

Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering (1712-70)

September 2018 version 1.2

Revised version for registrations from September 1st 2013



Qualification at a glance

Subject area	Engineering
City & Guilds number	1712
Age group approved	16+
Entry requirements	None
Assessment	Portfolio of evidence
Support materials	1712-70 Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering Handbook Level 3 NVQ Diploma in Mechanical Manufacturing Engineering Handbook PEO Unit pack (containing units 704-773)
Registration and certification	Consult the Walled Garden/online catalogue for last dates

In 2013 the Performing Engineering Operations (PEO) units, following a review by the SSC SEMTA, were updated for a Summer release. As a result of this City & Guilds obtained a new accreditation and qualification number for the Level 3 Extended Diploma, which contains a substantial number of the PEO units. The non-extended level 3 Diploma and level 2 qualifications were unchanged.

Title and level	GLH	TQT	City & Guilds number	Accreditation number
Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering - Machining	439	1060	1712-70	601/0081/3
Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering - CNC Machining	439	1060	1712-70	601/0081/3
Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering - Machine Tool Setting	439	1060	1712-70	601/0081/3
Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering - Fitting and Assembly	439	1060	1712-70	601/0081/3
Level 3 NVQ Extended Diploma in Mechanical	439	1060	1712-70	601/0081/3

Manufacturing Engineering - Pipe Fitting and Assembly				
Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering - Composite Manufacture Engineering	439	1060	1712-70	601/0081/3
Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering - Mechanical Overhaul and Testing	439	1060	1712-70	601/0081/3
Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering - Spring Making	439	1060	1712-70	601/0081/3
Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering - Photonics Engineering	439	1060	1712-70	601/0081/3

Version and date	Change detail	Section
1.1 August 2017	Added TQT details	Qualification at a glance, Structure
	Deleted QCF	Throughout
1.2 September 2018	Changed from a seven to nine	Unit 201 Assessment criteria 2.3



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1 Introduction

This document tells you what you need to do to deliver the qualification:

Area	Description
Who is the qualification for?	For learners who work or want to work in the mechanical manufacturing engineering sector.
What does the qualification cover?	Allow learners to learn, develop and practise the skills required for employment and/or career progression in the engineering sector.
Is the qualification part of a framework or initiative?	Serve as a competence qualification, in the Engineering Apprenticeship framework.
Who did we develop the qualification with?	It was developed in association with SEMTA, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
What opportunities for progression are there?	It allows learners to progress into employment or to the following City & Guilds qualifications: <ul style="list-style-type: none">• City & Guilds Level 4 Extended Diploma in Engineering Manufacture• City & Guilds Professional Recognition Awards.• ILM Level 4 or Level 5 Qualifications in Management• Foundation Degree or other higher education qualifications

Structure

The minimum credit required to achieve the **Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering (1712)**, is **106 credits**. However the minimum credit required can differ considerably depending on the pathway undertaken.

The Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering, pathways are:

- Machining
- CNC Machining
- Machine Tool Setting
- Fitting and Assembly
- Pipe Fitting and Assembly
- Composite Manufacture Engineering
- Mechanical Overhaul and Testing
- Spring Making
- Photonics Engineering

To achieve the Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering, learners **must** achieve the **15 credits** from the mandatory units (201-202, 303) and **must** complete the minimum requirements for the pathway they are undertaking.

Learners **must** also achieve from the Performing Engineering Operations (PEO) units either:

- a minimum of **27 credits** and **3 units** from PEO pathway A (704-761, 765-773), **or**:
- a minimum of **51 credits** must be achieved from PEO pathway B; this must be achieved from:
 - **11 credits** and **1 unit** from group B1 (704, 732, 761),
 - **16 credits** and **2 units** from group B2 (762-764) and
 - **24 credits** and **2 units** from group B3 (765-768).
- If the PEO pathway A (704-761, 765-773) is undertaken learners **must** note the following barred units:
 - Only one unit from 704, 732 and 761 may be included in the learners choice of three units.
 - If unit 765 is selected units 705, 706, 708, 711, 712, 715, 716, 717 cannot be included in the learners choice of three units.
 - If unit 766 is selected units 710, 722, 723, 725, 726, 727, 728, 729, 730, 734 cannot be included in the learners choice of three units.
 - If unit 767 is selected units 733, 735, 736, 740 cannot be included in the learners choice of three units.
 - If unit 768 is selected units 719, 721, 737, 738, 739, 740, 758, 759 cannot be included in the learners choice of three units.

Mandatory Units

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Mandatory			
A/601/5013	201	Complying with statutory regulations and organisational safety requirements	5
Y/601/5102	202	Using and interpreting engineering data and documentation	5
K/601/5055	303	Working efficiently and effectively in engineering	5

Performing Engineering Operations - Engineering Practices (Pathway A)

Learners must achieve a minimum of **27** credits from at least **3** units if they select this pathway.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value	Barred Units
Optional Group A				
F/504/6348	Unit 704	Producing Mechanical Engineering Drawings using a CAD System	11	732, 761
J/504/6349	Unit 705	Producing Components using Hand Fitting Techniques	14	765
F/504/6351	Unit 706	Producing Mechanical Assemblies	15	765
L/504/6353	Unit 707	Forming and Assembling Pipework Systems	14	
R/504/6354	Unit 708	Carrying Out Aircraft Detail Fitting Activities	14	765
L/504/6367	Unit 709	Installing Aircraft Mechanical Fasteners	11	

L/504/6370	Unit 710	Producing Aircraft Detail Assemblies	14	766
Y/504/6372	Unit 711	Preparing and Using Lathes for Turning Operations	15	765
K/504/6375	Unit 712	Preparing and Using Milling Machines	15	765
T/504/6377	Unit 713	Preparing and Using Grinding Machines	15	
F/504/6379	Unit 714	Preparing and Proving CNC Machine Tool Programs	14	
F/504/6382	Unit 715	Preparing and Using CNC Turning Machines	14	765
L/504/6384	Unit 716	Preparing and Using CNC Milling Machines	14	765
D/504/6387	Unit 717	Preparing and Using CNC Machining Centres	14	765
D/504/6390	Unit 718	Preparing and Using Industrial Robots	14	
T/504/6394	Unit 719	Maintaining Mechanical Devices and Equipment	14	768
J/504/6397	Unit 720	Assembling and Testing Fluid Power Systems	14	
F/504/6401	Unit 721	Maintaining Fluid Power Equipment	14	768
J/504/6402	Unit 722	Producing Sheet Metal Components and Assemblies	14	766
L/504/6403	Unit 723	Producing Platework Components and Assemblies	14	766

R/504/6404	Unit 724	Cutting and Shaping Materials using Thermal Cutting Equipment	14	
Y/504/6405	Unit 725	Preparing and Proving CNC Fabrication Machine Tool Programs	14	766
D/504/6406	Unit 726	Preparing and Using CNC Fabrication Machinery	14	766
K/504/6408	Unit 727	Preparing and Using Manual Metal Arc Welding Equipment	15	766
M/504/6409	Unit 728	Preparing and Using Manual TIG or Plasma-arc Welding Equipment	15	766
H/504/6410	Unit 729	Preparing and Using Semi-automatic MIG, MAG and Flux cored arc Welding Equipment	15	766
Y/504/6419	Unit 730	Preparing and Using Manual Oxy/fuel Gas Welding Equipment	14	766
L/504/6420	Unit 731	Preparing and Using Manual Flame Brazing and Braze Welding Equipment	11	
R/504/6421	Unit 732	Producing Electrical or Electronic Engineering Drawings using a CAD System	11	
Y/504/6422	Unit 733	Wiring and Testing Electrical Equipment and Circuits	14	767
D/504/6423	Unit 734	Forming and Assembling Electrical Cable Enclosure and Support Systems	13	766
H/504/6424	Unit 735	Assembling, Wiring and Testing Electrical Panels/Components Mounted in Enclosures	14	767
K/504/6425	Unit 736	Assembling and Testing Electronic Circuits	14	767
M/504/6426	Unit 737	Maintaining Electrical Equipment/Systems	15	768

T/504/6427	Unit 738	Maintaining Electronic Equipment/Systems	15	768
A/504/6428	Unit 739	Maintaining and Testing Process Instrumentation and Control Devices	15	768
F/504/6429	Unit 740	Wiring and Testing Programmable Controller Based Systems	15	767, 768
T/504/6430	Unit 741	Using Wood for Pattern, Modelmaking and Other Engineering Applications	15	
A/504/6431	Unit 742	Assembling Pattern, Model and Engineering Woodwork Components	14	
F/504/6432	Unit 743	Producing Composite Mouldings using Wet Lay-up Techniques	14	
L/504/6434	Unit 744	Producing Composite Mouldings using Pre-Preg Techniques	14	
R/504/6435	Unit 745	Producing Composite Mouldings using Resin Flow Infusion Techniques	14	
Y/504/6436	Unit 746	Producing Composite Assemblies	14	
D/504/6437	Unit 747	Producing Components by Rapid Prototyping Techniques	11	
H/504/6438	Unit 748	Producing and Preparing Sand Moulds and Cores for Casting	14	
K/504/6439	Unit 749	Producing and Preparing Molten Materials for Casting	14	
D/504/6440	Unit 750	Producing Cast Components by Manual Means	13	
H/504/6441	Unit 751	Fettling, Finishing and Checking Cast Components	11	

M/504/6443	Unit 752	Finishing Surfaces by Applying Coatings or Coverings	9	
T/504/6444	Unit 753	Finishing Surfaces by Applying Treatments	9	
A/504/6445	Unit 754	Carrying Out Heat Treatment of Engineering Materials	9	
F/504/6446	Unit 755	Carrying Out Hand Forging of Engineering Materials	9	
J/504/6447	Unit 756	Stripping and Rebuilding Motorsport Vehicles (Pre-Competition)	14	
L/504/6448	Unit 757	Inspecting a Motorsport Vehicle During a Competition	14	
R/504/6449	Unit 758	Diagnosing and Rectifying Faults on Motorsport Vehicle Systems (During Competition)	15	768
J/504/6450	Unit 759	Carrying out Maintenance Activities on Motorsport Vehicle Electrical Equipment	15	768
L/504/6451	Unit 760	Stripping and Rebuilding Motorsport Engines (Pre-Competition)	14	
R/504/6452	Unit 761	Producing CAD Models (Drawings) using a CAD System	11	704, 732
K/504/6456	Unit 765	General Machining, Fitting and Assembly Applications	12	705, 706, 708, 711, 712, 715, 716, 717
M/504/6457	Unit 766	General Fabrication and Welding Applications	12	710, 722, 723, 725, 726, 727, 728, 729, 730, 734
T/504/6458	Unit 767	General Electrical and Electronic Engineering Applications	12	733, 735, 736, 740

A/504/6459	Unit 768	General Maintenance Engineering Applications	12	719, 721, 737, 738, 739, 740, 758, 759
L/503/4056	Unit 769	Joining Public Service Vehicle Components by Mechanical Processes	11	
R/503/4057	Unit 770	Assembling Structural Sub Assemblies to Produce a Public Service Vehicle	14	
Y/503/4058	Unit 771	Fitting Sub Assemblies and Components to Public Service Vehicles	14	
R/503/7198	Unit 772	Preparing and Manoeuvring Armoured Fighting Vehicles (AFVs) for Maintenance and Transportation	14	
J/504/3404	Unit 773	Producing Composite Mouldings using Resin Film Infusion Techniques	14	

Performing Engineering Operations - Technical support (Pathway B)

Learners **must** achieve a minimum of **51** credits if they select this pathway. This **must** be achieved from **11 credits and 1 unit** from Optional group B1, **16 credits** and **2 units** from Optional group B2 and **24 credits** and **2 units** from Optional group B3.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value	Barred Units
Optional Group B1				
F/504/6348	Unit 704	Producing Mechanical Engineering Drawings using a CAD System	11	
R/504/6421	Unit 732	Producing Electrical or Electronic Engineering Drawings using a CAD System	11	

R/504/6452	Unit 761	Producing CAD Models (Drawings) using a CAD System	11
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Optional Group B2

Y/504/6453	Unit 762	Producing Engineering Project Plans	8
D/504/6454	Unit 763	Using Computer Software Packages to Assist with Engineering Activities	8
H/504/6455	Unit 764	Conducting Business Improvement Activities	8

Optional Group B3

K/504/6456	Unit 765	General Machining, Fitting and Assembly Applications	12
M/504/6457	Unit 766	General Fabrication and Welding Applications	12
T/504/6458	Unit 767	General Electrical and Electronic Engineering Applications	12
A/504/6459	Unit 768	General Maintenance Engineering Applications	12

To achieve the **Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering (Machining)**, learners **must** achieve a minimum of **111** credits and **2** units, both of which **must** come from the same **one** optional group, from the optional groups 1-13.

Learners **must** also achieve the mandatory units (201-202, 303) and one of the Performing Engineering Operations pathways.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Optional			
Group 1			
T/600/5385	Unit 304	Setting centre lathes for production	91
A/600/5386	Unit 305	Machining components using centre lathes	77
Group 2			
F/600/5387	Unit 306	Setting turret lathes for production	91
J/600/5388	Unit 307	Machining components using turret lathes	77
Group 3			
J/600/5391	Unit 308	Setting milling machines for production	91
L/600/5392	Unit 309	Machining components using milling machines	77
Group 4			
R/600/5393	Unit 310	Setting shaping, planing or slotting machines for production	78
Y/600/5394	Unit 311	Machining components using shaping, planing or slotting machines	69
Group 5			
D/600/5395	Unit 312	Setting gear cutting machines for production	91
K/600/5397	Unit 313	Machining components using gear cutting machines	77
Group 6			
M/600/5398	Unit 314	Setting gear grinding machines for production	91
D/600/5400	Unit 315	Machining components using gear grinding machines	77
Group 7			
K/600/5402	Unit 316	Setting horizontal boring machines for production	91

L/600/5411	Unit 317	Machining components using horizontal boring machines	77
Group 8			
F/600/5423	Unit 318	Setting vertical boring machines for production	91
Y/600/5430	Unit 319	Machining components using vertical boring machines	77
Group 9			
H/600/5432	Unit 320	Setting electro-discharge machines for production	91
L/600/5439	Unit 321	Machining components using electro-discharge machines	77
Group 10			
M/600/5448	Unit 322	Setting grinding machines for production	91
Y/600/5458	Unit 323	Machining components using grinding machines	77
Group 11			
L/600/5473	Unit 324	Setting honing and lapping machines for production	78
L/600/5487	Unit 325	Machining components using honing and lapping machines	33
Group 12			
L/600/5490	Unit 326	Setting broaching machines for production	78
A/600/5503	Unit 327	Machining components using broaching machines	33
Group 13			
D/600/5509	Unit 328	Setting metal spinning machines for production	78
K/600/5514	Unit 329	Producing components using metal spinning machines	77

To achieve the **Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering (CNC Machining)**, learners **must** achieve a minimum of **24** credits from the optional units in group A plus a minimum of **one** pair of units both of which **must** come from the same **one** optional group, from the optional groups B-K, to achieve a minimum of **157** credits

Learners **must** also achieve the mandatory units (201-202, 303) and one of the Performing Engineering Operations pathways.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Optional Group A			
L/600/5523	Unit 330	Loading and proving CNC machine tool programs	24
M/600/5529	Unit 331	Carrying out CNC machine tool programming	84
Optional Group B			
H/600/5561	Unit 332	Setting CNC turning machines for production	70
F/600/5566	Unit 333	Machining components using CNC turning machines	63
Optional Group C			
R/600/5572	Unit 334	Setting CNC milling machines for production	70
K/600/5576	Unit 335	Machining components using CNC milling machines	63
Optional Group D			
J/600/5584	Unit 336	Setting CNC grinding machines for production	70
R/600/5622	Unit 337	Machining components using CNC grinding machines	63
Optional Group E			
K/600/5643	Unit 338	Setting CNC punching machines for production	70
T/600/5662	Unit 339	Machining components using CNC punching machines	63
Optional Group F			
R/600/5670	Unit 340	Setting CNC laser profiling machines for production	70
H/600/5916	Unit 341	Machining components using CNC laser profiling machines	63

Optional Group G

M/600/5921	Unit 342	Setting CNC electro-discharge machines for production	70
F/600/5924	Unit 343	Machining components using CNC electro-discharge machines	63

Optional Group H

R/600/5927	Unit 344	Setting CNC vertical boring machines for production	70
Y/600/5928	Unit 345	Machining components using CNC vertical boring machines	63

Optional Group I

K/600/5951	Unit 346	Setting CNC horizontal boring machines for production	70
K/600/5965	Unit 347	Machining components using CNC horizontal boring machines	63

Optional Group J

L/600/5974	Unit 348	Setting CNC gear cutting machines for production	70
D/600/5980	Unit 349	Machining components using CNC gear cutting machines	63

Optional Group K

L/600/5991	Unit 350	Setting CNC machining centres for production	78
D/600/5994	Unit 351	Machining components using CNC machining centres	63

To achieve the **Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering (Machine Tool Setting)** learners **must** achieve **38** credits from the mandatory unit 352 and a minimum of **70** credits from the optional units available.

Learners **must** also achieve the mandatory units (201-202, 303) and one of the Performing Engineering Operations pathways.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Mandatory			
A/600/5436	Unit 352	Handing over machine tools to production operators	38
Optional			
J/600/5391	Unit 308	Setting milling machines for production	91
R/600/5393	Unit 310	Setting shaping, planing or slotting machines for production	78
D/600/5395	Unit 312	Setting gear cutting machines for production	91
M/600/5398	Unit 314	Setting gear grinding machines for production	91
H/600/5432	Unit 320	Setting electro-discharge machines for production	91
M/600/5448	Unit 322	Setting grinding machines for production	91
L/600/5473	Unit 324	Setting honing and lapping machines for production	78
L/600/5490	Unit 326	Setting broaching machines for production	78
H/600/5561	Unit 332	Setting CNC turning machines for production	70
R/600/5572	Unit 334	Setting CNC milling machines for production	70
J/600/5584	Unit 336	Setting CNC grinding machines for production	70
K/600/5643	Unit 338	Setting CNC Punching Machines for Production	70
R/600/5670	Unit 340	Setting CNC laser profiling machines for production	70
M/600/5921	Unit 342	Setting CNC electro-discharge machines for production	70
L/600/5974	Unit 348	Setting CNC gear cutting machines for production	70
L/600/5991	Unit 350	Setting CNC machining centres for production	70

Y/600/5444	Unit 353	Setting capstan and turret lathes for production	91
K/600/5450	Unit 354	Setting single-spindle automatic turning machines for production	91
T/600/5452	Unit 355	Setting multi-spindle automatic turning machines for production	77
J/600/5455	Unit 356	Setting single and multi-spindle drilling machines for production	77
Y/600/5461	Unit 357	Setting tool and cutter grinding machines for production	77
D/600/5462	Unit 358	Setting special-purpose machines for production	91
A/600/5467	Unit 359	Setting power presses for production	91

To achieve the **Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering (Fitting and Assembly)**, learners **must** achieve a minimum of **150** credits from a minimum of **3** units from the optional units available.

Learners **must** also achieve the mandatory units (201-202, 303) and one of the Performing Engineering Operations pathways.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Optional			
A/600/5470	Unit 360	Producing components using hand fitting techniques	70
J/600/5472	Unit 361	Assembling mechanical products	70
H/600/5477	Unit 362	Producing components by manual machining	70
H/600/5480	Unit 363	Fitting fluid power components to mechanical assemblies	60
F/600/5485	Unit 364	Fitting pipework systems to mechanical assemblies	60
R/600/5488	Unit 365	Fitting electrical and electronic components to mechanical assemblies	60
Y/600/5492	Unit 366	Producing power turbine combustion assemblies	70
A/600/5498	Unit 367	Producing power turbine compressor assemblies	70
F/600/5504	Unit 368	Producing turbine assemblies	70
R/600/5510	Unit 369	Producing power turbine gearbox assemblies	70
M/600/5515	Unit 370	Producing power turbine major assemblies	70
J/600/5522	Unit 371	Producing piston engine assemblies	70
H/600/5527	Unit 372	Repairing and modifying mechanical assemblies	70
L/600/5537	Unit 373	Checking that completed assemblies comply with specification	30

To achieve the **Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering (Pipe Fitting and Assembly)**, learners **must** achieve a minimum of **46** credits from optional group A and a minimum of **60** credits from a minimum of **2** units from optional group B.

Learners **must** also achieve the mandatory units (201-202, 303) and one of the Performing Engineering Operations pathways.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Optional Group A			
Y/600/5542	Unit 374	Pipe Bending and Forming by Hand Methods	46
T/600/5547	Unit 375	Pipe Bending and Forming using Bending Machines	46
Optional Group B			
L/600/5554	Unit 376	Assembling Screwed Pipework	30
D/600/5557	Unit 377	Assembling Small Bore Non-Ferrous Pipework	30
K/600/5562	Unit 378	Assembling Non-Metallic Pipework	30
J/600/5567	Unit 379	Preparing and Testing Pipework Systems	46
L/600/5571	Unit 380	Producing Socket and Flange Fillet Welded Joints in Pipe using a Manual Welding Process	86

To achieve the **Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering (Composite Manufacture)**, learners **must** achieve **2** units from 381-388 and **must** achieve a minimum of **86** credits from the optional units available in group A and a minimum of **30** credits from the optional units available in group B.

Learners **must** also achieve the mandatory units (201-202, 303) and one of the Performing Engineering Operations pathways.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Optional group A			
D/600/5574	Unit 381	Producing composite mouldings using pre-preg laminating techniques	86
T/600/5578	Unit 382	Producing composite mouldings using wet lay-up techniques	86
M/600/5580	Unit 383	Producing composite assemblies	86
Optional group B			
D/600/5574	Unit 381	Producing composite mouldings using pre-preg laminating techniques	86
T/600/5578	Unit 382	Producing composite mouldings using wet lay-up techniques	86
M/600/5580	Unit 383	Producing composite assemblies	86
F/600/5583	Unit 384	Bonding composite mouldings	30
Y/600/5587	Unit 385	Repairing composite mouldings	77
D/600/5588	Unit 386	Applying finishes to composite mouldings	46
K/600/5593	Unit 387	Trimming composite mouldings using hand tools	46
A/600/5596	Unit 388	Identifying defects in composite mouldings	30

To achieve the **Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering (Mechanical Overhaul and Testing)**, learners **must** achieve a minimum of **48** credits from a minimum of **2** units from the optional group A and a minimum of **70** credits from the optional group B.

Learners **must** also achieve the mandatory units (201-202, 303) and one of the Performing Engineering Operations pathways.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Optional group A			
T/600/5600	Unit 389	Slinging, lifting and moving equipment, components or materials for overhauling activities	24
R/600/5605	Unit 390	Dismantling mechanical equipment in preparation for overhaul	49
H/600/5611	Unit 391	Checking mechanical components for serviceability during overhauling activities	24
A/600/5615	Unit 392	Carrying out non-destructive flaw detection on components during overhauling activities	24
R/600/5619	Unit 393	Restoring mechanical components to usable condition by repair	49
D/600/5624	Unit 394	Producing replacement components for overhauling activities	49
A/600/5629	Unit 395	Checking that overhauled mechanical assemblies comply with specification	30
Optional group B			
T/600/5631	Unit 396	Overhauling industrial power turbines by module replacement	86
R/600/5636	Unit 397	Overhauling industrial power turbine compressor assemblies	86
Y/600/5640	Unit 398	Overhauling industrial power turbine combustion assemblies	86
A/600/5646	Unit 399	Overhauling turbine assemblies from industrial power turbines	86
F/600/5650	Unit 400	Overhauling piston engines	86
Y/600/5654	Unit 401	Overhauling gearbox assemblies	86

K/600/5657	Unit 402	Overhauling industrial clutch and brake assemblies	77
F/600/5468	Unit 403	Overhauling pump assemblies	77
K/600/5478	Unit 404	Overhauling valve assemblies	77
J/600/5486	Unit 405	Overhauling components of hydraulic equipment	77
D/600/5493	Unit 406	Overhauling components of pneumatic, vacuum or compressed air equipment	77
K/600/5500	Unit 407	Carrying out tests on overhauled industrial power turbines	70
D/600/5512	Unit 408	Carrying out tests on overhauled piston engines (fixed dynamometer)	70

To achieve the **Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering (Spring Making)**, learners **must** achieve a minimum of **64** credits from a minimum of **4** units from the optional units available.

Learners **must** also achieve the mandatory units (201-202, 303) and one of the Performing Engineering Operations pathways.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Optional			
F/600/5521	Unit 409	Making compression springs using hand forming methods	46
K/600/5531	Unit 410	Making torsion springs using hand forming methods	46
Y/600/5539	Unit 411	Making extension springs using hand forming methods	46
A/600/5548	Unit 412	Making spring wire forms using hand forming methods	46
D/600/5560	Unit 413	Grinding spring ends by hand	16
H/600/5575	Unit 414	Setting automatic cold wire compression spring making machines for production	46
L/600/5635	Unit 415	Setting automatic cold wire torsion spring making machines for production	46
J/600/5648	Unit 416	Setting automatic cold wire extension spring making machines for production	46
R/600/5653	Unit 417	Setting automatic spring making machines for the production of clock, power, scroll and volute springs	46
M/600/5661	Unit 418	Setting automatic cold wire forming machines to produce spring wire forms	46
D/600/5672	Unit 419	Setting automatic hot wire compression spring making machines for production	46
L/600/5683	Unit 420	Setting automatic spring end grinding machines for production	16
H/600/5687	Unit 421	Programming CNC spring making machines	84
H/600/5690	Unit 422	Setting CNC spring making machines for production	46
T/600/5693	Unit 423	Operating CNC spring making machines	30
F/600/5695	Unit 424	Setting and using a fly press for	30

spring making activities			
Y/600/5699	Unit 425	Making strip spring components using shearing machines	30
L/600/5702	Unit 426	Forming strip spring components using power rolling machines	30
Y/600/5704	Unit 427	Bending strip spring components using press brakes	30
M/600/5708	Unit 428	Forming strip spring components using power presses	30
M/600/5711	Unit 429	Drilling and finishing holes in strip spring components	16
L/600/5716	Unit 430	Using heat to assist with the bending and forming of spring components	16
D/600/5719	Unit 431	Carrying out heat treatment of springs	30
H/600/5723	Unit 432	Carrying out shot peening of springs	30
M/600/5725	Unit 433	Carrying out quality control of spring making activities	46
M/600/5739	Unit 434	Manufacturing one-off tooling for spring making activities	77
A/600/5744	Unit 435	Setting and operating CNC laser profiling machines for strip spring making	77

To achieve the **Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering (Photonics Engineering)**, learners **must** achieve a minimum of **76** credits from a minimum of **3** units from the optional units available.

Learners **must** also achieve the mandatory units (201-202, 303) and one of the Performing Engineering Operations pathways.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Optional			
J/600/5746	Unit 436	Machining infra-red/special material lenses	77
R/600/5751	Unit 437	Machining optical glass lenses	77
H/600/5754	Unit 438	Machining optical prism and flat components	77
A/600/5758	Unit 439	Setting CNC aspheric glass and diamond turning machines	78
F/600/5762	Unit 440	Machining components using CNC aspheric glass and diamond turning machines	46
Y/600/5766	Unit 441	Setting CNC optical grinding and polishing machines for production	78
D/600/5770	Unit 442	Machining components using CNC optical grinding and polishing machines	46
J/600/5813	Unit 443	Machining optical cylinders and domes	77
L/600/5814	Unit 444	Machining optical plastic components	77
R/600/5815	Unit 445	Polishing and smoothing of lens or mirror surfaces	77
Y/600/5816	Unit 446	Vacuum coating optical materials	30
D/600/5817	Unit 447	Inspecting optical components using mechanical instruments	30
K/600/5819	Unit 448	Inspecting optical components using co-ordinate measuring machines (CMM)	46
D/600/5820	Unit 449	Carrying out laser/optical metrology	46
K/600/5822	Unit 450	Terminating fibre-optic cables	30
M/600/5823	Unit 451	Building optical systems	78
F/600/5826	Unit 452	Performing laser optical system alignment	46
J/600/5827	Unit 453	Aligning and setting up holographic equipment	77

Total Qualification Time

Total Qualification Time (TQT) is the total amount of time, in hours, expected to be spent by a Learner to achieve a qualification. It includes both guided learning hours (which are listed separately) and hours spent in preparation, study and assessment.

Title and level	GLH	TQT
Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering	439	1060



2 Centre requirements

Approval

Centres currently offering the City & Guilds NVQ in Mechanical Manufacturing Engineering (1712) will be automatically approved to run this new qualification.

To offer this qualification new centres will need to gain both centre and qualification approval. Please refer to the Centre Manual - Supporting Customer Excellence for further information.

Centre staff should familiarise themselves with the structure, content and assessment requirements of the qualification before designing a course programme.

Resource requirements

Centre staffing

Staff delivering this qualification must be able to demonstrate that they meet the following occupational expertise requirements. They should:

- be occupationally competent or technically knowledgeable in the areas for which they are delivering training and/or have experience of providing training; this knowledge must be to the same level as the training being delivered
- have recent relevant experience in the specific area they will be assessing
- have credible experience of providing training.

Centre staff may undertake more than one role, e.g. tutor and assessor or internal verifier, but cannot internally verify their own assessments.

Assessors and internal verifier

Assessor Requirements to Demonstrate Effective Assessment Practice

Assessment must be carried out by competent Assessors that as a minimum must hold the Level 3 Award in Assessing Competence in the Work Environment. Current and operational assessors that hold units D32 and/or D33 or A1 and/or A2 as appropriate for the assessment requirements set out in this Unit Assessment Strategy. However, they will be expected to regularly review their skills, knowledge and understanding and where applicable undertake continuing professional development to ensure that they are carrying out workplace assessment to the most up to date National Occupational Standards (NOS).

Assessor Technical Requirements

Assessors must be able to demonstrate that they have verifiable, relevant and sufficient technical competence to evaluate and judge performance

and knowledge evidence requirements as set out in the relevant unit learning outcomes and associated assessment criteria.

This will be demonstrated either by holding a relevant technical qualification or by proven industrial experience of the technical areas to be assessed. The assessor's competence must, at the very least, be at the same level as that required of the learner(s) in the units being assessed.

Assessors must also be fully conversant with the Awarding Organisation's assessment recording documentation used for the NVQ units against which the assessments and verification are to be carried out, other relevant documentation and system and procedures to support the QA process.

Verifier Requirements (internal and external)

Internal quality assurance (**Internal Verification**) must be carried out by competent Verifiers that as a minimum must hold the Level 4 Award in the Internal Quality Assurance of Assessment Processes and Practices. Current and operational Internal Verifiers that hold internal verification units V1 or D34 will not be required to achieve the Level 4 Award as they are still appropriate for the verification requirements set out in this Unit Assessment Strategy. Verifiers must be familiar with, and preferably hold, either the nationally recognised Assessor units D32 and/or D33 or A1 and/or A2 or the Level 3 Award in Assessing Competence in the Work Environment.

External quality assurance (**External Verification**) must be carried out by competent External Verifiers that as a minimum must hold the Level 4 Award in the External Quality Assurance of Assessment Processes and Practices. Current and operational External Verifiers that hold external verification units V2 or D35 will not be required to achieve the Level 4 Award as they are still appropriate for the verification requirements set out in this Unit Assessment Strategy. Verifiers must be familiar with, and preferably hold, either the nationally recognised Assessor units D32 and/or D33 or A1 and/or A2 or the Level 3 Award in Assessing Competence in the Work Environment.

External and Internal Verifiers will be expected to regularly review their skills, knowledge and understanding and where applicable undertake continuing professional development to ensure that they are carrying out workplace Quality Assurance (verification) of Assessment Processes and Practices to the most up to date National Occupational Standards (NOS) Verifiers, both Internal and External, will also be expected to be fully conversant with the terminology used in the NVQ units against which the assessments and verification are to be carried out, the appropriate Regulatory Body's systems and procedures and the relevant Awarding Organisation's documentation.

Continuing Professional Development (CPD)

Centres must support their staff to ensure that they have current knowledge of the occupational area, that delivery, mentoring, training, assessment and verification is in line with best practice, and that it takes account of any national or legislative developments.

Candidate entry requirements

City & Guilds does not set entry requirements for this qualification. However, centres must ensure that candidates have the potential and opportunity to gain the qualification successfully so should have the opportunity to gather work based evidence.

The SEMTA Engineering Manufacture apprenticeship framework suggests that employers would be interested in candidates that:

- Are keen and motivated to work in an engineering environment
- Are willing to undertake a course of training both on-the-job and off-the-job and apply this learning in the workplace
- Have previous work experience or employment in the sector
- Have completed a 14 to 19 Diploma in Engineering or Manufacturing
- Have completed a Young Apprenticeship in Engineering or other related area
- Have GCSEs in English, Maths and Science
- Have completed tests in basic numeracy, literacy and communication skills and have spatial awareness.

As a guide, the Engineering Manufacturing framework is suitable for applicants who have five GCSEs grades D to E in English, Maths and Science. The selection process on behalf of employers may include initial assessment where applicants will be asked if they have any qualifications or experience that can be accredited against the requirements of the apprenticeship. They may also be required to take tests in basic numeracy and literacy, communications skills and spatial awareness. There may also be an interview to ensure applicants have selected the right occupational sector and are motivated to become an apprentice, as undertaking an apprenticeship is a major commitment for both the individual and the employer.

Assessment Environment (extract from SEMTA Unit Assessment Strategy 1 January 2011)

The evidence put forward for this qualification can only be regarded valid, reliable, sufficient and authentic if achieved and obtained in the working environment and be clearly attributable to the learner. However, in certain circumstances, simulation/replication of work activities may be acceptable.

The use of high quality, realistic simulations/replication, which impose pressures which are consistent with workplace expectations, should only be used in relation to the assessment of the following:

- rare or dangerous occurrences, such as those associated with health, safety and the environment issues, emergency scenarios and rare operations at work
- the response to faults and problems for which no opportunity has presented for the use of naturally occurring workplace evidence of learners competence
- aspects of working relationships and communications for which no opportunity has presented for the use of naturally occurring workplace evidence of learners competence.

Simulations/replications will require prior approval from centres City & Guilds external verifier/qualification consultant and should be designed in relation to the following parameters:

- the environment in which simulations take place must be designed to match the characteristics of the working environment
- competencies achieved via simulation/replication must be transferable to the working environment
- simulations which are designed to assess competence in dealing with emergencies, accidents and incidents must be verified as complying with relevant health, safety and environmental legislation by a competent health and safety/environmental control officer before being used
- simulated activities should place learners under the same pressures of time, access to resources and access to information as would be expected if the activity was real
- simulated activities should require learners to demonstrate their competence using plant and/or equipment used in the working environment
- simulated activities which require interaction with colleagues and contacts should require the learner to use the communication media that would be expected at the workplace
- for health and safety reason simulations need not involve the use of genuine substances/materials. Any simulations which require the learner to handle or otherwise deal with materials substances/should ensure that the substitute takes the same form as in the workplace.

Age restrictions

City & Guilds cannot accept any registrations for candidates under 16 as this qualification is not approved for under 16s.

Legal restrictions apply to candidates under the age of 18 working unsupervised with children. Centres and candidates should be fully aware of minimum age requirements in their home nation and any implications for completing assessments.



3 Delivering the qualification

Initial assessment and induction

An initial assessment of each candidate should be made before the start of their programme to identify:

- if the candidate has any specific training needs
- support and guidance they may need when working towards their qualifications
- any units they have already completed, or credit they have accumulated which is relevant to the qualifications
- the appropriate type and level of qualification.

We recommend that centres provide an induction programme so the candidate fully understands the requirements of the qualifications, their responsibilities as a candidate, and the responsibilities of the centre. This information can be recorded on a learning contract.

Recommended delivery strategies

Centre staff should familiarise themselves with the structure, content and assessment requirements of the qualifications before designing a course programme.

Centres may design course programmes of study in any way which:

- best meets the needs and capabilities of their candidates
- satisfies the requirements of the qualifications.

When designing and delivering the course programme, centres might wish to incorporate other teaching and learning that is not assessed as part of the qualifications. This might include the following:

- literacy, language and/or numeracy
- personal learning and thinking
- personal and social development
- employability

Where applicable, this could involve enabling the candidate to access relevant qualifications covering these skills.

Recording documents

Candidates and centres may decide to use a paper-based or electronic method of recording evidence.

City & Guilds endorses several ePortfolio systems, including our own, Learning Assistant, an easy-to-use and secure online tool to support and evidence learners' progress towards achieving qualifications. Further details are available at: www.cityandguilds.com/eportfolios.

City & Guilds has developed a set of *Recording forms* including examples of completed forms, for new and existing centres to use as appropriate.

Recording forms are available on the City & Guilds website.

Although new centres are expected to use these forms, centres may devise or customise alternative forms, which must be approved for use by the external verifier, before they are used by candidates and assessors at the centre.

Amendable (MS Word) versions of the forms are available on the City & Guilds website.



4 Assessment

Assessment of the qualification

Candidates must have a completed portfolio of evidence for each unit chosen.

Evidence requirements

Carrying Out Assessments

The NVQ units were specifically developed to cover a wide range of activities. The evidence produced for the units will, therefore, depend on the learners choice of “bulleted items” listed in the unit assessment criteria.

Where the assessment criteria gives a choice of bulleted items (for example ‘any three from five’), assessors should note that learners do not need to provide evidence of the other items to complete the unit (in this example, two) items, particularly where these additional items may relate to other activities or methods that are not part of the learners normal workplace activity or area of expertise.

Minimum Performance Evidence Requirements

Performance evidence must be the main form of evidence gathered. In order to demonstrate consistent, competent performance for a unit, a minimum of 3 different examples of performance must be provided, and must be sufficient to show that the assessment criteria have been achieved to the prescribed standards. It is possible that some of the bulleted items in the assessment criteria may be covered more than once. The assessor and learner need to devise an assessment plan to ensure that performance evidence is sufficient to cover all the specified assessment criteria and which maximises the opportunities to gather evidence. Where applicable, performance evidence may be used for more than one unit.

The most effective way of assessing competence, is through direct observation of the learner. Assessors must make sure that the evidence provided reflects the learner’s competence and not just the achievement of a training programme.

Evidence that has been produced from team activities, for example, maintenance or installation activities is only valid when it clearly relates to the learners specific and individual contribution to the activity, and not to the general outcome(s).

Each example of performance evidence will often contain features that apply to more than one unit, and can be used as evidence in any unit where appropriate.

Performance evidence must be a combination of:

- outputs of the learner's work, such as items that have been manufactured, installed, maintained, designed, planned or quality assured, and documents produced as part of a work activity
- evidence of the way the learner carried out the activities such as witness testimonies, assessor observations or authenticated learner reports, records or photographs of the work/activity carried out, etc.

Competent performance is more than just carrying out a series of individual set tasks. Many of the units contain statements that require the learner to provide evidence that proves they are capable of combining the various features and techniques. Where this is the case, separate fragments of evidence would not provide this combination of features and techniques and will not, therefore, be acceptable as demonstrating competent performance.

If there is any doubt as to what constitutes valid, authentic and reliable evidence, the internal and/or external verifier (qualifications consultant) should be consulted.

Assessing knowledge and understanding

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

Knowledge and understanding can be demonstrated in a number of different ways. Semta (the Sector Skills Council) expects oral questioning and practical demonstrations to be used, as these are considered the most appropriate for these units. Assessors should ask enough questions to make sure that the learner has an appropriate level of knowledge and understanding, as required by the unit.

Evidence of knowledge and understanding will **not** be required for those bulleted items in the assessment criteria that have not been selected by the learner.

The achievement of the specific knowledge and understanding requirements of the units cannot simply be inferred by the results of tests or assignments from other units, qualifications or training programmes. Where evidence is submitted from these sources, the assessor must, as with any assessment, make sure the evidence is valid, reliable, authentic, directly attributable to the learner, and meets the full knowledge and understanding requirements of the unit. Where oral questioning is used the assessor must retain a record of the questions asked, together with the learner's answers.

Witness testimony

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

For example, the observation may be carried out against the assessment criteria by someone else that is in close contact with the learner. This could be a team leader, supervisor, mentor or line manager who may be

regarded as a suitable witness to the learners' competency. However, the witness must be technically competent in the process or skills that they are providing testimony for, to at least the same level of expertise as that required of the learner. It will be the responsibility of the assessor to make sure that any witness testimonies accepted as evidence of the learner's competency are reliable, auditable and technically valid.

Recognition of Prior Learning (RPL)

Recognition of prior learning means using a person's previous experience or qualifications which have already been achieved to contribute to a new qualification. RPL is allowed and is also sector specific.



5 Units

Availability of units

Availability of units

This handbook contains the mandatory units that are specific to this qualification and all of its pathways; 201-202, 303.

To obtain the unit pack containing units 704-773, which are taken from the City & Guilds 7682 Level 2 NVQ Diploma in Performing Engineering Operations, visit **www.cityandguilds.com** and the 1712 qualification webpage.

To obtain the Level 3 NVQ Diploma in Mechanical Manufacturing Engineering Handbook containing the qualification specific units visit **www.cityandguilds.com** and the 1712 qualification webpage.

Structure of units

These units each have the following:

- City & Guilds unit number
- Title
- Unit Accreditation Number (UAN)
- Level
- Credit value
- Recommended Guided Learning Hours (GLH)
- Relationship to National Occupational Standards (NOS), other qualifications and frameworks
- Endorsement by a sector or other appropriate body
- Unit aim(s)
- Learning outcomes which are comprised of a number of assessment criteria.

Unit 201

Complying with statutory regulations and organisational safety requirements

UAN:	A/601/5013
Level:	Level 2
Credit value:	5
GLH:	35
Relationship to NOS:	This unit has been derived from national occupational standard: Complying with statutory regulations and organisational safety requirements (Suite 2).
Endorsement by a sector or regulatory body:	This unit is endorsed by SEMTA.
Aim:	<p>This unit covers the skills and knowledge needed to prove the competences required to deal with statutory regulations and organisational safety requirements. It does not deal with specific safety regulations or detailed requirements, it does, however, cover the more general health and safety requirements that apply to working in an industrial environment.</p>

The learner will be expected to comply with all relevant regulations that apply to their area of work, as well as their general responsibilities as defined in the Health and Safety at Work Act. The learner will need to be able to identify the relevant qualified first aiders and know the location of the first aid facilities. The learner will have a knowledge and understanding of the procedures to be adopted in the case of accidents involving injury and in situations where there are dangerous occurrences or hazardous malfunctions of equipment, processes or machinery. The learner will also need to be fully conversant with their organisation's procedures for fire alerts and the evacuation of premises.

The learner will also be required to identify the hazards and risks that are associated with their job. Typically, these will focus on their working environment, the tools and

equipment that they use, the materials and substances that they use, any working practices that do not follow laid-down procedures, and manual lifting and carrying techniques.

The learner's responsibilities will require them to comply with all relevant statutory and organisational policy and procedures for health and safety in the workplace. The learner must act in a responsible and safe manner at all times, and present themselves in the workplace suitably prepared for the activities to be undertaken. The learner will be expected to report any problems with health and safety issues, to the relevant authority.

The learner's knowledge will provide a good understanding of the relevant statutory regulations and organisational requirements associated with their work, and will provide an informed approach to the procedures used. The learner will need to understand their organisation's health and safety requirements and their application, in adequate depth to provide a sound basis for carrying out their activities in a safe and competent manner.

Learning outcome
The learner will: 1. comply with statutory regulations and organisational safety requirements
Assessment criteria
The learner can: 1.1 comply with their duties and obligations as defined in the health and safety at work act 1.2 demonstrate their understanding of their duties and obligations to health and safety by: a. applying in principle their duties and responsibilities as an individual under the Health and Safety at Work Act b. identifying, within their organisation, appropriate sources of information and guidance on health and safety issues, such as: i. eye protection and Personal Protective Equipment (PPE) ii. COSHH regulations iii. Risk assessments 1.3 identifying the warning signs and labels of the main groups of hazardous or dangerous substances 1.4 complying with the appropriate statutory regulations at all times 1.5 present themselves in the workplace suitably prepared for the activities to be undertaken 1.6 follow organisational accident and emergency procedures

- 1.7 comply with emergency requirements, to include:
 - a. identifying the appropriate qualified first aiders and the location of first aid facilities
 - b. identifying the procedures to be followed in the event of injury to themselves or others
 - c. following organisational procedures in the event of fire and the evacuation of premises
 - d. identifying the procedures to be followed in the event of dangerous occurrences or hazardous malfunctions of equipment
- 1.8 recognise and control hazards in the workplace
- 1.9 identify the hazards and risks that are associated with the following:
 - a. their working environment
 - b. the equipment that they use
 - c. materials and substances (where appropriate) that they use
 - d. working practices that do not follow laid-down procedures
- 1.10 use correct manual lifting and carrying techniques
- 1.11 demonstrate one of the following methods of manual lifting and carrying:
 - a. lifting alone
 - b. with assistance of others
 - c. with mechanical assistance
- 1.12 apply safe working practices and procedures to include:
 - a. maintaining a tidy workplace, with exits and gangways free from obstruction
 - b. using equipment safely and only for the purpose intended
 - c. observing organisational safety rules, signs and hazard warnings
 - d. taking measures to protect others from any harm resulting from the work that they are carrying out

Learning outcome
The learner will: 2. know how to comply with statutory regulations and organisational safety requirements
Assessment criteria
The learner can: 2.1 describe the roles and responsibilities of themselves and others under the health and safety at work act, and other current legislation (such as the management of health and safety at work regulations, workplace health and safety and welfare regulations, personal protective equipment at work regulations, manual handling operations regulations, provision and use of work equipment regulations, display screen at work regulations, reporting of injuries, diseases and dangerous occurrences regulations) 2.2 describe the specific regulations and safe working practices and procedures that apply to their work activities 2.3 describe the warning signs for the nine main groups of hazardous substances defined by classification, packaging and labelling of dangerous substances regulations 2.4 explain how to locate relevant health and safety information for

- their tasks, and the sources of expert assistance when help is needed
- 2.5 explain what constitutes a hazard in the workplace (such as moving parts of machinery, electricity, slippery and uneven surfaces, poorly placed equipment, dust and fumes, handling and transporting, contaminants and irritants, material ejection, fire, working at height, environment, pressure/stored energy systems, volatile, flammable or toxic materials, unshielded processes, working in confined spaces)
 - 2.6 describe their responsibilities for identifying and dealing with hazards and reducing risks in the workplace
 - 2.7 describe the risks associated with their working environment (such as the tools, materials and equipment that they use, spillages of oil, chemicals and other substances, not reporting accidental breakages of tools or equipment and not following laid-down working practices and procedures)
 - 2.8 describe the processes and procedures that are used to identify and rate the level of risk (such as safety inspections, the use of hazard checklists, carrying out risk assessments, coshh assessments)
 - 2.9 describe the first aid facilities that exist within their work area and within the organisation in general; the procedures to be followed in the case of accidents involving injury
 - 2.10 explain what constitute dangerous occurrences and hazardous malfunctions, and why these must be reported even if no-one is injured
 - 2.11 describe the procedures for sounding the emergency alarms, evacuation procedures and escape routes to be used, and the need to report their presence at the appropriate assembly point
 - 2.12 describe the organisational policy with regard to fire fighting procedures; the common causes of fire and what they can do to help prevent them
 - 2.13 describe the protective clothing and equipment that is available for their areas of activity
 - 2.14 explain how to safely lift and carry loads, and the manual and mechanical aids available
 - 2.15 explain how to prepare and maintain safe working areas; the standards and procedures to ensure good housekeeping
 - 2.16 describe the importance of safe storage of tools, equipment, materials and products
 - 2.17 describe the extent of their own authority, and to whom they should report in the event of problems that they cannot resolve

Unit 202

Using and interpreting engineering data and documentation

UAN:	Y/601/5102
Level:	Level 2
Credit value:	5
GLH:	25
Relationship to NOS:	This unit has been derived from national occupational standard: Using and interpreting engineering data and documentation (Suite 2).
Endorsement by a sector or regulatory body:	This unit is endorsed by SEMTA.
Aim:	<p>This unit covers the skills and knowledge needed to prove the competences required to make effective use of text, numeric and graphical information, by interpreting and using technical information extracted from documents such as engineering drawings, technical manuals, reference tables, specifications, technical sales/marketing documentation, charts or electronic displays, in accordance with approved procedures. The learner will be required to extract the necessary information from the various documents, in order to establish and carry out the work requirements, and to make valid decisions about the work activities based on the information extracted.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for obtaining and using the documentation applicable to the activity. They will be expected to report any problems with the use and interpretation of the documents that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions if necessary, with an appropriate level of supervision or as a member of a team, and take personal responsibility for their own actions and for the quality and accuracy of</p>

the work that they carry out.

The learner's underpinning knowledge will provide a good understanding of the types of documentation used, and will provide an informed approach to applying instructions and procedures. They will be able to read and interpret the documentation used and will know about the conventions, symbols and abbreviations, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learning outcome
The learner will: 1. use and interpret engineering data and documentation
Assessment criteria
The learner can: 1.1 use the approved source to obtain the required data and documentation 1.2 use the data and documentation and carry out all of the following: a. check the currency and validity of the data and documentation used b. exercise care and control over the documents at all times c. correctly extract all necessary data in order to carry out the required tasks d. seek out additional information where there are gaps or deficiencies in the information obtained e. deal with or report any problems found with the data and documentation f. make valid decisions based on the evaluation of the engineering information extracted from the documents g. return all documents to the approved location on completion of the work h. complete all necessary work related documentation such as production documentation, installation documentation, maintenance documentation, planning documentation 1.3 correctly identify, interpret and extract the required information 1.4 extract information that includes three of the following: a. materials or components required b. dimensions c. tolerances d. build quality e. installation requirements f. customer requirements g. time scales h. financial information i. operating parameters j. surface texture requirements k. location/orientation of parts l. process or treatments required

- m. dismantling/assembly sequence
 - n. inspection/testing requirements
 - o. number/volumes required
 - p. repair/service methods
 - q. method of manufacture
 - r. weld type and size
 - s. operations required
 - t. connections to be made
 - u. surface finish required
 - v. shape or profiles
 - w. fault finding procedures
 - x. safety/risk factors
 - y. environmental controls
 - z. specific data (such as component data, maintenance data, electrical data, fluid data)
 - aa. resources (such as tools, equipment, personnel)
 - bb. utility supply details (such as electricity, water, gas, air)
 - cc. location of services, including standby and emergency backup systems
 - dd. circuit characteristics (such as pressure, flow, current, voltage, speed)
 - ee. protective arrangements and equipment (such as containment, environmental controls, warning and evacuation systems and equipment)
 - ff. other specific related information
- 1.5 use the information obtained to ensure that work output meets the specification
- 1.6 use information extracted from documents to include one from the following:
- a. drawings (such as component drawings, assembly drawings, modification drawings, repair drawings, welding/fabrication drawings, distribution and installation drawings)
 - b. diagrams (such as schematic, fluid power diagrams, piping, wiring/circuit diagrams)
 - c. manufacturers manuals/drawings
 - d. approved sketches
 - e. technical illustrations
 - f. photographic representations
 - g. visual display screen information
 - h. technical sales/marketing documentation
 - i. contractual documentation
 - j. other specific drawings/documents
- 1.7 use information extracted from related documentation, to include two from the following:
- a. instructions (such as job instructions, drawing instructions, manufacturers instructions)
 - b. specifications (such as material, finish, process, contractual, calibration)
 - c. reference materials (such as manuals, tables, charts, guides, notes)
 - d. schedules
 - e. operation sheets

<ul style="list-style-type: none"> f. service/test information g. planning documentation h. quality control documents i. company specific technical instructions j. national, international and organisational standards k. health and safety standards relating to the activity (such as COSHH) l. other specific related documentation <p>1.8 deal promptly and effectively with any problems within their control and report those which cannot be solved</p> <p>1.9 report any inaccuracies or discrepancies in documentation and specifications</p>

Learning outcome
The learner will: 2. know how to use and interpret engineering data and documentation
Assessment criteria
The learner can: 2.1 explain what information sources are used for the data and documentation that they use in their work activities 2.2 explain how documents are obtained, and how to check that they are current and valid 2.3 explain the basic principles of confidentiality (including what information should be available and to whom) 2.4 describe the different ways/formats that data and documentation can be presented (such as drawings, job instructions product data sheets, manufacturers' manuals, financial spreadsheets, production schedules, inspection and calibration requirements, customer information) 2.5 explain how to use other sources of information to support the data (such as electronic component pin configuration specifications, reference charts, standards, bend allowances required for material thickness, electrical conditions required for specific welding rods, mixing ratios for bonding and finishing materials, metal specifications and inspection requirements, health and safety documentation) 2.6 describe the importance of differentiating fact from opinion when reviewing data and documentation 2.7 describe the importance of analysing all available data and documentation before decisions are made 2.8 describe the different ways of storing and organising data and documentation to ensure easy access 2.9 describe the procedures for reporting discrepancies in the data or documentation, and for reporting lost or damaged documents 2.10 describe the importance of keeping all data and documentation up to date during the work activity, and the implications of this not being done 2.11 explain the care and control procedures for the documents, and how damage or graffiti on documents can lead to scrapped work 2.12 explain the importance of returning documents to the designated location on completion of the work activities 2.13 explain what basic drawing conventions are used and why there

needs to be different types of drawings (such as isometric and orthographic, first and third angle, assembly drawings, circuit and wiring diagrams, block and schematic diagrams)

- 2.14 explain what types of documentation are used and how they interrelate (such as production drawings, assembly drawings, circuit and wiring diagrams, block and schematic diagrams)
- 2.15 explain the imperial and metric systems of measurement; tolerancing and fixed reference points
- 2.16 describe the meaning of the different symbols and abbreviations found on the documents that they use (such as surface finish, electronic components, weld symbols, linear and geometric tolerances, pressure and flow characteristics)
- 2.17 describe the extent of their own responsibility, when to act on their own initiative to find, clarify and evaluate information, and to whom they should report if they have problems that they cannot resolve

Unit 303

Working efficiently and effectively in engineering

UAN:	K/601/5055
Level:	Level 3
Credit value:	5
GLH:	25
Relationship to NOS:	This unit has been derived from national occupational standard: Working efficiently and effectively in engineering (Suite 3).
Endorsement by a sector or regulatory body:	This unit is endorsed by SEMTA.
Aim:	<p>This unit covers the skills and knowledge needed to prove the competences required to work efficiently and effectively in the workplace, in accordance with approved procedures and practices. Prior to undertaking the engineering activity, the learner will be required to carry out all necessary preparations within the scope of their responsibility. This may include preparing the work area and ensuring that it is in a safe condition to carry out the intended activities, ensuring they have the appropriate job specifications and instructions and that any tools, equipment, materials and other resources required are available and in a safe and usable condition.</p> <p>On completion of the engineering activity, the learner will be required to return their immediate work area to an acceptable condition before recommencing further work requirements. This may involve placing completed work in the correct location, returning and/or storing any tools and equipment in the correct area, identifying any waste and/or scrapped materials and arranging for their disposal, and reporting any defects or damage to tools and equipment used.</p> <p>In order to be efficient and effective in the workplace, the learner will also be required to demonstrate that they can create and maintain effective working relationships with colleagues and line management. The</p>

learner will also be expected to review objectives and targets for their personal development and make recommendations to, and communicate any opportunities for, improvements that could be made to working practices and procedures.

The learner's responsibilities will require them to comply with organisational policy and procedures for the engineering activities undertaken, and to report any problems with the activities, or the tools and equipment that are used that they cannot personally resolve, or are outside their permitted authority, to the relevant people. The learner will be expected to take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

The learner's knowledge will provide a good understanding of their work, and will provide an informed approach to working efficiently and effectively in an engineering environment. The learner will understand the need to work efficiently and effectively, and will know about the areas they need to consider when preparing and tidying up the work area, how to contribute to improvements, deal with problems, maintain effective working relationships and agree their development objectives and targets, in adequate depth to provide a sound basis for carrying out the activities safely and correctly.

The learner will understand the safety precautions required when carrying out engineering activities. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Learning outcome
The learner will: 1. work efficiently and effectively in engineering
Assessment criteria
The learner can: 1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 prepare the work area to carry out the engineering activity 1.3 prepare to carry out the engineering activity, taking into consideration all of the following, as applicable to the work to be

undertaken:

- a. the work area is free from hazards and is suitably prepared for the activities to be undertaken
 - b. any required safety procedures are implemented
 - c. any necessary personal protection equipment is obtained and is in a usable condition
 - d. tools and equipment required are obtained and checked that they are in a safe and useable condition
 - e. all necessary drawings, specifications and associated documentation is obtained
 - f. job instructions are obtained and understood
 - g. the correct materials or components are obtained
 - h. storage arrangements for work are appropriate
 - i. appropriate authorisation to carry out the work is obtained
- 1.4 check that there are sufficient supplies of materials and/or consumables and that they meet work requirements
- 1.5 ensure that completed products or resources are stored in the appropriate location on completion of the activities
- 1.6 complete work activities, to include all of the following:
- a. completing all necessary documentation accurately and legibly
 - b. returning tools and equipment
 - c. returning drawings and work instructions
 - d. identifying, where appropriate, any unusable tools, equipment or components
 - e. arranging for disposal of waste materials
- 1.7 tidy up the work area on completion of the engineering activity
- 1.8 deal promptly and effectively with problems within their control and report those that cannot be resolved
- 1.9 deal with problems affecting the engineering process, to include two of the following:
- a. materials
 - b. tools and equipment
 - c. drawings
 - d. job specification
 - e. quality
 - f. people
 - g. timescales
 - h. safety
 - i. activities or procedures
- 1.10 contribute to and communicate opportunities for improvement to working practices and procedures
- 1.11 make recommendations for improving to two of the following:
- a. working practices
 - b. working methods
 - c. quality
 - d. safety
 - e. tools and equipment
 - f. supplier relationships
 - g. internal communication
 - h. customer service

	<ul style="list-style-type: none"> i. training and development j. teamwork k. other
1.12	<p>maintain effective working relationships with colleagues to include two of the following:</p> <ul style="list-style-type: none"> a. colleagues within own working group b. colleagues outside normal working group c. line management d. external contacts
1.13	<p>review personal training and development as appropriate to the job role</p>
1.14	<p>review personal development objectives and targets to include one of the following:</p> <ul style="list-style-type: none"> a. dual or multi-skilling b. training on new equipment / technology c. increased responsibility d. understanding of company working practices, procedures, plans and policies e. other specific requirements

Learning outcome	
The learner will:	
2. know how to work efficiently and effectively in engineering	
Assessment criteria	
The learner can:	
2.1	describe the safe working practices and procedures to be followed whilst preparing and tidying up their work area
2.2	describe the correct use of any equipment used to protect the health and safety of themselves and their colleagues
2.3	describe the procedure for ensuring that all documentation relating to the work being carried out is available and current, prior to starting the activity
2.4	describe the action that should be taken if documentation received is incomplete and/or incorrect
2.5	describe the procedure for ensuring that all tools and equipment are available prior to undertaking the activity
2.6	describe the checks to be carried out to ensure that tools and equipment are in full working order, prior to undertaking the activity
2.7	describe the action that should be taken if tools and equipment are not in full working order
2.8	describe the checks to be carried out to ensure that all materials required are correct and complete, prior to undertaking the activity
2.9	describe the action that should be taken if materials do not meet the requirements of the activity
2.10	explain whom to inform when the work activity has been completed
2.11	describe the information and/or documentation required to confirm that the activity has been completed
2.12	explain what materials, equipment and tools can be reused
2.13	explain how any waste materials and/or products are transferred, stored and disposed of

- 2.14 explain where tools and equipment should be stored and located
- 2.15 describe the importance of making recommendations for improving working practices
- 2.16 describe the procedure and format for making suggestions for improvements
- 2.17 describe the benefits to organisations if improvements can be identified
- 2.18 describe the importance of maintaining effective working relationships within the workplace
- 2.19 describe the procedures to deal with and report any problems that can affect working relationships
- 2.20 describe the difficulties that can occur in working relationships
- 2.21 describe the regulations that affect how they should be treated at work (such as equal opportunities act, race and sex discrimination, working time directive)
- 2.22 describe the benefits of continuous personal development
- 2.23 describe the training opportunities that are available in the workplace
- 2.24 describe the importance of reviewing their training and development
- 2.25 explain with whom to discuss training and development issues
- 2.26 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve



Appendix 1 Relationships to other qualifications

Links to other qualifications

Mapping is provided as guidance and suggests areas of commonality between the qualifications. It does not imply that candidates completing units in one qualification have automatically covered all of the content of another.

Centres are responsible for checking the different requirements of all qualifications they are delivering and ensuring that candidates meet requirements of all units/qualifications.

This qualification has connections to the:

- Level 2 NVQ in Performing Engineering Operations (7682)
- Level 2 NVQ Diploma in Mechanical Manufacturing Engineering (1712)
- Level 3 NVQ Diploma in Mechanical Manufacturing Engineering (1712)
- Level 3 NVQ Extended Diploma in Fabrication and Welding Engineering (1782)
- Level 3 NVQ Extended Diploma in Engineering Technical Support (1786)
- Level 3 NVQ Extended Diploma in Engineering Maintenance (1788)
- Level 3 NVQ Extended Diploma in Aeronautical Engineering (1789)

Literacy, language, numeracy and ICT skills development

This qualification can develop skills that can be used in the following qualifications:

- Functional Skills (England) – see www.cityandguilds.com/functionalskills
- Essential Skills (Northern Ireland) – see www.cityandguilds.com/essentialskillsni
- Essential Skills Wales – see www.cityandguilds.com/esw



Appendix 2 Sources of general information

The following documents contain essential information for centres delivering City & Guilds qualifications. They should be referred to in conjunction with this handbook. To download the documents and to find other useful documents, go to the **Centres and Training Providers homepage** on www.cityandguilds.com.

Centre Manual - Supporting Customer Excellence contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve 'approved centre' status, or to offer a particular qualification, as well as updates and good practice exemplars for City & Guilds assessment and policy issues. Specifically, the document includes sections on:

- The centre and qualification approval process
- Assessment, internal quality assurance and examination roles at the centre
- Registration and certification of candidates
- Non-compliance
- Complaints and appeals
- Equal opportunities
- Data protection
- Management systems
- Maintaining records
- Assessment
- Internal quality assurance
- External quality assurance.

Our Quality Assurance Requirements encompasses all of the relevant requirements of key regulatory documents such as:

- SQA Awarding Body Criteria (2007)
- NVQ Code of Practice (2006)

and sets out the criteria that centres should adhere to pre and post centre and qualification approval.

Access to Assessment & Qualifications provides full details of the arrangements that may be made to facilitate access to assessments and qualifications for candidates who are eligible for adjustments in assessment.

The **centre homepage** section of the City & Guilds website also contains useful information such on such things as:

- **Walled Garden:** how to register and certificate candidates on line
- **Events:** dates and information on the latest Centre events
- **Online assessment:** how to register for e-assessments.

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Useful contacts

UK learners General qualification information	T: +44 (0)844 543 0033 E: learnersupport@cityandguilds.com
International learners General qualification information	T: +44 (0)844 543 0033 F: +44 (0)20 7294 2413 E: intcg@cityandguilds.com
Centres Exam entries, Certificates, Registrations/enrolment, Invoices, Missing or late exam materials, Nominal roll reports, Results	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: centresupport@cityandguilds.com
Single subject qualifications Exam entries, Results, Certification, Missing or late exam materials, Incorrect exam papers, Forms request (BB, results entry), Exam date and time change	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 F: +44 (0)20 7294 2404 (BB forms) E: singlesubjects@cityandguilds.com
International awards Results, Entries, Enrolments, Invoices, Missing or late exam materials, Nominal roll reports	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: intops@cityandguilds.com
Walled Garden Re-issue of password or username, Technical problems, Entries, Results, e-assessment, Navigation, User/menu option, Problems	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: walledgarden@cityandguilds.com
Employer Employer solutions, Mapping, Accreditation, Development Skills, Consultancy	T: +44 (0)121 503 8993 E: business@cityandguilds.com
Publications Logbooks, Centre documents, Forms, Free literature	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413

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As the UK's leading vocational education organisation, City & Guilds is leading the talent revolution by inspiring people to unlock their potential and develop their skills. We offer over 500 qualifications across 28 industries through 8500 centres worldwide and award around two million certificates every year. City & Guilds is recognised and respected by employers across the world as a sign of quality and exceptional training.

City & Guilds Group

The City & Guilds Group operates from three major hubs: London (servicing Europe, the Caribbean and Americas), Johannesburg (servicing Africa), and Singapore (servicing Asia, Australia and New Zealand). The Group also includes the Institute of Leadership & Management (management and leadership qualifications), City & Guilds Land Based Services (land-based qualifications), the Centre for Skills Development (CSD works to improve the policy and practice of vocational education and training worldwide) and Learning Assistant (an online e-portfolio).

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