to the relevant authority.

Candidate underpinning knowledge will provide a good understanding of the relevant Statutory Regulations and Organisational requirements associated with the work, and provide an informed approach to the procedures used. Candidates will need to understand the organisations requirements and their application, in adequate depth to provide a sound basis for carrying out the improvement activities in a safe and competent manner.

Unit 1 Complying with Statutory Regulations and organisational Safety requirements

Performance statements:

Candidates must be able to

1 Comply with duties and obligations as defined in the Health and Safety at Work Act
2 Present themselves in the workplace suitably prepared for the activities to be undertaken
3 Follow organisational accident and emergency procedures
4 Recognise and control hazards in the workplace
5 Use correct manual lifting and carrying techniques
6 Apply safe working practices and procedures

Scope of the unit:

In carrying out the above activities candidates must be able to:

Demonstrate understanding of duties and obligations to health and safety by carrying out the following:
- describing in principle duties and responsibilities as an individual under the Health and Safety at Work Act
- identifying within the organisation, appropriate sources of information and guidance on health and safety issues, such as:
  Eye protection and Personal Protective Equipment (PPE)
  COSHH regulations
  Risk assessments
- identifying the warning signs and labels of the main groups of hazardous or dangerous substances
- complying with the appropriate Statutory Regulations at all times
2. Comply with emergency requirements to include:
- identifying the appropriate qualified first aiders and the location of first aid facilities
- identifying the procedures to be followed in the event of injury to self or others
- following organisational procedures in the event of fire and the evacuation of premises
- identifying the procedures to be followed in the event of dangerous occurrences or hazardous malfunctions
3. Identify the hazards and risks that are associated with the following:
- their working environment
- the equipment that is used
- materials and substances (where appropriate) that candidates use
- working practices that do not follow laid down procedures
4. Demonstrate two methods of manual lifting and carrying techniques:
- lifting alone
- with assistance of others
- with mechanical assistance
5. Apply safe working practices in a working environment to include:
- maintaining a tidy workplace with exits and gangways free from obstructions
- using equipment safely and only for the purpose intended
- observing organisational safety rules, signs and hazard warnings
- taking measures to protect others from harm by any work candidates are carrying out.
  -

Unit 1   Complying with Statutory Regulations and organisational Safety requirements

Knowledge statements:

Candidates must have knowledge and understanding of:

1   The roles and responsibilities of self and others under the Health and Safety at Work Act 1974 and other current legislation (such as The Management of Health and Safety at Work Regulations, Workplace Health and Safety and Welfare Regulations, Personal Protective Equipment at Work Regulations, Manual Handling Operations Regulations, Provision and Use of Work Equipment Regulations, Display Screen at Work Regulations, Reporting of Injuries, Diseases and Dangerous Occurrences Regulations
2   The specific regulations and safe working practices and procedures that apply to the work activities
3   The warning signs for the seven main groups of hazardous substances defined by Classification, Packaging and Labelling of Dangerous Substances Regulations
4   How to locate relevant health and safety information for the tasks and the sources of expert assistance when help is needed
5   What constitutes a hazard in the workplace (such as moving parts of machinery, electricity, slippery and uneven surfaces, poorly placed equipment, dust and fumes, handling and transporting, contaminants and irritants, material ejection, fire, working at height, environment, pressure/stored energy systems, volatile, flammable or toxic materials, unshielded processes, working in confined spaces)
6   What their responsibilities are for identifying and dealing with hazards and reducing risks in the workplace
7   What are the risks associated with their working environment (such as the tools, materials and equipment used, spillages of oil, chemicals and other substances, not reporting accidental breakages of tools or equipment and not following laid down working practices and procedures)
8   The processes and procedures that are used to identify and rate the level of risk, (such as safety inspections; the use of hazard check lists, carrying out Risk assessments, COSH assessments)
9   What first aid facilities exist within their work area and within the organisation in general and the procedures to be followed in the case of accidents involving injury
10 What constitutes dangerous occurrences and hazardous malfunctions and why these must be reported even if no one was injured
11 The procedures for sounding the emergency alarms, evacuation procedures and escape routes to be used and the need to report their presence at the appropriate assembly point
12 What the organisational policy is with regard to fire fighting procedures, the common causes of fire and what candidates can do to help prevent them
13 What protective clothing and equipment is available for their areas of activity
14 How to safely lift and carry loads and the manual and mechanical aids available
15 How to prepare and maintain safe working areas, standards and procedures to ensure good housekeeping
16 The importance of safe storage of tools, equipment, materials and products
17 The extent of candidate own authority and whom they should report to, in the event of problems that they cannot resolve.

Unit 2 Contributing to Effective team Working

Unit Summary

This unit covers the competencies required to work effectively as a team member within a continuous improvement environment. Candidates will be required to establish and maintain productive working relationships whilst challenging fixed ideas, deal with disagreements in an amicable and constructive way. Candidates will also be expected to contribute to team activities by providing ideas and solutions and to find ways of resolving issues that cause concern and disagreement. As part of the team activities candidates will need to keep others informed about work plans or activities, which affect them.

Responsibilities will require candidates to comply with organisational policy and procedures for the activities undertaken, report any problems with the activities to the relevant people, and complete any necessary job/task documentation accurately and legibly. Candidates will be expected to take full responsibility for their actions within the team and for the quality and accuracy of the work that they produce.

Underpinning knowledge will be sufficient to provide a good understanding of team working, and provide an informed approach to the techniques and procedures used. Candidates will need to understand how their actions will affect the overall performance of the team.

Applying safe working practices will be a key issue throughout.

Unit 2 Contributing to Effective team Working

Performance statements:

Candidates must be able to:

1 Establish and maintain productive working relationships, using the key performance measures and communication processes available to candidates

2 Deal with disagreements in an amicable and constructive way using relevant information and data to support views and arguments

3 Provide ideas and solutions to find ways of resolving issues that cause concern and disagreement

4 Use all relevant information available to candidates to keep others informed about work plans or activities which affect them

5 Seek assistance from others in a polite courteous way, without disturbing normal work activities

6 Respond in a timely and positive way using data and information available when others ask for help or information

Scope of the unit:

In carrying out the above activities candidates must be able to:

Establish and maintain good working relationships with three of the following:

- colleagues within their own work group
- colleagues in other work groups
- immediate line management
- those for whom they have responsibility
- external contacts

2. Communicate orally by three of the following:

- question and answer sessions
- team briefings
- brain storming sessions
- problem resolution processes

3. Communicate in writing and /or electronically to include three from the following:

- maintaining up to date key performance indicators for the work area
- adding ideas and actions to team boards
- processing information
- communicating via e-mail/ internal network services
- producing briefs or updates

Unit 2   Contributing to Effective team Working

Knowledge statements:

Candidates must have knowledge and understanding of:

1   The importance of creating and maintaining effective working relationships
2   The types of problems that can occur with working relationships
3   How their own behaviour, dress and language can effect working relationships
4   What actions can be taken to deal with specific difficulties in working relationships
5   The importance of challenging fixed ideas within the team
6   How to challenge fixed ideas without causing problems with working relationships
7   How to use data and information to help resolve concerns and disagreements
8   Who should candidates seek assistance from when they have difficulties with working relationships
9   The importance of sharing their knowledge and information and performance measures, with other people in the team and other groups
10 How to use the data and information available to candidates to communicate their performance effectively to others
11 The types of information and data available in their area (such as Key performance measures for RFT, quality, Target v Actual, scrap, OEE, SPC) problem resolution processes and action planning; continuous improvement, brainstorming and trialling new ideas
12 The mixture of skills and experience available in the team to support candidates or the process when problems occur (team skills matrix)
13 Why candidates need to keep others involved in any plans or activities they may be doing
14 The types of support or assistance that they might need from others
15 The importance of being polite when requesting assistance
16 The types of disruption that can be caused by inopportune requests for assistance
17 The methods used in their area for effective communication such as (team briefings covering, team performance, quality, cost, delivery, people; team boards general information; process performance boards covering measures, graphs, action plans)
18 The extent of their own authority and whom they should report to, in the event of problems that they cannot resolve.

Unit 3 Leading Effective Teams

Unit Summary

This unit covers the competencies required for leading effective teams, which are involved in carrying out continuous improvement activities. It involves obtaining appropriate authority and support for the release of resources to carry out team activities, which will include: people, work space/work area, documentation and information. Candidates will be required to determine and agree individual roles and responsibilities and set realistic and achievable goals for both the individuals within the team and the team as a whole. Coaching/mentoring and monitoring the performance of their team will also features in this unit. Candidates will also be expected to prioritise the work activities to achieve the overall objectives cost-effectively and efficiently.

Responsibilities will require candidates to comply with organisational policy and procedures for the activities undertaken and to report any problems that they cannot solve, or are outside their responsibility, to the relevant authority. Candidates must ensure that the team performs the task to the required standard and that all necessary job/task documentation is completed accurately and legibly. Candidates will be expected to take full responsibility for the decisions that they make and the overall performance of the team.

Underpinning knowledge will be sufficient to provide a good understanding of effective team leading and working, and provide an informed approach to the techniques and procedures used. Candidates will need to understand the various techniques of team leading, coaching, monitoring performance and communication methods available to them in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying safe working practices will be a key issue throughout.

Unit 3 Leading Effective Teams

Performance statements:

Candidates must be able to:

1 Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2 Work in accordance with the Roles and Responsibilities identified for the Team Leader role

3 Obtain the authority and support for the release of the necessary resources to carry out the teams activity

4 Set realistic and achievable goals and objectives for their team in accordance with the targets set for themselves or work area/activity

5 Prioritise the work activities to achieve the objectives cost-effectively and efficiently

6 Determine and agree individual roles and responsibilities and coach/mentor their team focusing on the objectives they have been set

7 Monitor the performance of their team against the goals and objectives which have been set and communicate this to the relevant people

8 Consult with subject specialists when required to gain information required to support the team goals and objectives

9 Deal promptly and effectively with any problems within their control and report those that cannot be resolved.

Scope of the unit:
In carrying out the above activities candidates must be able to:

1 Consult with appropriate people in order to secure the release of the following resources:
   - people involved
   - work space/work area required
   - documentation and information required
   -
2 Develop action plans clearly identifying activities and responsibilities required to meet the team targets:
   - for themselves
   - for the team
   -
3 Communicate effectively with:
   - management
   - peers
   - subordinates
   -
4 Communication should include:
   - verbal
   - written
   - electronic methods

Unit 3   Leading Effective Teams

Knowledge statements

Candidates must have knowledge and understanding of:

1   The roles and responsibilities of themselves and others under the Health and Safety at Work Act 1974
2   The business targets set for their area of responsibility and how to set personal, individual and team targets to achieve them (Action Planning)
3   How to prioritise their own and their teams work load to ensure targets are met
4   How to communicate effectively, listen and question, support and coach others to work towards the business targets
5   How to present information effectively to Management, peers or team members using different methods
6   How to conduct a team performance review and involve the team in brainstorming activities to identify opportunities, threats and solutions
7   What type of conflict and problems might emerge between work activities.
8   The organisational processes and procedures required to effectively run their area of responsibility such as: quality procedures, code of conduct, standard operations, problem resolution procedures
9   The improvement tools and techniques being used in their area of responsibility (such as hourly count monitor, TAKT time, continuous flow process, flexible manpower systems, quality level, defects per million opportunities, workplace organisation)
10 The specialist help candidates may require in their area of responsibility and how this can be obtained
11 How to structure and lead a team event and the presentation materials and work documentation required
12 How to train others in the processes and procedures relevant to them and area of responsibility
13 How to monitor and check that their team is working to identified quality and safety standards
14 The extent of their own authority and whom candidates should report to, in the event of problems that candidates cannot resolve.

Unit 4 Applying workplace organisation

Unit Summary

This unit covers the competencies required to apply a systemic approach to continuously make improvements to the workplace organisation. It involves applying the principles and techniques of workplace organisation (such as 5S or 5C). Candidates will need to consider the work area and its activity and determine where information, materials, tools and/or equipment are missing or require a new location and where improvements to the area or activity could be made. Candidates will also be expected to produce and/or contribute to improving existing standard operating procedures and visual controls for the work area, which could cover such things as; producing shadow boards to standardise the storage and location of area equipment, colour coding of equipment, cleaning and maintenance of equipment, production operations and health and safety. The overall objective of the activity will be to improve the condition of the working environment.

Responsibilities will require candidates to comply with organisational policy and procedures for the activities undertaken and to report any problems that they cannot solve, or are outside their responsibility, to the relevant authority. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work they carry out.

Underpinning knowledge will provide a good understanding of the workplace organisation activity and the area in which candidates are working, and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles of workplace organisation and their application, in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying safe working practices will be a key issue throughout.

Unit 4   Applying workplace organisation

Performance statements

Candidates must:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines
2   Apply the principles and process of workplace organisation within the chosen work area and establish the area score
3   Identify where information, resources or equipment is missing or is in surplus and where improvements can be made
4   Contribute to the production and/or updating of Standard Operation Procedures (SOP's), and visual controls that everyone works to within the area
5   Make improvements to the workplace organisation.

Scope of the unit

In carrying out the above activities candidates must:

Produce and/or contribute to the identification of improvements in existing standard operating procedures which cover three of the following:
- cleaning of equipment/work area
- maintenance of equipment
- health and safety
- process procedures
- manufacturing operations/working processes
- quality systems
- regulatory compliance system.

2. Produce and/or contribute to the production of visual controls, which cover three of the following:
- producing shadow boards or an alternative (such a labelled racking and storage systems) to standardise the storage and location of area resources and/or equipment
- colour coding
- line status systems (such as line, process system)
- skills matrix
- performance measures
- process control boards
- improvement systems
- planning systems.

Unit 4   Applying workplace organisation (5S/5C)

Knowledge statements:

Candidates must have knowledge and understanding of:

1   The health and safety requirements of the area in which candidates are carrying out the workplace organisation activity
2   How a work area is selected for an activity
3   The procedure used to identify and address surplus or missing equipment or resources (such as carrying out a 'red tagging' exercise)
4   How to arrange and label the necessary resources or equipment for rapid identification and access
5   How to create Standard Operating Procedures (SOPs)
6   The process and principles used to make improvements to the workplace organisation
7   How to score and audit the workplace organisation
8   The techniques required to communicate information using visual control systems (shadow boards)
9   How information and equipment can be displayed for various work applications (such as information sheets, boards or IT systems)
10 How to correlate work activities into Standard Operating Procedures (SOPs)
11 The extent of own authority and whom candidates should report to, in the event of problems that they cannot resolve.

Unit 5 Applying Continuous Improvement Techniques (Kaizen)

Unit Summary

This unit covers the competencies required for applying continuous improvement techniques (Kaizen) to their work activities. It involves benchmarking the process before and after the Kaizen activity in order to set quantifiable objectives and targets for the improvement activity. The activities undertaken will include the identification of all forms of waste, and problems or conditions within the work area or activity where improvements can be made. Candidates will need to focus on improvements which would give: business benefits such as reduced product cost, increased capacity and/or flexibility, improved safety, improved regulatory compliance, improved quality, improved customer service, improvements to working practices and procedures, reduction in lead time and reduction/elimination of waste.

Candidates will also be required to produce and/or contribute to improving existing Standard Operating Procedures (SOPs), which could include, cleaning of equipment, maintenance of equipment, health and safety practices and procedures, process procedures, manufacturing operations and quality improvements.

Responsibilities will require candidates to comply with organisational policy and procedures for the activities undertaken and to report any problems that they cannot solve, or are outside their responsibility, to the relevant authority. Candidates will be expected to take full responsibility for their own actions within the activity and the quality and accuracy of the work that they carry out.

Underpinning knowledge will provide a good understanding of the Kaizen activity and the area in which candidates are working, and provide an informed approach to the techniques and procedures used. Candidates will need to understand the Kaizen principles and their application, in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying safe working practices will be a key issue throughout.

Unit 5 Applying Continuous Improvement Techniques (Kaizen)

Performance statements:

Candidates must be able to:

1 Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2 Provide comparisons of the process before and after the Kaizen activity (to confirm improvements)

3 Apply the principles and process of the Kaizen activity

4 Contribute to the identification of quantifiable objectives and targets for the Kaizen activity

5 Carry out the Kaizen activity within the chosen work area/activity

6 Identify waste, problems or conditions within the work area or activity where improvements can be made

7 Carry out a structured waste elimination activity based on the identified wastes, problems or conditions

8 Contribute to the production and/or updating of Standard Operating Procedures (SOP's), or other approved documentation that will sustain the improvements made, resulting from the Kaizen activity

9 Determine and calculate measure of performance for quality, cost and delivery

10 Record and show business improvement using key performance indicators

11 Calculate and visually represent the optimum resources required for a process based on customer demand.

Scope of the unit:

In carrying out the above activities candidates must be able to:

1 Identify improvements within the working area/activity which cover three of the following:

- reduction in cost
- improved health, safety and/or working environment
- improved quality
- improved regulatory compliance
- improvements to working practices
- reduction in lead time
- reduction in waste and/or energy usage
- improved customer service
- improved resource utilisation

2   Produce and/or contribute to the identification and application of improvements, which cover three of the following

- cleaning of equipment or work area
- maintenance of equipment
- health and safety
- process procedures
- manufacturing operations or work area operations
- quality system
- regulatory compliance systems

3   Determine and calculate one of the following quality measures:

- not right first time (as a percentage or as Parts Per Million PPM)
- company specific quality measure

4   Determine and calculate one of the following measures:

- delivery schedule achievement
- company specific delivery or service measure

5   Determine and calculate one of the following cost measures:

- parts per operator hour (PPOH)
- production volume
- value added per person (VAPP)
- overall equipment effectiveness (OEE)
- stock turns
- floor space utilization (FSU)
- cost breakdown (such as labour, material, energy and overhead)
- company specific cost measure

6   Record and show business improvement using one of the following key performance indicators:

- not right first time (as a percentage or as Parts Per Million PPM)
- company specific quality measure
- delivery schedule achievement
- company specific delivery measure
- parts per operator hour (PPOH)
- production volume
- value added per person (VAPP)
- overall equipment effectiveness (OEE)
- stock turns
- floor space utilization (FSU)
- cost breakdown (such as labour, material, energy and overhead)
  - company specific cost measure

Unit 5 Applying Continuous Improvement Techniques (Kaizen)

Knowledge statements:

Candidates must have knowledge and understanding of:

1 The health and safety requirements of the area in which candidates are carrying out the Kaizen activity

2 How a work area/activity is selected for the Kaizen activity

3 The principles and process for the deployment of Kaizen

4 What are the eight wastes (over-production, inventory, transport, over-processing, waiting time, operator motion, bad quality, failure to exploit human potential) and how to eliminate them

5 Problem solving and root cause analysis

6 The importance of understanding the process/activity under review and how this will affect the quality of the problem solving

7 How to carry out a Kaizen activity and establish measurable improvements

8 How to distinguish facts from opinions in order to identify improvement actions

9 How improvements to the process are achieved by engaging the knowledge and experience of the people involved in the process

10 How to encourage people to identify potential improvements

11 How to evaluate improvement ideas in order to select those that are to be pursued

12 How to set quantifiable targets and objectives

13 How to create or update Standard Operating Procedures (SOPs) or other approved documentation

14 The techniques used to visually communicate the work of the Kaizen activity to participants and others

15 The application of the business's key measures of competitiveness (such as the DTI's seven measures, delivered right first time, delivery schedule achievement, people productivity, stock turns, overall equipment effectiveness, value added per person, floor space utilisation)

16 How the cycle time of a process can be defined.

17 How to calculate the required production rate for a process by using a calculation such as Takt Time.

18 How to calculate the optimum resources such as people, equipment, facilities and materials required for a process based on customer demand.

19 The techniques used to distribute work content to balance cycle times to the rate of customer demand and how to visually represent it. For example, line balance, and process displays.

20 The extent of their own authority and whom they should report to, in the event of problems that they cannot resolve

Unit 6 Creating Flexible Production and Manpower Systems

Unit Summary

This unit covers the competencies required for creating flexible business systems. It involves applying the principles and processes of creating flexible production and manpower systems to the chosen activity. This will include obtaining the schedule and batch size for the parts in the work area and creating level schedules for those parts. The activities will require candidates to identify improvement opportunities and waste, which needs to be removed in order to achieve Takt Time and Flow processing. Candidates will also be required to produce a visual representation for identifying which resources do not meet the Takt Time requirements, this would typically cover areas such as: standard work in progress, consignment stocks, part routers, physical control signals, number of people required and their flexibility and the rules and disciplines of the Pull System.

Responsibilities will require candidates to comply with organisational policy and procedures for the activities undertaken and to report any problems that they cannot solve, or are outside their responsibility, to the relevant authority. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work they carry out.

Underpinning knowledge will provide a good understanding of their work, and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and procedures of creating flexible production and manpower systems and its application, in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying safe working practices will be a key issue throughout.

Unit 6   Creating Flexible Production and Manpower Systems

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2   Apply the principles and processes of creating flexible production and manpower systems systems to the chosen activity

3   Obtain the schedule and batch size for the parts or materials in the work area

4   Create level schedules for the parts in the work area

5   Identify improvement opportunities and waste which needs to be removed in order to achieve Takt Time and Flow processing

6   Produce a local workforce flexibility matrix (skills matrix)

7   Produce a visual representation identifying which resources do not meet the Takt Time requirements

8   Implement a visually controlled system based on the demand of subsequent processes for the chosen parts which improves the overall process effectiveness.

Scope of the unit:

In carrying out the above activities candidates must be able to:

1   Choose three different parts or materials in the work area and calculate the following:
    • work load
    • capacity of resource (equipment, people)
    • Takt time

2   Produce a visual communication of the schedule which includes:
    • work load
    • resource capacity
    • Takt time for the work area

3   Create a visually controlled system based on the demand of subsequent processes for the chosen parts or materials which include four of the following:

    • standard work in progress
    • safety stocks
    • part or material routers
    • physical control signals
    • rules and disciplines of the control system implemented.
        •

Unit 6 Creating Flexible Production and Manpower Systems

Knowledge statements:

Candidates must have knowledge and understanding of:

1 The health and safety requirements of the work area in which candidates are conducting the activity

2 What information will be required to create Level Schedules, Load and Capacity, Takt Time and batch sizes

3 What is meant by Level Schedules and how to create them

4 How to create a Load & Capacity diagram

5 What is Takt Time and how this is calculated

6 The application of Standard Work in Progress

7 The application of visually controlled systems and signals based on the demand of subsequent processes

8 The application of Skills Matrices

9 The application of Consignment Stocking

10 How to simplify working practices and reduce the human error risk

11 The application of introducing a new improved part/process/material router

12 Problem solving and route cause analysis

13 What are the eight wastes (over-production, inventory, transport, over-processing, waiting time, operator motion, bad quality, failure to exploit human potential) and how to eliminate them

14 How to stabilise and then optimise Equipment Effectiveness

15 How to conduct a review of asset care/best practice effectiveness and establish a robust routine of asset care and correct operation

16 The appropriate techniques that provides value to the customer such as push-pull systems, single piece flow, Just in Time (JIT), Kanban, Autonomation

17 The techniques used to visually communicate the work done (such as Level Schedules, Load & Capacity diagrams, revised Batch Sizes, and Takt Time)

18 How to lay out an effective workplace utilising recognised techniques (such as cellular manufacturing incorporating parallel lines or U-shaped cells)

19 The extent of their own authority and whom they should report to, in the event of problems that they cannot resolve.

Unit 7 Analysing and selecting Parts for Improvements

Unit Summary

This unit covers the competencies required for analysing and selecting parts for improvement. It involves applying the principles and processes of analysing and selecting parts for improvements within the chosen area/product range. Candidates will be expected to identify and produce part families using criteria such as part shape, part size, material used to manufacture part and manufacturing process used.   Candidates will also be required to carry out Pareto analysis within the chosen area/product range, typically focusing on customer schedules (volume), cost of producing the part, profit for each part as a percentage, manufacturing lead time, quality (scrap and non-conformance percentage) and process/manufacturing route.

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken and to report any problems that they cannot solve, or are outside their responsibility, to the relevant authority. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work they carry out.

Candidates underpinning knowledge will provide a good understanding of their work, and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and procedures of analysing and selecting parts for improvements and its application, in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying Safe working practices will be a key issue throughout.

Unit 7 Analysing and selecting Parts for Improvements

Performance statements:

Candidates must be able to:

1 Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2 Obtain all the required information, documentation and equipment necessary to carry out the activity

3 Apply the principles and processes of analysing and selecting representative parts for improvements within the chosen area/product range

4 Identify the representative parts for improvements

5 Group the identified parts into appropriate Part Families

6 Produce a finalised list of the Representative Parts for the chosen area/product range

Scope of the unit:

In carrying out the above activities candidates must be able to:

1 Carry out Pareto analysis against three of the following criteria:
   - customer schedules (volume)
   - cost of producing the part
   - profit for each part, as a percentage
   - manufacturing lead time
   - quality (scrap and non-conformance percentage)
   - process/manufacturing route

2 Produce Part Families using the following criteria:
   - part shape
   - part size
   - material used to manufacture part
   - manufacturing process
   -

Unit 7   Analysing and selecting Parts for Improvements

Knowledge statements:

Candidates must have knowledge and understanding of:

1   The health and safety requirements of the work area in which they are conducting the activity

2   From whom authority is gained for the release of the information required to carry out the selection of Representative Parts?

3   What information will be required to conduct the activity and where the information can be found?

4   The principles and process of Pareto analysis

5   The techniques used to communicate the information and results gained by this process

6   How to create and present Bar Graphs/histograms

7   How to differentiate between Lead-time and Cycle-time

8   How the Bill of Materials (BOM) structure is configured for each of the representative parts

9   How to identify the origin/source of the parts within the chosen area

10 How to evaluate the information in order to select the Representative Parts for the chosen area

11 The principles of problem solving and route cause analysis

12 The extent of their own authority and whom they should report to, in the event of problems that they cannot resolve

Unit 8 Carrying out Lead Time Analysis

Unit Summary

This unit covers the competencies required for carrying out lead-time analysis. It involves applying the principles and processes of Lead Time Analysis to the selected parts or processes. Candidates will be expected to identify suitable parts or processes for which lead time profiles are to be produced and then define suitable and quantifiable objectives and targets for the reduction in Lead-time and the creation of Lead-time profiles for all of the representative parts or processes chosen. Candidates will also be expected to identify any problems or conditions within the work area/process where improvements can be made, this will require the production of frequency diagrams listing the major bottlenecks or constraints as identified by each Lead-time Profile. Typically improvements would focus on: supply or delivery of parts, improved work flow, improved quality, flexibility of people, launch of material and inventory balancing.

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken and to report any problems that they cannot solve, or are outside their responsibility, to the relevant authority. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work they carry out.

Candidates underpinning knowledge will provide a good understanding of their work, and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and procedures of Lead Time Analysis and its application, in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying Safe working practices will be a key issue throughout.

Unit 8   Carrying out Lead Time Analysis

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2   Identify the Representative Parts or processes for which Lead-time profiles are to be produced

3   Define quantifiable objectives and targets for the reduction in Lead-time of the chosen parts or processes

4   Apply the principles and processes of Lead-time analysis and create Lead-time profiles for all of the representative parts or processes chosen

5   Identify from the Lead-time Profiles any problems or conditions within the work area where improvements can be made

6   Produce revised Lead-time Profiles identifying the improved process

7   Produce a plan of the improvement activities and resources required with timescales to achieve the targeted lead-time

Scope of the unit:

In carrying out the above activities candidates must be able to:

1   Produce a frequency diagram listing the major bottlenecks or constraints as identified by each Lead-time Profile

2   Identify improvement opportunities and determine waste, which needs to be removed in order to achieve the Lead-time target, covering three of the following:
- supply or delivery of parts
- improved work flow
- improved quality
- flexibility of people
- launch of material
- inventory balancing

Unit 8 Carrying out Lead Time Analysis

Knowledge statements:

Candidates must have knowledge and understanding of:

1 The health and safety requirements of the work area in which they are conducting the activity

2 From whom authority is gained for the release of the information required to create Lead-time Profiles

3 What information will be required to construct the Lead-time profiles and where can the information be obtained

4 How to create Lead-time Profiles

5 How to create frequency charts

6 The techniques used to communicate the information and results obtained by this process

7 How to differentiate between Lead-time and Cycle-time

8 Problem solving and route cause analysis (Ishikawa diagrams)

9 The principles and process of brain Storming

10 The extent of their own authority and whom they should report to, in the event of problems that they cannot resolve

Unit 9 Creating Visual Management Systems

Unit Summary

This unit covers the competencies required for applying the principles and processes of visual management. It involves applying the principles and processes of visual management to the selected work area and Identifying the appropriate parts of the process or work area that will have visual controls. The activity will require candidates to determine the key performance indicators, which are to be displayed in the work area. Candidates will also be required to measure the effectiveness of the visual management system and maintain the quality of the information that is being displayed.

The information to be displayed will include such things as Safety, Zero defects, Process concerns or corrective actions, Performance measures, Standard operating procedures (SOPs), Workplace organisation, Skills matrices, Autonomous maintenance worksheets, Parts control systems, Problem resolution (e.g. Kaizen boards), Shadow boards and Standard work in progress locations and quantities (WIP).

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken and to report any problems that they cannot solve, or are outside their responsibility, to the relevant authority. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work they carry out.

Candidates underpinning knowledge will provide a good understanding of their work, and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and procedures of visual management and its application, in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying Safe working practices will be a key issue throughout.

Unit 9   Creating Visual Management Systems

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2   Apply the principles and processes of visual management to a process using a variety of visual management techniques

3   Identify appropriate parts of the process or work area that will have visual controls

4   Identify the key performance indicators that will be displayed in the work area

5   Measure the effectiveness of the visual management system and maintain the quality of the information that is being visually displayed in the work area

Scope of the unit

In carrying out the above activities candidates must be able to:

1   Create and update visual management systems that promotes six of the following:
- health and safety
- quality/zero defects
- process concerns or corrective actions
- performance measures
- standard operating procedures
- workplace organisation
- skills matrices
- autonomous maintenance worksheets
- parts/material control systems
- problem resolution (e.g. Kaizen boards)
- shadow boards
- standard work in progress locations and quantities (WIP)
- planning systems
- the delivery of effective meetings
-

Unit 9   Creating Visual Management Systems

Knowledge statements:

Candidates must have knowledge and understanding of:

1   The health and safety requirements of the work area in which they are conducting the visual management activities

2   The criteria for selection of the process using visual management

3   Where to find the information required to develop a local Visual Management System

4   How to create Visual Management Systems (the Visual Factory) such as using Kanban systems, card systems, colour coding, floor footprints, graphs, team boards

5   The techniques used to communicate the information and results obtained by this process

6   How to differentiate between Business Performance Measures and Local Performance Measures

7   The measures of performance in a lean business environment (such as health, safety and the environment; right first time; cost; delivery; responsiveness; process concerns and corrective actions; performance measures; workplace organisation)

8   Improvement activities that will drive the implementation of the visual management system (such as Kanban and level scheduling)

9   The application of the Deming cycle (Plan, Do, Check, Act)

10 The measurement techniques required for communicating the visual management within an area and to others who may use the information (such as Target versus Actual, % Right First Time, Pareto Analysis, Bar Charting, Action Plans, Paynter Charts)

11 The extent of their own authority and whom they should report to, in the event of problems that they cannot resolve

Unit 10   Carrying out Value Stream Mapping (VSM)

Unit Summary

This unit covers the competencies required for carrying out Value Stream Mapping (VSM). It involves applying the principles and processes of value stream mapping on the chosen parts using the appropriate improvement tools and techniques. Candidates will be expected to create a current state map for the parts or materials chosen, and to identify problems or conditions within the current state map, where improvements can be made. Typically the improvements will include: improved workflow, improved lead-time, improved quality, reduced waste and improved safety.

Candidates will also need to produce future State Maps which includes part or material flow through the process, information flow, inventory, set-up and cycle times for each operation, lead-time for the part or material, value-adding percentage of lead time, delays which occur between each operation, Takt-time and schedules for the chosen part or material, and customer and supplier ordering and delivery.

Responsibilities will require candidates to comply with organisational policy and procedures for the value stream mapping activities undertaken and to report any problems that they cannot solve, or are outside their responsibility, to the relevant authority. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work they carry out.

Underpinning knowledge will provide a good understanding of their work, and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and procedures of value stream mapping and its application, in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying safe working practices will be a key issue throughout.

Unit 10   Carrying out Value Stream Mapping (VSM)

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2   Select appropriate parts or materials on which to carry out the activity

3   Carry out the Value Stream Mapping process on the chosen parts using the appropriate improvement tools and techniques

4   Create a current state map for the parts or materials chosen

5   Identify problems or conditions within the current state map, where improvements can be made

6   Produce a future state map

7   Implement the changes identified.

Scope of the unit

In carrying out the above activities candidates must be able to:

1   Identify opportunities for improvements and waste that needs to be removed in order to create a future state map covering three of the following:

- improved work flow
- improved lead time
- improved quality
- improved safety
- less inventory
- improved flexibility
- less waste/cost

2   Produce current and future State Maps which include the following:

- part or material flow through the process
- information flow
- inventory
- set-up and cycle times for each operation
- lead-time for the part or material
- value-adding percentage of lead time
- delays which occur between each operation
- Takt-time and schedules for the chosen part
- customer and supplier ordering and delivery.

Unit 10   Carrying out Value Stream Mapping (VSM)

Knowledge statements:

Candidates must have knowledge and understanding of:

1   The health and safety requirements of the area in which they are carrying out the Value Stream Mapping activity

2   How a part is selected for a Value Stream Mapping activity

3   From whom authority is gained for release of people and resources for the Value Stream Mapping activity

4   How to structure and run a Value Stream Mapping event

5   The principles and processes for the deployment of Value Stream Mapping

6   How improvements to the process can be achieved

7   How to evaluate improvement ideas and select those that will give the greatest benefit for the least spend

8   How to set quantifiable objectives and targets for the Future State Maps

9   How to create Standard Operating Procedures

10 The techniques used to visually communicate the information and results of the process

11 The techniques of problem solving and root cause analysis

12 Systems lead-time and how they differ from actual lead-time and how both are constructed

13 How to calculate Takt-time

14 The principles of increasing Process Capacity

15 What constitutes value adding and non-value adding activities

16 The extent of their own authority and whom candidates should report to, in the event of problems that they cannot resolve.

Unit 11   Applying Set-up Reduction Techniques (SMED – Single Minute Exchange of Dies)

Unit Summary

This unit covers the competencies required for applying set-up reduction techniques. It involves applying the principles and processes of set-up reduction to a machine or process set-up, change over, clean down or turnaround, activity that is a bottleneck or constraint that affects the process such as capacity, flexibility, lead time, inventory or other business performance measure. Candidates will be expected to identify where the problems occur within the set-up process and determine where improvements can be made. Candidates will need to set suitable quantifiable objectives and targets against which the improvements are to be made. The activities will require them to carry out set-up reduction activities on different machines or processes and make improvements to the current set-up which includes such things as reduced set-up time, improved safety, improved quality and improved work practice.

Candidates will also be required to produce standard operating procedures for the new set-up which includes all of the new steps to be carried out, the time required for each step, differentiation between internal and external steps, standard equipment and its location (e.g. cutting tools, clamps, hand tools, inspection equipment) and information required for a quick set-up and its location (e.g. CNC programmes, drawings and manufacturing instructions).

Responsibilities will require candidates to comply with organisational policy and procedures for the activities undertaken and to report any problems that they cannot solve, or are outside their responsibility, to the relevant authority. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work they carry out.

Underpinning knowledge will provide a good understanding of their work, and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and procedures of set-up reduction and its application, in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying safe working practices will be a key issue throughout.

Unit 11   Applying Set-up Reduction Techniques (SMED – Single Minute Exchange of Dies)

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2   Identify a machine, or process set-up activity, that is a bottleneck or constraint that effects productivity

3   Carry out the set -up reduction activity on the chosen machine, or process using the appropriate techniques

4   Identify the problems or conditions within the current set-up, where improvements can be made

5   Define quantifiable objectives/targets for improvements to the set-up chosen

6   Make improvements to the current set-up to meet the identified objectives and targets

7   Contribute to the production and/or updating of Standard Operating Procedures (SOP's) or other approved documentation that will sustain the improvements made to the set-up requirements

Scope of the unit

In carrying out the above activities candidates must be able to:

1   Make improvements to the current set-up which cover three of the following:
   - reduced set-up time
   - improved safety
   - improved quality
   - improved work practice
   - improved regulatory compliance
   - reduced cost

2   Produce and/or contribute to the identification and application of improvements to the new set-up, which covers three of the following:

   - all of the new steps and the time required for each step
   - differentiation between internal and external steps
   - standard equipment and its location (e.g. cutting tools, clamps, hand tools, inspection equipment)
   - information required for a quick set-up and its location (such as. CNC programmes, drawings and manufacturing instructions)
   - methods and standards (such as, PICME to provide info)
   - documentation for co-ordination control (such as, PICME to provide info).

Unit 11   Applying Set-up Reduction Techniques (SMED – Single Minute Exchange of Dies)

Knowledge statements:

Candidates must have knowledge and understanding of:

1   The health and safety requirements of the area in which candidates are carrying out the set-up reduction activities

2   How a machine or process is selected for a set-up reduction activity

3   From whom authority is gained for the release of people and resources for the set-up reduction activity

4   How to structure and run a set-up reduction activity

5   The principles and processes for the deployment of set-up reduction

6   How improvements to the set-up can be achieved

7   How to evaluate improvement ideas and select those that will give most benefit for the least spend

8   How to set quantifiable targets and objectives for the improved set-up

9   How to create or update Standard Operating Procedures (SOPs) or other approved documentation for the revised set-up

10 How to distinguish between internal and external activities with reference to set-up

11 Problem solving and the application of Root Cause Analysis

12 The difference between 'Motion' and 'Work'

13 The principles and application of the 5 'Why's

14 What constitutes a Value Adding and Non Value Adding activity?

15 The extent of their own authority and whom they should report to, in the event of problems that they cannot resolve

Unit 12   Applying Total Productive Maintenance (TPM)

Unit Summary

This unit covers the competencies required to apply Total Productive Maintenance (TPM) principles to equipment and processes and aims to prevent equipment problems by identifying potential causes and not waiting for the problem to occur. It involves the measurement of the six classic hidden losses, assessment of potential and priorities for loss reduction. It covers the application of the TPM principles and processes to resources such as plant and equipment, machines, office equipment, service equipment and utilities. It also concerns assessment of the equipment/process condition, the steps required to restore the equipment/process to good working order, and then to set a robust asset care regime to maintain this condition.

Candidates will be required to apply the appropriate TPM techniques and use the data gathered on the resource to refine the working practices through the application of autonomous, condition based and planned maintenance. Working practice improvement will include cleaning and checking, early problem detection and process monitoring routine servicing. This will involve close working with both production and maintenance staff, and include cross shift implementation if applicable to the organisation.

Responsibilities will require candidates to comply with organisational policy and procedures for the activities undertaken and to report any problems that they cannot solve, or are outside their responsibility, to the relevant authority. Candidates will also be responsible for ensuring that all tools and equipment used during the maintenance activities are correctly accounted for and that all necessary job/task documentation is completed accurately and legibly. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work they carry out.

Underpinning knowledge will provide a good understanding of their work, and provide an informed approach to the TPM techniques and procedures used. Candidates will need to understand the principles and procedures of total productive maintenance and its application, in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying safe working practices will be a key issue throughout.

Unit 12   Applying Total Productive Maintenance (TPM)

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines

Select the appropriate asset on which to carry out the total productive maintenance activity

Assist in obtaining the necessary information to carry out the activity

Carry out the total productive maintenance activity by applying the appropriate techniques

Use the Overall Equipment Effectiveness (OEE) measure and information to determine which elements of the OEE and their associated losses need improvement.

Develop and/or use an action plan which will reduce/eliminate the losses and hence improve the overall equipment effectiveness

Implement improvements to working practices through autonomous maintenance (front line asset care), condition based maintenance (predictive) and planned (fixed interval) maintenance steps

Scope of the unit

In carrying out the above activities candidates must be able to:

1   Carry out the Total Productive Maintenance process on at least two assets from the following:
   * plant and equipment
   * machines
   * office equipment
   * service equipment
   * utilities

2   Carry out the Total Productive Maintenance process and show how one of the following are undertaken:
   * assess criticality of equipment/process condition and identify refurbishment needs
   * identify an integrated asset care plan for both operator and maintenance staff

3   Collect information relating to:
   * load or demand
   * capacity
   * Takt time or bottleneck analysis

4   Show improvements to working practices through three of the following:
   * initial cleaning
   * counter measures for cause and effect of dust and dirt
   * cleaning and lubrication standards
   * general inspection
   * autonomous inspection
   * workplace organisation
   * full circle implementation of autonomous maintenance

Unit 12   Applying Total Productive Maintenance (TPM)

Knowledge statements:

Candidates must have knowledge and understanding of:

1   The health and safety requirements of the area in which candidates are carrying out the Total Productive Maintenance activities

2   The principles of TPM and how they can be applied in administration procedures, safety improvement and quality maintenance

3   How to select an asset on which to carry out the activity (assets could be plant and equipment, machines, office equipment, service equipment, utilities)

4   How to implement a systematic and structured approach to carrying out autonomous, condition based and planned maintenance

5   The difference between a chronic and sporadic loss, and the countermeasures to both

6   How to calculate Overall Equipment Effectiveness (OEE)

7   Where to find the information required to calculate the OEE for the chosen asset

8   What are the benefits of having a Total Productive Maintenance system

9   The importance of taking ownership of the TPM system and the issues that can be expected to be resolved

10 The six major losses and how loss reduction actions need to be prioritised

11 The use of Standard Operating Procedures, single point lessons and machine/process start-up and shut down procedures

12 An awareness of the improvement activities that will drive the implementation of the Total Productive Maintenance activities (Kaizen and Team Working)

13 Critical processes and early problem detection steps

14 Loss areas and opportunities for improvements

15 Standards of wear and the ability to stabilise the component life

16 The techniques of visual management used to communicate the information and results obtained by this process including TPM activity boards and check lists

17 The integration with workplace organisation and improving OEE

18 Contaminants and sources of contaminants

19 The extent of their own authority and whom candidates should report to, in the event of problems that they cannot resolve.

Unit 13   Applying Problem Solving Techniques

Unit Summary

This unit covers the competencies required for applying problem solving techniques. It involves identifying the nature and extent of the problem and obtaining all the relevant information relating to it, using appropriate problem solving tools and applying them within a team focused environment.
In carrying out the problem solving activities candidates will be expected to take on one of the key roles such as facilitator, timekeeper or scribe. Candidates will be required to identify the root cause of the problem and determine what permanent corrective actions need to be implemented to meet with organisational requirements. Typically these corrective actions will lead to reduced costs, improved quality, improved delivery and responsiveness (lead time reduction) improved output, health and safety and regulatory compliance.

Responsibilities will require candidates to comply with organisational policy and procedures for the activities undertaken and to report any problems that they cannot solve, or are outside their responsibility, to the relevant authority. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work they carry out.

Underpinning knowledge will provide a good understanding of their work, and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and procedures of structured problem solving and its application, in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying safe working practices will be a key issue throughout.

Unit 13   Applying Problem Solving Techniques

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2   Identify the nature and extent of the problem and obtain all relevant information relating to it

3   Adopt a structured approach to problem resolution

4   Identify appropriate problem solving tools and apply them within a team focused environment

5   Identify the root cause of the problem and determine permanent corrective actions

6   Ensure that the corrective actions determined meet with organisational requirements

7   Obtain the appropriate authority and implement the agreed permanent corrective actions within agreed timescales

8   Monitor and record the problem resolution progress in the appropriate information systems

Scope of the unit

In carrying out the above activities candidates must be able to:

1. Participate in problem solving activities, taking on one of the following key roles:

- facilitator
- timekeeper
- documentation and information required
- scribe

2. Identify the savings within the chosen problem solving activity covering two of the following:

- cost
- quality
- delivery or service
- responsiveness (Lead time reduction, output or capacity)
- health and safety
- regulatory compliance

Unit 13   Applying Problem Solving Techniques

Knowledge statements:

Candidates must have knowledge and understanding of:

1   The business need for problem identification and removal

2   What are the benefits of adopting a formalised problem solving process?

3   How to establish and select the team to be used and what will be their roles and responsibilities

4   Why there must be clearly defined roles within the team and what these roles are (such as facilitator, scribe, time keeper)?

5   How to establish a problem profile and the involvement of the customer in the problem solving issues

6   What is 'Time Line Graphing' and how this is applied to the problem solving process?

7   Process definition and data collection

8   Containment action planning to include process risk, action planning, testing decisions, determining time-scales and protecting the customer

9   How to define and verify root cause of a problem to include the use of brainstorming, the 5 'Why's, Ishikawa diagrams, testing decisions, verification techniques, Root Cause Paths

10   How to determine and select permanent corrective actions to include decision making, identifying criteria for givens and wants, assessing the criteria and determining the risks, generating alternatives

11   How to implement the permanent corrective actions identified to include implementation planning, protecting the plan, contingency planning, process monitoring and formalising changes

12   How to prevent recurrence of the problems to include changes to management systems, operating systems and procedures and identification of opportunities for improvements

13   How to capture process improvement opportunities to include identifying changes, applying reinforcements and improvements, reviewing recommendations, co-ordinating necessary actions, implementing the improvement plan and evaluating the results

14   How to recognise the team's problem solving efforts, review the lessons learned and ensure that implementation has occurred

15   The extent of their own authority and whom candidates should report to, in the event of problems that they cannot resolve.

Unit 14   Carrying out Statistical Process Control Procedures (SPC)

Unit Summary

This unit covers the competencies required for Carrying out Statistical Process Control Procedures (SPC). It involves applying the principles and processes of SPC to a selected process and gathers all the necessary data for analysis in consultation with relevant people. Candidates will be expected to use apply Statistical Process Control, utilising Statistical and Graphical methods to represent the process conditions. Typically these would focus on: simple run charts, tally charts, bar charts, histograms, run charts, box plots time series charts, Pareto diagrams and stem and leaf plots.

Candidates will need to perform basic statistical process control identifying special cause versus common cause. Candidates will also be expected to identify activities, which will improve the process performance, and produce an action plan to implement the improvements. Calculation of the capability of the process will focus on identifying: Cp and Cpk.

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken and to report any problems that they cannot solve, or are outside their responsibility, to the relevant authority. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work they carry out.

Candidates underpinning knowledge will provide a good understanding of their work, and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and procedures of Statistical Process Control and its application, in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying Safe working practices will be a key issue throughout.

Unit 14   Carrying out Statistical Process Control Procedures (SPC)

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2   Work to, and comply with all the required process monitoring documentation and work instruction sheets

3   Select and/or confirm the process on which the Process Analysis is to be carried out

4   Consult with relevant people and gather all the necessary data for analysis

5   Apply the principles and processes of Statistical Process Control to the chosen process

6   Utilise Statistical and Graphical methods to represent the process conditions

7   Identify activities which will improve the process performance

8   Contribute to the production of an action plan to implement the improvements

Scope of the unit:

In carrying out the above activities candidates must be able to:

1   Perform basic Statistical process control using appropriate tools and techniques

2   Calculate the capability of the process identifying:
   - Cp
   - Cpk

3   Produce charts for process and control information to include three from:
   - simple run charts
   - tally charts
   - bar charts
   - histograms
   - box plots time series charts
   - Pareto diagrams
   - stem and leaf plots
   - run charts

Unit 14 Carrying out Statistical Process Control Procedures (SPC)

Knowledge statements:

Candidates must have knowledge and understanding of:

1 The health and safety requirements of the area in which they are carrying out the process control activities

2 Were process control fits in within a continuous improvement environment?

3 How process performance affect customer satisfaction and process costs

4 Where and why is Statistical process control used, what are the benefits and how it is applied?

5 The importance of standardisation within a process operation and why process performance can only be determined when they are controlled

6 How process control can improve process performance

7 What are the benefits of prevention and detection?

8 The two types of variation within a process, and the impact they have within the process (Common cause, Special cause)

9 How to gather data and effectively analyse it, understanding how the data can be used to communicate abnormalities within a process

10 What are the main types of control charts used for SPC, what are there features and benefits and how to construct and implement them?

11 What is meant by a population and what is a sample?

12 The measurements of Central Tendency and Variability and how they are calculated

13 The properties of a normal curve of distribution

14 How to create charts or diagrams (such as Run Charts, Histograms, Box plots, time series charts, Pareto Diagrams and Stem and Leaf Plots)

15 How to explain the terms and calculate Mean, Median, Mode, Standard Deviation, Range and Variance

16 How to explain and calculate Process Capability (Cp & Cpk)

17 The extent of their own authority and whom candidates should report to in the event of problems that they cannot resolve

Unit 15   Applying Flow Process Analysis

Unit Summary

This unit covers the competencies required to Apply Flow Process Analysis. It involves applying the principles and procedures of flow process analysis within a given work area to produce a flow process analysis sheet. Candidates will be required to identify and establish elements of waste and problems or conditions within the process where improvements can be made. Candidates will need to evaluate and prioritise the opportunities for improvements and to assist in this activity they will be required to produce a payback matrix. Candidates will also be expected to use the information gathered to define quantifiable objectives and targets for all the identified improvement activities, with an appropriate measure and time scale for their implementation. Typically flow process analysis will be carried out on: manufacturing processes or administrative processes and will focus on: non-value added activity and value added activity.

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken and to report any problems that they cannot solve, or are outside their responsibility, to the relevant authority. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work they carry out.

Candidates underpinning knowledge will provide a good understanding of their work, and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and procedures of Flow Process Analysis and its application, in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying Safe working practices will be a key issue throughout.

Unit 15   Applying Flow Process Analysis

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2   Apply the principles of flow process analysis within a given work area

3   Produce a flow process analysis sheet

4   Use the flow process sheet to identify and establish elements of waste, problems or conditions where improvements can be made

5   Identify and record the opportunities for improvement within the process

6   Produce a payback matrix to assist with the evaluation and prioritisation of the opportunities

7   Evaluate the opportunities for improvement and prioritise these using suitable criteria

8   Define quantifiable objectives and targets for all the defined improvement activities, with an appropriate measure and time scale for completion

Scope of the unit

In carrying out the above activities candidates must be able to:

1   Carry out flow process analysis activities on either:
   - manufacturing processes
   - administrative processes

2   Analyse the data obtained above into
   - non-value added activity
   - value added activity

3   Create and agree an action plan which:
   - eliminates non-value added activity
   - simplifies value added activity

Unit 15   Applying Flow Process Analysis

Knowledge statements:

Candidates must have knowledge and understanding of:

1   The health and safety requirements of the area in which they are carrying out the Flow Process Analysis activities

2   How to describe a process in its elements/activities of work

3   The eight forms of waste within a lean manufacturing environment

4   The symbols and abbreviations used for flow process analysis such as those defined by the American Standard for Methods Engineering (ASME) to include operation, inspection, transport, waiting, storage

5   How to map out a process or deployment flowchart using the recognised symbols (such as defined in ASME) on a flow process sheet

6   What are classed as value-added and non-value added activities

7   How to establish which of the elements/activities in the process are value added or non-value added

8   How to identify opportunities for improvements to the process

9   How to use data to eliminate activities that do not add value to the process

10   How to construct an action plan that will simplify the value added activities and eliminate the non-value added activities

11   How to construct a payback matrix/action plan

12   The extent of their own authority and whom they should report to in the event of problems that they cannot resolve

Unit 16 Applying Policy Deployment (HOSHIN KANRI, Quality Operating Systems, Business Plan Deployment)

Unit Summary

This unit covers the competencies required for Applying Policy Deployment (HOSHIN KANRI, Quality Operating Systems, Business Plan Deployment). It involves applying the principles and processes of business plan deployment in their local area and defining the area goals for the customer and the business they work in to enable improvement opportunities and conditions to be identified which when implemented will deliver the local area Policy Deployment plan.

Typically improvement opportunities will focus on such things as is there a local commitment to deliver the improvement plan, is the Policy Deployment Plan communicated to everyone in the business, are there procedures for making all employees aware of and engaged in the local Policy plan, are there local measures reflecting Policy Deployment plans, are policy review dates adhered to, are there procedures for eliminating cross-functional boundaries, are improvement actions being linked to the Policy Deployment plan.

Candidates will also be required to create a visual communication of the plans which must include: the resources required, measures of performance, time scales for completion, review dates of each activity, assigned ownership and responsibility for each action and the order of importance of each improvement activity.

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken and to report any problems that they cannot solve, or are outside their responsibility, to the relevant authority. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work they carry out.

Candidates underpinning knowledge will provide a good understanding of their work, and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and procedures of Policy Deployment and is application, in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying Safe working practices will be a key issue throughout.

Unit 16   Applying Policy Deployment (HOSHIN KANRI, Quality Operating Systems, Business Plan Deployment)

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2   Obtain the current Policy Deployment plan

3   Carry out the policy deployment process in their local area and define the area goals

4   Identify improvement opportunities and conditions which when implemented deliver the local area Policy Deployment plan

5   Produce quantifiable objectives and targets for all the defined improvement activities, with an appropriate measure and time scale for completion

6   Produce and communicate the plan in an appropriate visual format

Scope of the unit:

In carrying out the above activities candidates must be able to:

1   Define the area goals for:
   - customers
   - the business in which they work

2   Use at least four of the following criteria when identifying improvement opportunities:
   - is their local commitment to deliver the improvement plan
   - is the plan communicated to everyone in the business
   - are all employees aware of and engaged in the local Policy plan
   - do local measures reflect Policy Deployment plans
   - are policy review dates adhered to
   - are cross-functional boundaries eliminated
   - are improvement actions linked to the Policy Deployment plan
   -
3   Create a visual communication of the plans, which must include:
   - the resources required
   - measures of performance
   - time scales for completion
   - review dates of each activity
   - assigned ownership and responsibility for each action
   - the order of importance of each improvement activity

Unit 16 Applying Policy Deployment (HOSHIN KANRI, Quality Operating Systems, Business Plan Deployment)

Knowledge statements:

Candidates must have knowledge and understanding of:

1   The health and safety requirements of the work area in which they are carrying out the improvement activities

2   Where to find the information required to develop a local Policy Deployment plan?

3   How to create Policy Deployment plans

4   The techniques used to communicate the information and results obtained by this process

5   How to differentiate between their business Vision, Mission and Main Business drivers

6   Measures of performance in a lean business environment

7   The limits of their responsibility and involvement in the Policy Deployment planning process

8   The type of improvement activities that will drive the implementation of the Business plan e.g. management tools and techniques which contribute to Quality, cost, delivery and responsiveness

9   The meaning and application of the Deming cycle (Plan, Do, Check, Act)

10   The application of Gap analysis (Current situation Via Desired situation

11   The extent of their own authority and whom they should report to, in the event of problems that they cannot resolve

Unit 17 Applying Value Management (Value engineering and Value Analysis)

Unit Summary

This unit covers the competencies required for Applying Value Management (Value engineering and Value Analysis). It involves applying the principles and processes of Value Management (VM) on the chosen product or process. Candidates will be expected to identify what the customer requires from the product or the process and to set quantifiable objectives and targets to achieve this. Candidates will need to analyse the functions of the process, identify and allocate costs of each of these functions and identify the added and non-value added activities within the process. Candidates will also be expected to identify the most appropriate alternatives, carry out a risk assessment of the alternatives, prioritise and rank the alternatives, identify the expected benefits. Candidates will need to develop these alternatives into detailed proposals that will improve the value of the product or process and provide costing recommendations for management approval.

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken and to report any problems that they cannot solve, or are outside their responsibility, to the relevant authority. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work they carry out.

Candidates underpinning knowledge will provide a good understanding of their work, and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and processes of Value Management and its application, in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying Safe working practices will be a key issue throughout.

Unit 17   Applying Value Management (Value engineering and Value Analysis)

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2   Apply the principles and processes of Value Management (VM) on the chosen product or process

3   Identify what the customer requires from the product or the process and set quantifiable objectives and targets for the Value Management activity

4   Analyse the functions of the product or process being studied and allocate costs to those functions

5   Identify the non-value added activity within the product or process and suggest alternatives

6   Develop these alternatives into detailed proposals that will improve the value of the product or process

7
8   Identify the new value added process and implement the plan within agreed time scales

Scope of the unit:

In carrying out the above activities Candidates must be able to:

1   Produce a Total Cost Model and Supply Chain Map for the product or process which shows how cost are related to function

2   Produce detailed proposals of the findings of the Value Management activities which:
   - identifies the non-value added activities and indicates alternatives
   - prioritises and ranks the alternatives
   - includes a risk assessment of the alternatives
   - identifies the most appropriate alternatives
   - provides costing recommendations for management approval
   - identifies expected benefits

Unit 17 Applying Value Management (Value engineering and Value Analysis)

Knowledge statements:

Candidates must have knowledge and understanding of:

1. The health and safety requirements of the work area in which they are carrying out the Value Management activities

2. How to select a product or process on which to carry out the Value Management activity

3. How to structure and run a Value Management activity

4. How to set quantifiable objectives and targets for the Value Management activity

5. How to carry out a Function Analysis

6. The performance related tools used in order to qualify customer wants and needs

7. The Cost of Function equation and how to calculate the cost of function

8. FAST Diagramming and Value Trees

9. Decision making and creativity techniques (brainstorming)

10. How Value Management relates to the overall business strategy and competitive positioning

11. How to produce a Total Cost Model and Supply Chain Map for the product or process

12. What constitutes value adding and non-value adding activities?

13. How to identify what a customer requires from a product or process

14. How to prioritise and rank the alternatives

15. How to complete a risk assessment of the alternatives

16. How to prepare the findings into proposals

17. How to monitor and track proposals to implementation

18. The extent of their own authority and whom they should report to in the event of problems that they cannot resolve

Unit 18   Applying Six Sigma Methodology to a project

Unit Summary

This Unit covers the competencies required for applying a structured Six Sigma Methodology to a project. It involves identifying the Six Sigma organisational infrastructure, roles and responsibilities and business specific metrics that will apply. These will include financial, quality and process aspects of the project. Candidates will then be expected to identify areas where the Six Sigma tools, techniques and activities can be applied in order to demonstrate those factors that are critical to the customer, business and process.

Contribution to the identification of the cost of poor quality by identifying the defects per million opportunities (DPMO) is a major part of this unit.

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken and to report any problems with the activities that they cannot solve or are outside their responsibility to the relevant authority. Candidates will need to ensure that all the five phases of Six Sigma are utilised within the project (such as define, improve, measure, control and analyse) and complete all necessary project documentation accurately and legibly. Candidates will be expected to take full responsibility for their own actions within the activity and the quality and accuracy of the work that they produce.

Candidates underpinning knowledge will provide a good understanding of the application Six Sigma Methodology, and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and application of Six Sigma Methodology in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying Safe working practices will be a key issue throughout.

Unit 18   Applying Six Sigma Methodology to a project

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines
2   Apply the structured Six Sigma Methodology and approach to the selected project
3   Identify the six sigma organisational infrastructure, roles and responsibilities and business specific metrics that would apply
4   Identify areas where the Six Sigma tools, techniques and activities can be applied and demonstrate the need to measure those factors that are Critical to Customer Quality (CTQC) for the customer, business and process
5   Contribute to the identification of the cost of poor quality by identifying the defects per million opportunities (DPMO)
6   Relate defects per million opportunities to the sigma score and identify the gap to Six Sigma performance

Scope of the unit:

In carrying out the above activities candidates must be able to:

1   Identify and participate in Six Sigma projects which cover two the following:
   - manufacturing
   - quality level
   - administration

Utilise the five phases of Six Sigma within the project:
   - define
   - improve
   - measure
   - control
   - analyse

Contribute to producing a metric chart for the Six Sigma projects undertaken
   - financial
   - quality
   - process

Identify the Critical To Quality Characteristic (CTQC) of the projects to include:
   - cost
   - quality
   - delivery
   -
Produce a diagram (family tree) of the Six Sigma organisational infrastructure and the roles of the:
   - Champion
   - Mentor
   - Yellow Belt
   - Green belt
   - Black belt
   - Master black belt

Unit 18   Applying Six Sigma Methodology to a project

Knowledge statements:

Candidates must have knowledge and understanding of:

1   The Six Sigma Methodology and how it is applied to a project

2   The Six Sigma Infrastructure and Philosophy

3   What are the benefits that will arise from a Six Sigma Project?

4   The Parts per Million Opportunities goal of Six Sigma

5   The calculation of defects per million opportunities

6   The five phases of six sigma that are applied to a project

7   What is a Critical To Quality Characteristic (CTQC)?

8   How non value added activity can serve as a "Roadblock" for achieving Zero Defect

9   What is an "Opportunity For Defect"?

10   What are the roles and responsibilities of the key players in the Six Sigma process (Champion, Mentor, Master Black Belt, Black Belt, Green Belt and Yellow Belt.)?

11   What is the relationship between Key Process Input Variables and Key Process Output Variables using the equation $Y=(f)\ x$?

12   The extent of their own authority and whom they should report to, in the event of problems that they cannot resolve

Unit 19   Carrying out Six Sigma Process Mapping

Unit Summary

This unit covers the competencies required for carrying out a Six Sigma process mapping activity. It requires candidates to select a suitable process on which to carry out the process mapping activity and identify the Key stages that form the overall process under investigation. These would be the Process Input Variables and the Process Output Variables and would include things, which are controllable, critical, noise and standard operating procedures.

Candidates will be required to contribute to the construction of the Process Map for the Six Sigma project and identify the Value Added and Non Value Added Steps in the process. Candidates will also need to consider the information gathered in the Six Sigma mapping activity and suggest areas where improvements can be made to the process as a result of the information gathered.

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken and to report any problems with the activities that they cannot solve or are outside their responsibility to the appropriate authority. Candidates must ensure that all the necessary documentation/visual representation is completed accurately and legibly. Candidates will be expected to take full responsibility for their own actions within the activity and the quality and accuracy of the work that they produce.

Candidates underpinning knowledge will provide a good understanding of Six Sigma process mapping, and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and the application of Six Sigma process mapping in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying Safe working practices will be a key issue throughout.

Unit 19   Carrying out Six Sigma Process Mapping

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2   Select a suitable process on which to carry out the process mapping activity

3   Identify the Key stages that form the overall process under investigation

4   Collect the data necessary to construct the Six Sigma Process Map

5   Contribute to the construction of the Process Map for the Six Sigma project

6   Identify Value Added and Non Value Added Steps in a process

7   Identify improvements to the process as a result of the information gathered in the Six Sigma mapping activity

Scope of the unit:

In carrying out the above activities candidates must be able to:

1   Produce a process map, which identifies:
    - the Key Process Input Variables
    - the Key Process Output Variables

2   Classify both the Key Process Input Variables and the Key Process Output Variables as one or more of the following:
    - controllable
    - critical
    - noise
    - standard operating procedure

3   Identify and add to the process map the specifications of both the:
    - Key Process Input Variables
    - Key Process Output Variables

Unit 19   Carrying out Six Sigma Process Mapping

Knowledge statements:

Candidates must have knowledge and understanding of:

1   The health and safety requirements of the area in which they are carrying out the process mapping activity

2   The benefits of carrying out Six Sigma process mapping

3   What a Six Sigma Process map is and how it is constructed?

4   How the Six Sigma Process Map integrates within a Six Sigma Project

5   What is meant by Key Process Input Variables (KPIV's) and Key Process Output Variables (KPOV's)?

6   The data collection point for the Key process Input Variables and Key Process Output Variables (such as gauges, forms and samples)

7   What the main types of Key Process Input Variables and Key Process Output Variables are in terms of being Controllable, Critical, Noise, or Standard operating procedures?

8   Who should create a Six Sigma Process Map?

9   The data collection point for both the Key Process Input Variables and the Key Process Output Variables (e.g. gauges, forms, samples)

10 The difference between a Value Added activity and a Non-Value added activity

11 The roles and responsibilities of individuals within a Process Mapping team

12 The extent of their own authority within the project and whom they should report to, in the event of problems that they cannot resolve

Unit 20   Applying Basic Statistics

Unit Summary

This unit covers the competencies required for applying basic statistics by consulting with the appropriate people and gathering the relevant data for statistical analysis on a Six Sigma Project. Candidates will need to use the data gathered to produce descriptive statistics, which cover: mean, median, mode, standard deviation, range and variance for the selected representative sample. Candidates will be expected to record the statistics gathered using a variety of techniques that could include bar charts, histograms, Pareto diagrams, stem & leaf diagrams, box plots and time series charts. Candidates will also be required to produce an action plan as a result of the statistical and graphical analysis undertaken.

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken and to report any problems with the activities that they can not solve or are outside their responsibility to the relevant authority. Candidates will need to ensure that all the necessary documentation and/or visual representations are completed accurately and legibly. Candidates will be expected to take full responsibility for their own actions within the activity and the quality and accuracy of the work that they produce.

Candidates underpinning knowledge will provide a good understanding of basic statistics and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and application of basic statistics, in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying Safe working practices will be a key issue throughout.

Unit 20   Applying Basic Statistics

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2   Consult with appropriate people and gather the relevant data for statistical analysis

3   Produce Data gathering forms or charts to gather information to enable statistical and graphical analysis to take place

4   Utilise Statistical and Graphical analysis on a Six Sigma Project

5   Produce a normal distribution to asses a Population from the representative Sample

6   Interpret the statistical data collected in order to validate the pre-determined course of actions

7   Produce an action plan as a result of the statistical and graphical analysis undertaken

Scope of the unit:

In carrying out the above activities candidates must be able to:

1   Produce descriptive statistics of data to include:
    - mean
    - median
    - mode
    - standard Deviation
    - range and variance.

2   Record the collected data utilising three of the following methods:
    - bar charts
    - histograms
    - Pareto diagrams
    - stem & leaf diagrams
    - box plots
    - time series charts

Unit 20 Applying Basic Statistics

Knowledge statements:

Candidates must have knowledge and understanding of:

1 The health and safety requirements of the area in which they are collecting data

2 The meaning of variation, how this can be detected with statistics and how this variation can affect a process

3 How many data points are needed to draw a statistically valid conclusion

4 Why we need to use basic statistics?

5 What is meant by the terms Population and Sample when applied to basic statistics?

6 Distribution curves and the properties of a normal curve

7 How to create and use charts and diagrams such as Histograms, Box plots, time series charts, Pareto Diagrams, Stem and Leaf Diagrams

8 How to calculate Mean, Median, Mode, Standard Deviation, Range and Variance

9 The difference between Descriptive and inferential Statistics

10 The extent of their own authority within the project and whom they should report to, in the event of problems that they cannot resolve

Unit 21 Carrying Out Potential Failure Modes and Effects Analysis (FMEA)

Unit Summary

This unit covers the competencies required for Applying Potential Failure Modes and Effects Analysis (FMEA). It involves applying the principles and processes of Potential Failure Modes and Effects Analysis and identifying the key features of FMEA required for the activity under investigation. The activities will include concepts, designs, systems, products, processes and machines.

Candidates will be required to record the information gathered in an appropriate format and make valid judgements about the activity using FMEA principles. This will include calculating Risk Priority Numbers (RPN's), identifying high RPN's and developing actions to improve them. Once actions have been completed they will need to reassess the activity and re-score severity, occurrence and detection.

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken and to report any problems with the activities that they cannot solve or are outside their responsibility to the relevant authority. Candidates will need to ensure that all the necessary documentation is completed accurately and legibly. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work that they produce.

Candidates underpinning knowledge will provide a good understanding of Potential Failure Modes and Effects Analysis and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and application of FMEA in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying Safe working practices will be a key issue throughout.

Unit 21 Carrying Out Potential Failure Modes and Effects Analysis (FMEA)

Performance statements:

Candidates must be able to:

1 Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2 Identify the key features of Potential Failure Modes and Effects Analysis required for the activity under investigation

3 Contribute as a team member to the production of an Potential Failure Modes and Effects Analysis

4 Record the information gathered in an appropriate format

5 Make valid judgements about the activity using Potential Failure Modes and Effects principles

6 Calculate Risk Priority Numbers (RPN's) and identify high RPN's and develop actions to improve them

7 Reassess a FMEA once actions have been completed and re-score severity, occurrence and detection

Scope of the unit:

In carrying out the above activities candidates must be able to:

1 Carry out a Potential Failure Modes and Effects analysis on two of the following:
   - concept
   - product
   - design
   - process
   - system
   - machine

2 Identify for the activities analysed:
   - the potential failure modes
   - the potential effects from failure modes
   - the potential causes of failure modes

3 Establish rating tables for:
   - occurrence
   - severity
   - detection

4 Identify and score:
   - the likely occurrence of a potential failure modes
   - the severity of the potential failure modes
   - the likely hood of detection of the potential failure modes

Unit 21   Carrying Out Potential Failure Modes and Effects Analysis (FMEA)

Knowledge statements:

Candidates must have knowledge and understanding of:

1. The health and safety requirements of the area in which they are conducting the Potential Failure Modes and Effects Analysis

2. What are the main features and benefits of carrying out a Potential Failure Modes and Effects Analysis?

3. Who should be part of a team that constructs and updates a Potential Failure Modes and Effects?

4. What is and where they should use a System FMEA, Concept FMEA, Design FMEA and a Process FMEA?

5. The meaning of a Failure Mode, Failure Effect or Failure Cause

6. The rating scale used in Potential Failure Modes and Effects projects to include, the Severity rating scale, the Occurrence rating scale and the Detection rating scale

7. How to calculate a Risk Priority Number

8. How to Use the Risk Priority Numbers

9. How to apply a structured approach to risk reduction

10. When to start a Potential Failure Modes and Effects Analysis?

11. When to Update a Potential Failure Modes and Effects Analysis?

12. The roles and responsibilities of individuals within a Potential Failure Modes and Effects Analysis team

13. The extent of their own authority within the project and whom they should report to, in the event of problems that they cannot resolve

Unit 22 Applying Six Sigma Metrics to a Project

Unit Summary

This unit covers the competencies required for Applying Six Sigma Metrics to products and processes. It involves consulting with appropriate personnel and gathering all the necessary data to produce a metric graph. Candidates will need to apply Six Sigma Metrics to monitor the process and justify improvements, applying both primary and secondary metrics for the Six Sigma project. Candidates will be expected to use the data collected and the graph produced to identify where improvements can be made and to prepare an action plan that will bring about the improvements.

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken and to report any problems with the activities that they cannot solve or are outside their responsibility to the relevant authority. Candidates must ensure that all the necessary documentation/visual representation is completed accurately and legibly. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work that they produce.

Candidates underpinning knowledge will provide a good understanding of the production of Six Sigma Metrics and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and application of Six Sigma Metrics in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying Safe working practices will be a key issue throughout.

Unit 22   Applying Six Sigma Metrics to a Project

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2   Consult with appropriate personnel and gather the necessary data to produce a metric graph

3   For the selected activity apply Six Sigma Metrics to monitor the process and justify improvements

4   Apply both primary and secondary metrics for the Six Sigma project

5   Where appropriate transform variable data to attribute data

6   Use the data collected to complete a primary metric graph

7   Use the graph produced to identify where improvements to metrics can be made

8   Prepare an action plan that will bring about the improvements

Scope of the unit:

In carrying out the above activities candidates must be able to:

1   Carry out Six Sigma Metrics activities on:
   - products
   - processes

2   Calculate for each of the activities covered:
   - defects per million opportunities
   - defects per unit
   - rolled through put yield (Y_{rt})
   - the Sigma score

3   Calculate metrics, which are:
   - long-term
   - short-term
   - variable or attribute

Unit 22   Applying Six Sigma Metrics to a Project

Knowledge statements:

Candidates must have knowledge and understanding of:

1   The health and safety requirements of the area in which they are conducting the Six Sigma Metrics activity

2   What are the main features and benefits of carrying out a Six Sigma Metrics activity?

3   The importance of using metrics to drive a six sigma project

4   How to calculate defects per million opportunities, defects per unit and rolled throughput yield

5   How to utilise Z tables to calculate the Sigma score

6   The time period necessary to calculate a meaningful baseline

7   How to set realistic objectives and targets for the Six Sigma Metrics activity

8   How to gather the data required for inclusion in a metric chart

9   How to construct a Six Sigma metric chart

10 What the relationship is between Parts Per Million, Defects per Million Opportunities, Y_{rt} and the Sigma score?

11 What is the difference between variable and attribute data?

12 Why it is advantageous to transform attribute data into variable data?

13 How to transform attribute data into variable data

14 What is the significance of the 1.5s shift and how it can be utilised to infer long-term metric values?

15 The extent of their own authority within the project and whom they should report to, in the event of problems that they cannot resolve

Unit 23   Producing a Characteristic Selection Matrix

Unit Summary

This unit covers the competencies required for producing a Characteristic Selection Matrix. It involves working with the customer to score the customer requirements and applying a characteristic selection matrix to the Six Sigma project to create greater customer satisfaction. Candidates will need to collect the necessary data and produce a Characteristic Selection Matrix for the chosen activity by completing the five-step process for generating the Matrix. This will require candidates to list the customer Key Process Output Variables, score the Key Process Output Variables, list the Key Process Input Variables that impact the Customer Key Process Output Variables, numerically rate the interaction between Key Process Input Variables and Customer Key Process Output Variables and use ranking to prioritise future team focus. Candidates will then be expected to use this information to identify activities in the process where improvements can be made.

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken and to report any problems with the activities that they cannot solve or are outside their responsibility to the relevant authority. Candidates will need to ensure that all the necessary documentation/visual representation is completed accurately and legibly. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work that they produce.

Candidates underpinning knowledge will provide a good understanding of producing a Characteristic Selection Matrix and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and application for producing a Characteristic Selection Matrix in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying Safe working practices will be a key issue throughout.

Unit 23   Producing a Characteristic Selection Matrix

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2   Work with the customer to score the customer requirements and apply a characteristic selection matrix to the Six Sigma project

3   Collect all the required data necessary to create the Matrix

4   Produce a Characteristic Selection Matrix for the chosen activity

5   Use the matrix produced to identify activities in the process where improvements can be made

6   Prepare an action plan that will bring about the improvements

Scope of the unit:

In carrying out the above activities candidates must be able to:

1   Produce a Characteristics Selection Matrix for two of the following:
- concept
- product
- design
- process
- system
- machine

2   Use the Characteristic Selection Matrix produced to generate scoring parameters for: customers
- team members

3   Complete the five-step process for generating a Characteristic Selection Matrix:
- list the customer Key Process Output Variable
- score the Key Process Output Variables
- list the Key Process Input Variables that impact the Customer Key Process Output Variables
- numerically rate the interaction between Key Process Input Variables and Customer Key Process Output Variables
- use ranking to prioritise future team focus

Unit 23 Producing a Characteristic Selection Matrix

Knowledge statements:

Candidates must have knowledge and understanding of:

1 The health and safety requirements of the area in which they are carrying out the Characteristic Selection Matrix activity

2 What is a Characteristic Selection Matrix, why we need to produce them, who should create a Characteristic Selection Matrix?

3 How to generate a Characteristic Selection Matrix using the five step process

4 What is meant by the term "customer" when producing a Characteristic Selection Matrix?

5 What are Key Process Output Variables and Key Process Input Variables?

6 Where in the Quality Function Deployment matrix does the Characteristic Selection Matrix appear?

7 The inter-relationship between a Characteristic Selection Matrix and a Potential Failure Modes and Effects Analysis

8 The inter-relationship between Six Sigma process mapping and a Characteristic Selection Matrix

9 How to score a Characteristic Selection Matrix

10 How a process map links into a Characteristic Selection Matrix

11 How a Characteristic Selection Matrix links into a Potential Failure Modes and Effects Analysis

12 How to utilise the results of a Characteristic Selection Matrix

13 How to prioritise a Six Sigma Project teams focus

14 The extent of their own authority within the project and whom they should report to, in the event of problems that they cannot resolve

Unit 24 Carrying out Measurement Systems Analysis (MSA)

Unit Summary

This unit covers the competencies required for carrying out Measurement Systems Analysis (MSA). It involves selecting an appropriate measurement system on which to carry out the analysis and obtaining all the necessary data in order to carry out the measurement systems analysis. Candidates will be expected to apply the principles and processes of Measurement System Analysis which will include such things as completing a calibration study on a gauge, conducting a gauge Linearity Study, completing either an attribute or a variable gauge Repeatability & Reproducibility study, conducting a Metrology Study on a measurement system which includes either a variable or attribute Gauge Repeatability & Reproducibility.

Candidates will be required to carry out the analysis using the appropriate techniques and record the results of the analysis in the appropriate format. From this information candidates will need to determine the percentage Gauge Repeatability & Reproducibility of the measurement system under study and produce a detail report suggesting ways in which the measurement system might be improved.

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken and to report any problems with the activities that they cannot solve or are outside their responsibility to the relevant authority. Candidates will need to ensure that all the necessary documentation is completed accurately and legibly. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work that they produce.

Candidates underpinning knowledge will provide a good understanding of Measurement Systems Analysis and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and application of MSA in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying Safe working practices will be a key issue throughout.

Unit 24 Carrying out Measurement Systems Analysis (MSA)

Performance statements:

Candidates must be able to:

1. Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2. Select an appropriate measurement system on which to carry out the analysis

3. Obtain all the necessary data in order to carry out the measurement systems analysis

4. Carry out the analysis using the appropriate techniques

5. Record the results of the analysis in the appropriate format

6. Determine the percentage Gauge Repeatability & Reproducibility of the measurement system under study and suggest ways of improving the measurement system

7. Produce a Measurement Systems Analysis report detailing ways of improving the measurement system under study

Scope of the unit:

In carrying out the above activities candidates must be able to:

1   Carry out a measurement system analysis, which includes three from the following:
    *   completing a calibration study on a gauge
    *   conducting a gauge Linearity Study
    *   completing either an attribute or a variable gauge Repeatability & Reproducibility study
    *   conducting a Metrology Study on a measurement system which includes either a variable or attribute Gauge Repeatability & Reproducibility

Determine the type of measurement system variation to include two of the following:
    *   bias
    *   linearity
    *   stability
    *   accuracy
    *   repeatability
    *   reproducibility

Unit 24   Carrying out Measurement Systems Analysis (MSA)

Knowledge statements:

Candidates must have knowledge and understanding of:

1   The health and safety requirements of the area in which they are carrying out the measurement systems analysis

2   Why we should study our Measurement Systems?

3   How to select a measurement system for analysis

4   What are the possible sources of Measurement Systems variation?

5   The use of Measurement Systems Analysis and how it can be used in a Six Sigma improvement Project

6   How to conduct a Variable and a attribute Repeatability & Reproducibility study

7   The terminology used in measurement system analysis (such as bias, linearity, stability, accuracy, repeatability, discrimination, resolution, reproducibility)

8   How to conduct a Measurement Systems Analysis Study

9   How to calculate Gauge Repeatability & Reproducibility

10 How to calculate Gauge Precision and Tolerance

11 Industry rules for Repeatability & Reproducibility results

12 The extent of their own authority within the project and whom they should report to, in the event of problems that they cannot resolve

Unit 25   Carrying out Capability Studies

Unit Summary

This unit covers the competencies required for carrying out capability studies. It involves obtaining all the necessary data in order to carry out the study analysis and determining the appropriate sample size using statistical based techniques. From the study candidates will be required to produce statistical information, this will include calculating mean, mode, median, standard deviation, range, variance, and the capability indices Cp and Cpk for the process. Candidates will also need to calculate the sigma score (Z) from the Cpk and the parts per million outside upper and lower specification limits for the processes studied for both the long and short term.

Candidates will be expected to analyse the information gained and identify activities, which will improve the process capability. Candidates will also need to present their findings in a Process Capability report, highlighting the improvements to be made and the actions to be taken.

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken and to report any problems with the activities that they cannot solve or are outside their responsibility to the relevant authority. Candidates will need to ensure that all the necessary documentation is completed accurately and legibly. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work that they produce.

Their underpinning knowledge will provide a good understanding of capability studies and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and application for carrying out the capability studies in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying Safe working practices will be a key issue throughout.

Unit 25   Carrying out Capability Studies

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2   Obtain all the necessary data in order to carry out the capability study analysis

3   Determine the appropriate sample size using statistical based techniques

4   Determine whether rational sub-grouping is appropriate

5   Carry out the Processes Capability Study and produce relevant Statistics

6   Produce a histogram to represent the Cp and Cpk graphically

7   Analyse the information gained and Identify activities to improve the process capability

8   Produce a Process Capability report highlighting the improvements to be made and the actions to be taken

Scope of the unit:

In carrying out the above activities candidates must be able to:

1   Carry out a capability study, which covers both:
     * the short term
     * the long term

2   Calculate the following statistics:
     * mean
     * median
     * mode
     * standard Deviation
     * range
     * variance

3   Calculate the following from the above statistics:
     * the capability indices Cp and Cpk for the process
     * the sigma score (Z) from the Cpk
     * the parts per million outside upper and lower specification limits for the processes studied

Unit 25   Carrying out Capability Studies

Knowledge statements:

Candidates must have knowledge and understanding of:

1   The health and safety requirements of the area in which they are carrying out the capability studies

2   Why we need to assess process capability and how this affects a Six Sigma project?

3   What is meant by the term Sigma Score (Z)?

4   How to calculate the Sigma Score (Z) and use this to estimate the percentage outside of specification

5   What are Cp and Cpk and how are they calculated?

6   How to calculate long-term capability from short term data

7   How many samples are needed for a statistically valid short term capability study

8   What is a population and what is a sample?

9   How to select appropriate sample sizes

10   How to calculate Parts Per Million

11   How to calculate mean, median, mode, standard deviation, range, and variance

12   How to perform rational sub-grouping

13   The extent of their own authority within the project and whom they should report to, in the event of problems that they cannot resolve

Unit 26   Producing Multi Variable Charts

Unit Summary

This unit covers the competencies required for Producing Multi Variable Charts. It involves selecting a suitable activity on which to carry out the multi variance charting process, consulting with the appropriate people and gathering the relevant data necessary for the analysis. Candidates will be required to use the data collected to produce a Data Demographics Form for the process and subsequently a Multi Variance chart showing within part variation, piece-to-piece variation and time-to-time variation. Candidates will need to record and display the information as bar charts, histograms, Pareto diagrams, stem and leaf diagrams, Box plots and time series charts. Candidates will also be expected to produce a report of the activity highlighting the opportunities for improvement and an action plan, which makes recommendations of how they can be implemented.

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken and to report any problems with the activities that they cannot solve or are outside their responsibility to the relevant authority. Candidates will need to ensure that all the necessary documentation/visual representation is completed accurately and legibly. Candidates will also be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work that they produce.

Candidates underpinning knowledge will provide a good understanding of Multi Variance Charts and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and application of Multi Variance Charting in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying Safe working practices will be a key issue throughout.

Unit 26   Producing Multi Variance Charts

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2   Select a suitable activity on which to carry out the multi variance charting process

3   Consult with the appropriate people and gather the relevant data necessary for the multi variance charting analysis

4   Produce a Data Demographics Form for the selected activity

5   Produce a Multi Variance chart on the activity selected

6   Identify opportunities for improvement from the Multi Variance chart

7   Create an action plan that minimises variation and make recommendations of how the improvements can be implemented

Scope of the unit:

In carrying out the above activities candidates must be able to:

1   Use the data Demographics Form to produce a Multi Variance chart showing:
   - within part variation
   - piece to piece variation
   - time to time variation

2   Record the collected data utilising at least three of the following techniques:
   - bar charts
   - histograms
   - Pareto diagrams
   - stem and leaf diagrams
   - box plots
   - time series charts

3   Produce Multi Variance charts for two of the following:
   - concept
   - product
   - design
   - process
   - system
   - machine

Unit 26   Producing Multi Variance Charts

Knowledge statements:

Candidates must have knowledge and understanding of:

1   The health and safety requirements of the area in which they are gathering the data for a multi variance chart activity

2   Why we need to carry out multi variance charting and the benefits to be gained from this activity?

3   How to construct a Data Demographics Form and a Multi Variance chart

4   How to assess the chart for within piece variation, piece to piece variation and time to time variation

5   How much data needs to be gathered to draw statistically valid conclusions from the chart

6   How to draw further conclusion by utilising such tools as bar charts, box plots, histograms, stem and leaf diagrams, Pareto diagrams and time series charts

7   The benefits of multi variance analysis with respect to Design of Experiment

8   The extent of their own authority within the project and whom they should report to, in the event of problems that they cannot resolve

Unit 27 Applying Hypothesis testing

Unit Summary

This unit covers the competencies required for applying hypothesis testing. It involves calculating the correct sample size to ensure the statistical validity of the hypothesis test and producing a suitable sampling plan to reduce systematic errors. The tests should be conducted on a variable/process in a Six Sigma project where the actual statistics from data collected is compared with the calculated statistics so that a decision can be reached as to which hypothesis is true. Typically tests that can be carried out could be F-Test, Chi-Square test, normality tests, T-test, Levene's test, Bartlett's test, contingency table, one-way ANOVA. Candidates will be required to produce a Hypothesis test Report on the variable/process studied.

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken and to report any problems with the activities that they cannot solve or are outside their responsibility to the relevant authority. Candidates will need to ensure that all the necessary documentation/visual representation is completed accurately and legibly. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work that they produce.

Candidates underpinning knowledge will provide a good understanding of hypothesis testing and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and application of hypothesis testing in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying Safe working practices will be a key issue throughout.

Unit 27   Applying Hypothesis testing

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2   Utilise Sample size selection to ensure the statistical validity of an hypothesis test and calculate the correct sample size required for the test

3   Produce a suitable sampling plan to reduce systematic errors

4   Conduct a hypothesis test on a variable/process in a Six Sigma project

5   Calculate the actual statistic from data collected

6   Use the appropriate test to compare the calculated statistic against actual statistic and decide which hypothesis is true

7   Produce a Hypothesis test Report on the variable/process studied

Scope of the unit:

In carrying out the above activities candidates must be able to:

1   Determine for a hypothesis test:
   - the Delta/Sigma ratio
   - the alpha risk
   - the beta risk

2   Determine the following:
   - null hypothesis
   - alternative hypothesis
   - test statistic

3   Determine the correct statistic from one of the following:
   - F-Test
   - Chi-Square test
   - normality tests
   - T-test
   - Levene's test
   - Bartlett's test
   - contingency table
   - one way ANOVA

Unit 27 Applying Hypothesis testing

Knowledge statements:

Candidates must have knowledge and understanding of:

1. What is Hypothesis testing, why we need to use hypothesis testing and how this benefits a Six Sigma improvement project?

2. Why we need to identify a suitable sample size?

3. How to calculate a suitable sample size

4. What is meant by alpha risk, beta risk and delta Sigma Ratio?

5. What is meant by practical difference and statistical difference?

6. How to conduct a hypothesis test

7. How to calculate test statistics such as Mean, Median, Mode, Standard Deviation, Range and Variance

8. What are a population and a sample?

9. What is meant by the null hypothesis?

10. What is meant by the alternate hypothesis?

11. How to determine the correct statistic from the following F-Test, Chi-Square test, Normality tests, T-test, Levene's test, Bartlett's test, Contingency tables, One way ANOVA

12. The extent of their own authority within the project and whom they should report to, in the event of problems that they cannot resolve

Unit 28   Carrying out Design of Experiments (DOE)

Unit Summary

This unit covers the competencies required for carrying out Design of Experiments (DOE). It involves applying the principles and process of Design of experiments to the selected plant or process, which will require the plant or process being taken out of production to run the methodology.

Candidates will need to calculate the correct sample size required and identify a suitable sampling plan to reduce any systematic errors. Candidates will be expected to determine the scope/parameters of the experiment and carry out the experiment within these parameters utilising the appropriate tools and techniques. The results of the Design of Experiment will be recorded and analysed to identify areas where improvements to the process can be made. Candidates will also need to produce a report of the findings along with an action plan to ensure the improvements identified are implemented.

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken, report any problems with the activities that they cannot solve or are outside their responsibility to the relevant authority. Candidates will need to ensure that all sampling is carried out correctly and the necessary job/task documentation is completed accurately and legibly. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work that they produce.

Candidates underpinning knowledge will provide a good understanding of Design of Experiments and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and application of Design of Experiments in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying Safe working practices will be a key issue throughout.

Unit 28   Carrying out Design of Experiments (DOE)

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2   Select an appropriate process on which to carry out the Design of Experiment and obtain all the necessary data

3   Determine the scope/parameters of the experiment

4   Utilise Sample size selection to ensure the statistical validity of the experiment and calculate the correct sample size required for the experiment

5   Estimate the resources and expected benefits for the design of experiment undertaken

6   Identify a suitable sampling plan to reduce systematic errors

7   Carry out a Design of Experiment within an improvement project utilising the appropriate tools and techniques

8   Record the results of the Design of Experiment in the appropriate format

9   Analyse the data gathered and identify areas where improvements to the process can be made

10   Produce a design of experiment report which includes an action plan to ensure the improvements are implemented

Scope of the unit:

In carrying out the above activities candidates must be able to:

1   For the experiment undertaken identify:
    - a suitable alpha risk level
    - a suitable Delta that needs to be observed
    - a suitable Beta level

2   Determine the correct experimental design to use from one of the following:
    - full factorial
    - 2^k factorial
    - fractional factorial

3   Calculate and produce graphs for the following:
    - main effects
    - interactions

4   Document the resources required to include:
    - financial
    - time scales
    - manpower
    - plant/equipment
    - materials

Unit 28   Carrying out Design of Experiments (DOE)

Knowledge statements:

Candidates must have knowledge and understanding of:

1   The health and safety requirements of the area in which they are carrying out an experiment

2   Why we need to use Design of Experiments and how this benefits an improvement project?

3   How to determine the scope of an experiment

4   How to carry out a Design of Experiment project and the tools and techniques used

5   Where to obtain the data required to carry out the design of experiment?

6   How to calculate the sample size to be used in the design of experiment

7   What is meant by alpha risk and beta risk?

8   How to use the data obtained to calculate: Mean, Median, Mode, Standard Deviation, Range and Variance

9   How to calculate and graphically display Main effects and Interactions

10 What is the meaning of a population and a sample in terms of the Design of Experiment?

11 How to design a suitable array for the designs to include full factorial, 2^k factorial and fractional

12 How to design an array to assess the selected interactions from the designs to include full factorial, 2^k factorial and fractional

13 The extent of their own authority and whom they should report to, in the event of problems that they cannot resolve

Unit 29   Carry out Mistake/Error Proofing (Poka Yoke)

Unit Summary

This unit covers the competencies required for Carrying out Mistake/Error Proofing (Poka Yoke), which is a method of making an activity 'foolproof'. It involves applying the principles and procedures Mistake/Error Proofing to the chosen activity to enable work sheets to be produced for the activity, which identify the problem, actions to be taken, and indicates the benefits to be gained. Typically worksheets would focus on: the description of the mistake/error identified, the containment action taken, the root cause of the mistake/error and the permanent corrective action to be taken. Candidates will also be required to conduct trials on the suggested improvements, which will include determining their effectiveness, cost and complexity.

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken, report any problems with the activities that they cannot solve or are outside their responsibility to the relevant authority. Candidates need to ensure that all necessary job/task documentation and analysed data is completed accurately and legibly. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work that they produce.

Candidates underpinning knowledge will provide a good understanding of Mistake/Error Proofing and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and application of Mistake/Error Proofing in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying Safe working practices will be a key issue throughout.

Unit 29   Carry out Mistake/Error Proofing (Poka Yoke)

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2   Select a suitable process on which to carry out mistake/error proofing

3   Apply the mistake/error proofing process to the chosen activity

4   Use appropriate techniques to analyse the data received and draw valid conclusions

5   Produce work sheets for the activity which identifies the problem and actions to be taken

6   Determine suitable solutions and conduct trials to measure the effectiveness of the solution

7   Measure and document the results

Scope of the unit

In carrying out the above activities candidates must:

1   Identify the benefits of mistake/error proofing in terms of:

- improved quality/compliance (such as ISO9001 and Good Manufacturing Practice, GMP)
- reduced costs
- delivery or service

2   Create a worksheet of the mistake/error proofing activity identifying:

- the description of the mistake/error identified
- the containment action taken
- the root cause of the mistake/error
- the permanent corrective action to be taken

3   Identify suitable solutions and determine their:

- effectiveness
- cost
- complexity

Unit 29   Carry out Mistake/Error Proofing (Poka Yoke)

Knowledge statements:

Candidates must have knowledge and understanding of:

1   What is a mistake/error proofing activity and what are the benefits of carrying this out

2   The selection criteria used to determine a suitable product or process on which to carry out the mistake/error proofing activity

3   How mistake/error proofing will lead to zero defects

4   What is the relationship between errors and defects

5   The difference and benefits between mistake/error proofing and Prevention and Detection

6   The different types and range of mistakes

7   How defects originate in products or processes

8   How the role of source inspection contributes to the reduction of defects

9   The key mistake/error proofing (Poka Yoke) tools (such as Cause and Effect, and the 5 'Why's)

10   The type of mistake/error proofing documentation and the information it should contain

11   The analysis and charting methodology used for mistake/error proofing

12   The financial implications of mistake/error proofing projects

13   The relationship between mistake/error proofing and other continuous improvement processes (such as workplace organisation 5S/5C, quick changeovers, cellular manufacturing, Total Productive Maintenance, structured problem solving and visual management)

14   How to undertake trials and measure the effectiveness of mistake/error proofing projects

15   The different types and range of mistake proofing devices used

16   The roles and responsibilities of individuals within a mistake/error proofing team including facilitator, time keeper, scribe

17   The extent of their own authority within the activity and whom they should report to, in the event of problems that they cannot resolve

Unit 30   Carrying out Evolutionary Operations (EVOP)

Unit Summary

This unit covers the competencies required for Carrying out Evolutionary Operations (EVOP). It involves applying the principles and processes of EVOP to the selected process over a period of time whilst the plant/process is still in production.

Candidates will need to calculate the correct sample size required and identify a suitable sampling plan to reduce systematic errors. Candidates will be expected to determine the scope/parameters of the experiment and carry out the experiment within these parameters utilising the appropriate tools and techniques. The results of the EVOP will be recorded and analysed to identify areas where improvements to the process can be made. Candidates will also need to produce a report of the findings along with an action plan to ensure the improvements identified are implemented.

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken and to report any problems with the activities that they cannot solve or are outside their responsibility to the relevant authority. Candidates will need to ensure that all sampling is carried out correctly and the necessary job/task documentation is completed accurately and legibly. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work that they produce.

Candidates underpinning knowledge will provide a good understanding of the application of Evolutionary Operations and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and application of EVOP in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying Safe working practices will be a key issue throughout.

Unit 30   Carrying out Evolutionary Operations (EVOP)

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2   Select an appropriate process on which to carry out the evolutionary operations and obtain all the Necessary data

3   Determine the scope/parameters of the experiment

4   Utilise Sample size selection to ensure the statistical validity of the experiment and calculate the correct Sample size for an experiment

5   Estimate the resources and expected benefits for the evolutionary operations undertaken

6   Identify a suitable sampling plan to reduce systematic errors

7   Run an evolutionary operation experiment using appropriate tools and techniques, recording and Analysing the data collected

8   Contribute to the construction of an evolutionary operations board

9   Identify suitable optimum conditions and produce an evolutionary operations report highlighting the findings and includes an action plan to ensure the improvements are implemented

Scope of the unit:

In carrying out the above activities candidates will be expected to:

1   Identify for the experiment undertaken:
   - a suitable alpha risk level
   - a suitable Delta that needs to be observed
   - a suitable Beta level

2   Determine the correct experimental design to use from one of the following:
   - full factorial
   - 2^k factorial
   - fractional factorial

3   Calculate and produce graphs for the following:
   - main effects
   - interactions

4   Document the resources required to include:
   - financial
   - time scales
   - manpower
   - plant/equipment
   - materials

Unit 30   Carrying out Evolutionary Operations (EVOP)

Knowledge statements:

Candidates must have knowledge and understanding of:

1   The advantages and disadvantages to using Evolutionary Operations (EVOP)

2   What is meant by a cycle and a phase?

3   How to gather the data during an Evolutionary Operations activity

4   Why we should use Evolutionary Operations in an improvement activity?

5   Evolutionary operation experimental design and how it is used in a Six Sigma improvement project

6   How and when an Evolutionary Operations should be rerun and why

7   What statistics should be calculated in applying Evolutionary Operations?

8   The measurements of central tendency and variation and how they are calculated

9   Sample size selection to ensure the statistical validity of an experiment

10   Delta/Sigma ratio, alpha and beta risk for experiments

11   How to create an evolutionary operations board

12   How to carry out cost and benefit analysis within Evolutionary Operations

13   How to conduct full factorial, 2^k factorial and fractional factorial experiments

14   How to calculate and produce graphs for Main effects and Interactions

15   How to identify suitable optimum conditions and create an action plan to ensure these conditions are implemented

16   The extent of their own authority within the activity and whom they should report to, in the event of problems that they cannot resolve

Unit 31 Applying Central Limit Theorem & Confidence Intervals

Unit Summary

This unit covers the competencies required for Applying Central Limit Theorem & Confidence Intervals to a project. It involves demonstrating how central limit theorem can be utilised to estimate the mean of a population when it is not normally distributed. Candidates will be required to calculate confidence intervals from the standard confidence interval equations, which will include Mean, Standard deviation, Cp, and Cpk. Candidates will be expected to demonstrate how sample size affects the accuracy of the mean. Candidates will also be expected to produce a report highlighting the findings and an action plan identifying how the improvements can be implemented.

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken and to report any problems with the activities that they cannot solve or are outside their responsibility to the relevant authority. Candidates will need to ensure that all the necessary calculations and documentation is completed accurately and legibly. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work that they produce.

Candidates underpinning knowledge will provide a good understanding of Central Limit Theorem & Confidence Intervals and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and application of Central Limit Theorem & Confidence Intervals in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying Safe working practices will be a key issue throughout.

Unit 31   Applying Central Limit Theorem & Confidence Intervals

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2   Demonstrate how central limit theorem can be utilised to estimate the mean of a population when it is not normally distributed

3   Calculate confidence intervals from the standard confidence interval equations

4   Demonstrate how sample size affects the accuracy of the mean

5   Produce a report highlighting the findings and includes an action plan to ensure the improvements are implemented

Scope of the unit:

In carrying out the above activities candidates must be able to:

1   Utilise the central limit theorem to:
   - transform Non Normal data into Normal data
   - increase the accuracy of measurement system
   - calculate the standard error of the mean for a set of data
   - utilise central limit theorem to give an appropriate sample size for a test or inspection

2   Calculate confidence intervals for the following:
   - mean
   - standard deviation
   - Cp
   - Cpk

Unit 31 Applying Central Limit Theorem & Confidence Intervals

Knowledge statements:

Candidates must have knowledge and understanding of:

1   The health and safety requirements of the area in which they are carrying out an experiment

2   What the central limit theorem is?

3   What is meant by the standard error of the mean?

4   How the central limit theorem can be used to reduce measurement error

5   The number of observations that must be made in order to estimate a population mean when the data is not normally distributed

6   How to calculate the standard error of the mean

7   The relationship between the standard error of the means and sample size

8   How to utilise central limit theorem to reduce measurement system error

9   How to calculate Mean, Median, Mode, Standard Deviation, Range, Variance, Cp and Cpk

10 How to calculate confidence intervals from the standard confidence interval equations

11 The mean of means principle

12 The extent of their own authority within the activity and whom they should report to, in the event of problems that they cannot resolve

Unit 32   Producing Taguchi Linear Graphs

Unit Summary

This unit covers the competencies required for Producing Taguchi Linear Graphs. It involves utilising sample size selection to ensure the statistical validity of the experiment and calculating the correct sample size for the experiment. Candidates will need to produce and use suitable sampling plans to reduce systematic errors and estimate the resources and expected benefits from carrying out the Taguchi linear graph activity. Candidates will need to choose the appropriate Taguchi linear graph to use and calculate the factor settings for the Taguchi linear graph experiment. Having gathered all the necessary information and completed the appropriate calculations they will need to run an experiment and analyse the data collected for main effects and interactions. Candidates will be required to identify suitable optimum conditions and produce a report of the activities, which includes and action plan of how the improvements can be implemented.

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken and to report any problems with the activities that they cannot solve or are outside their responsibility to the relevant authority. Candidates will need to ensure that all the necessary documentation and calculations are completed accurately and legibly. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work that they produce.

Candidates underpinning knowledge will provide a good understanding of Taguchi Linear Graphs and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and application of Taguchi Linear Graphs in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying Safe working practices will be a key issue throughout.

Unit 32   Producing Taguchi Linear Graphs

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2   Utilise Sample size selection to ensure the statistical validity of the experiment and calculate the correct sample size for the experiment

3   Identify suitable sampling plans to reduce systematic errors

4   Estimate the resources and expected benefits from the Taguchi linear graph activity and gain approval

5   Determine the correct Taguchi linear graph to use

6   Calculate factor settings for the Taguchi linear graph experiment

7   Determine factors and levels for the design of experiment

8   Run an experiment recording and analysing the data collected

9   Identify suitable optimum conditions and create an action plan to ensure these conditions are implemented

10 Complete a written Taguchi linear graph report

Scope of the unit:

In carrying out the above activities candidates must be able to:

1   Determine for the Taguchi linear graph experiment:
   - a suitable alpha risk level
   - a suitable Beta level
   - a suitable Delta that needs to be observed

2   Calculate and produce graphs for the following:
   - main effects
   - interactions

3   Document the resources required to include:
   - financial
   - time scales
   - manpower
   - plant/equipment
   - materials

Unit 32   Producing Taguchi Linear Graphs

Knowledge statements:

Candidates must have knowledge and understanding of:

1   The health and safety requirements of the area in which they carry out an Taguchi linear graph experiment

2   What is meant by the following terms, Fold over, confounded, Alias?

3   How to produce Taguchi linear graph designs for a range of arrays (such as L4, L8 and L16)

4   What is meant by alpha risk and beta risk?

5   What are a population and a sample?

6   How to calculate a suitable sample size

7   Why we need to use Taguchi linear graph experimental design and how it is used in a Six Sigma improvement project?

8   How to conduct a Taguchi linear graph experiment

9   How to calculate, Mean, Median, Mode, Standard Deviation, Range and Variance

10   How to calculate and graphically display Main effects and Interactions

11   How to identify suitable optimum conditions

12   How to create an action plan to ensure that improvements are implemented

13   How to create a Taguchi linear graph report and the information is should contain

14   The extent of their own authority within the activity and whom they should report to, in the event of problems that they cannot resolve

Unit 33   Applying Response Surface Methodology

Unit Summary

This unit covers the competencies required for Applying Response Surface Methodology. It involves selecting an appropriate process on which to carry out the activity and applying the principles and processes of Response Surface Methodology utilising orthogonal array, level and factor. Candidates will be expected to determine the scope/parameters of the activity, estimate the resources required (which will include costs, time scales, manpower, plant/equipment and materials) and identify the expected benefits to be gained by carrying out the activity. Candidates will be required to utilise sample size selection to ensure the statistical validity of the experiment and calculate the correct sample size methodology within an improvement project.

Candidates will also be expected to record the results of the activity in the appropriate format, analyse the data gathered and identify areas where improvements can be made. Candidates will need to produce a report of the Response Surface Methodology activity undertaken which identifies the areas where improvements can be made and the optimum operating conditions along with an action plan to ensure the identified improvements are implemented.

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken and to report any problems with the activities that they cannot solve or are outside their responsibility to the relevant authority. Candidates will need to ensure that all the necessary documentation is completed accurately and legibly. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work that they produce.

Candidates underpinning knowledge will provide a good understanding of Response Surface Methodology and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and application of Response Surface Methodology in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying Safe working practices will be a key issue throughout.

Unit 33   Applying Response Surface Methodology

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2   Select an appropriate process on which to carry out the Response Surface Methodology and obtain all the required information

3   Estimate the resources and expected benefits for the Response Surface Methodology and gain approval

4   Utilise sample size selection to ensure the statistical validity of the experiment and calculate the correct sample size required

5   Determine the scope/parameters of the Response Surface Methodology activity

6   Carry out the Response Surface Methodology within an improvement project utilising the appropriate tools and techniques

7   Record the results of the project in the appropriate format

8   Analyse the data gathered and identify areas where improvements could be made

9   Identify suitable optimum conditions and produce a Response Surface Methodology report which includes an action plan to ensure the improvements are implemented

Scope of the unit:

In carrying out the above activities candidates must be able to:

1   Carry out Response Surface Methodology utilising:
- orthogonal array
- level
- documentation and information required

2   Document the resources required to include:
- financial
- time scales
- manpower
- plant/equipment
- materials

3   Identify for the Response Surface Methodology undertaken:
- a suitable alpha risk level
- a suitable Delta that needs to be observed
- a suitable Beta level
- steepest ascent for the surface design

Unit 33   Applying Response Surface Methodology

Knowledge statements:

Candidates must have knowledge and understanding of:

1   The health and safety requirements of the area in which they are carrying out the Response Surface Methodology

2   The use of Response Surface Methodology and how it can be used in a Six Sigma improvement Project

3   How to carry out a Response Surface Methodology project and the tools and techniques used

4   Where to obtain the required data necessary to carry out the project?

5   How to calculate a statistically valid sample size to be used in the Response Surface Methodology activity

6   What is the meaning of population and a sample in terms of the Response Surface Methodology activity?

7   What is meant by a method of steepest ascent?

8   What is meant by the terms; coded variables and uncoded variables?

9   What is meant by alpha risk and beta risk?

10   How to use the data collected to calculate: Mean, Median, Mode, Standard Deviation, Range and Variance

11   How to calculate cost benefits when considering response surface methodology

12   The extent of their own authority within the project and whom they should report to, in the event of problems that they cannot resolve

Unit 34   Applying Quality Function Deployment (QFD)

Unit Summary

This unit covers the competencies required for Applying Quality Function Deployment (QFD). It involves identifying the customer requirement of a product or process and obtaining all the required information necessary to perform the QDF project study, these typically would cover the needs and expectations of the customer and the functions and features required by the customer. Candidates will be required to produce a Matrix for the Quality Function Deployment activity, which identifies the four phases (e.g. pre- planning, design deployment, process and production planning and managing deployment). Candidates will need to analyse the information gathered (such as: score matrices for relationships, technical requirements, correlation's, planning and specifications) and draw conclusions as to the appropriate cause of action. Candidates will be expected to record the results of the analysis in the appropriate format to enable a report to be compiled outlining the findings of the activity and the recommended solutions.

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken and to report any problems with the activities that they cannot solve or are outside their responsibility to the relevant authority. Candidates will need to ensure that all the necessary documentation is completed accurately and legibly. Candidates will be expected to take full responsibility for their own actions within the activity and for the quality and accuracy of the work that they produce.

Candidates underpinning knowledge will provide a good understanding of Quality Function Deployment and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and application of QFD in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying Safe working practices will be a key issue throughout.

Unit 34   Applying Quality Function Deployment (QFD)

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines

2   Identify the customer requirement of a product or process using Quality Function Deployment

3   Obtain all the required information necessary to perform the Quality Function Deployment study

4   Carry out the Quality Function Deployment project

5   Analyse the information gathered and draw conclusions as to the appropriate cause of action

6   Record the results of the analysis in the appropriate format

7   Produce a report outlining the findings and the recommended solutions

Scope of the unit:

In carrying out the above activities candidates must be able to:

1   Produce a Matrix for a Quality Function Deployment project which identifies the four phases as follows:
     * pre-planning
     * design deployment
     * process and production planning
     * managing deployment

2   Determine the customer requirements within the project in terms of:
     * needs and Expectations
     * functions
     * features

3   Identify within the QFD project the:
     * necessary inputs and how to acquire them
     * the outputs from each of the four phases and their execution
     * customer rankings
     * substitute quality characteristics

4   Produce and score matrices for three of the following:
     * relationships
     * technical requirements
     * correlation's
     * planning
     * specifications

Unit 34   Applying Quality Function Deployment (QFD)

Knowledge statements:

Candidates must have knowledge and understanding of:

1   The health and safety requirements of the area in which they are carrying out the Quality Function Deployment activity

2   The advantages of using Quality Function Deployment

3   The "Quality lever" and how Quality function Deployment fits this model

4   The terms "house of quality" and "voice of the customer"

5   How Quality Function Deployment relates to Potential Failure Modes and Effects Analysis, Design of Experiments, Value Analysis, Control Plans, Pugh Concept Diagrams

6   How to carry out a Quality function Deployment activity and the tools and techniques used

7   The four phases of Quality Function Deployment (pre-planning, design deployment, process and production planning, managing deployment)

8   How to identify the necessary inputs and outputs for each of the phases

9   What are the customer's requirements within the project in terms of needs and expectations, features and functions?

10 How to produce matrices for relationships, specifications, technical requirements and planning

11 How to score the matrices within the Quality Function Deployment

12 The extent of their own authority within the project and whom they should report to, in the event of problems they cannot resolve

Unit 35   Carrying out Project Management Activities

Unit Summary

This Unit covers the competencies required to carry out Project Management involved with continuous improvement activities. It involves identifying the need for a project and determining its scope and then developing this into a fully detailed project plan. Candidates will be required to form a suitable project team taking into account the technicalities within the project and the individual skills and abilities of the team members. Candidates will also be expected to determine and agree the individual roles and responsibilities of the team members and to set realistic and achievable goals for both the individuals within the team and the team as a whole. Obtaining appropriate authority and support for the release of resources to carry out the project is also included and this will include people, work space/work area, documentation and information. Monitoring the performance of the project to ensure that it meets the identified objectives also features in this unit.

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken and to report any problems that they cannot solve, or are outside their responsibility, to the relevant authority. Candidates must ensure that the project is delivered on time; to cost and to the required quality/outcomes and that all necessary project documentation is completed accurately and legibly. Candidates will be expected to take full responsibility for the decisions that they make and the overall performance of the project.

Candidates underpinning knowledge will be sufficient to provide a good understanding of project management, and provide an informed approach to the techniques and procedures used. Candidates will need to understand the various techniques of project management and of team building, coaching, monitoring performance and communication methods available to them in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying Safe working practices will be a key issue throughout.

Unit 35   Carrying out Project Management Activities

Performance statements:

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines
2   Identify the need for the project and determine the project scope
3   Develop a full project plan which accurately identifies the project aims and objectives
4   Form the project team comprising of the right mix of personnel to deliver the project objectives
5   Determine and agree individual roles and responsibilities within the project team
6   Develop and manage a monitoring process to review the progress of the project, adjusting the project plan as required
7   Obtain authority and support for the release of the necessary resources to carry out the project
8   Conduct and manage the project in accordance with the plan consulting with subject experts and specialists according to the needs of the project
9   Report project progress to relevant parties at the agreed stages
10 Deal promptly and effectively with any problems within their control and report those that cannot be resolved
11 Report project completion and closure to relevant personnel

Scope of the unit
In carrying out the above activities candidates must be able to:

1   Develop project plans, which clearly identify the following:
    - full cost of the project
    - time scale required for the project
    - resources required
    - individual tasks within the project
    - milestones and deliverables to be met

2   Consult with appropriate people in order to secure the release of the following resources:
    - people involved
    - work space/work area required
    - documentation and information required

3   Monitor the progress of the project to ensure:
    - the project objectives will be met
    - deliver on time
    - project keeps within budget
    - agreed quality standards are met and maintained

4   Communicate effectively with:
    - management
    - peers
    - project team
    - customers

5   Communicate by the following methods:
    - verbal

- written
- electronic

Unit 35   Carrying out Project Management Activities

Knowledge statements:

Candidates must have knowledge and understanding of:

1   The roles and responsibilities of themselves and others under the Health and Safety at Work Act 1974

2   How to identify the project scope to determine the need for a full project plan and management approval

3   How to develop specific, measurable, realistic project objectives and deliverables, allowing progress to be monitored and measured

4   The tools and techniques available for project planning and monitoring

5   How to communicate effectively, listen and question, provide feedback, support and coach others

6   How to break the project down into individual deliverable tasks

7   How to form and develop the project team required to meet the identified objectives

8   How to allocate specific tasks and responsibilities to the project team members according to individual skills and abilities

9   How to determine the specialist help they may require in the project, and how this can be obtained

10 How to conduct a project meeting

11 How to present information effectively to management, peers, team members and customers

12 How to solve problems and overcome barriers/difficulties encountered during the life of the project

13 Who to liaise with and who to obtain relevant and specific information from to support and assist them in running the project

14 How to monitor progress of the project in terms of delivery on time, to budget, with agreed levels of quality

15 How to report project closure, completion and final status to management, teams and customers

16 How to agree limits of their own authority within the scope of the project and how to identify, outside of their authority area, whom they should report to in the event of encountering problems that they cannot resolve

Unit 36 Creating Standard Operating Procedures

Unit summary

This unit covers the competences required to create Standard Operating Procedures (SOPs) for work activities.

This will involve analysing and documenting the method used when performing the operation/process. Candidates will list the preparations required from start to finish, the quality and safety standards to be maintained, the drawings, tooling, fixtures, gauges and other items that are used during the operation or process. Candidates will need to highlight 'key points' in the document using drawings, photographs and/or sketches as appropriate.

Candidates will also be required top produce SOP's for a range of activities such as cleaning of equipment, maintenance of equipment, health and safety practices and procedures, process procedures, manufacturing operations and quality improvements.

Candidates responsibilities will require them to comply with organisational policy and procedures for the activities undertaken and to report any problems that they cannot solve, or are outside their responsibility, to relevant authority. Candidates will be expected to take full responsibility for their own actions within the activity and the quality and accuracy of the work that they carry out.

Candidates underpinning knowledge will provide a good understanding of their work and provide an informed approach to the techniques and procedures used. Candidates will need to understand the principles and procedures for creating Standard Operating Procedures and their application in adequate depth to provide a sound basis for carrying out the activities to the required criteria.

Applying safe working practices will be a key issue throughout.

Unit 36 Creating Standard Operating Procedures

Performance statements

Candidates must be able to:

1   Work safely at all times, complying with health and safety and other relevant regulations and guidelines
2   Analyse the current operation or process to identify the optimum and safest method
3   Confirm the method defined will meet quality, productivity, health, safety and environmental requirements
4   Specify all tools, equipment, fixtures, documentation and standards required
5   Ensure all operators performing the operation or process have the opportunity to contribute and agree the method identified
6   Produce Standard Operating Procedures in an agreed format and monitor its use against the operation or process requirements
7   Supply Standard Operating Procedures at their point of use and store copies and master copies in accordance with company requirements
8   Revise Standard Operating Procedures as appropriate to ensure their effectiveness in the workplace

Scope of the unit:

In carrying out the above activities candidates must be able to:

1   Produce three Standard Operating Procedures from of the following:
    - cleaning of equipment
    - maintenance of equipment
    - health, safety and environmental practices and procedures
    - process procedures
    - manufacturing operations
    - quality improvements
    - improvements to customer satisfaction

2   Produce Standard Operating Procedures that include all of the following:
    - operation/process to be performed
    - part/product number and part/product description/operation reference
    - operation/process number
    - preparation activities prior to starting the operation/process
    - description of the full operation/process broken down into appropriate tasks/activities
    - quality standards, health & safety requirements, environmental issues/requirements
    - tooling/equipment/fixtures/gauges required
    - sketches/photographs/drawings that assist completion of the operation/process
    - date of first issue
    - originator of the document
    - latest revision date

3   Produce Standard Operating Procedures that minimise all of the following:
    - time
    - effort
    - waste

Unit 36 Creating Standard Operating Procedures

Knowledge statements

Candidates must have knowledge and understanding of:

1 The health and safety requirements of the area for which they are creating Standard Operating Procedures
2 The specific regulations and safe working practices and procedures that apply to their work activities
3 The various formats used in creating Standard Operating Procedures (SOP`s)
4 Where to find the SOP document format to be used in their business
5 What information will be required to create a SOP
6 How SOP`s are structured and the importance of their use
7 Methods of communicating/facilitating to ensure all the required information for the SOP is captured
8 The operation/process to be captured in the SOP
9 Why SOP`s are the basis for Quality and Continuous Improvement
10 What are the eight wastes (over-production, inventory, transport, over-processing, waiting time, operator motion, bad quality, failure to exploit human potential) and how to eliminate them
11 How to simplify work done, eliminating waste and potential for human error
12 What actions can be taken to deal with specific difficulties in working relationships
13 Who should they seek assistance from when they have difficulties with working relationships
14 What is Takt time and the relationship with achieving flow in a process
15 How to distinguish facts from opinions in order to identify improvement actions
16 The extent of their own authority and whom they should report to, in the event of problems that they cannot resolve.

Unit 37 Carrying Out Problem Solving Activities

Unit Summary

This unit covers the competencies required to solve problems, in accordance with approved procedures. Problems could occur in any aspect of the business, such as manufacturing, engineering, processing, service and support functions. Candidates will be expected to take prompt and appropriate action to identify, analyse and implement corrective actions to solve the problem.

Candidates will be required to investigate problems, by obtaining all the necessary data and information to enable them to identify and evaluate the possible corrective actions, and their effects on both the process and the people involved.

Candidates responsibilities will require them to comply with organisational policy and procedures for the successful implementation of the corrective actions to problems, and to report any difficulties that they cannot personally resolve to the relevant authority.

Candidates underpinning knowledge will provide a good understanding of a structured approach to problem solving. Candidates will be conversant with organisational procedures and systems, including methods of evaluating the outcomes of the problem solving activity. Their underpinning knowledge will enable them to take an informed approach to applying problem solving techniques and procedures to a range of problems, and will provide a sound basis for carrying out the activities to the required standard.

Candidates will be fully aware of any health, safety and environmental requirements, and the appropriate legislative and regulatory frameworks, applicable to their area of work. Candidates will be required to ensure that safe working practices are maintained throughout, and will understand the responsibility they owe to themselves and others in the work area.

Unit 37   Carrying Out Problem Solving Activities

Performance statements:

Candidates must be able to:

1   Take prompt action to identify the nature and extent of the problems that arise
Obtain all relevant data and information relating to the problem
Evaluate all realistic root causes of the problem
Identify the most effective corrective action
Ensure that corrective actions are implemented correctly and promptly
Keep all relevant people informed of progress throughout the problem solving activity
Ensure that corrective actions to problems comply with all relevant regulations and guidelines

Scope of the unit:

In carrying out the above activities candidates must be able to:

1   Carry out **all** the following as part of the problem solving activity:
- ensure performance monitoring / measurement and review processes are in place such as the DTI seven measures of QCD, the seven quality tools, SPC
- utilise a team-based approach for the problem solving activity
- discuss/consult with the relevant people on the nature and extent of the problem
- follow a structured problem solving process and use appropriate techniques to identify root cause(s)
- communicate the proposed corrective action to the relevant people, obtaining feedback where appropriate
- prepare a plan of action for implementation of the appropriate corrective action
- monitor the implementation of corrective actions and make necessary revisions to the plan of action (Plan, Do, Check, Act)
- monitor the effectiveness of corrective actions following their implementation
- review the effectiveness of corrective actions against the costs of implementation
- review the problem-solving process to understand the lessons learnt in-order to achieve further improvements within the business

Obtain and use data on the problem from **four** of the following sources
- statistical data
- historical records (e.g., maintenance or shift logs)
- quality audits
- external sources
- feedback from customers
- mapping the process
- operating procedures / manufacturing manuals
- company procedures
- health and safety information
- environmental documents
- observation
- designed and controlled trials / experiments

Establish possible root causes to problems by **two** of the following methods/techniques
- cause and effect diagram
- five why analysis
- flowcharting
- fault tree analysis

Evaluate possible corrective actions to problems, by considering **all** of the following:
- operational effectiveness
- ease of implementation
- timescale for implementation
- financial impact
- functionality of the system
- environmental impact
- staffing implications
- quality implications
- conformity with company policies
- health and safety implications
- customer delivery implications

Implement corrective actions to problems that comply with **one** of the following
- company standards and procedures
- BS and/or ISO standards and procedures
- customer standards and requirements

Monitor the effectiveness of corrective actions by using **one** of the following
- one or more of the DTI seven measures of QCD
- one or more of the seven quality tools
- statistical process control (SPC)

Communicate with the relevant people throughout the problem solving activity by using **both** of the following
- verbal communication
- completing company specific documentation (paper or IT based)

Unit 37   Carrying Out Problem Solving Activities

Knowledge statements:

Candidates must have knowledge and understanding of:

1   The health and safety requirements of the area in which they are carrying out the problem solving activity
2   The importance of wearing protective clothing and other appropriate safety equipment during the investigation of the problem, and where it may be obtained
3   Methods used to detect that a problem has occurred
4   Methods of containment of non-conforming product or process
5   A structured process for problem solving such as DMAIC methodology (Define, Measure, Analyse, Improve, Control)
6   The processes and procedures used within the scope of the problem solving activity
7   How to obtain any necessary resources to support the problem solving activity
8   The extent of their own responsibility and whom they should report to if they have problems that they cannot resolve
9   The use of performance measurement and analysis to direct and focus improvement effort
10   The techniques used to obtain data and information on problems such as the DTI seven measures of QCD, and the sources of information
11   The methods and techniques involved in evaluating information such as the seven quality tools, Is / Is Not sheets, Capability studies, Measurement System Analysis
12   The importance of getting to the root cause
13   The methods and techniques involved in root cause analysis such as 5 Why Analysis, Cause and Effect Diagrams, Fault Tree Analysis, Flowcharting, FMEA, Process Flow Analysis
14   The criticality of different types of problems, and how to prioritise the problems to be solved
15   How to obtain and interpret company policy and procedures
16   The factors that have to be taken into account when selecting the corrective action to a problem
17   Methods used to choose and implement corrective actions such as Decision Matrix, Design Of Experiments, Gantt Chart, Deming Cycle (Plan Do Check Act), Error proofing
18   Who to inform of actions taken and by what means
19   The reporting procedures, documentation and their application
20   Methods used to monitor the effectiveness of corrective actions such as Statistical Process Control (SPC),the DTI seven measures of QCD, seven quality tools
21   How to review the problem-solving process to understand the lessons learnt in-order to achieve further improvements within the business.

Further information

Further information regarding centre/scheme approval or any aspect of assessment of our qualifications should be referred to the relevant City & Guilds regional/national office:

Region	Telephone	Facsimile
City & Guilds Scotland	0141 341 5700	0141 341 5725
City & Guilds North East	0191 402 5100	0191 402 5101
City & Guilds North West	01925 897900	01925 897925
City & Guilds Yorkshire	0113 380 8500	0113 380 8525
City & Guilds Wales	02920 748600	02920 748625
City & Guilds West Midlands	0121 503 8900	0121 359 7734
City & Guilds East Midlands	01773 842900	01773 833030
City & Guilds South West	01823 722200	01823 444231
City & Guilds London and South East	020 7294 8139	020 7294 2419
City & Guilds Southern	020 7294 2677	020 7294 2403
City & Guilds East	01480 308300	01480 308325
City & Guilds Northern Ireland/ Ireland	028 9032 5689	028 9031 2917

City & Guilds Customer Relations Unit	020 7294 2800	020 7294 2400

Website www.cityandguilds.com.uk