education

Department:
Education
REPUBLIC OF SOUTH AFRICA

National Curriculum Statement Grades 10–12 (General)

CIVIL TECHNOLOGY

Department of Education

Sol Plaatje House
123 Schoeman Street
Private Bag X895
Pretoria 0001
South Africa
Tel: +27 12 312-5911
Fax: +27 12 321-6770

120 Plein Street
Private Bag X9023
Cape Town 8000
South Africa
Tel: +27 21 465-1701
Fax: +27 21 461-8110

http://education.gov.za

ISBN: 1–920054–02–2

Design and Layout by: Formeset Digital (Tshwane), 012 324 0607

HOW TO USE THIS BOOK

This document is a policy document divided into four chapters. It is important for the reader to read and integrate information from the different sections in the document. The content of each chapter is described below.

Chapter 1 – Introducing the National Curriculum Statement

This chapter describes the principles and the design features of the National Curriculum Statement Grade 10–12 (General). It provides an introduction to the curriculum for the reader.

Chapter 2 – Introducing the Subject

This chapter describes the definition, purpose, scope, career links and Learning Outcomes of the subject. It provides an orientation to the Subject Statement.

Chapter 3 – Learning Outcomes, Assessment Standards, Content and Contexts

This chapter contains the Assessment Standards for each Learning Outcome, as well as content and contexts for the subject. The Assessment Standards are arranged to assist the reader to see the intended progression from Grade 10 to Grade 12. The Assessment Standards are consequently laid out in double page spreads. At the end of the chapter is the proposed content and contexts, which may be used to teach, learn and attain Assessment Standards.

Chapter 4 – Assessment

This chapter deals with the generic approach to assessment being suggested by the National Curriculum Statement. At the end of the chapter is a table of subject-specific competence descriptions. Codes, scales and competence descriptions are provided for each grade. The competence descriptions are arranged to demonstrate progression from Grade 10 to Grade 12.

Symbols

The following are used to identify Learning Outcomes, Assessment Standards, grades, codes, scales, competence description, and content and context.

 = Learning Outcome

 = Assessment Standard

 = Grade

 = Code

 = Scale

 = Competence Description

 = Content and Contexts

CONTENTS

ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
CAD	Computer-Aided Design
CASS	Continuous Assessment
FET	Further Education and Training
FETC	Further Education and Training Certificate
FETI	Further Education and Training Institution
GET	General Education and Training
GETC	General Education and Training Certificate
HEI	Higher Education Institutions
HE	Higher Education
HIV	Human Immunodeficiency Virus
HR	Human Rights
IKS	Indigenous Knowledge Systems
ISO	International Organisation for Standardisation
LO	Learning Outcome
LP	Learning Programme
LPG	Learning Programme Guidelines
LSEN	Learners with Special Educational Needs
LTSM	Learning and Teaching Support Material
NCS	National Curriculum Statement
NQF	National Qualifications Framework
OBE	Outcomes-Based Education
OHS	Occupational Health and Safety
RNCS	Revised National Curriculum Statement Grades R-9 (schools)
SABS	South African Bureau of Standards
SANS	South African National Standards
SAQA	South African Qualification Authority
SI	Système International
SKVA	Skills, Knowledge, Values and Attitudes
TOP	Trade Occupational Profession

CHAPTER 1

INTRODUCING THE NATIONAL CURRICULUM STATEMENT

The adoption of the Constitution of the Republic of South Africa (Act 108 of 1996) provided a basis for curriculum transformation and development in South Africa. The Preamble states that the aims of the Constitution are to:

- heal the divisions of the past and establish a society based on democratic values, social justice and fundamental human rights;
- improve the quality of life of all citizens and free the potential of each person;
- lay the foundation for a democratic and open society in which government is based on the will of the people and every citizen is equally protected by law; and
- build a united and democratic South Africa able to take its rightful place as a sovereign state in the family of nations.

The Constitution further states that "everyone has the right … to further education which the State, through reasonable measures, must make progressively available and accessible ".

The National Curriculum Statement Grades 10–12 (General) lays a foundation for the achievement of these goals by stipulating Learning Outcomes and Assessment Standards, and by spelling out the key principles and values that underpin the curriculum.

PRINCIPLES

The National Curriculum Statement Grades 10–12 (General) is based on the following principles:

- social transformation;
- outcomes-based education;
- high knowledge and high skills;
- integration and applied competence;
- progression;
- articulation and portability;
- human rights, inclusivity, environmental and social justice;
- valuing indigenous knowledge systems; and
- credibility, quality and efficiency.

Social transformation

The Constitution of the Republic of South Africa forms the basis for social transformation in our post-apartheid society. The imperative to transform South African society by making use of various transformative tools stems from a need to address the legacy of apartheid in all areas of human activity and in education in particular. Social transformation in education is aimed at ensuring that the educational imbalances of the past are redressed, and that equal educational opportunities are provided for all sections of our population. If social transformation is to be achieved, all South Africans have to be educationally affirmed through the recognition of their potential and the removal of artificial barriers to the attainment of qualifications.

Outcomes-based education

Outcomes-based education (OBE) forms the foundation for the curriculum in South Africa. It strives to enable all learners to reach their maximum learning potential by setting the Learning Outcomes to be achieved by the end of the education process. OBE encourages a learner-centred and activity-based approach to education. The National Curriculum Statement builds its Learning Outcomes for Grades 10–12 on the Critical and Developmental Outcomes that were inspired by the Constitution and developed through a democratic process.

The Critical Outcomes require learners to be able to:

- identify and solve problems and make decisions using critical and creative thinking;
- work effectively with others as members of a team, group, organisation and community;
- organise and manage themselves and their activities responsibly and effectively;
- collect, analyse, organise and critically evaluate information;
- communicate effectively using visual, symbolic and/or language skills in various modes;
- use science and technology effectively and critically showing responsibility towards the environment and the health of others; and
- demonstrate an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation.

The Developmental Outcomes require learners to be able to:

- reflect on and explore a variety of strategies to learn more effectively;
- participate as responsible citizens in the life of local, national and global communities;
- be culturally and aesthetically sensitive across a range of social contexts;
- explore education and career opportunities; and
- develop entrepreneurial opportunities.

High knowledge and high skills

The National Curriculum Statement Grades 10–12 (General) aims to develop a high level of knowledge and skills in learners. It sets up high expectations of what all South African learners can achieve. Social justice requires the empowerment of those sections of the population previously disempowered by the lack of knowledge and skills. The National Curriculum Statement specifies the minimum standards of knowledge and skills to be achieved at each grade and sets high, achievable standards in all subjects.

Integration and applied competence

Integration is achieved within and across subjects and fields of learning. The integration of knowledge and skills across subjects and terrains of practice is crucial for achieving applied competence as defined in the National Qualifications Framework. Applied competence aims at integrating three discrete competences – namely, practical, foundational and reflective competences. In adopting such integration and applied competence, the National Curriculum Statement Grades 10–12 (General) seek to promote an integrated learning of theory, practice and reflection.

Progression

Progression refers to the process of developing more advanced and complex knowledge and skills. The Subject Statements show progression from one grade to another. Each Learning Outcome is followed by an explicit statement of what level of performance is expected for the outcome. Assessment Standards are arranged in a format that shows an increased level of expected performance per grade. The content and context of each grade will also show progression from simple to complex.

Articulation and portability

Articulation refers to the relationship between qualifications in different National Qualifications Framework levels or bands in ways that promote access from one qualification to another. This is especially important for qualifications falling within the same learning pathway. Given that the Further Education and Training band is nested between the General Education and Training and the Higher Education bands, it is vital that the Further Education and Training Certificate (General) articulates with the General Education and Training Certificate and with qualifications in similar learning pathways of Higher Education. In order to achieve this articulation, the development of each Subject Statement included a close scrutiny of the exit level expectations in the General Education and Training Learning Areas, and of the learning assumed to be in place at the entrance levels of cognate disciplines in Higher Education.

Portability refers to the extent to which parts of a qualification (subjects and/or unit standards) are transferable to another qualification in a different learning pathway of the same National Qualifications Framework band. For purposes of enhancing the portability of subjects obtained in Grades 10–12, various mechanisms have been explored, for example, regarding a subject as a 20-credit unit standard. Subjects contained in the National Curriculum Statement Grades 10–12 (General) compare with appropriate unit standards registered on the National Qualifications Framework.

Human rights, inclusivity, environmental and social justice

The National Curriculum Statement Grades 10–12 (General) seeks to promote human rights, inclusivity, environmental and social justice. All newly-developed Subject Statements are infused with the principles and the practices of social and environmental justice and human rights as is defined in the Constitution of the Republic of South Africa. In particular, the National Curriculum Statement Grades 10–12 (General) is sensitive to issues of diversity such as poverty, inequality, race, gender, language, age, disability and other factors.

The National Curriculum Statement Grades 10–12 (General) adopts an inclusive approach by specifying minimum requirements for all learners. It acknowledges that all learners should be able to develop to their full potential provided they receive the necessary support. The intellectual, social, emotional, spiritual and physical needs of learners will be addressed through the design and development of appropriate Learning Programmes and through the use of appropriate assessment instruments.

Valuing Indigenous Knowledge Systems

In the 1960's, the theory of multi-intelligences forced educationists to recognise that there were many ways of processing information to make sense of the world, and that, if one were to define intelligence anew, one would have to take these different approaches into account. Up until then the Western world had only valued logical, mathematical and specific linguistic abilities, and rated people as 'intelligent' only if they were adept in these ways. Now people recognise the wide diversity of knowledge systems through which people make sense of and attach meaning to the world in which they live. Indigenous knowledge systems in the South African context refer to a body of knowledge embedded in African philosophical thinking and social practices that have evolved over thousands of years. The National Curriculum Statement Grades 10–12 (General) has infused indigenous knowledge systems into the Subject Statements. It acknowledges the rich history and heritage of this country as important contributors to nurturing the values contained in the Constitution. As many different perspectives as possible have been included to assist problem solving in all fields.

Credibility, quality and efficiency

The National Curriculum Statement Grades 10–12 (General) aims to achieve credibility through pursuing a transformational agenda and through providing an education that is comparable in quality, breadth and depth to those of other countries. Quality assurance is to be regulated by the requirements of the South African Qualifications Authority Act (Act 58 of 1995), the Education and Training Quality Assurance Regulations, and the General and Further Education and Training Quality Assurance Act (Act 58 of 2001).

THE KIND OF LEARNER THAT IS ENVISAGED

Of vital importance to our development as people are the values that give meaning to our personal spiritual and intellectual journeys. *The Manifesto on Values, Education and Democracy* (Department of Education, 2001: 9–10) states the following about education and values:

" Values and morality give meaning to our individual and social relationships. They are the common currencies that help make life more meaningful than might otherwise have been. An education system does not exist to simply serve a market, important as that may be for economic growth and material prosperity. Its primary purpose must be to enrich the individual and, by extension, the broader society."

The kind of learner that is envisaged is one who will be imbued with the values and act in the interests of a society based on respect for democracy, equality, human dignity and social justice as promoted in the Constitution.

The learner emerging from the Further Education and Training band must also demonstrate achievement of the Critical and Developmental Outcomes listed earlier in this document. Subjects in the Fundamental Learning Component collectively promote the achievement of the Critical and Developmental Outcomes, while specific subjects in the Core and Elective Components individually promote the achievement of particular Critical and Developmental Outcomes.

In addition to the above, learners emerging from the Further Education and Training band must:

- have access to, and succeed in, life-long education and training of good quality;
- demonstrate an ability to think logically and analytically, as well as holistically and laterally; and
- be able to transfer skills from familiar to unfamiliar situations.

THE KIND OF TEACHER THAT IS ENVISAGED

All teachers are key the contributors to the transformation process of education in South Africa. The National Curriculum Statement Grades 10–12 (General) visualises teachers who are qualified, competent, dedicated and caring. They will be able to fulfil the various roles outlined in the Norms and Standards for Teachers. These include being mediators of learning, interpreters and designers of Learning Programmes and materials, leaders, administrators and managers, scholars, researchers and lifelong learners, community members, citizens and pastors, assessors, and subject specialists.

STRUCTURE AND DESIGN FEATURES

Structure of the National Curriculum Statement

The National Curriculum Statement Grades 10–12 (General) consists of an Overview Document, the Qualifications and Assessment Policy Framework, and the Subject Statements.

The subjects in the National Curriculum Statement Grades 10–12 (General) are categorised into Learning Fields.

What is a Learning Field?

A Learning Field is a category that serves as a home for cognate subjects, and that facilitates the formulation of rules of combination for the Further Education and Training Certificate (General). The demarcations of the Learning Fields for Grades 10–12 took cognisance of articulation with the General Education and Training and Higher Education bands, as well as with classification schemes in other countries.

Although, in the development of all the National Curriculum Statement, Grades 10–12 (General) has taken the twelve National Qualifications Framework organising fields as its point of departure, it should be emphasised that those organising fields are not necessarily Learning Fields or "knowledge" fields, but rather are linked to occupational categories.

The following subject groupings were demarcated into Learning Fields to help with learner subject combinations:

- Agricultural Sciences;
- Arts and Culture;
- Business, Commerce and Management Studies;
- Languages;
- Manufacturing, Engineering and Technology;
- Human and Social Studies;
- Physical, Mathematical, Computer and Life Sciences; and
- Services.

What is a subject?

Historically, a subject has been defined as a specific body of academic knowledge. This understanding of a subject laid emphasis on knowledge at the expense of skills, values and attitudes. Subjects were viewed by some as static and unchanging, with rigid boundaries. Very often, subjects mainly emphasised Western contributions to knowledge.

In an outcomes-based curriculum like the National Curriculum Statement Grades 10–12 (General), subject boundaries are blurred. Knowledge integrates theory, skills and values. Subjects are viewed as dynamic, always responding to new and diverse knowledge, including knowledge that traditionally has been excluded from the formal curriculum.

A subject in an outcomes-based curriculum is broadly defined by Learning Outcomes, and not only by its body of content. In the South African context, the Learning Outcomes should, by design, lead to the achievement of the Critical and Developmental Outcomes. Learning Outcomes are defined in broad terms and are flexible, making allowances for the inclusion of local inputs.

What is a Learning Outcome?

A Learning Outcome is a statement of an intended result of learning and teaching. It describes skills, knowledge, values and attitudes (SKVA) that learners should acquire by the end of the Further Education and Training band.

What is an Assessment Standard?

Assessment Standards are criteria that collectively describe what a learner should know and be able to demonstrate at a specific grade. They embody the skills, knowledge, values and attitudes (SKVA) the required to achieve the Learning Outcomes. Assessment Standards within each Learning Outcome collectively show how conceptual progression occurs from grade to grade.

Contents of Subject Statements in the Manufacturing, Engineering and Technology Field

Each draft Subject Statement consists of four chapters:

- *Chapter 1, Introducing the National Curriculum Statement:* This is a generic chapter that introduces the National Curriculum Statement Grades 10–12 (General).
- *Chapter 2, Introducing the Subject:* This chapter introduces the key features of the subject. It consists of a definition of the subject, its purpose, scope, educational and career links, and Learning Outcomes.
- *Chapter 3, Learning Outcomes, Assessment Standards:* This chapter contains Learning Outcomes with their associated Assessment Standards.
- *Chapter 4, Assessment:* This chapter outlines principles for assessment and makes suggestions for recording and reporting on assessment. It also lists subject-specific competence descriptions.
- *Glossary:* Where appropriately, a list of selected general and subject-specific terms are briefly defined.

LEARNING PROGRAMME GUIDELINES

A Learning Programme specifies the scope of learning and assessment for the three grades in the Further Education and Training band. It is the plan that ensures that learners achieve the Learning Outcomes as prescribed by the Assessment Standards for a particular grade. The Learning Programme Guidelines (LPGs) assist teachers and other Learning Programme developers to plan and design quality learning, teaching and assessment programmes.

CHAPTER 2

CIVIL TECHNOLOGY

DEFINITION

Civil Technology focuses on concepts and principles in the built environment and on the technological process. It embraces practical skills and the application of scientific principles. This subject aims to create and improve the built environment to enhance the quality of life of the individual and society and ensures sustainable use of the natural environment.

Civil Technology focuses on concepts and principles in the built environment and on the technological process. It embraces practical skills and the application of scientific principles. This subject aims to create and improve the built environment to enhance the quality of life of the individual and society and ensures sustainable use of the natural environment.

PURPOSE

Civil Technology exposes learners to knowledge, skills, values and attitudes relevant to construction processes and life and environmental sustainability. It takes cognisance of and relates to the Critical and Developmental Outcomes outlined in Chapter 1 by teaching learners to:

- understand the social contribution of Civil Technology with regards to improving the quality of life, promoting a culture of human rights, economic growth, entrepreneurship and sustainability and providing solutions that are responsive to individual and community needs;
- demonstrate an understanding of the ethical considerations, values and attitudes, which relate to Civil Technology;
- use technology effectively and critically showing responsibility to the environment and the health of others, with particular reference to sustainability; understand and manage the impact of Civil Technology on natural resources, cultural values and socio-economic development;
- identify and solve problems in the built environment and make decisions using critical, economical and creative thinking to develop the creative potential of learners;
- collect, analyse, organise, critically evaluate and present information;
- communicate effectively using various modes;
- demonstrate an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation;
- participate as responsible citizens in the life of local, national and global communities;
- demonstrate the integration between theoretical knowledge and practical skills, enhancing dexterity and technique; and
- take into account indigenous knowledge systems.

Learners are prepared for various career pathways and additional education and training opportunities by:

- developing entrepreneurial skills necessary for self-employment;
- exploring education and career opportunities to become lifelong learners;
- learning to be sensitive to human and environmental issues; and
- being sensitive to the rights of others including those living with and affected by HIV/Aids and learners with special educational needs.

SCOPE

Civilisation was founded on Civil Engineering and related professions such as architecture, construction and quantity surveying, collectively known as the built environment. Through these professions, essential services, such as roads, bridges, purified water, waterborne sewage, railway lines, high-rise buildings, factories and housing in general, are provided. The subject Civil Technology aims to create an awareness of these aspects in learners and society.

Civil Technology falls in the Engineering and Technology Learning Field. The subject is structured and organised to cater for learners with a range of abilities and talents including learners with special educational needs (LSEN). Civil Technology gives learners the opportunity to:

- carry out practical simulations and real-life projects using a variety of processes and skills;
- solve practical problems in a Civil Technology context using the technological process (identify, investigate, design, make, evaluate and communicate) in both cognitive and creative ways;
- learns by dealing directly with human rights, about social and environmental issues in theoretical and practical contexts;
- use and engage subject-related knowledge in a purposeful way;
- use a variety of life skills when working on projects in an authentic context;
- develop a positive attitude and perception towards Civil Technology-based careers;
- experience the interrelationship between scientific principles and technology;
- use scientific methods where the emphasis is placed on the following activities:
  - identification of problems and problem solutions;
  - observation;
  - experimentation (emphasis on dexterity in the handling of apparatus);
  - classification;
  - control of variables;
  - measurements;
  - interpretation of data;
  - deduction;
  - prediction; and
  - communication.

The following concepts are embedded in Civil Technology:

- Safety and first aid (including HIV/Aids awareness)
- Effective communication techniques
- Entrepreneurial skills
- Use of computers
- Practical competencies
- Application of scientific, applied mechanics and mathematical principles

EDUCATIONAL AND CAREER LINKS

The study of Civil Technology builds on the Technology Learning Area Statement for the General Education and Training Band. The offering of Civil Technology is an educational activity. Civil Technology provides many career opportunities for all learners including Learners with Special Educational Needs, allowing them to participate and be economically productive.

The subject is designed to provide learners with a sound technical base that integrates theoretical and practical competencies. The design also provides for entrepreneurship, further studies at Higher Education and Training Institutions and a number of related learnerships in other Further Education and Training Learning Fields.

Examples of fields of opportunities for study or employment, although not exhaustive, include:

At Higher Education and Training Institutions (HETIs):

- Civil engineering
- Design and construction of infrastructure (e.g. storm water and roads, purified water systems and waterborne sewerage systems)
- Structures and buildings
- Materials
- Mining
- Bridges and reservoirs
- Railways
- Materials engineering
- Architecture
- Landscape architecture
- Town and regional planning
- Quantity surveying
- Surveying
- Construction and project management
- Property valuation
- Environmental engineering

At Further Education and Training Institutions (FETIs):

- Draughting
- Shop fitting
- Cabinet making
- Stage building
- Carpentry and joinery
- Plumbing
- Bricklaying and plastering
- Tiling
- Painting
- Construction supervising

In the world of work or entrepreneurship:

- Shop fitting
- Cabinet making
- Stage building
- Carpentry and joinery
- Plumbing
- Bricklaying and plastering
- Tiling
- Painting
- Paving
- Basic building and contracting

LEARNING OUTCOMES

Civil Technology enables learners at Further Education and Training Institutions to directly achieve four specific Learning Outcomes. The Learning Outcomes are interrelated and should not be dealt with in isolation.

The Learning Outcomes are equally important but have not been allocated the same weighting in time and resources. Learning Outcomes 3 and 4 reflect knowledge and understanding and the application of knowledge and support each other.

Learning Outcome 1: Technology, Society and the Environment

The learner is able to demonstrate an awareness and understanding of the interrelationship between technology, society and the environment.

In this Learning Outcome, learners will understand the impact of technology on natural resources, cultural values and socio-economic development with particular reference to sustainability and indigenous knowledge systems.

It also seeks to create awareness in learners about health and fair and equal access to employment and services and prepare them for the world of work, entrepreneurial opportunities and further studies.

Learning Outcome 2: Technological Process

The learner is able to understand and apply the technological process.

In this Learning Outcome, learners develop the skill to identify, investigate, design, make and evaluate processes and products and/or projects related to Civil Technology and to communicate the findings through the use of appropriate terminology and a variety of communication media.

Learning Outcome 3: Knowledge and Understanding

The learner is able to demonstrate an understanding of the knowledge, principles and concepts used in Civil Technology.

In this Learning Outcome, learners acquire an understanding of the knowledge, concepts and principles used in the built environment.

Learning Outcome 4: Application of Knowledge

The learner is able to demonstrate and apply the concepts, principles and practices related to Civil Technology by organising and managing activities responsibly and effectively.

In this Learning Outcome, learners apply concepts, principles and practices to demonstrate practical competencies used in Civil Technology.

CHAPTER 3

LEARNING OUTCOMES, ASSESSMENT STANDARDS, CONTENT AND CONTEXTS

INTERRELATEDNESS OF THE LEARNING OUTCOMES

The Learning Outcomes are equally important but have not been allocated the same weighting in time and resources. Learning Outcome 3 reflects knowledge and understanding, whilst Learning Outcome 4 deals with the application of this knowledge. These two Learning Outcomes are underpinned by Learning Outcome 1, which reflects the interrelationship of technology, society and the environment and Learning Outcome 2, which outlines the technological process that is used as the organising concept.

NUMBERING SYSTEM

All Assessment Standards are numbered in the following manner:

- The first number refers to the grade.
- The second number refers to the Learning Outcome.
- The third number refers to the Assessment Standard, for example, 10.1.4 implies Grade 10, Learning Outcome 1 and Assessment Standard 4.

Grade 10

Learning Outcome 1

Technology, Society and the Environment

The learner is able to demonstrate an awareness and understanding of the interrelationship between technology, society and the environment.

Assessment Standards

We know this when the learner is able to:

- 10.1.1
  Describe the interrelationship between technology, society and the environment.
- 10.1.2
  Describe human rights issues.
- 10.1.3
  Describe, explain and respond to basic medical emergencies in context, taking cognisance of health issues such as HIV/Aids.
- 10.1.4
  Identify indigenous knowledge systems of different cultures.
- 10.1.5
  Describe entrepreneurship and its influence on society and the environment.

Grade 11

Assessment Standards

We know this when the learner is able to:

- 11.1.1
  Discuss and evaluate the interrelationship between technology, society and the environment.
- 11.1.2
  Show consideration of human rights by discussing fair and equal employment opportunities.
- 11.1.3
  Describe, explain and respond to basic medical emergencies in context, taking cognisance of health issues such as HIV/Aids.
- 11.1.4
  Compare how different cultures solve technological problems.
- 11.1.5
  Discuss the competencies required by entrepreneurs.

Grade 12

Assessment Standards

We know this when the learner is able to:

- 12.1.1
  Predict the impact of future developments in technology on society and the environment.
- 12.1.2
  Respect human rights and analyse issues relating to employment equity.
- 12.1.3
  Describe, explain and respond to basic medical emergencies in context, taking cognisance of health issues such as HIV/Aids.
- 12.1.4
  Analyse how solutions to technological problems in different cultures are combined into an optimum solution.
- 12.1.5
  Identify and investigate possible entrepreneurial opportunities.

Grade 10

Learning Outcome 2

Technological Process

The learner is able to understand and apply the technological process.

Note: There is no progression in the Assessment Standards across the grades as Learning Outcome 2 is a process. The progression across the grades is reflected in the increasing degree of complexity of the content.

Assessment Standards

We know this when the learner is able to:

- 10.2.1
  Identify, investigate, define and analyse problems in a given real-life situation.
- 10.2.2
  Generate and/or design possible solutions for problems.
- 10.2.3
  Make or improve products according to the selected design.
- 10.2.4
  Evaluate the product against the initial design.
- 10.2.5
  Present assignments by means of a variety of communication media.

Grade 11

Assessment Standards

We know this when the learner is able to:

- 11.2.1
  Identify, investigate, define and analyse problems in a given real-life situation.
- 11.2.2
  Generate and/or design possible solutions for problems.
- 11.2.3
  Make or improve products according to the selected design.
- 11.2.4
  Evaluate the product against the initial design.
- 11.2.5
  Present assignments by means of a variety of communication media.

Grade 12

Assessment Standards

We know this when the learner is able to:

- 12.2.1
  Identify, investigate, define and analyse problems in a given real-life situation.
- 12.2.2
  Generate and/or design possible solutions for problems.
- 12.2.3
  Make or improve products according to the selected design.
- 12.2.4
  Evaluate the product against the initial design.
- 12.2.5
  Present assignments by means of a variety of communication media.

Grade 10

Learning Outcome 3

Knowledge and Understanding

The learner is able to demonstrate an understanding of the knowledge, principles and concepts used in Civil Technology.

Assessment Standards

We know this when the learner is able to:

- 10.3.1
  Describe the impact of the Occupational Health and Safety Act (OHS Act) on personal safety.
- 10.3.2
  Describe the properties and the use of materials in the built environment.
- 10.3.3
  Describe the function, use and care of basic tools and equipment.
- 10.3.4
  Show knowledge of freehand sketching and the use of instruments for basic drawings, with an introduction to CAD.
- 10.3.5
  Demonstrate an understanding of applicable terminology.
- 10.3.6
  Distinguish between the different types of forces found in load-bearing structures.
- 10.3.7
  List different manufacturing processes or construction methods.

Grade 11

Assessment Standards

We know this when the learner is able to:

- 11.3.1
  Describe the impact of the Occupational Health and Safety Act (OHS Act) on personal safety.
- 11.3.2
  Discuss the use of materials in the built environment.
- 11.3.3
  Explain the function, use and care of special tools and equipment.
- 11.3.4
  Show knowledge of advanced freehand sketching, instruments and basic CAD drawings.
- 11.3.5
  Describe applicable terminology.
- 11.3.6
  Demonstrate an understanding of the effects of forces and moments in structural engineering by applying design principles.
- 11.3.7
  Discuss the different manufacturing processes or construction methods.

Grade 12

Assessment Standards

We know this when the learner is able to:

- 12.3.1
  Describe the impact of the Occupational Health and Safety Act (OHS Act) on personal safety.
- 12.3.2
  Evaluate the sustainability of materials according to their appropriate use and nature.
- 12.3.3
  Explain the function, use and care of specialised tools and equipment.
- 12.3.4
  Show knowledge of advanced freehand sketching, instruments and CAD drawings and the use of electronic media.
- 12.3.5
  Define applicable terminology in the proper context.
- 12.3.6
  Demonstrate an understanding of the concepts of stress and strain, shear forces, bending moments, point and evenly distributed loads and the modulus of elasticity.
- 12.3.7
  Evaluate the different manufacturing processes or construction methods.

Grade 10

Learning Outcome 3 (continued)

Knowledge and Understanding

The learner is able to demonstrate an understanding of the knowledge, principles and concepts used in Civil Technology.

Assessment Standards

We know this when the learner is able to:

- 10.3.8
  Explain civil services.

- 10.3.9
  Identify quantities of materials for a small project.

- 10.3.10
  Explain the uses of different joining applications (methods).

Grade 11

Assessment Standards

We know this when the learner is able to:

- 11.3.8
  Analyse the maintenance of civil services.
- 11.3.9
  Identify quantities of materials for a project.
- 11.3.10
  Compare the application of materials used in joining applications.

Grade 12

Assessment Standards

We know this when the learner is able to:

- 12.3.8
  Identify the most suitable processes in designing civil services.
- 12.3.9
  Identify quantities of materials and costs involved in a project
- 12.3.10
  Evaluate and compare the specific application of joining materials.

Grade 10

Learning Outcome 4

Application of Knowledge

The learner is able to demonstrate and apply the concepts, principles and practices related to Civil Technology by organising and managing activities responsibly and effectively.

Assessment Standards

We know this when the learner is able to:

- 10.4.1
  Apply relevant safety measures in accordance with the Occupational Health and Safety Act.
- 10.4.2
  Calculate quantities and evaluate properties of materials used in the built environment.
- 10.4.3
  Identify and use hand tools and power tools.
- 10.4.4
  Make a basic drawing using freehand sketching and instruments and perform basic CAD commands.
- 10.4.5
  Apply the correct use of terminology in Civil Technology.
- 10.4.6
  Perform simple tests to show the effects of different types of forces acting on load-bearing structures.
- 10.4.7
  Apply different construction methods.

Grade 11

Assessment Standards

We know this when the learner is able to:

- 11.4.1
  Apply relevant safety measures in accordance with the Occupational Health and Safety Act.
- 11.4.2
  Identify, describe and apply the use of materials in the built environment.
- 11.4.3
  Use and maintain hand and power tools and construction machinery.
- 11.4.4
  Make basic drawings using freehand sketching, instruments and CAD.
- 11.4.5
  Apply and use the correct terminology in Civil Technology.
- 11.4.6
  Perform simple experiments to show the effects of forces and moments on load-bearing structures.
- 11.4.7
  Compare the different construction methods in a project.

Grade 12

Assessment Standards

We know this when the learner is able to:

- 12.4.1
  Apply relevant safety measures in accordance with the Occupational Health and Safety Act.
- 12.4.2
  Evaluate the sustainability of materials according to their use and nature.
- 12.4.3
  Use and maintain specialised tools and equipment.
- 12.4.4
  Make drawings using freehand sketching, instruments and CAD and use electronic media.
- 12.4.5
  Define and apply with comprehension the terminology used in Civil Technology.
- 12.4.6
  Perform experiments to determine stress and strain, shear force, bending moments and modulus of elasticity.
- 12.4.7
  Analyse a construction project and use the relevant method to complete a project successfully.

Grade 10

Learning Outcome 4 (continued)

Application of Knowledge

The learner is able to demonstrate and apply the concepts, principles and practices related to Civil Technology by organising and managing activities responsibly and effectively.

Assessment Standards

We know this when the learner is able to:

- 10.4.8
  Demonstrate the functions of civil services.
- 10.4.9
  Calculate quantities of materials for a small project.
- 10.4.10
  Use various methods to join materials.

Grade 11

Assessment Standards

We know this when the learner is able to:

- 11.4.8
  Dismantle and assemble civil services.
- 11.4.9
  Calculate quantities for a project.
- 11.4.10
  Use various bonding materials and methods to join materials.

Grade 12

Assessment Standards

We know this when the learner is able to:

- 12.4.8
  Dismantle, assemble and maintain civil services.
- 12.4.9
  Calculate quantities of materials and costs involved for a project.
- 12.4.10
  Use various bonding materials and methods to join materials.

CONTENT AND CONTEXTS FOR THE ATTAINMENT OF ASSESSMENT STANDARDS

In this section, content and contexts are provided to support the attainment of the Assessment Standards. The content indicated needs to be dealt with in such a way that the learner can achieve the Learning Outcomes. Content must serve the Learning Outcomes and not be an end in itself.

The contexts suggested enable the content to be embedded in situations which are meaningful to the learner and so assist learning and teaching. The teacher should be aware of and use local contexts, not necessarily indicated here, which could be more suited to the experiences of the learner.

Content and contexts, when aligned to the attainment of the Assessment Standards, provide a framework for the development of Learning Programmes. The Civil Technology Learning Programme Guidelines give more detail in this respect.

Grade 10

Learning Outcome 1

Technology, Society and the Environment

The learner is able to demonstrate an awareness and understanding of the interrelationship between technology, society and the environment.

Assessment Standards

The content and contexts could include:

- 10.1.1
  understanding issues of environmental technology;
- 10.1.2
  understanding human rights as captured in the Bill of Rights;
- 10.1.3
  responding to basic medical emergencies in context, taking cognisance of health issues such as HIV/Aids;
- 10.1.4
  understanding indigenous knowledge systems of different cultures; and
- 10.1.5
  understanding the principles of entrepreneurial activity.

Grade 11

Assessment Standards

The content and contexts could include:

- 11.1.1
  describing environmental technology;
- 11.1.2
  discussing human rights including fairness, equality and inclusivity;
- 11.1.3
  responding to basic medical emergencies in context, taking cognisance of health issues such as HIV/Aids;
- 11.1.4
  comparing how different cultures solve technological problems; and
- 11.1.5
  discussing entrepreneurial principles to help improve the economy.

Grade 12

Assessment Standards

The content and contexts could include:

- 12.1.1
  applying the principles of conservation to environmental technology;
- 12.1.2
  applying human rights and work ethics;
- 12.1.3
  responding to basic medical emergencies in context, taking cognisance of health issues such as HIV/Aids;
- 12.1.4
  analysing solutions to technological problems in different cultures; and
- 12.1.5
  investigating entrepreneurial opportunities.

Grade 10

Learning Outcome 2

Technological Process

The learner is able to understand and apply the technological process.

Note: There is no progression in the Assessment Standards across the grades as Learning Outcome 2 is a process. The progression across the grades is reflected in the increasing degree of complexity of the content.

Assessment Standards

The content and contexts could include:

- 10.2.1
  identifying, investigating, researching, accessing, processing and using data to make a meaningful summary;
- 10.2.2
  designing by taking cognisance of constrains, specifications, alternative solutions and substantiating choice of design;
- 10.2.3
  making products according to the design and specifying materials, tools and equipment, processes and sequence of manufacturing process;
- 10.2.4
  evaluating and testing the product to establish if it satisfies the design brief and suggesting improvements; and
- 10.2.5
  choosing and using appropriate technologies such as computers, photocopiers, stencils and audio-visual recordings to combine graphics and text to record and communicate the problem-solving process.

Grade 11

Assessment Standards

The content and contexts could include:

- 11.2.1
  identifying, investigating, researching, accessing, processing and using data to make a meaningful summary;
- 11.2.2
  designing by taking cognisance of constrains, specifications, alternative solutions and substantiating choice of design;
- 11.2.3
  making products according to the design and specifying materials, tools and equipment, processes and sequence of manufacturing process;
- 11.2.4
  evaluating and testing the product to establish if it satisfies the design brief and suggesting improvements; and
- 11.2.5
  choosing and using appropriate technologies such as computers, photocopiers, stencils and audio-visual recordings to combine graphics and text to record and communicate the problem-solving process.

Grade 12

Assessment Standards

The content and contexts could include:

- 12.2.1
  identifying, investigating, researching, accessing, processing and using data to make a meaningful summary;
- 12.2.2
  designing by taking cognisance of constrains, specifications, alternative solutions and substantiating choice of design;
- 12.2.3
  making products according to the design and specifying materials, tools and equipment, processes and sequence of manufacturing process;
- 12.2.4
  evaluating and testing the product to establish if it satisfies the design brief and suggesting improvements; and
- 12.2.5
  choosing and using appropriate technologies such as computers, photocopiers, stencils and audio-visual recordings to combine graphics and text to record and communicate the problem-solving process.

Grade 10

Learning Outcome 3

Knowledge and Understanding

The learner is able to demonstrate an understanding of the knowledge, concepts and principles used in Civil Technology.

Assessment Standards

The content and contexts could include:

- 10.3.1
  Safety
  The impact of the Occupational Health and Safety Act (OHS Act) on personal safety

- 10.3.2
  Materials
  The properties of materials used in the built environment (wood, metal, concrete, plastics, glass and other materials)

- 10.3.3
  Equipment
  Hand tools, power tools

- 10.3.4
  Graphics and communication
  Freehand sketching, instrument drawings (orthographic, isometric) and introduction to CAD

- 10.3.5
  Terminology
  Construction, material, forces, equipment, measuring, systems, joining and graphics

Grade 11

Assessment Standards

The content and contexts could include:

- 11.3.1
  Safety
  The impact of the Occupational Health and Safety Act (OHS Act) on the use of tools and equipment
- 11.3.2
  Materials
  The uses of materials in the built environment (wood, metal, concrete, plastics, glass and other materials)
- 11.3.3
  Equipment
  Hand tools, power tools and construction machinery
- 11.3.4
  Graphics and communication
  Freehand sketching, instrument drawings and basic CAD drawings (orthographic with sections, isometric)
- 11.3.5
  Terminology
  Construction, material, forces, equipment, measuring, systems, joining and graphics

Grade 12

Assessment Standards

The content and contexts could include:

- 12.3.1
  Safety
  The application and regulation of the Occupational Health and Safety Act (OHS Act)
- 12.3.2
  Materials
  The sustainability and protection of materials according to their appropriate use and nature (wood, metal, concrete, plastics, glass and other materials)
- 12.3.3
  Equipment
  Hand tools, power tools, specialised tools and construction machinery
- 12.3.4
  Graphics and communication
  Freehand sketching, instrument and CAD drawings (orthographic with sections, house plans, isometric and basic designs to specifications) and use electronic media
- 12.3.5
  Terminology
  Construction, material, forces, equipment, measuring, systems, joining and graphics

Grade 10

Learning Outcome 3 (continued)

Knowledge and Understanding

The learner is able to demonstrate an understanding of the knowledge, concepts and principles used in Civil Technology.

Assessment Standards

The content and contexts could include:

- 10.3.6
  Applied mechanics
  Triangle and polygon of forces, centre of gravity

- 10.3.7
  Construction
  Concrete, plaster, mortar, brickwork and block work, formwork, waterproofing, excavations up to floor level, woodworking, steel, roof covering, finishing, cabinet making for a basic structure

- 10.3.8
  Civil services
  The fundamentals of water supply, sewage, storm water and electrical systems

- 10.3.9
  Quantities
  Quantities for a small project such as the foundations of a building

- 10.3.10
  Joining
  Brickwork, wood

Grade 11

Assessment Standards

The content and contexts could include:

- 11.3.6
  Applied mechanics
  Stress and strain moments and force diagrams, centre of gravity
- 11.3.7
  Construction
  Concrete, plaster, mortar, brickwork and block work, formwork, waterproofing, excavations up to wall plate, woodworking, steel, roof covering, finishing, cabinet making for a house
- 11.3.8
  Civil services
  The installation of water supply, sewage, storm water and electrical systems
- 11.3.9
  Quantities
  Quantities of materials for a project such as the walls and finishing in a building
- 11.3.10
  Joining
  Steel, metals, wood, plumbing, pipes

Grade 12

Assessment Standards

The content and contexts could include:

- 12.3.6
  Applied mechanics
  Stress and strain, beams and force diagrams, centre of gravity
- 12.3.7
  Construction
  Concrete, plaster, mortar, brickwork and block work, formwork, waterproofing, excavations up to the roof, woodworking, steel, roof covering, finishing, cabinet making for a larger project
- 12.3.8
  Civil services
  The design of water supply, sewage, storm water and electrical systems
- 12.3.9
  Quantities
  Quantities of materials and costing for a project such as a complete building
- 12.3.10
  Joining
  Steel, metals, wood, plumbing, pipes

Grade 10

Learning Outcome 4

Application of Knowledge

The learner is able to demonstrate and apply the concepts, principles and practices used in Civil Technology by organising and managing activities responsibly and effectively.

Assessment Standards

The content and contexts could include:

- 10.4.1
  Safety
  The application of safety (personal, hand tools, power tools, and workplace)

- 10.4.2
  Materials
  The correct application of materials in the built environment (wood, metal, concrete, plastics, glass and other materials)

- 10.4.3
  Equipment
  The use and care of hand tools and power tools

- 10.4.4
  Graphics and communication
  Freehand sketching, instrument drawings (orthographic, isometric) and introduction to CAD

- 10.4.5
  Terminology
  The selection and use of the correct terminology for construction, materials, forces, equipment, measuring, systems, joining and graphics

Grade 11

Assessment Standards

The content and contexts could include:

- 11.4.1
  Safety
  The application of safety (personal, hand tools, power tools, construction machinery and workplace)
- 11.4.2
  Materials
  The description and application of the correct materials in the built environment (wood, metal, concrete, plastics, glass and other materials)
- 11.4.3
  Equipment
  The use and care of hand tools, power tools and construction machinery
- 11.4.4
  Graphics and communication
  Freehand sketching, instrument drawings and basic CAD drawings (orthographic with sections, isometric)
- 11.4.5
  Terminology
  The selection and use of the correct terminology for construction, materials, forces, equipment, measuring, systems, joining and graphics

Grade 12

Assessment Standards

The content and contexts could include:

- 12.4.1
  Safety
  The application of safety (personal, hand tools, power tools, construction machinery and workplace)
- 12.4.2
  Materials
  The evaluation and application of the correct materials in the built environment (wood, metal, concrete, plastics, glass and other materials)
- 12.4.3
  Equipment
  The use and care of hand tools, power tools, specialised tools and construction machinery
- 12.4.4
  Graphics and communication
  Freehand sketching, instrument and CAD drawings (orthographic with sections, house plans, isometric and basic designs to specifications) and the use of electronic media
- 12.4.5
  Terminology
  The selection and use of the correct terminology for construction, materials, forces, equipment, measuring, systems, joining and graphics

Grade 10

Learning Outcome 4 (continued)

Application of Knowledge

The learner is able to demonstrate and apply the concepts, principles and practices used in Civil Technology by organising and managing activities responsibly and effectively.

Assessment Standards

The content and contexts could include:

- 10.4.6
  Applied mechanics
  The determination of the solutions, graphically for triangle and polygon of forces and centre of gravity (simple regular shapes)

- 10.4.7
  Construction
  The introduction to concrete, plaster, mortar, brickwork and block work, formwork, waterproofing, excavations up to floor level, woodworking, steel, roof covering, finishing, cabinet making for a basic structure

- 10.4.8
  Civil services
  The introduction to the fundamentals of water supply, sewage, storm water and electrical systems

- 10.4.9
  Quantities
  The calculation of the quantities for a small project such as the foundations of a building

Grade 11

Assessment Standards

The content and contexts could include:

- 11.4.6
  Applied mechanics
  The calculation of moments, stress and strain and the determination of solutions, graphically for force diagrams and centre of gravity (combined regular shapes)

- 11.4.7
  Construction
  The application of concrete, plaster, mortar, brickwork and block work, formwork, waterproofing, excavations up to wall plate, woodworking, steel, roof covering, finishing, cabinet making for a house

- 11.4.8
  Civil services
  The installation of water supply, sewage, storm water and electrical systems

- 11.4.9
  Quantities
  The calculation of the quantities of materials for a project such as the walls and finishing in a building

Grade 12

Assessment Standards

The content and contexts could include:

- 12.4.6
  Applied mechanics
  The calculation of stress and strain, shear forces, bending moments and the modulus of elasticity and the determination of solutions, graphically for force diagrams and centre of gravity (irregular shapes)

- 12.4.7
  Construction
  The application of concrete, plaster, mortar, brickwork and block work, formwork, waterproofing, excavations up to the roof, woodworking, steel, roof covering, finishing, cabinet making for a larger project

- 12.4.8
  Civil services
  The design and maintenance of water supply, sewage, storm water and electrical systems

- 12.4.9
  Quantities
  The calculation of quantities of materials and costing for a project such as a complete building

Grade 10

Learning Outcome 4 (continued)

Application of Knowledge

The learner is able to demonstrate and apply the concepts, principles and practices used in Civil Technology by organising and managing activities responsibly and effectively

Assessment Standards

The content and contexts could include:

- 10.4.10
  Joining
  The application of joining methods in brickwork and wood

Grade 11

Assessment Standards

The content and contexts could include:

- 11.4.10
  Joining
  The application of joining methods in steel, metals, wood, plumbing and pipes

Grade 12

Assessment Standards

The content and contexts could include:

- 12.4.10
  Joining
  The application of joining methods and comparison of joints in steel, metals, wood, plumbing and pipes

CHAPTER 4

ASSESSMENT

INTRODUCTION

Assessment is a critical element of the National Curriculum Statement Grades 10–12 (General). It is a process of collecting and interpreting evidence in order to determine the learner's progress in learning and to make a judgement about a learner's performance. Evidence can be collected at different times and places, and with the use of various methods, instruments, modes and media.

To ensure that assessment results can be accessed and used for various purposes at a future date, the results have to be recorded. There are various approaches to recording learners' performances. Some of these are explored in this chapter. Others are dealt with in a more subject-specific manner in the Learning Programme Guidelines.

Many stakeholders have an interest in how learners perform in Grades 10–12. These include the learners themselves, parents, guardians, sponsors, provincial departments of education, the Department of Education, the Ministry of Education, employers, and higher education and training institutions. In order to facilitate access to learners' overall performances and to inferences on learners' competences, assessment results have to be reported. There are many ways of reporting. The Learning Programme Guidelines and the *Qualifications and Assessment Policy Framework for Grades 10–12 (General)* discuss ways of recording and reporting on school-based and external assessment as well as giving guidance on assessment issues specific to the subject.

WHY ASSESS

Before a teacher assesses learners, it is crucial that the purposes of the assessment be clearly and unambiguously established. Understanding the purposes of assessment ensures that an appropriate match exists between the purposes and the methods of assessment. This, in turn, will help to ensure that decisions and conclusions based on the assessment are fair and appropriate for the particular purpose or purposes.

There are many reasons why learners' performance is assessed. These include monitoring progress and providing feedback, diagnosing or remediating barriers to learning, selection, guidance, supporting learning, certification and promotion.

In this curriculum, learning and assessment are very closely linked. Assessment helps learners to gauge the value of their learning. It gives them information about their own progress and enables them to take control of and to make decisions about their learning. In this sense, assessment provides information about whether teaching and learning is succeeding in getting closer to the specified Learning Outcomes. When assessment indicates lack of progress, teaching and learning plans should be changed accordingly.

TYPES OF ASSESSMENT

This section discusses the following types of assessment:

- baseline assessment;
- diagnostic assessment;
- formative assessment; and
- summative assessment.

Baseline assessment

Baseline assessment is important at the start of a grade, but can occur at the beginning of any learning cycle. It is used to establish what learners already know and can do. It helps in the planning of activities and in Learning Programme development. The recording of baseline assessment is usually informal.

Diagnostic assessment

Any assessment can be used for diagnostic purposes – that is, to discover the cause or causes of a learning barrier. Diagnostic assessment assists in deciding on support strategies or identifying the need for professional help or remediation. It acts as a checkpoint to help redefine the Learning Programme goals, or to discover what learning has not taken place so as to put intervention strategies in place.

Formative assessment

Any form of assessment that is used to give feedback to the learner is fulfilling a formative purpose. Formative assessment is a crucial element of teaching and learning. It monitors and supports the learning process. All stakeholders use this type of assessment to acquire information on the progress of learners. Constructive feedback is a vital component of assessment for formative purposes.

Summative assessment

When assessment is used to record a judgement of the competence or performance of the learner, it serves a summative purpose. Summative assessment gives a picture of a learner's competence or progress at any specific moment. It can occur at the end of a single learning activity, a unit, cycle, term, semester or year of learning. Summative assessment should be planned and a variety of assessment instruments and strategies should be used to enable learners to demonstrate competence.

WHAT ASSESSMENT SHOULD BE AND DO

Assessment should:

- be understood by the learner and by the broader public;
- be clearly focused;
- be integrated with teaching and learning;
- be based on pre-set criteria of the Assessment Standards;
- use a variety of instruments;
- use a variety of methods;
- allow for expanded opportunities for learners;
- be learner-paced and fair; and
- be flexible.

HOW TO ASSESS

Teachers' assessment of learners' performances must have a great degree of reliability. This means that teachers' judgements of learners' competences should be generalised across different times, assessment items and markers. The judgements made through assessment should also show a great degree of validity; that is, they should be made on the aspects of learning that were assessed.

Because each assessment cannot be totally valid or reliable by itself, decisions on learner progress must be based on more than one assessment. This is the principle behind continuous assessment (CASS). Continuous assessment is a strategy that bases decisions about learning on a range of different assessment activities and events that happen at different times throughout the learning process. It involves assessment activities that are spread throughout the year, using various kinds of assessment instruments and methods such as tests, examinations, projects and assignments. Oral, written and performance assessments are included. The different pieces of evidence that learners produce as part of the continuous assessment process can be included in a portfolio. Different subjects have different requirements for what should be included in the portfolio. The Learning Programme Guidelines discuss these requirements further.

Continuous assessment is classroom-based and school-based, and focuses on the ongoing manner in which assessment is integrated into the process of teaching and learning. Teachers get to know their learners through their day-to-day teaching, through questioning, through observation, and through interacting with the learners and watching them interact with one another.

Continuous assessment should be applied both to sections of the curriculum that are best assessed through written tests and assignments and those that are best assessed through other methods, such as by performance, using practical or spoken evidence of learning.

METHODS OF ASSESSMENT

Self-assessment

All Learning Outcomes and Assessment Standards are transparent. Learners know what is expected of them. Learners can, therefore play an important part, through self-assessment, in 'pre-assessing' work before the teacher does the final assessment. Reflection on one's own learning is a vital component of learning.

Peer assessment

Peer assessment, using a checklist or rubric, helps both the learners whose work is being assessed and the learners who are doing the assessment. The sharing of the criteria for assessment empowers learners to evaluate their own and others performances.

Group assessment

The ability to work effectively in groups is one of the Critical Outcomes. Assessing group work involves looking for evidence that the group of learners co-operate, assist one another, divide work, and combine individual contributions into a single composite assessable product. Group assessment looks at process as well as product. It involves assessing social skills, time management, resource management and group dynamics, as well as the output of the group.

METHODS OF COLLECTING ASSESSMENT EVIDENCE

There are various methods of collecting evidence. Some of these are discussed below.

Observation-based assessment

Observation-based assessment methods tend to be less structured and allow the development of a record of different kinds of evidence for different learners at different times. This kind of assessment is often based on tasks that require learners to interact with one another in pursuit of a common solution or product. Observation has to be intentional and should be conducted with the help of an appropriate observation instrument.

Test-based assessment

Test-based assessment is more structured, and enables teachers to gather the same evidence for all learners in the same way and at the same time. This kind of assessment creates evidence of learning that is verified by a specific score. If used correctly, tests and examinations are an important part of the curriculum because they give good evidence of what has been learned.

Task-based assessment

Task-based or performance assessment methods aim to show whether learners can apply the skills and knowledge they have learned in unfamiliar contexts or in contexts outside of the classroom. Performance assessment also covers the practical components of subjects by determining how learners put theory into practice. The criteria, standards or rules by which the task will be assessed are described in rubrics or task checklists, and help the teacher to use professional judgement to assess each learner's performance.

RECORDING AND REPORTING

Recording and reporting involves the capturing of data collected during assessment so that it can be logically analysed and published in an accurate and understandable way.

Methods of recording

There are different methods of recording. It is often difficult to separate methods of recording from methods of evaluating learners' performances.

The following are examples of different types of recording instruments:

- rating scales;
- task lists or checklists; and
- rubrics.

Each is discussed below.

Rating scales

Rating scales are any marking system where a symbol (such as A or B) or a mark (such as 5/10 or 50%) is defined in detail to link the coded score to a description of the competences that are required to achieve that score. The detail is more important than the coded score in the process of teaching and learning, as it gives learners a much clearer idea of what has been achieved and where and why their learning has fallen short of the target. Traditional marking tended to use rating scales without the descriptive details, making it difficult to have a sense of the learners' strengths and weaknesses in terms of intended outcomes. A six-point scale is used in the National Curriculum Statement Grades 10–12 (General).

Task lists or checklists

Task lists or checklists consist of discrete statements describing the expected performance in a particular task. When a particular statement (criterion) on the checklist can be observed as having been satisfied by a learner during a performance, the statement is ticked off. All the statements that have been ticked off on the list (as criteria that have been met) describe the learner's performance. These checklists are very useful in peer or group assessment activities.

Rubrics

Rubrics are a combination of rating codes and descriptions of standards. They consist of a hierarchy of standards with benchmarks that describe the range of acceptable performance in each code band. Rubrics require teachers to know exactly what is required by the outcome. Rubrics can be holistic, giving a global picture of the standard required, or analytic, giving a clear picture of the distinct features that make up the criteria, or can combine both. The Learning Programme Guidelines give examples of subject-specific rubrics.

To design a rubric, a teacher has to decide the following:

- Which outcomes are being targeted?
- Which Assessment Standards are targeted by the task?
- What kind of evidence should be collected?
- What are the different parts of the performance that will be assessed?
- What different assessment instruments best suit each part of the task (such as the process and the product)?
- What knowledge should be evident?
- What skills should be applied or actions taken?
- What opportunities for expressing personal opinions, values or attitudes arise in the task and which of these should be assessed and how?
- Should one rubric target all the Learning Outcomes and Assessment Standards of the task or does the task needs several rubrics?
- How many rubrics are, in fact, needed for the task?

It is crucial that a teacher shares the rubric or rubrics for the task with the learners before they do the required task. The rubric focuses both the learning and the performance and becomes a powerful tool for self-assessment.

Reporting performance and achievement

Reporting performance and achievement informs all those involved with or interested in the learner's progress. Once the evidence has been collected and interpreted, teachers need to record a learner's achievements. Sufficient summative assessments need to be made so that a report can make a statement about the standard achieved by the learner.

The National Curriculum Statement Grades 10–12 (General) adopts a six-point scale of achievement. The scale is shown in Table 4.1.

Table 4.1 Scale of achievement for the National Curriculum Statement Grades 10–12 (General)

Rating Code	Description of Competence	Marks (%)
6	Outstanding	80–100
5	Meritorious	60–79
4	Satisfactory	50–59
3	Adequate	40–49
2	Partial	30–39
1	Inadequate	0–29

SUBJECT COMPETENCE DESCRIPTIONS

To assist with benchmarking the achievement of Learning Outcomes in Grades 10–12, subject competences have been described to distinguish the grade expectations of what learners must know and be able to achieve. Six levels of competence have been described for each subject for each grade. These descriptions will assist teachers to assess learners and place them in the correct rating. The descriptions summarise what is spelled out in detail in the Learning Outcomes and the Assessment Standards, and give the distinguishing features that fix the achievement for a particular rating. The various achievement levels and their corresponding percentage bands are as shown in Table 4.1.

In line with the principles and practice of outcomes-based assessment, all assessment – both school-based and external – should primarily be criterion-referenced. Marks could be used in evaluating specific assessment tasks, but the tasks should be assessed against rubrics instead of simply ticking correct answers and awarding marks in terms of the number of ticks. The statements of competence for a subject describe the minimum skills, knowledge, attitudes and values that a learner should demonstrate for achievement on each level of the rating scale.

When teachers/assessors prepare an assessment task or question, they must ensure that the task or question addresses an aspect of a particular outcome. The relevant Assessment Standard or Standards must be used when creating the rubric for assessing the task or question. The descriptions clearly indicate the minimum level of attainment for each category on the rating scale.

The competence descriptions for this subject appear at the end of this chapter.

PROMOTION

Promotion at Grade 10 and Grade 11 level will be based on internal assessment only, but must be based on the same conditions as those for the Further Education and Training Certificate. The requirements, conditions, and rules of combination and condonation are spelled out in the Qualification and Assessment Policy Framework.

WHAT REPORT CARDS SHOULD LOOK LIKE

There are many ways to structure a report card, but the simpler the report card the better, providing that all-important information is included. Report cards should include information about a learner's overall progress, including the following:

- the learning achievement against outcomes;
- the learner's strengths;
- the support needed or provided where relevant;
- constructive feedback commenting on the performance in relation to the learner's previous performance and the requirements of the subject; and
- the learner's developmental progress in learning how to learn.

In addition, report cards should include the following:

- name of school;
- name of learner;
- learner's grade;
- year and term;
- space for signature of parent or guardian;
- signature of teacher and of principal;
- date;
- dates of closing and re-opening of school;
- school stamp; and
- school attendance profile of learner.

ASSESSMENT OF LEARNERS WHO EXPERIENCE BARRIERS TO LEARNING

The assessment of learners who experience any barriers to learning will be conducted in accordance with the recommended alternative and/or adaptive methods as stipulated in the *Qualifications and Assessment Policy Framework for Grades 10–12 (General)* as it relates to learners who experience barriers to learning.

COMPETENCE DESCRIPTIONS FOR CIVIL TECHNOLOGY

The competence descriptions are a reporting tool. Competence descriptions report on the learner's level of achievements, based on the Assessment Standards and the Learning Outcomes.

Grade 10

Code	Scale	Competence Descriptions
6	**Outstanding 80%–100%**	**At the end of Grade 10 the learner with Outstanding Achievement can:**
		■ Independently analyse and apply the technological process to solve a problem in a real-life situation, always using appropriate terminology and taking full cognisance of indigenous knowledge systems.
		■ Independently illustrate and comprehensively compare safety methods in the workplace and comprehensively apply basic first aid with sensitivity to health issues such as HIV/Aids.
		■ Demonstrate impressive insight into the basic knowledge, concepts and principles used in Civil Technology.
		■ Independently demonstrate the application of basic concepts, principles and practices used in Civil Technology to organise and manage activities responsibly and effectively.
		■ Describe with clear insight human rights issues and employment opportunities within the South African context.

Grade 11

Competence Descriptions

At the end of Grade 11 the learner with Outstanding Achievement can:

- Independently analyse and apply with recommendations the technological process to solve a problem in a real-life situation, always using relevant terminology and taking full cognisance of indigenous knowledge systems.
- Independently demonstrate and apply safety methods in the workplace and comprehensively apply basic first aid with sensitivity to health issues such as HIV/Aids.
- Demonstrate impressive insight into the knowledge, concepts and principles used in Civil Technology.
- Independently demonstrate the application of concepts, principles and practices used in Civil Technology to organise and manage activities responsibly and effectively.
- Describe with clear insight human rights issues and employment opportunities within the South African context, fully taking into account environmental impact.

Grade 12

Competence Descriptions

At the end of Grade 12 the learner with Outstanding Achievement can:

- Independently identify, define, analyse, interpret and apply the technological process to solve a problem in a real-life situation, with detailed explanations and recommendations, always using correct terminology and taking full cognisance of indigenous knowledge systems.
- Independently analyse and evaluate safety methods in the workplace and comprehensively apply basic first aid with sensitivity to health issues such as HIV/Aids.
- Demonstrate impressive insight into the advanced knowledge, concepts and principles used in Civil Technology.
- Independently demonstrate the application of basic concepts, principles and practices used in Civil Technology to organise and manage activities responsibly and effectively.
- Describe with clear insight human rights issues, access to employment and employment opportunities within the South African context, fully taking into account environmental impact.

Grade 10

Code	Scale	Competence Descriptions
5	**Meritorious 60%–79%**	**At the end of Grade 10 the learner with Meritorious Achievement can:**

- Comprehensively demonstrate and apply the technological process to solve a problem in a real-life situation, mostly using appropriate terminology and taking good cognisance of indigenous knowledge systems.
- Demonstrate and comprehensively compare basic safety methods in the workplace and confidently apply basic first aid with sensitivity to health issues such as HIV/Aids.
- Demonstrate good insight into the basic knowledge, concepts and principles used in Civil Technology.
- Comprehensively demonstrate the application of basic concepts, principles and practices used in Civil Technology to organise and manage activities responsibly and effectively.
- Describe with good insight human rights issues and entrepreneurship opportunities within the South African context.

Grade 11

Competence Descriptions

At the end of Grade 11 the learner with Meritorious Achievement can:

- Comprehensively demonstrate and apply the technological process to solve a problem in a real-life situation, mostly using relevant terminology and taking good cognisance of indigenous knowledge systems.
- Comprehensively demonstrate safety methods in the workplace and confidently apply basic first aid with sensitivity to health issues such as HIV/Aids.
- Demonstrate good insight into the knowledge, concepts and principles used in Civil Technology.
- Comprehensively demonstrate the application of concepts, principles and practices used in Civil Technology to organise and manage activities responsibly and effectively.
- Describe with good insight human rights issues and entrepreneurship opportunities within the South African context, mostly taking into account environmental impact.

Grade 12

Competence Descriptions

At the end of Grade 12 the learner with Meritorious Achievement can:

- Comprehensively demonstrate and apply the technological process to solve a problem in a real-life context, with detailed explanations and recommendations, mostly using correct terminology and taking good cognisance of indigenous knowledge systems.
- Comprehensively apply and compare safety methods in the workplace and confidently apply basic first aid with sensitivity to health issues such as HIV/Aids.
- Demonstrate good insight into the advanced knowledge, concepts and principles used in Civil Technology.
- Comprehensively demonstrate the application of basic concepts, principles and practices used in Civil Technology to organise and manage activities responsibly and effectively.
- Describe with good insight human rights issues and access to employment and entrepreneurship opportunities within the South African context, mostly taking into account environmental impact.

Grade 10

Code	Scale	Competence Descriptions
4	**Satisfactory 50%–59%**	**At the end of Grade 10 the learner with Satisfactory Achievement can:**

- Demonstrate and apply the technological process to solve a problem in a real-life situation, using appropriate terminology and taking cognisance of indigenous knowledge systems.
- Explain basic safety in the workplace and apply basic first aid with reference and sensitivity to health issues such as HIV/Aids.
- Demonstrate insight into the basic knowledge, concepts and principles used in Civil Technology.
- Demonstrate the application of basic concepts, principles and practices used in Civil Technology to organise and manage activities responsibly and effectively.
- Describe with reasonable insight human rights issues and entrepreneurship opportunities within the South African context.

Grade 11

Competence Descriptions

At the end of Grade 11 the learner with Satisfactory Achievement can:

- Demonstrate and apply the technological process to solve a problem in a real-life situation, using correct terminology and taking cognisance of indigenous knowledge systems.
- Explain safety in the workplace and apply basic first aid with reference and sensitivity to health issues such as HIV/Aids.
- Demonstrate insight into the knowledge, concepts and principles used in Civil Technology.
- Demonstrate the application of concepts, principles and practices used in Civil Technology to organise and manage activities responsibly and effectively.
- Describe with reasonable insight human rights issues and entrepreneurship opportunities within the South African context, taking into account some aspects of environmental impact.

Grade 12

Competence Descriptions

At the end of Grade 12 the learner with Satisfactory Achievement can:

- Demonstrate and apply the technological process to solve a problem in a real-life situation with recommendations, using correct terminology and taking cognisance of indigenous knowledge systems.
- Explain safety in the workplace and apply basic first aid with reference to health issues such as HIV/Aids.
- Demonstrate insight into the advanced knowledge, concepts and principles used in Civil Technology.
- Demonstrate the application of basic concepts, principles and practices used in Civil Technology to organise and manage activities responsibly and effectively.
- Describe with reasonable insight human rights issues and their influence on employment and entrepreneurship opportunities within the South African context, taking into account some aspects of environmental impact.

Grade 10

Code	Scale	Competence Descriptions
3	**Adequate 40%–49%**	**At the end of Grade 10 a learner with Adequate Achievement can:**

- Apply with minimal guidance the technological process to solve a problem in a real-life situation, using some appropriate terminology and taking some cognisance of indigenous knowledge systems.
- Describe with minimal guidance basic safety methods in the workplace and apply first aid with guidance with reference or sensitivity to HIV/Aids.
- Demonstrate sufficient insight into the basic knowledge, concepts and principles used in Civil Technology.
- Demonstrate with minimal guidance the application of basic concepts, principles and practices used in Civil Technology to organise and manage activities responsibly and effectively.
- Describe some aspects of human rights issues and entrepreneurship opportunities within the South African context.

Grade 11

Competence Descriptions

At the end of Grade 11 the learner with Adequate Achievement can:

- Apply with minimal guidance the technological process to solve a problem in a real-life situation, using some relevant terminology and taking some cognisance of indigenous knowledge systems.
- Describe with minimal guidance basic safety methods in the workplace and apply first-aid with guidance with reference or sensitivity to HIV/Aids.
- Demonstrate sufficient insight into the knowledge, concepts and principles used in Civil Technology.
- Demonstrate with minimal guidance the application of concepts, principles and practices used in Civil Technology to organise and manage activities responsibly and effectively.
- Describe some aspects of human rights issues and entrepreneurship opportunities within the South African context, taking account of some aspects of environmental impact.

Grade 12

Competence Descriptions

At the end of Grade 12 the learner with Adequate Achievement can:

- Apply with minimal guidance the technological process to solve a problem in a real-life situation, using some relevant terminology and taking some cognisance of indigenous knowledge systems.
- Describe with minimal guidance basic safety methods in the workplace and apply first-aid with guidance with reference or sensitivity to HIV/Aids.
- Demonstrate sufficient insight into the knowledge, concepts and principles used in Civil Technology.
- Demonstrate with minimal guidance the application of concepts, principles and practices used in Civil Technology to organise and manage activities responsibly and effectively.
- Describe some aspects of human rights issues and entrepreneurship opportunities within the South African context, taking account of some aspects of environmental impact.

Grade 10

Code	Scale	Competence Descriptions
2	**Partial 30%–39%**	**At the end of Grade 10 the learner with Partial Achievement can:**

- Apply with assistance the technological process to solve a problem in a real-life situation, using little appropriate terminology and taking limited cognisance of indigenous knowledge systems.
- Describe with assistance safety methods in the workplace and apply basic first aid with assistance but little reference or sensitivity to HIV/Aids.
- Demonstrate with assistance insight into the basic knowledge, concepts and principles used in Civil Technology.
- Demonstrate with assistance guidance the application of basic concepts, principles and practices used in Civil Technology to organise and manage activities responsibly and effectively.
- Describe with assistance human rights issues and entrepreneurship opportunities within the South African context.

Grade 11

Competence Descriptions

At the end of Grade 11 the learner with Partial Achievement can:

- Apply with assistance the technological process to solve a problem in a real-life situation, using little appropriate terminology and taking limited cognisance of indigenous knowledge systems.
- Describe with assistance safety methods in the workplace and apply basic first aid with assistance but little reference or sensitivity to HIV/Aids.
- Demonstrate with assistance insight into the basic knowledge, concepts and principles used in Civil Technology.
- Demonstrate with assistance guidance the application of basic concepts, principles and practices used in Civil Technology to organise and manage activities responsibly and effectively.
- Describe with assistance human rights issues and entrepreneurship opportunities within the South African context.

Grade 12

Competence Descriptions

At the end of Grade 12 the learner with Partial Achievement can:

- Apply with assistance the technological process to solve a problem in a real-life situation, using limited correct terminology and taking limited cognisance of indigenous knowledge systems.
- Describe with assistance safety methods in the workplace and apply basic first aid with assistance but little reference or sensitivity to HIV/Aids.
- Demonstrate with assistance insight into the advanced knowledge, concepts and principles used in Civil Technology.
- Demonstrate with assistance guidance the application of basic concepts, principles and practices used in Civil Technology to organise and manage activities responsibly and effectively.
- Describe with assistance human rights issues and their influence on employment and entrepreneurship opportunities within the South African context, hardly taking into account the environmental impact.

Grade 10

Code	Scale	Competence Descriptions
1	**Inadequate 0%–29%**	**At the end of Grade 10 the learner with Inadequate Achievement can:** ■ Apply with only a little knowledge the technological process to solve a problem in a real-life situation, using limited appropriate terminology and taking no or little cognisance of indigenous knowledge systems. ■ Describe no or only a few basic safety methods in the workplace and apply little basic first aid with no reference or sensitivity to HIV/Aids. ■ Demonstrate little insight into the basic knowledge, concepts and principles used in Civil Technology. ■ Demonstrate with little insight the application of basic concepts, principles and practices used in Civil Technology to organize and manage activities responsibly and effectively. ■ Describe with only little knowledge human rights issues and entrepreneurship opportunities within the South African context.

Grade 11

Competence Descriptions

At the end of Grade 11 the learner with Inadequate Achievement can:

- Apply with only a little knowledge the technological process to solve a problem in a real-life situation, using limited appropriate terminology and taking no or little cognisance of indigenous knowledge systems.
- Describe no or only a few basic safety methods in the workplace and apply little basic first aid with no reference or sensitivity to HIV/Aids.
- Demonstrate little insight into the basic knowledge, concepts and principles used in Civil Technology.
- Demonstrate with little insight the application of basic concepts, principles and practices used in Civil Technology to organize and manage activities responsibly and effectively.
- Describe with only little knowledge human rights issues and entrepreneurship opportunities within the South African context.

Grade 12

Competence Descriptions

At the end of Grade 12 the learner with Inadequate Achievement can:

- Apply with only a little knowledge the technological process to solve a problem in a real-life situation, using limited appropriate terminology and taking no or little cognisance of indigenous knowledge systems.
- Describe no or only a few basic safety methods in the workplace and apply little basic first aid with no reference or sensitivity to HIV/Aids.
- Demonstrate little insight into the basic knowledge, concepts and principles used in Civil Technology.
- Demonstrate with little insight the application of basic concepts, principles and practices used in Civil Technology to organize and manage activities responsibly and effectively.
- Describe with only little knowledge human rights issues and entrepreneurship opportunities within the South African context.

GLOSSARY

aesthetic – relating to beauty and attractiveness

applied – put to practical use as opposed to being theoretical

apply – to employ or to administer or to devote oneself to a task or activity

architecture – the art and science of designing constructions in the built environment

assessment – the process of determining the quality of a learner's work

assignment – a task or duty that has been selected for someone to do

Bill of Rights – a written declaration of the rights and privileges of the citizens of a country

built environment – the term, built environment, was formulated by an act of parliament (Act 43 of 2000) to describe built environment professions which include the architecture, building, civil engineering, landscape architecture, property valuers and quantity surveying professions

civil engineering – focuses on the construction of reinforced concrete structures, bridges, roads, etc., in the built environment.

cognitive skills – thinking and problem-solving skills

communicate graphically – transfer information through the medium of a drawing using a combination of lines and symbols

comparison – the process or act of comparing two or more objects or concepts

competent – having sufficient skill or training to do something

computer-based tools – computer software and hardware components

conceptual – ideas transformed into visual drawing applications

continuous assessment – constant evaluations of existing work, work in progress

control – to direct, check or verify activities; the means by which systems are regulated, an adjustment of the process which makes the actual result conform more closely to the desired result

control systems – a set of components functioning together

convention – a universally acceptable means of representing complex features clearly and simply

criteria – statements of a particular standard or requirement that a solution must satisfy

culture – the customs, ideas, values, etc. of a particular civilisation, society or social group, especially at a particular time

data – quantities, facts and figures (*e.g. population statistics, rainfall figures, temperature readings*); data may be processed into information

demonstrate – to show or prove something by reasoning or providing evidence

design (*noun*) – application of a variety of processes and knowledge of the properties of materials that are used in solving technological challenges

design (*verb*) – to use knowledge and skills, the unique characteristics or properties of materials, a variety of processes and systems to solve a challenge, need or want; to devise a plan, solution or production process

design brief – a short, concise statement that defines what has to be done

design process – a creative procedure used to solve problems and meet challenges; an organised and orderly approach of combining scientific principles, resources and existing products into a solution to a problem

dexterity skill – skill in using one's hands

discuss – to examine or consider something in speech or writing

dismantle – to take something to pieces

draw – a means of conveying information using lines, symbols and signs

elasticity – the property of a material to allow it to be stretched or elongated; ability to resume its normal shape spontaneously after contraction or distortion, springiness

electronic media – the means by which information etc. is communicated using electronic devices such as a television or computer

elements – the part of something; components or features

embed – to fix firmly in a surrounding

energy – capacity for action

engineering – the application of science to design, build and use machines, constructions, etc.

enhance – to improve or increase the value, quality or intensity of material

entrepreneur (ship) – a person who invents or identifies a useful idea and then sets up a business using that idea

entrepreneurial activity – actions by an entrepreneur with the aim to make profit and be of service in the community

environment – the physical surroundings; external conditions as affecting (nature) plant and animal life; the physical conditions on earth, especially as affected by human activity and pollution

environmental technology – the responsible application of science and the development of conservation principles during building and construction projects, the design and use of machines, chemicals and waste, etc.

envisage – to have a mental picture of

ethics – standard of moral values applied to designing and manufacturing processes

force – an influence that changes or tends to change the state of rest of a body

freehand drawing – a method of generating a drawing using only a pencil and an eraser

human rights – a person's right to humanity, equity and fairness; rights held to be treated justly

impact – a strong effect or impression

indigenous knowledge – belonging naturally to or occurring naturally in a country or area

indigenous knowledge systems – knowledge occurring naturally and belonging to a country, area or community

insight – understanding concepts that influence design or drawing

instrument drawing – a method of drawing that uses conventional drawing tools to generate drawings

integrate – to fit parts together to form a whole

interrelationship – how two or more things relate to each other

investigation – the process of a formal examination or study; to inquire intensively into or to study carefully

isometric drawing – a pictorial drawing where the height, width and depth axes are set at 120° angles to each other

joining – a process of putting materials together whether with fasteners, glues or electrical and heating processes

joint – a place at which two components are joined or two parts of an artificial structure are connected

learnership – a programme that leads to an occupational qualification

learning pathways – directions or passages of attaining knowledge through study

machine – an apparatus using or applying mechanical power, having several parts each with a definite function and together performing certain kinds of work

maintain – to cause to continue or keep up; to preserve a state of affairs

maintenance – precautionary measures, actions and processes that are taken to keep something, like a machine or engine, in functional order

manipulative skills – fine motor skills that are developed over time and with practice to produce a drawing that incorporates hand-eye co-ordination

manufacture – to make or produce something; includes product design, process, production and quality control

manufacturing process – the process of making or fabricating articles, especially in a factory; branch of industry; mechanical production

materials – physical substances (*e.g. iron, steel, alloys, metals and plastics*) used in the technological process

medical emergency – sudden state of danger or condition that needs immediate treatment or action

moments (bending) – the turning effect produced by a force acting at a distance from the support on an object; this effect expressed as the product of the force and the distance from its line of action to a point

opportunity – the chance to do something about a need or a want

orthographic projection – a system of drawing showing several views of an object (*e.g. first angle orthographic projection and third angle orthographic projection*)

polygon – a figure with many (*usually four or more*) sides and angles

positive feedback – feedback applied to a system in such a way that the feedback tends to increase the input signal causing the feedback

power – the ability to do or act; the capacity for exerting mechanical energy force applied or doing work; the rate of energy output

predict – to foretell or forecast

pressure – the exertion of continuous force of one body on or against another body

problem – a situation that leads to a need or want and that can give rise to an opportunity

process – the part of a system that combines resources to produce an output in response to input

produce – to make goods from raw materials; to bring into existence

product – the physical or tangible artefact that results from a process (*e.g. model, poster, chart*)

property – quality or attribute of something

quantity – measurement of size, weight, amount or number

safety – the way that a person works with tools, materials and equipment that causes no physical harm (*precaution*)

safety act – being safe, free from risk or danger; a decree or law made by parliament

safety regulation – being safe, free from risk or danger; being regulated

sewage – liquid waste drained away from houses, towns, factories etc. for disposal

sewerage – a system of sewers; drainage by sewers

skills – the ability to do something

socio-economic – relating to or involving both social and economic factors

solutions – act or means of solving a problem or difficulty

specification – an organised, detailed description of the requirements or criteria that the solution or product must meet (*e.g. safety, size, material, function, environment*)

strain – intensely or excessively, press to extremes; the force exerted on a body subjected to stress

stress – induced in material due to a force acting on it

system – a set of connected components or interlinked parts; a set of devices that function together as a whole to accomplish a specific goal or task

technological process – the identification, design, development and evaluation processes and products related to Civil Technology

verify – to check or confirm the truth or accuracy of something

waterborne sewage – water waste transported or drained away from houses, towns, factories, etc. for final disposal

world of work – working opportunity that is available in the world in the world.