

IVQs in Construction (6161)

Level 2 IVQ Diploma in

- Timber Vocations (6161-12) (500/5808/3)
- Trowel Vocations (6161-13) (500/5806/X)
- Painting and Decorating (6161-14)
- Plumbing (6161-15) (500/6025/9)
- Refrigeration and Air Conditioning (6161-16)
(500/6027/2)
- Electrical Installation (6161-17)
(500/6026/0)

Qualification handbook for centres



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117 Calculations, setting out and drawing

118 Practical skills

120 Communications and information technology

122 Alteration, repair and planned maintenance

124 Assessment

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134 Materials (Plant and refrigerants)

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Important notice

Following the accreditation of the IVQs in Construction (6161) on the National Qualifications Framework of England, Wales and Northern Ireland (NQF), some changes have been made to the qualification, at the request of the Office of the Qualifications and Examinations Regulator (Ofqual), the qualifications regulator in England.

These changes took effect on 1 June 2009 and are outlined on pages 05–07.

Note: the content of the qualifications has not changed following accreditation.

Changes to the qualification titles

The qualification titles have changed as follows:

Diploma in Timber Vocations – Site Carpentry (6161-12)
changed to
Level 2 IVQ Diploma in Timber Vocations (Site Carpentry) (6161-12)
Accreditation number: 500/5808/3

Diploma in Timber Vocations – Bench Joinery (6161-12)
changed to
Level 2 IVQ Diploma in Timber Vocations (Bench Joinery) (6161-12)
Accreditation number: 500/5808/3

Diploma in Trowel Vocations (6161-13)
changed to
Level 2 IVQ Diploma in Trowel Vocations (6161-13)
Accreditation number: 500/5806/X

Diploma in Painting and Decorating (6161-14)
changed to
Level 2 IVQ Diploma in Painting and Decorating (6161-14)
Accreditation number: 500/5810/1

Diploma in Plumbing (6161-15)
changed to
Level 2 IVQ Diploma in Plumbing (6161-15)
Accreditation number: 500/6025/9

Diploma in Refrigeration and Air Conditioning (6161-16)
changed to
Level 2 IVQ Diploma in Refrigeration and Air Conditioning (6161-16)
Accreditation number: 500/6027/2

Diploma in Electrical Installation (6161-17)
changed to
Level 2 IVQ Diploma in Electrical Installation (6161-17)
Accreditation number: 500/6026/0

Changes to the unit titles

Following the accreditation of IVQs in Construction, each unit has been given an accreditation reference number which will appear on the Certificate of Unit Credit.

The content of the units is unchanged.

Level 2 IVQ Diploma in Timber Vocations (Site Carpentry) (6161-12)
Accreditation number: 500/5808/3

Mandatory units

A/502/2730 – Basic Construction Skills Principles
L/502/2750 – Timber Vocations 2 Principles I
R/502/2751 – Timber Vocations 2 Principles II
Y/502/2752 – Site Carpentry 2 Practice

Optional units (one required)

L/502/2733 – Trowel Vocations Basic Skills Practice
R/502/2734 – Painting and Decorating Basic Skills Practice
Y/502/2735 – Plumbing Basic Skills Practice
D/502/2736 – Refrigeration and Air Conditioning Basic Skills Practice
H/502/2737 – Electrical and Electronic Basic Skills Practice

Level 2 IVQ Diploma in Timber Vocations (Bench Joinery) (6161-12)
Accreditation number: 500/5808/3

Mandatory units

A/502/2730 – Basic Construction Skills Principles
L/502/2750 – Timber Vocations 2 Principles I
R/502/2751 – Timber Vocations 2 Principles II
D/502/2753 – Bench Joinery 2 Practice

Optional units (one required)

L/502/2733 – Trowel Vocations Basic Skills Practice
R/502/2734 – Painting and Decorating Basic Skills Practice
Y/502/2735 – Plumbing Basic Skills Practice
D/502/2736 – Refrigeration and Air Conditioning Basic Skills Practice
H/502/2737 – Electrical and Electronic Basic Skills Practice

Level 2 IVQ Diploma in Trowel Vocations (6161-13)
Accreditation number: 500/5806/X

Mandatory units

A/502/2730 – Basic Construction Skills Principles
H/502/2754 – Trowel Vocations 2 Principles
K/502/2755 – Trowel Vocations 2 Practice

Optional units (one required)

M/502/2739 – Timber Vocations Basic Skills Practice
R/502/2734 – Painting and Decorating Basic Skills Practice
Y/502/2735 – Plumbing Basic Skills Practice
D/502/2736 – Refrigeration and Air Conditioning Basic Skills Practice
H/502/2737 – Electrical and Electronic Basic Skills Practice

Level 2 IVQ Diploma in Painting and Decorating (6161-14)

Accreditation number: 500/5810/1

Mandatory units

A/502/2730 – Basic Construction Skills Principles
M/502/2756 – Painting and Decorating 2 Principles
T/502/2757 – Painting and Construction 2 Practice

Optional units (one required)

M/502/2739 – Timber Vocations Basic Skills Practice
L/502/2733 – Trowel Vocations Basic Skills Practice
Y/502/2735 – Plumbing Basic Skills Practice
D/502/2736 – Refrigeration and Air Conditioning Basic Skills Practice
H/502/2737 – Electrical and Electronic Basic Skills Practice

Level 2 IVQ Diploma in Plumbing (6161-15)

Accreditation number: 500/6025/9

Mandatory units

A/502/2730 – Basic Construction Skills Principles
A/502/2758 – Plumbing 2 Principles
F/502/2759 – Plumbing 2 Practice

Optional units (one required)

M/502/2739 – Timber Vocations Basic Skills Practice
L/502/2733 – Trowel Vocations Basic Skills Practice
R/502/2734 – Painting and Decorating Basic Skills Practice
D/502/2736 – Refrigeration and Air Conditioning Basic Skills Practice
H/502/2737 – Electrical Installation Basic Skills Practice

Level 2 IVQ Diploma in Refrigeration and Air Conditioning (6161-16)

Accreditation number: 500/6027/2

Mandatory units

A/502/2730 – Basic Construction Skills Principles
T/502/2760 – Refrigeration and Air Conditioning 2 Principles
A/502/2761 – Refrigeration and Air Conditioning 2 Practice

Optional units (one required)

M/502/2739 – Timber Vocations Basic Skills Practice
L/502/2733 – Trowel Vocations Basic Skills Practice
R/502/2734 – Painting and Decorating Basic Skills Practice
Y/502/2735 – Plumbing Basic Skills Practice
H/502/2737 – Electrical Installation Basic Skills Practice

Level 2 IVQ Diploma in Electrical Installation (6161-17)

Accreditation number: 500/6026/0

Mandatory Units

A/502/2730 – Basic Construction Skills Principles
F/502/2762 – Electrical Installation 2 Principles
J/502/2763 – Electrical Installation 2 Practice

Optional units (one required)

M/502/2739 – Timber Vocations Basic Skills Practice
L/502/2733 – Trowel Vocations Basic Skills Practice
R/502/2734 – Painting and Decorating Basic Skills Practice
Y/502/2735 – Plumbing Basic Skills Practice
D/502/2736 – Refrigeration and Air Conditioning Basic Skills Practice

Registration for theory examination

Registration process for the theory examination has not changed.

Result submission for practical assessment

Result submission process for the practical assessments has not changed.

Change to the grading

The grade 'Credit' has been changed to 'Merit'. All other grades are unchanged. The content of the units concerned is also unchanged.

Notification of Candidate Results (NCR) and Certificate of Unit Credit (CUC)

Notification of Candidate Results (NCR) and Certificate of Unit Credit (CUCs) continue to be available on completion of each assessment (theory or practical).

Final certificate will be issued on successful completion of all the required assessments.

Changes to the certificate layout

Certificates issued on completion of an accredited IVQ show the accredited title and the accreditation number for the qualification. The level in the accredited title refers to the NQF level the qualification is accredited at.

The certificate also lists all the units achieved, including the grade and the unit accreditation number.

The certificate carries the logos of the regulatory authorities in England, Wales and Northern Ireland indicating that the NQF accreditation only applies to these countries.

Levels of City & Guilds qualifications

All City & Guilds qualifications are part of an integrated progressive structure of awards arranged over eight levels, allowing people to progress from foundation to the highest level of professional competence. Senior awards, at levels 4 to 7, recognise outstanding achievement in industry, commerce and the public services. They offer a progressive vocational, rather than academic, route to professional qualifications. An indication of the different levels and their significance is given below.

NQF level#	City & Guilds qualifications/programmes	Other qualifications*
8	Fellowship (FCGI)	Doctorate
7	Membership (MCGI) Master Professional Diploma Level 5 vocational awards NVQ/SVQ Level 5	Master's Degree Postgraduate Diploma Postgraduate Certificate
6	Graduateship (GCGI) Associateship (ACGI)**	Bachelor's Degree Graduate Certificate and Diploma
5	Level 5 IVQ Advanced Technician Diploma Full Technological Diploma	Higher National Diplomas Foundation Degree Diplomas of Higher and Further Education
4	Licentiatehip (LCGI) Higher Professional Diploma Level 4 vocational awards NVQ/SVQ Level 4	Certificate of Higher Education
3	Level 3 IVQ Advanced Diploma Level 3 IVQ Specialist Advanced Diploma*** Level 3 IVQ Technician Diploma Level 3 vocational awards NVQ/SVQ Level 3	A Level Scottish Higher Advanced National Certificate in Education BTEC National Certificate/Diploma
2	Level 2 IVQ Diploma Level 2 IVQ Specialist Diploma*** Level 2 IVQ Technician Certificate Level 2 vocational awards NVQ/SVQ Level 2	GCSE grades A*-C Scottish Intermediate 2/Credit S Grade BTEC First Certificate
1	Level 1 IVQ Certificate Level 1 vocational awards NVQ/SVQ Level 1	GCSE grades D-G Scottish Intermediate 1/General S Grade Scottish Access 1 and 2

National Qualifications Framework of England, Wales and Northern Ireland (NQF)

* Broad comparability in level

** Only graduates of the City & Guilds College, Imperial College of Science, Technology and Medicine, are awarded the Associateship (ACGI)

*** Part of a new qualification structure which is being introduced across the IVQ provision

IVQ International Vocational Qualifications

NVQ National Vocational Qualifications

IVQ in Construction Industry 6161

About City & Guilds

We provide assessment and certification services for schools and colleges, business and industry, trade associations and government agencies in more than 100 countries. We have 120 years of experience in identifying training needs, developing assessment materials, carrying out assessments and training assessment staff. We award certificates to people who have shown they have mastered skills that are based on world-class standards set by industry. City & Guilds International provides a particular service to customers around the world who need high quality assessments and certification.

Introduction to this programme

We have designed the Awards in the Construction Industry programme for those undergoing training or employed in these areas of work. The programme aims to reflect the international nature of the knowledge and skills and activities needed for different countries or cultures.

We do not say the amount of time a candidate would need to carry out the programme, but we do provide advice on guided learning hours for each level (see below). The programme has three related levels.

Certificate

The certificate (about 360 guided learning hours) provides a broad introduction to the theory and practical side of construction for a front-line worker on a construction site.

Diploma

The diploma (about 360 guided learning hours) provides specialised skills and knowledge in any one of the six crafts covered by this programme at an appropriate level for a person who will be working independently.

Advanced diploma

The advanced diploma (about 360 guided learning hours) takes these skills to the level appropriate for a person preparing for or working in a supervisory role.

We stress that these figures are only a guideline and that we award certificates and diplomas for gaining and showing skills by whatever mode of study, and not for periods of time spent in study.

We provide certificates for all work-related areas at seven levels within our structure of awards shown in appendix B. This programme covers level 2. The standards and assessments for the certificate (level 1) and the advanced diploma (level 3) are published separately.

Making entries for assessments

Candidates can only be entered for the assessments in this subject if the approved examination centres agree. Candidates must enter through an examination centre we have approved to carry out the assessments for 6161 Awards in the Construction Industry.

There are two ways of entering candidates for assessments.

Internal candidates

Candidates can enter for examinations if they are taking or have already finished a course at a school, college or similar training institution that has directed their preparation, whether by going to a training centre, working with another institution, or by open learning methods.

External candidates

These are candidates who have not finished a programme as described above. The examination centres must receive their application for entry well before the date of the examination concerned. This allows them to act on any advice you give about assessment arrangements or any further preparation needed. External candidates must carry out practical assignments and projects if necessary, and they will need extra time and guidance to make sure that they meet all the requirements for this part of the assessment.

In this publication we use the term 'centre' to mean a school, college, place of work or other institution.

Resources

If you want to use this programme as the basis for a course, you must read this booklet and make sure that you have the staff and equipment to carry out all parts of the programme. If there are no facilities for realistic practical work, we strongly recommend that you develop links with local industry to provide opportunities for hands-on experience.

Assessments

There is one level of this award.

Diploma

We use a numbering system to allow entries to be made for our awards. The numbers used for this programme are as follows.

Award numbers

- 6161-12 Diploma in Timber Vocations
- 6161-13 Diploma in Trowel Vocations
- 6161-14 Diploma in Painting and Decorating
- 6161-15 Diploma in Plumbing
- 6161-16 Diploma in Refrigeration and Air Conditioning
- 6161-17 Diploma in Electrical Installation

We use award numbers to describe the subject of the award.

Component numbers

- 031 Timber Vocations 2 Principles I
- 131 Site Carpentry 2 Practice
- 032 Timber Vocations 2 Principles II
- 132 Bench Joinery 2 Practice
- 033 Trowel Vocations 2 Principles
- 133 Trowel Vocations 2 Practice
- 034 Painting and Decorating 2 Principles
- 134 Painting and Decorating 2 Practice
- 035 Plumbing 2 Principles
- 135 Plumbing 2 Practice
- 036 Refrigeration and Air Conditioning 2 Principles
- 136 Refrigeration and Air Conditioning 2 Practice
- 037 Electrical Installation 2 Principles
- 137 Electrical Installation 2 Practice

We use component numbers to show units for which we may award a certificate of unit credit.

We use these numbers throughout this booklet. You must use these numbers correctly if you send forms to us.

Diploma in Timber Vocations

To carry out what is needed for the Diploma in Timber Vocations, candidates must be successful in all of the following assessments.

6161-12-031 Timber Vocations 2 Principles I (written multiple choice paper which lasts one and a half hours)

6161-12-032 Timber Vocations 2 Principles II (written structured answer paper which lasts two hours)

and either

[6161-12-131] Site Carpentry 2 Practice

or

[6161-12-132] Bench Joinery 2 Practice

(Total two written papers)

Candidates who have not gained the Basic Construction Skills requirements through the certificate level must gain these in order to be successful in the diploma awards.

The assessments for these are as follows.

6161-12-002 Basic Construction Skills Principles (written multiple choice paper which lasts one hour)

(Total one written paper)

And any one of the following practical assessments.

[6161-12-103] Trowel Vocations Basic Skills

[6161-12-104] Painting and Decorating Basic Skills

[6161-12-105] Plumbing Basic Skills

[6161-12-106] Refrigeration and Air Conditioning Basic Skills

[6161-12-107] Electrical Installation Basic Skills.

The practical assessment is carried out during the learning programme and should be finished by the date of the written examination so you can send all the results to us. (See appendix A.)

Diploma in Trowel Vocations

To carry out what is needed for the Diploma in Trowel Vocations, candidates must be successful in all of the following assessments.

6161-13-033 Trowel Vocations 2 Principles (written multiple choice paper which lasts two and a half hours)

[6161-13-133] Trowel Vocations 2 Practice
(Total one written paper)

Candidates who have not gained the Basic Construction Skills requirements through the certificate level must gain these in order to be successful in the diploma award.

The assessments for these are as follows.

6161-13-002 Basic Construction Skills Principles (written multiple choice paper which lasts one hour)
(Total one written paper)

And any one of the following practical assessments.

[6161-13-102] Timber Vocations Basic Skills

[6161-13-104] Painting and Decorating Basic Skills

[6161-13-105] Plumbing Basic Skills

[6161-13-106] Refrigeration and Air Conditioning Basic Skills

[6161-13-107] Electrical Installation Basic Skills

The practical assessment is carried out during the learning programme and should be finished by the date of the written examination so you can send all the results to us. (See appendix A.)

Diploma in Painting and Decorating

To carry out what is needed for the Diploma in Painting and Decorating, candidates must be successful in all of the following assessments.

6161-14-034 Painting and Decorating 2 Principles (written multiple choice paper which lasts two and a half hours)

6161-14-134 Painting and Decorating 2 Practice
(Total one written paper)

Candidates who have not gained the Basic Construction Skills requirements through the certificate level must gain these in order to be successful in the diploma award.

The assessments for these are as follows.

6161-14-002 Basic Construction Skills Principles (written multiple choice paper which lasts one hour)
(Total one written paper)

And any one of the following practical assessments.

[6161-14-102] Timber Vocations Basic Skills

[6161-14-103] Trowel Vocations Basic Skills

[6161-14-105] Plumbing Basic Skills

[6161-14-106] Refrigeration and Air Conditioning Basic Skills

[6161-14-107] Electrical Installation Basic Skills

The practical assessment is carried out during the learning programme and should be finished by the date of the written examination so you can send all the results to us. (See appendix A.)

Diploma in Plumbing

To carry out what is needed for the Diploma in Plumbing, candidates must be successful in all of the following assessments.

[6161-15-035] Plumbing 2 Principles (written multiple choice paper which lasts two and a half hours)

[6161-15-135] Plumbing 2 Practice
(Total one written paper)

Candidates who have not gained the Basic Construction Skills requirement through the certificate level must gain these in order to be successful in the diploma award.

The assessments for these are as follows.

6161-15-002 Basic Construction Skills Principles (written multiple choice paper which lasts one hour)
(Total one written paper)

And any one of the following practical assessments.

[6161-15-102] Timber Vocations Basic Skills

[6161-15-103] Trowel Vocations Basic Skills

[6161-15-104] Painting and Decorating Basic Skills

[6161-15-106] Refrigeration and Air Conditioning Basic Skills

[6161-15-107] Electrical Installation Basic Skills

The practical assessment is carried out during the learning programme and should be finished by the date of the written examination so you can send all the results to us. (See appendix A.)

Diploma in Refrigeration and Air Conditioning

To carry out what is needed for the Diploma in Refrigeration and Air Conditioning, candidates must be successful in all of the following assessments.

6161-16-036 Refrigeration and Air Conditioning 2 Principles (written multiple choice paper which lasts two and an half hours)

[6161-16-136] Refrigeration and Air Conditioning 2 Practice
(Total one written paper)

Candidates who have not gained the Basic Construction Skills requirement through the certificate level must gain these in order to be successful in the diploma award.

The assessments for these are as follows.

6161-16-002 Basic Construction Skills Principles (written multiple choice paper which lasts one hour)
(Total one written paper)

And any one of the following practical assessments.

[6161-16-102] Timber Vocations Basic Skills

[6161-16-103] Trowel Vocations Basic Skills

[6161-16-104] Painting and Decorating Basic Skills

[6161-16-105] Plumbing Basic Skills

[6161-16-107] Electrical Installation Basic Skills

The practical assessment is carried out during the learning programme and should be finished by the date of the written examination so you can send all the results to us. (See appendix A.)

Diploma in Electrical Installation

To carry out what is needed for the Diploma in Electrical Installation, candidates must be successful in all of the following assessments.

6161-17-037 Electrical Installation 2 Principles (written multiple choice paper which lasts two and a half hours)

[6161-17-137] Electrical Installation 2 Practice
(Total one written paper)

Candidates who have not gained the Basic Construction Skills requirement through the certificate level must gain these in order to be successful in the diploma award.

The assessments for these are as follows.

6161-17-002 Basic Construction Skills Principles (written multiple choice paper which lasts one hour)
(Total one written paper)

And any one of the following practical assessments.

[6161-17-102] Timber Vocations Basic Skills

[6161-17-103] Trowel Vocations Basic Skills

[6161-17-104] Painting and Decorating Basic Skills

[6161-17-105] Plumbing Basic Skills

[6161-17-106] Refrigeration and Air Conditioning Basic Skills

The practical assessment is carried out during the learning programme and should be finished by the date of the written examination so you can send all the results to us. (See appendix A.)

We provide assessments in two ways.

a Fixed date

These are assessments which are carried out on dates and times we set. These assessments have no brackets around their numbers.

b Free date

These are assessments which are carried out at a college or other training establishment on a date or over a period which the college chooses. These assessments have brackets around their numbers.

In this programme the written assessment is fixed date. The practical assessments are free date.

You must carry out assessments according to our International Directory of Examinations and Assessments. If there are any differences between information in this publication and the current directory, the Directory has the most up-to-date information.

Results and certification

Everyone who enters for our certificates, diplomas and advanced diplomas receives a 'Notification of Candidate Results' giving details of how they performed.

If candidates successfully finish any assessment within this programme (for example, the examination paper) they will receive a certificate of unit credit towards the certificate for which they are aiming. We grade practical and course work assessments as pass or fail. We grade written assessments on the basis of fail, pass, credit or distinction. The certificate of unit credit will not mention assessments which they do not enter, which they failed or from which they were absent.

Each certificate clearly states what candidates need for full certification at the relevant level, allowing schools, colleges and employers to see whether they have met the full requirements.

If candidates successfully finish all the requirements for a full certificate, they will automatically receive the appropriate certificate.

We will send the 'Notification of Candidate Results', certificates of unit credit and certificates to the examination centre to be awarded to successful candidates. It is your responsibility to give the candidates the certificates. If candidates have a question about the results and certificates, they must contact you. You may then contact us if necessary.

We will also send you a results list showing how all candidates performed.

How to offer this programme

To offer this programme you must get approval from us. There are two categories of approval.

Subject approval

We give approval to offer a teaching course based on this syllabus.

Examination centre approval

We give approval to enter candidates for examinations.

To be approved by us to offer a teaching course you must send us the application form.

To enter candidates for examinations you must be approved by us as an examination centre. For this programme it is possible to act as a registered examination centre only, and accept external candidates. Approved examination centres must provide suitable facilities for taking examinations, secure places to keep the examination papers and materials, and may have an appointed visiting verifier to review practical work.

After we have received and accepted an application, we will send an approval letter confirming this. You can then send entries in at any time using the International Directory of Examinations and Assessments for guidance.

Please note that in this section we have provided an overview of centre approval procedures. Please refer to the current issue of 'Delivering International Qualifications – Centre Guide' for full details of each aspect of these procedures.

Other information

Designing courses of study

Candidates for the Awards in the Construction Industry will have come from different backgrounds and will have different employment and training experiences. We recommend the following:

- carry out an assessment of the candidates' achievements so you can see what learning they already have and decide the level of entry they will need; and
- consider what learning methods and places will best suit them.

When you assess a candidate's needs, you should design teaching programmes that consider:

- what, if any, previous education qualifications or training the candidate has, especially in the various general vocational education certificates we provide; and
- what, if any, previous practical experience the candidate has which is relevant to the aims of the programme and from which they may have learned the relevant skills and knowledge.

When you choose learning methods and places, you should consider the results of your assessments and whether the following are available.

- Open or distance learning material.
- Workplace learning that can be carried out on site or between you and a local workplace. This will allow the candidates access to specialised equipment and work experience.
- Working with other registered centres to share facilities.
- Opportunities for co-operative learning between candidates who need to gain similar skills.

As long as the candidates meet the aims of this learning programme the structures of courses of study are up to you. So, it is possible to include extra topics that meet local needs.

You should avoid teaching theory alone. As far as possible the practical work should be closely related to work in the classroom so that candidates use their theory in a realistic work environment. You can use formal lectures in the classroom with appropriate exercises and demonstrations. Candidates should keep records of the practical work they do so they can refer to it at a later date.

We assume that you will include core skills, such as numeracy, communication, working with people, and organisation and planning throughout a teaching programme.

Presentation format of units

Practical competences

Each module starts with a section on practical competences which shows the practical skills candidates must have.

At times we give more detail about important words in each 'competence statement'.

For example:

- 1.10a Identify the various types of protective clothing/equipment and their uses.
Protective clothing: overalls, ear defenders/plugs, safety boots, knee pads, gloves/gauntlets, hard hats, particle masks, glasses/goggles/visors'

In the above statement the words 'protective clothing' are given as a range which the candidate should be familiar with. If a range starts with the abbreviation 'eg' the candidates only need to cover some of the ranged areas or you can use suitable alternatives.

Knowledge requirements

Immediately after the section on practical competences the module tells you what knowledge is needed for that area. The knowledge needed is closely linked to the practical competences, so it is best to teach the two together so that the candidate appreciates the topic more.

Practical assessments

The end of each unit contains practical assessments which deal with the practical competences we mentioned earlier. Candidates must carry out the practical assessments. You should make sure all practical assessments are supervised and instructors should make sure that the results reflect the candidate's own performance. You must hold all the evidence in a file (portfolio) for each candidate for eight weeks after the application for a certificate. You must also keep separate records of the dates of all attempts by each candidate.

Entry levels

We consider the following programme to be relevant preparation for this programme:

Certificate Awards in the Construction Industry (6161)
Numeracy (3750)

We also consider the following City & Guilds Pitman Qualifications award as relevant alongside this programme:

English for Speakers of Other Languages – higher intermediate level

Progression routes and recognition

We have a range of related programmes for onward progression. These include:

Technician Certificate in Construction (6165)
Technician Diploma in Construction (6165)
Advanced Diploma Awards in The Construction Industry (6161).

A number of UK universities and other higher-education institutions may accept success in this programme combined with the Diploma and Advanced Diploma awards towards evidence for direct entry onto higher-level programmes. The decision to accept a candidate on to a degree programme, and the level of entry, is up to the institution. We provide details of organisations recognising achievement in this programme.

Useful publications

We can provide a list of suggested text books covering specific areas of this programme. We may also have knowledge about other support materials. You should make sure that you have the latest information. We will automatically send updated lists to centres we have approved to offer this programme.



Plain English Campaign's Crystal Mark only applies to the 6161 Diploma Awards in the Construction Industry regulations pages 09 to 15 inclusive.

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
City & Guilds Level 2 IVQ Diploma in Electrical Installation	360	432
City & Guilds Level 2 IVQ Diploma in Plumbing	360	432
City & Guilds Level 2 IVQ Diploma in Refrigeration and Air Conditioning	360	432

Syllabus

IVQ in Construction Industry 6161

Unit numbers

9 31 Timber Vocations 2 – Site Carpentry

0 Safety at work

2 Materials

4 Calculations, setting out and drawing

5 Practical skills

29 Communications and information technology

1 Alteration, repair and renovation

1 32 Timber Vocations 2 – Bench Joinery

2 Safety at work

4 Materials

6 Calculations, setting out and drawing

7 Practical skills

55 Communications and information technology

57 Alteration, repair and renovation

69 33 Trowel Vocations 2

70 Safety at work

72 Materials

74 Calculations, setting out and drawing

75 Practical skills

80 Communications and information technology

82 Alteration, repair and renovation

91 34 Painting and Decorating 2

92 Safety at work

94 Materials

97 Calculations, setting out and drawing

98 Practical skills

100 Communications and information technology

102 Repair, restoration and glazing

111 35 Plumbing 2

112 Safety at work

114 Materials

117 Calculations, setting out and drawing

118 Practical skills

120 Communications and information technology

122 Alteration, repair and planned maintenance

131 36 Refrigeration and Air Conditioning 2

132 Safety at work

134 Materials (plant and refrigerants)

135 Calculations, science and drawing

137 Practical skills

139 Communication and information technology

141 Alteration, repair and planned maintenance

151 37 Electrical Installation 2

152 Safety at work

154 Materials

157 Calculations, setting out and drawing

159 Practical skills

162 Communication and information technology

164 Alteration, repair and planned maintenance

31 Site Carpentry 2 – Summary of syllabus sections

Page 20 Safety at work (Objectives 31.1 to 31.19)

The aim of this section is to enable the candidate to maintain safe working conditions and to adopt safe procedures for themselves and others.

The use of national/local regulations and working practices must be included in all practical competences.

Page 22 Materials (Objectives 31.20 to 31.50)

The aim of this section is to enable the candidate to:

- a identify and select materials for specific applications based on their technical properties
- b describe the technical properties of the main types of materials in use
- c identify environmental effects and benefits of timber based materials and processes

The properties of locally manufactured materials or materials in local general use should be considered.

Page 24 Calculations, setting out and drawing (Objectives 31.51 to 31.66)

The aim of this section is to enable the candidate to:

- a take off dimensions from drawings of circular, semi circular and triangular structures/products
- b calculate quantities to assist in preparing, costing and estimating
- c set out components to form products
- d produce working drawings of complex structures and products

Page 25 Practical skills (Objectives 31.67 to 31.147)

The aim of this section is to enable the candidate to:

- a set up, change tooling and operate portable powered hand tools
- b install components, frames and products

All operations involving powered tools must comply with national/local standards.

Page 29 Communications and information technology (Objectives 31.148 to 31.172)

The aim of this section is to enable the candidate to use:

- a communication skills in the workplace
- b information technology in the workplace

Page 31 Alteration, repair and renovation (Objectives 31.173 to 31.190)

The aim of this section is to enable the candidate to apply tool skills to carry out the alteration, repair and renovation of existing buildings.

Safety at work

The use of national/local regulations and working practices must be included in all practical procedures for themselves and others.

Practical competences

The candidate must be able to do the following:

- 31.1 Carry out safe working practices to prevent hazards and to ensure the safety of working personnel and members of the public.
Hazards: wood dust, preservatives, obstructions, sharp tools, warning notices
- 31.2 Carry out safe working practices using various equipment/materials to protect surrounding work areas from infringement or contamination.
Equipment/materials: dust extraction, ventilation, dust sheets, masking tapes/paper, shields (boards)
- 31.3 Carry out the safe erection, use and dismantling of scaffold platforms less than 2m high.
Scaffolding: trestles, folding trestles, hop up stools, scaffold boards
- 31.4 Carry out the safe erection, use and dismantling of scaffold platforms over 2m high.
Scaffolding: quick assembly towers, scaffold boards, toe boards, hand rails, stabilisers/outriggers
- 31.5 Inspect for faults, set up and safely use steps and ladders in general use.
Faults: metal components (corrosion), timber components (deterioration, splits, cracks)
Set up: firm/level base, clip/lash down
- 31.6 Set up safety barriers around a hazard to protect working personnel and members of the public.
Barriers: security tape, barrier material (eg timber, metal, plastic), safety/warning (signs, lights)
Hazards: openings in (floors, walls, roofs), roof edges, operating machinery
- 31.7 Select and use protective clothing and safety equipment for specific tasks.
Equipment: overalls, gloves, eye protection, face mask, ear defenders/plugs, safety shoes, safety helmet (hard hat), machine guards, residual current device
Tasks: producing joints and components to form products, use of dangerous substances (preservatives, insecticides, insulating materials, adhesives, lubricants)
- 31.8 Use and store toxic materials in a safe manner.
Use: manufacturers' instructions, toxic effect
Materials: wood dust, preservatives/insecticides, insulating materials, adhesives, lubricants

- 31.9 Carry out a risk assessment and prepare a report identifying the potential hazards.
Risk assessment: working practices, hazard identification, dangerous substances, machinery, noise, scaffolding

Knowledge requirements

The instructor must ensure the candidate is able to:

- 31.10 State the methods used to prevent hazards and to ensure the safety of working personnel and members of the public.
Methods: warning notices, barriers
- 31.11 State the methods used to protect surrounding work areas from infringement or contamination.
Methods: dust extraction, ventilation, dust sheets, masking tapes/paper, shields (boards)
- 31.12 Explain the safe use of scaffold platforms less than 2m high.
Scaffolding: trestles, folding trestles, hop up stools, scaffold boards
Safe use: manufacturers' instructions, nationally/locally applied regulations
- 31.13 Explain the safe use of scaffold platforms over 2m high.
Scaffolding: quick assembly towers, scaffold boards, toe boards, hand rails, stabilisers/outriggers
Safe use: manufacturers' instructions, nationally/locally applied regulations
- 31.14 State the faults, possible hazards and dangerous practices when using ladders and steps.
Faults: metal components (corrosion), timber components (deterioration, splits, cracks)
Hazards: base fixing/stabilising, clip/lash at platform level, clear space around base
Dangerous practices: uneven/loose ground
- 31.15 Explain the purpose and use of barriers and warning signs/lights to protect working personnel and members of the public from possible accidents.
Barriers: security tape, barrier material (timber, metal, plastic), safety/warning (signs, lights)
Purpose: segregation of different work activities, segregation of work from members of the public, prevention of falls from heights above 2m

- 31.16 Describe the purpose and use of protective clothing and safety equipment for a range of applications.
Equipment: overalls, gloves, eye protection, face mask, ear defenders/plugs, safety shoes, safety helmet (hard hat), machine guards, residual current device
Purpose: handling corrosive/heavy materials, cutting /preparing timber products, using power tools, protecting feet from heavy objects, working below other workers or machines
Applications: producing joints and components to form products, use of dangerous substances (preservatives, insecticides, insulating materials, adhesives, lubricants)
- 31.17 State the toxic effect of materials used in site carpentry.
Effect: eyes, skin, breathing
Materials: wood dust, preservatives, adhesives, lubricants, insecticides, insulating materials
- 31.18 Describe the preventative and remedial actions to be taken in the case of exposure to toxic materials.
Exposure: ingested, contact with skin, inhaled
Preventative action: dust extraction, ventilation, masks, protective clothing/equipment
Remedial action: immediate first aid, report to supervisor
Materials: wood dust, preservatives, adhesives, lubricants, insulating materials, insecticides, manufacturers' instructions
- 31.19 Explain the method by which a risk assessment is carried out.
Method: identify task procedure, identify hazards, identify control actions to reduce hazard, assess final risk

Materials

The properties of locally manufactured materials or materials in local general use should be considered.

Practical competences

The candidate must be able to do the following:

- 31.20 Identify and select common softwoods for specific applications based on their technical properties.
Softwoods: eg pine, redwood, whitewood
Applications: joinery products (eg windows, doors, stairs, tables, units/fitments, roofs, partitions, flooring)
- 31.21 Identify and select common hardwoods for specific applications based on their technical properties.
Hardwoods: eg mahogany, oak, teak
Applications: joinery products (eg windows, doors, stairs, tables, units/fitments, roofs, flooring)
- 31.22 Identify and select manufactured boards and sheet materials for specific applications based on their technical properties.
Board/sheet: eg plywood (3 ply, multiply, block board, lamin board, batten board), medium density fibreboard (MDF), hardboard, particle board (chipboard, wafer board), veneered boards (melamine, Formica, cloth, real wood)
Applications: joinery products (eg doors, stairs, tables, units/fitments, roofs, partitions, flooring)
- 31.23 Identify and select wood preservatives and insecticides for specific applications based on their technical properties.
Preservatives/insecticides: water based, spirit based, tar/oil based
Applications: joinery products (eg windows, doors, stairs, tables, units/fitments, roofs, partitions, flooring), insect attack, fungal attack
- 31.24 Identify and select adhesives for specific applications based on their technical properties.
Adhesives: eg polyvinyl acetate (PVA), urea-formaldehyde (uf), hot melt, contact, animal
Applications: joinery products (eg windows, doors, stairs, tables, units/fitments)
- 31.25 Identify and select abrasive sheets for specific applications based on their technical properties.
Abrasive sheets: sand, glass, garnet, aluminium oxide
Applications: hand/machine surface finish
- 31.26 Identify and select wood screws/components and nails for specific applications based on their technical properties.
Screws/components: eg counter sunk, raised counter sunk, round-head, dome-head, twin fast, Phillips, posidrive, slotted, brass, bronze, chromium, sheradized, japanned, steel, alloy, cups, caps

Nails: eg lost head, oval, round wire, hardboard pins, panel pins, annular ring shank, masonry
Applications: joinery products (eg windows, doors, stairs, tables, units/fitments, roofs, partitions, flooring)

- 31.27 Identify and select timber based doors for specific applications based on their technical properties.
Doors: eg FLB (framed, ledged, braced and battened), fire check, flush, panelled, glazed, panelled and glazed, internal, external
Applications: internal, external, fire resistant, security, lighting, decorative
- 31.28 Identify and select timber based windows for specific applications based on their technical properties.
Windows: eg storm proof, pivot, sliding sash, tilt and turn, shuttered, screened, features (eg bay, bow, bulls eye, arched)
Applications: security, lighting, insulating, decorative, ventilation
- 31.29 Prepare a report identifying the availability, suitability and relative costs of timber based products available in the country of study.
Timber: softwoods, hardwoods, manufactured boards
Suitability: climate, ecological effects
- 31.30 Prepare a report on the environmental effects of forestry and the manufacture of timber based products.
Forestry: managed, unmanaged
Manufactured products: manufactured boards
Environmental effects: forestry (soil erosion, water pollution, air pollution, landscape, photosynthesis), manufactured products (air pollution, water supplies/pollution)

Knowledge requirements

The instructor must ensure the candidate is able to:

Timber

- 31.31 Identify the machines used for converting timber (all with log carriage).
Machines: circular saw, horizontal saw, reciprocating saw, band saw/mill
- 31.32 Explain the various terms associated with the seasoning process.
Terms: moisture content, fibre saturation point, equilibrium moisture content, moisture gradient
- 31.33 Describe the different methods of seasoning timber.
Methods: kiln, dehumidifier, air
- 31.34 Identify the various defects associated with seasoning timber.
Defects: case hardening, honey combing, surface checks, splits

- 31.35 Identify and explain the terms used to describe timber characteristics.
Terms: grain (sloping, spiral, open, close, tight, interlocked, straight, curly, wavy), compression/ tension wood (growth, converted timber), permeability (permeable, moderately resistant, resistant, very resistant), durability (perishable, non-durable, moderately durable, durable, very durable), texture (coarse, fine, even, uneven, figuring)
- 31.36 State the technical properties of common softwoods.
Softwoods: pine, redwood, whitewood
Properties: colour, grain, structure, density, stability, strength, workability, permeability, durability, texture
- 31.37 State the technical properties of common hardwoods.
Hardwoods: mahogany, oak, teak
Properties: colour, grain, structure, density, stability, strength, workability, permeability, durability, texture
- Manufactured boards**
- 31.38 State the construction and technical properties of the various types of manufactured boards.
Boards: plywood (3 ply, multiply, block board, lamin board, batten board), fibreboard (medium density fibreboard/MDF, hardboard), particle board (chipboard, wafer board), veneered boards (melamine, Formica, cloth, real wood)
Properties: strength, stability, available sizes, moisture resistance, fire resistance, insect/fungal resistance
Construction: adhesives, particle size, laminates, additives (moisture resistance, fire resistance, insect/fungal resistance)
- 31.39 State the various terms used to describe manufactured boards and the reasons for this classification.
Terms: Grade, Int (interior), MR (moisture resistant), BR (boil resistant), WBP (weather and boil proof)
Reasons: adhesive type, material type, applications (internal, external)
- Preservatives**
- 31.40 Describe the life cycle and characteristics of common wood destroying fungus.
Fungus: wet rot, dry rot, sap stains
- 31.41 Describe the life cycle and characteristics of common beetles and insects that attack timber and timber based products.
Beetles/insects: beetles (furniture, death-watch, lyctus, house long horn, forest long horn, weevil, bark), insects (termites, wood wasp)
- 31.42 State the properties and uses of various types of preservatives.
Preservatives: water based, spirit based, tar/oil based
Properties: penetration, odour, method of cleaning applicator, toxicity
- Uses: suitability for application/location (eg non poisonous near animals)
- Adhesives**
- 31.43 State the properties and uses of various types of adhesives.
Adhesives: polyvinyl acetate (PVA), urea-formaldehyde (uf), hot melt, contact, animal
Properties: shelf life, pot life, moisture resistance, strength, curing time, open time, elasticity, film thickness, gap filling quality, surrounding conditions (frost, heat, moisture)
Uses: interior/exterior, suitability for application (eg sheet bonding, joint bonding)
- 31.44 Identify the effects adhesives have on tooling.
Effects: blunting, clogging
- Abrasives**
- 31.45 State the different backing materials used with abrasive sheets and explain their use.
Backings: paper, cloth
Use: machine, hand
- 31.46 Explain the terms open coat and closed coat.
- 31.47 Identify the uses of open coat and closed coat abrasive sheets.
Uses: dry, wet, resinous, hardwoods, softwoods, manufactured boards
- Fixings**
- 31.48 Identify the various types of wood screws/components and explain their use.
Screws: counter sunk, raised counter sunk, round-head, dome-head, twin fast, Philips, posidrive, slotted, steel, alloy, brass, bronze, chromium, sheradized, japanned
Components: cups, caps
Use: strength, appearance, corrosion resistance, flush/raised head, suitability for material being fixed, driving method
- 31.49 Identify the various types of nails and explain their use.
Nails: lost head, oval, round wire, hardboard pins, panel pins, annular ring shank, masonry
Use: strength, appearance, corrosion resistance, flush/sunken head, suitability for material being fixed
- 31.50 State the environmental effects of forestry and the manufacture of timber based products.
Forestry: managed, unmanaged
Manufactured products: manufactured boards
Environmental effects: forestry (soil erosion, water pollution, air pollution, landscape, photosynthesis), manufactured products (air pollution, water supplies/pollution)

Calculations, setting out and drawing

Practical competences

The candidate must be able to do the following:

Calculations

31.51 Take off accurate dimensions from drawings of circular, semi circular and triangular structures/products.
Drawings: plans, sectional drawings
Dimensions: components (length, width, thickness)

31.52 Calculate areas from dimensions taken off drawings of circular, semi circular and triangular structures/products.
Areas: walls, floors, openings

31.53 Calculate volumes from dimensions taken off drawings of circular, semi circular and triangular structures/products.
Volumes: timber, logs

31.54 Calculate the quantity and cost of materials required from drawings of circular, semi circular and triangular structures/products.
Materials: timber, timber based products, fixings
Costs: product catalogues, price lists, discounts
Drawings: joinery components

31.55 Calculate component spacings of circular, semi circular and triangular structures/products.
Component: eg glazing bars, joists, palings, jambs, mullions

Setting out

31.56 Use tools and equipment to take measurements from site for the manufacture of components and products.
Tools/equipment: eg water level, spirit level, plumb line, straight edge, tape measure, rule
Measurements: eg windows, doors, frames, fitments, stairs, flooring, mouldings, surrounding influencing factors

31.57 Measure and set out components to produce workshop rods and drawings of complex linear, rectangular and triangular structures/products.
Workshop rods: vertical sections, horizontal sections
Drawings: elevations
Products: doors, windows, frames, linings, cupboards
Complex products: using rebated/grooved/moulded cross sectioned timbers

31.58 Draw cut away and hidden detail onto setting out rods of complex linear, rectangular and triangular structures/products.
Detail: eg mortice and tenon detail

31.59 Set out component spacings of complex linear, rectangular and triangular structures/products.
Component: eg glazing bars, joists, palings, mullions, transom, rails, muntins

31.60 Prepare cutting lists from setting out rods of complex linear, rectangular and triangular structures/products.
Setting out rods: eg doors, windows, frames, linings, cupboards

Drawing

31.61 Produce working drawings from plans and details of complex linear, rectangular and triangular structures/products.
Drawing: dimensions, detail (eg glazing bars, rails, stiles, heads, jambs, transom, mullion, muntin), exploded views, isometric

Knowledge requirements

The instructor must ensure the candidate is able to:

Calculations

31.62 Identify calculations involving areas and volumes of circular, semi circular and triangular structures/products.
Areas: walls, floors, openings, timber cross sections
Volumes: timber, logs
Complex products: using rebated/grooved/moulded cross sectioned timbers

31.63 Identify calculations involving quantities and costs of materials of circular, semi circular and triangular structures/products.
Materials: timber, timber based products, fixings
Costs: product catalogues, price lists, discounts

Setting out

31.64 Identify and explain the use of tools and equipment for measuring and levelling.
Tools/equipment: water level, spirit level, plumb line, straight edge, tape measure, rule

31.65 Identify components from setting out rods and drawings of complex linear, rectangular and triangular structures/products.
Components: jambs, mullions, transom, head, cill, glazing bars, rails, styles, muntins

Drawing

31.66 Identify scale working drawings of items taken from plans and details of complex linear, rectangular and triangular structures/products.
Drawings: dimensions, detail (eg glazing bars, rails, stiles, heads), exploded views, isometric

Practical skills

All operations involving powered tools must comply with national/local standards.

Practical competences

The candidate must be able to do the following:

Portable powered hand tools

Circular saw

31.67 Set and operate a portable circular saw to cut material.
Cut: straight (angled, square)
Materials: eg hardwood, softwood, sheet

31.68 Select and change blades for the material being cut.
Selection: tooth (parts, angles), blade material (alloy steel, tungsten carbide tipped)
Materials: eg hardwood, softwood, sheet

Jig saw

31.69 Set and operate a portable jig saw to cut material.
Cut: straight, curved, canted
Materials: eg hardwood, softwood, sheet

31.70 Select and change blades for the material being cut.
Selection: tooth (parts, angles), blade material (carbon steel, high speed steel/HSS, tempered steel)
Materials: eg hardwood, softwood, sheet

Router

31.71 Set and operate a portable router to cut material.
Cut: straight, curved, internal, external
Materials: eg hardwood, softwood, sheet

31.72 Select and change cutters for the material being cut.
Selection: blade material (high speed steel, tungsten carbide tipped), shape
Materials: eg hardwood, softwood, sheet

Planer

31.73 Set and operate a portable planer to prepare timber.
Operation: flattening, edging, rebating, chamfering, bevelling
Timber: eg hardwood, softwood

31.74 Select and change blades for the material being cut.
Selection: blade material (high speed steel/HSS, tungsten carbide tipped)
Materials: eg hardwood, softwood

Power drills

31.75 Set and operate a portable power drill suitable for various materials.
Drills: eg mains electric, cordless (battery)
Materials: hardwood, softwood, sheet material, masonry/concrete, steel

31.76 Select and change drill bits suitable for the material being drilled.
Drill bits: twist, masonry, flat, material (carbon steel, high speed steel/HSS, tungsten carbide tipped)
Materials: eg hardwood, softwood, sheet material, masonry/concrete, steel

Sanding machines

31.77 Set and operate a portable sanding machine to produce a surface finish on various materials.
Machines: belt, orbital
Surface finish: smooth, clean, free from defects
Materials: eg hardwood, softwood, sheet

31.78 Select and change abrasive sheets/belts suitable for the material being sanded.
Selection: grade, abrasive (aluminium oxide, garnet, glass), backing material
Materials: eg hardwood, softwood, sheet

31.79 Clean, service and store portable power tools in accordance with the manufacturers' schedules.
Tools: circular saw, jig saw, router, planer, drill (mains electric, cordless), belt sander, orbital sander

31.80 Use safety equipment and machine guards for all portable powered tools in accordance with national/local standards.

Carcassing and first fixing

Floors

31.81 Space, level and fix joists to form floors with tolerances to industry standards.
Tolerances: levelling 4mm in 2m length, centres \pm 5mm

31.82 Form an opening to create an access trap using trimmer joists and trimmed joists with tolerances to industry standards.
Tolerances: opening dimensions \pm 10mm

31.83 Cut and fix strutting to secure and stabilise joists.
Strutting: herringbone, noggins, metal ties/struts, not to protrude beyond surface of joist

31.84 Measure, cut and fix floor coverings.
Coverings: tongue and grooved sheets, tongue and grooved floor boards

31.85 Finish and make good openings.
Openings: eg linings, access traps

Stud partitioning

- 31.86 Mark out components to form stud partitioning with tolerances to industry standards.
Components: sole plate, head, studs and noggins
Tolerances: overall dimensions $\pm 5\text{mm}$
Stud partitioning: openings (door, hatch), change in direction (eg 90%)
- 31.87 Cut and assemble components to produce stud partitioning with tolerances to industry standards.
Tolerances: overall dimensions $\pm 5\text{mm}$
- 31.88 Erect and fix stud partitioning with tolerances to industry standards.
Tolerances: position $\pm 5\text{mm}$, plumbing 1mm in 1m, opening to size $\pm 5\text{mm}$

Frames and linings

- 31.89 Prepare, fit and fix door linings with tolerances to industry standards.
Tolerances: face plumb $\pm 1\text{mm}$ in 1m, edge plumb $\pm 1\text{mm}$ in 1m, head level $\pm 1\text{mm}$ in 1m, free from twist with no bow exceeding 2mm, edge flush to wall finish $\pm 2\text{mm}$
- 31.90 Prepare, fit and fix door frames with tolerances to industry standards.
Tolerances: plumb $\pm 1\text{mm}$ in 1m, level $\pm 1\text{mm}$ in 1m, free from twist with no bows exceeding 2mm
- 31.91 Prepare, fit and fix window frames with tolerances to industry standards.
Tolerances: plumb $\pm 2\text{mm}$ in 1m, level $\pm 2\text{mm}$ in 1m, free from twist with no bows exceeding 2mm
- 31.92 Prepare, fit and secure glazing panels to window frames and openers with tolerances to industry standards.
Tolerances: overall dimensions + 0mm, - 3mm

Flat roofs

- 31.93 Set out a flat roof to scale with tolerances to industry standards.
Scale: eg 1:5, 1:20
Tolerances: overall dimensions ± 1 , component dimensions $\pm 0.5\text{mm}$
- 31.94 Prepare components to form a flat roof with tolerances to industry standards.
Prepare: select, cut, space
Components: joists, noggins, wall plate, firings, decking, angle fillets, fascia, gutter boards, soffit board
Tolerances: overall dimensions $\pm 5\text{mm}$
- 31.95 Assemble and fix components to form a flat roof with tolerances to industry standards.
Components: joists, noggins, wall plate, firings, decking, angle fillets, fascia, gutter boards, soffit board
Tolerances: joists in line $\pm 2\text{mm}$, joist ends cut level $\pm 3\text{mm}$, fascias level and in line $\pm 2\text{mm}$ in 1m, fascia mitres with gaps not exceeding 1mm

Pitched roofs

- 31.96 Set out an equal pitched roof to scale with tolerances to industry standards.
Set out: lengths, bevels, angles
Roof: gable end, hipped end
Scale: eg 1:5, 1:20
Tolerances: overall dimensions $\pm 1\text{mm}$, components dimensions $\pm 0.5\text{mm}$, angles $\pm 2^\circ$, bevels $\pm 2\%$
- 31.97 Prepare components to form an equal pitched roof with tolerances to industry standards.
Prepare: select, cut, space
Components: ridge board, rafters, wall plate, gable ladder, barge boards, ties
Tolerances: overall dimensions $\pm 3\text{mm}$
- 31.98 Assemble and fix components to form an equal pitched roof with tolerances to industry standards.
Components: ridge board, rafters, wall plate, gable ladder, barge boards, ties
Tolerances: components plumb/level $\pm 3\text{mm}$, rafters ends cut level $\pm 3\text{mm}$, overall dimensions $\pm 5\text{mm}$

Finishing and second fixing

- 31.99 Prepare and hang timber based doors with tolerances to industry standards.
Doors: internal, external
Tolerances: 2mm clearance (+0mm $\pm 2\text{mm}$), free from binding, hinge recess with gaps not exceeding 1mm
- 31.100 Select, fit and fix ironmongery to a timber based door.
Ironmongery: butt hinges, locks (mortice, cylinder), handles, latches, letter plate
- 31.101 Cut, joint and fix wall mouldings and finishes with tolerances to industry standards.
Joints: internal (scribed), external (mitred)
Mouldings: skirting, architrave
Tolerances: mitre joint gaps not exceeding 0.5mm, scribe joint gaps not exceeding 1mm, skirting (level $\pm 2\text{mm}$ in 1m), architrave (plumb $\pm 1\text{mm}$ in 1m, margin $\pm 2\text{mm}$)
- 31.102 Prepare, fit and fix fitments with tolerances to industry standards.
Fitments: eg kitchen units, bedroom units, built in furniture
Tolerances: plumb $\pm 1\text{mm}$ in 1m, level $\pm 1\text{mm}$ in 1m
- 31.103 Transfer levels and datum points with tolerances to industry standards.
Tolerances: level $\pm 1\text{mm}$ in 3m

Knowledge requirements

The instructor must ensure the candidate is able to:

Portable power tools

Tooling

- 31.104 Identify portable power tools.
Tools: circular saw, jig saw, router, planer, drills (battery, mains)
- 31.105 Identify various circular saw blades and describe their use.
Blades: cross cut, rip saw, tungsten carbide tipped, alloy steel
- 31.106 Identify various jig saw blades and describe their use.
Blades: tooth parts/angles, blade material (carbon steel, high speed steel, tempered steel)
- 31.107 Identify various router cutters and describe their use.
Cutters: tungsten carbide tipped, high speed steel, panel cutter, profiled cutter, chip limited, guide/roller bearings, disposable tips, hinge cutters, door sets
- 31.108 Identify various planer blades and describe their use.
Blades: disposable tip, tungsten carbide tipped, high speed steel
- 31.109 Identify various drill bits and describe their use.
Drill bits: twist, masonry, flat, saw tooth, Forster, drill material (carbon steel, high speed steel, tungsten carbide)

Abrasives

- 31.110 Identify the various types of abrasive used on sanding machines.
Abrasives: garnet, aluminium oxide, silicone carbide, glass
- 31.111 Identify and describe the reason for different backing material.
Material: cloth, paper
- 31.112 Identify and explain the use of different abrasive grit sizes or grades.
Size/grade: eg 180, 240
- 31.113 Explain the term clogged or loaded in relation to abrasive sheets/belts.

Safety in use

- 31.114 Describe the correct cutting techniques for all portable power hand tools.
Tools: circular saw, jig saw, router, planer, drill (mains electric, cordless), belt sander, orbital sander.

Carcassing and first fixing

Floors and stud partitions

- 31.115 Identify the component parts up timber floors.
Component parts: joists, strutting, coverings, joists hangers, sleeper walls
- 31.116 Identify the component parts of stud partitions.
Component parts: head, sole plate, studs, noggins, coverings
- 31.117 Identify and explain the use of joints and proprietary fixings.
Joints: tusked tenon, bevelled housing, housings, lengthening, joist hangers, strutting, straps, clips
Fixings: joists hangers, strutting, straps, clips
- 31.118 State the factors that affect the position of notches and holes in floor joists for installing pipes and cables.
Factors: access, floor fixings, joist dimensions
- 31.119 Identify various materials used for insulation and covering for floors and stud partitioning.
Insulation: application (sound, temperature), material (fibreglass, mineral wool, polystyrene, foam, foam boards, loose fill)
Covering: solid timber board, chip board, plywood, plaster board
- 31.120 Explain the suitability of fixings for floors and stud partitioning.
Suitability: location, appearance
Fixings: nails, screws, adhesives
- 31.121 Explain the techniques involved in applying coverings and claddings.
Techniques: external corners (mitred, tongue and grooved, beaded, butted), featured, internal corners (mitred, tongue and grooved, beaded), scribed
- 31.122 Identify and explain the use of specialised floor tooling.
Tooling: flooring cramps, dogs, tongue stripper, board saw

Stair cases

- 31.123 Describe methods of securing components to ground and upper floor.
Methods: notched over joints, cut to floor, dowelled (grouted in)
- 31.124 Explain the methods and techniques used for assembling components on site.
Components: newels, hand railing, shaped bottom steps, steps, string, balustrade
- 31.125 Identify calculations involving the spacing of spindles and fillet pieces from given parameters.
Parameters: distance between newel posts, spindle cross section, permissible gap between spindles

- 31.126 Explain the methods used to fix stair strings and hand rails to a wall.
Methods: proprietary fixings, patress, brackets
- 31.127 Identify various types of protective covering for staircases.
Types: nosings, inserts, carpet pads, hard board pads
- 31.128 Identify various types of stair enclosures.
Types: balustrade, railings, spindles, sheet, framed, spandrel framing

Frames and linings

- 31.129 Identify components used to make frames and linings.
Components: jambs, head, cill, planted stop, weather bar, draught excluders, intumescent strips, seals, mullions, transom, glazing bars, thresholds
- 31.130 Explain construction methods and techniques for frames and linings.
Methods/techniques: mortice and tenon, housed, planted (moulds, stops), draw boring, nailing, star 27dowelling
- 31.131 Explain methods and techniques used during fitting and fixing of frames and linings.
Methods/techniques: levelling, lining in, plumb, square, straight, true

- 31.132 Describe methods of fixing and securing frames and linings.
Methods: wood plugs, frame fasteners, adhesives, proprietary (fixings, plugs), packings, spacers

Roofs

- 31.133 Identify various types of roof construction.
Types: flat, pitched, trussed, mono pitch, gable, hipped
- 31.134 Identify various components used in roof construction.
Components: decking, joists, noggins, gutter, fascia, fillets, soffit, firrings, hangers, anchors, joist clips, wall ties, wall plate, wall bracket, verge, flashing, insulation, purlin, hips, spars, rafters, barge boards, trimming, trimmer, ridge board, pitch board, gable ladder, roof trusses
- 31.135 Explain the use of trimming for roof projections.
Use: chimneys, loft access, dormers
- 31.136 Identify various roof coverings.
Coverings: felt, sheeting, tiles, laths, bitumen, slate, stone, clay

Finishing and second fixing

Door hanging

- 31.137 Describe the methods used to hang doors.
Methods: fitting to opening, position of hinges, fixing hinges, applying leads, ironmongery (position, fixing)

Wall mouldings and finishings

- 31.138 Identify various types of wall moulding.
Types: materials (solid wood, composite board), cross section (plain, moulded), mouldings (skirting, architrave, dado, picture rail)
- 31.139 Describe the various methods used in the jointing and fixing of wall mouldings.
Methods: mitred, scribed, heading, nailed, glued, panel adhesives, screws, plugs (plastic, metal, fibre, wood)
- 31.140 Identify and explain the use of plinth blocks and architrave blocks.
- 31.141 Describe the various methods and applications for jointing plinth and architrave blocks.
Methods: dovetails, butted, lapped
Applications: polished, painted, material (timber, composite)

Fitments

- 31.142 Describe the method for fitting units and fitments to walls and floors.
Method: scribing techniques
- 31.143 Identify methods of fixing and securing units and fitments.
Methods: fixing to (walls, each other, bearers, battens)
- 31.144 Describe various methods used for levelling units and fitments.
Methods: adjustable feet, wedges, packings, chopping out, scribing

Services

- 31.145 Explain the various methods used for encasing services.
Methods: ladder frame, battens, framed panelling, sheet materials
- 31.146 Identify various fixings and ironmongery used for securing and fixing service encasings.
Fixings/ironmongery: screws/cups, nails, screws, adhesives, pins
- 31.147 Describe the use of traps built into service encasings.
Use: access

Communications and information technology

Practical competences

The candidate must be able to do the following:

Communications

31.148 Use language in written and oral forms to communicate needs clearly.

Written: technical/commercial letters (eg internal memos, technical reports, job applications, curriculum vitae/résumé), summarise (eg document, report)

Oral: telephone, work instructions, group, one to one

31.149 Interpret, use and draw diagrams in a routine work environment.

Interpret: graphical to written, written to graphical, graphical (eg bar charts, histograms, graphs)

31.150 Collect and select information on the use of national and international standards.

Standards: eg British Standards, International Standards Organization (ISO)

31.151 Collect and select technical information from different sources.

Information: eg technical drawings, schedules, data sheets/charts, manufacturers' information sheets/brochures, microfilm, micro fiche, libraries, library index systems/classification, video tape, CD ROM, computer systems (eg Internet)

31.152 Use information technology systems for communication.

Systems: word processor, fax

Information technology

31.153 Select a suitable software application for a given task.

Software: word processing, database, spreadsheet

31.154 Access a word processing applications software package.

31.155 Open a new word processing file and enter text.

31.156 Edit the contents of a document.

Edit: correct errors, insert words, delete words, insert paragraph breaks, delete paragraph breaks, sections of text (copy, cut, paste)

31.157 Use the spell-check function to check the document.

31.158 Enhance the appearance of a document.

Enhancement: font (size, bold, italics), text (centre, underline)

31.159 Close and save an edited document under an existing and a new file name.

31.160 Print a word processed file.

31.161 Exit the word processing applications package and switch off the equipment.

Knowledge requirements

The instructor must ensure the candidate is able to:

Communications

31.162 Explain the use of language in written and oral forms to communicate needs clearly.

Written: technical/commercial letters (internal memos, technical reports, job applications, curriculum vitae/résumé), summarise (documents/reports)

Oral: telephone, work instructions, group, one to one

31.163 Identify the use of national and international standards in the construction industry.

Standards: eg British Standards, International Standards Organization (ISO)

31.164 Identify the various sources of technical information.

Information: technical drawings, schedules, data sheets/charts, manufacturers' information sheets/brochures, microfilm, micro fiche, libraries, library index systems/classification, video tape, CD ROM, computer systems (eg Internet)

31.165 Explain the use of various electronic and information technology systems for communication.

Systems: word processor, fax, Internet, E-mail

Information technology

31.166 Identify the main functions of commonly used software applications packages.

Packages: word processing (document production), spreadsheets (numerical analysis, manipulation), database (file creation, updating, searching, sorting), computer aided design (line drawings used for architecture/engineering/construction)

31.167 Describe the various editing operations that can be performed on a word processing file.

Edit: correct errors, insert words, delete words, insert paragraph breaks, delete paragraph breaks, sections of text (copy, cut, paste)

- 31.168 Explain the use of the spell-check function to check word processing documents.
- 31.169 Explain the use of the various enhancements that can be used to improve the appearance of a document.
Enhancement: font (size, bold, italics), text (centre, underline)
- 31.170 Explain how to close and save an edited document under an existing and a new file name.
Save: hard disk, floppy disk
- 31.171 Explain how to print a word processing file.
- 31.172 Explain how to exit the word processing applications package and switch off the equipment.

Alteration, repair and renovation

Practical competences

The candidate must be able to do the following:

Doors and frames

31.173 Service, clean and change the handing of a mortice lock.

31.174 Splice a new section into a door style.

31.175 Remove and replace a door panel.
Remove/replace: cut out/remove moulding, remove panel, refit panel, cut/fit new beading

31.176 Insert sections into a door surface following the relocation of ironmongery.

General

31.177 Identify and select materials to match existing and surrounding areas.
Materials: timber, sheet materials, fixings, ironmongery, finishing, finishes

31.178 Remove and replace a section of flooring.
Remove/replace: cut out required section, refit section
Flooring: eg tongue/grooved floor boards, tongue/grooved sheets

31.179 Prepare suitable material and repair a section of damaged walling.
Repair: eg plaster, sand/cement mix
Damage: eg local to (window frame, door frame, skirting board)

Knowledge requirements

The instructor must ensure the candidate is able to:

Doors

31.180 Describe the procedure for refitting a mortice lock and door furniture following removal of material from the closing style.
Door furniture: handles, latches, key escutcheons

31.181 Describe the procedure for servicing and changing the handing of a mortice door lock.

31.182 Describe the procedure for splicing sections into existing products.
Products: doors, windows, frames

31.183 Describe the various faults associated with fitted doors.
Faults: incorrectly fitted hinges, oversized door, incorrectly fitted keep/striking plate, twisted/warped door

31.184 Describe the procedure for removing and replacing a door panel.
Procedure: cut out/remove moulding, remove panel, refit panel, cut/fit new beading

Staircases

31.185 Describe the procedure for repairing stair components.
Procedures: wedges/glue blocks, screw through tread/riser, secure existing fixings
Components: strings, treads, risers, wedges, glue blocks, balustrades, newels, hand rails

31.186 Describe the procedure for replacing stair components.
Components: treads, risers, wedges, glue blocks, balustrades, newels, hand rails

Fitments

31.187 Describe the various faults associated with cupboard drawers.
Faults: warped sections, damaged sections, lack of lubricant

General

31.188 Describe the various methods of taking site details to make repairs.
Methods: sketches, detailing, measuring, samples, notes, templates, finishes, decorations

31.189 Explain the remedial treatment for the eradication of insect and fungal attacks.
Treatment: chemical treatment of affected material, removal of affected material, treatment of surrounding areas (chemical, heat)

31.190 Describe the procedure for removing and replacing a section of flooring.
Procedure: locate hidden pipes/cables, cut out required section, refit section
Flooring: tongue/grooved floor boards, tongue/grooved sheet

Assessment

Test specification for written paper Timber Vocations 2 Principles I (6161-12-031)

This is a multiple choice examination paper lasting one and a half hours and comprising of 50 questions. Candidates must answer all questions.

The examination paper is one of two for the Diploma in Timber Vocations and will cover the knowledge specifications for the following:

Topic	Approximate % examination weighting
Safety at work	20
Materials	40
Calculations, setting out and drawing	10
Communications and information technology	10
Alteration, repair and renovation	20

NB

Bench Joinery candidates will sit the same question papers as the Site Carpentry candidates. Therefore, the test specification given above is also included with the Bench Joinery syllabus.

Assessment

Test specification for written paper Timber Vocations 2 Principles II (6161-12-032)

This is a structured answer examination paper lasting two hours comprising 15 questions. Candidates must answer seven questions.

The examination paper is one of two for the Diploma in Timber Vocations and will cover the knowledge specifications for the following:

Topic	Approximate % examination weighting
Practical skills	
Portable power tools	15
and	
Carcassing and first fixing	55
Finishing and second fixing	30
or	
Woodworking machinery	50
Framed Products	35

NB

Bench Joinery candidates will sit the same question papers as the Site Carpentry candidates. Therefore, the test specification given above is also included with the Bench Joinery syllabus.

31 Site Carpentry 2: Safety at work

Practical competences

The candidate must be able to do the following:

- 31.1 Carry out safe working practices to prevent hazards and to ensure the safety of working personnel and members of the public.
- 31.2 Carry out safe working practices using various equipment/materials to protect surrounding work areas from infringement or contamination.
- 31.3 Carry out the safe erection, use and dismantling of scaffold platforms less than 2m high.
- 31.4 Carry out the safe erection, use and dismantling of scaffold platforms over 2m high.
- 31.5 Inspect for faults, set up and safely use steps and ladders in general use.
- 31.6 Set up safety barriers around a hazard to protect working personnel and members of the public.
- 31.7 Select and use protective clothing and safety equipment for specific tasks.
- 31.8 Use and store toxic materials in a safe manner.
- 31.9 Carry out a risk assessment and prepare a report identifying the potential hazards.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

31 Site Carpentry: Materials

Practical competences

The candidate must be able to do the following:

- | | | | | | |
|-------|--|--------------------------|-------|---|--------------------------|
| 31.20 | Identify and select common softwoods for specific applications based on their technical properties. | <input type="checkbox"/> | 31.29 | Prepare a report identifying the availability, suitability and relative costs of timber based products available in the country of study. | <input type="checkbox"/> |
| 31.21 | Identify and select common hardwoods for specific applications based on their technical properties. | <input type="checkbox"/> | 31.30 | Prepare a report on the environmental effects of forestry and the manufacture of timber based products. | <input type="checkbox"/> |
| 31.22 | Identify and select manufactured boards and sheet materials for specific applications based on their technical properties. | <input type="checkbox"/> | | | |
| 31.23 | Identify and select wood preservatives and insecticides for specific applications based on their technical properties. | <input type="checkbox"/> | | | |
| 31.24 | Identify and select adhesives for specific applications based on their technical properties. | <input type="checkbox"/> | | | |
| 31.25 | Identify and select abrasive sheets for specific applications based on their technical properties. | <input type="checkbox"/> | | | |
| 31.26 | Identify and select wood screws/components and nails for specific applications based on their technical properties. | <input type="checkbox"/> | | | |
| 31.27 | Identify and select timber based doors for specific applications based on their technical properties. | <input type="checkbox"/> | | | |
| 31.28 | Identify and select timber based windows for specific applications based on their technical properties. | <input type="checkbox"/> | | | |

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature _____

Candidate name (please print) _____

Instructor signature _____

Instructor name (please print) _____

Completion date _____

31 Site Carpentry 2: Calculations, setting out and drawing

Practical competences

The candidate must be able to do the following:

Calculations

- 31.51 Take off accurate dimensions from drawings of circular, semi circular and triangular structures/products.
- 31.52 Calculate areas from dimensions taken off drawings of circular, semi circular and triangular structures/products.
- 31.53 Calculate volumes from dimensions taken off drawings of circular, semi circular and triangular structures/products.
- 31.54 Calculate the quantity and cost of materials required from drawings of circular, semi circular and triangular structures/products.
- 31.55 Calculate component spacings of circular, semi circular and triangular structures/products.

Setting out

- 31.56 Use tools and equipment to take measurements from site for the manufacture of components and products.
- 31.57 Measure and set out components to produce workshop rods and drawings of complex linear, rectangular and triangular structures/products.
- 31.58 Draw cut away and hidden detail onto setting out rods of complex linear, rectangular and triangular structures/products.
- 31.59 Set out component spacings of complex linear, rectangular and triangular structures/products.
- 31.60 Prepare cutting lists from setting out rods of complex linear, rectangular and triangular structures/products.

Drawing

- 31.61 Produce working drawings from plans and details of complex linear, rectangular and triangular structures/products.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

31 Site Carpentry 2: Practical skills

Practical competences

The candidate must be able to do the following:

Portable powered hand tools

Circular saw

31.67 Set and operate a portable circular saw to cut material.

31.68 Select and change blades for the material being cut.

Jig saw

31.69 Set and operate a portable jig saw to cut material.

31.70 Select and change blades for the material being cut.

Router

31.71 Set and operate a portable router to cut material.

31.72 Select and change cutters for the material being cut.

Planner

31.73 Set and operate a portable planer to prepare timber.

31.74 Select and change blades for the material being cut.

Power drills

31.75 Set and operate a portable power drill suitable for various materials.

31.76 Select and change drill bits suitable for the material being drilled.

Sanding machines

31.77 Set and operate a portable sanding machine to produce a surface finish on various materials.

31.78 Select and change abrasive sheets/belts suitable for the material being sanded.

31.79 Clean, service and store portable power tools in accordance with the manufacturers' schedules.

31.80 Use safety equipment and machine guards for all portable powered tools in accordance with national/local standards.

Carcassing and first fixing

Floors

31.81 Space, level and fix joists to form floors with tolerances to industry standards.

31.82 Form an opening to create an access trap using trimmer joists and trimmed joists with tolerances to industry standards.

31.83 Cut and fix strutting to secure and stabilise joists.

31.84 Measure, cut and fix floor coverings.

31.85 Finish and make good openings.

Stud partitioning

31.86 Mark out components to form stud partitioning with tolerance to industry standards.

31.87 Cut and assemble components to produce stud partitioning with tolerances to industry standards.

31.88 Erect and fix stud partitioning with tolerances to industry standards.

Frames and linings

31.89 Prepare, fit and fix door linings with tolerances to industry standards.

31.90 Prepare, fit and fix door frames with tolerances to industry standards.

31.91 Prepare, fit and fix window frames with tolerances to industry standards.

31.92 Prepare, fit and secure glazing panels to window frames and openers with tolerances to industry standards.

Flat roofs

31.93 Set out a flat roof to scale with tolerances to industry standards.

31.94 Prepare components to form a flat roof with tolerances to industry standards.

31.95 Assemble and fix components to form a flat roof with tolerances to industry standards.

Pitched roofs

31.96 Set out an equal pitched roof to scale with tolerance to industry standards.

31.97 Prepare components to form an equal pitched roof with tolerances to industry standards.

31.98 Assemble and fix components to form an equal pitched roof with tolerances to industry standards.

Finishing and second fixing

31.99 Prepare and hang timber based doors with tolerances to industry standards.

31.100 Select, fit and fix ironmongery to a timber based door.

31.101 Cut, joint and fix wall mouldings and finishes with tolerances to industry standards.

31.102 Prepare, fit and fix fitments with tolerances to industry standards.

31.103 Transfer levels and datum points with tolerances to industry standards.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature _____

Candidate name (please print) _____

Instructor signature _____

Instructor name (please print) _____

Completion date _____

31 Site Carpentry: Communications and information technology

Practical competences

The candidate must be able to do the following:

Communications

- 31.148 Use language in written and oral forms to communicate needs clearly.
- 31.149 Interpret, use and draw diagrams in a routine work environment.
- 31.150 Collect and select information on the use of national and international standards.
- 31.151 Collect and select technical information from different sources.
- 31.152 Use information technology systems for communication.

Information technology

- 31.153 Select a suitable software application for a given task.
- 31.154 Access a word processing applications software package.
- 31.155 Open a new word processing file and enter text.
- 31.156 Edit the contents of a document.
- 31.157 Use the spell-check function to check the document.
- 31.158 Enhance the appearance of a document.
- 31.159 Close and save an edited document under an existing and a new file name.
- 31.160 Print a word processed file.
- 31.161 Exit the word processing applications package and switch off the equipment.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

31 Site Carpentry: 2 Alteration, repair and renovation

Practical competences

The candidate must be able to do the following:

Doors and frames

31.173 Service, clean and change the handing of a mortice lock.

31.174 Splice a new section into a door style.

31.175 Remove and replace a door panel.

31.176 Insert sections into a door surface following the relocation of ironmongery.

General

31.177 Identify and select materials to match existing and surrounding areas.

31.178 Remove and replace a section of flooring.

31.179 Prepare suitable material and repair a section of damaged walling.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

32 Bench Joinery 2 – Summary of syllabus sections

Page 42 Safety at work
(Objectives 32.1 to 32.19)

The aim of this unit is to enable the candidate to maintain safe working conditions and to adopt safe procedures for themselves and others.

Page 44 Materials
(Objectives 32.20 to 32.50)

The aim of this unit is to enable the candidate to:

- a identify and select materials for specific applications based on their technical properties
- b describe the technical properties of the main types of materials in use
- c identify environmental effects and benefits of timber based materials and processes

Page 46 Calculations, setting out and drawing
(Objectives 32.51 to 32.66)

The aim of this unit is to enable the candidate to:

- a take off dimensions from drawings of circular, semi circular and triangular structures/products
- b calculate quantities to assist in preparing, costing and estimating
- c set out components to form products
- d produce working drawings of complex structures and products

Page 47 Practical skills
(Objectives 32.67 to 32.251)

The aim of this unit is to enable the candidate to :

- a set up, change tooling and operate woodworking machinery
- b set up, change tooling and operate portable powered hand tools
- c set out, manufacture and assemble components, frames and products

Page 55 Communications and information technology
(Objectives 32.252 to 32.276)

The aim of this unit is to enable the candidate to use:

- a communication skills in the workplace
- b information technology in the workplace

Page 57 Alteration, repair and renovation
(Objectives 32.277 to 32.294)

The aim of this unit is to enable the candidate to apply tool skills to carry out the alteration, repair and restoration of existing buildings.

Safety at work

The use of national/local regulations and working practices must be included in all practical competences.

Practical competences

The candidate must be able to do the following:

- 32.1 Carry out safe working practices to prevent hazards and to ensure the safety of working personnel and members of the public.
Hazards: wood dust, preservatives, obstructions, sharp tools, warning notices
- 32.2 Carry out safe working practices using various equipment/materials to protect surrounding work areas from infringement or contamination.
Equipment/materials: dust extraction, ventilation, dust sheets, masking tapes/paper, shields (boards)
- 32.3 Carry out the safe erection, use and dismantling of scaffold platforms less than 2m high.
Scaffolding: trestles, folding trestles, hop up stools, scaffold boards
- 32.4 Carry out the safe erection, use and dismantling of scaffold platforms over 2m high.
Scaffolding: quick assembly towers, scaffold boards, toe boards, hand rails, stabilisers/outriggers
- 32.5 Inspect for faults, set up and safely use steps and ladders in general use.
Faults: metal components (corrosion), timber components (deterioration, splits, cracks)
Set up: firm/level base, clip/lash down
- 32.6 Set up safety barriers around a hazard to protect working personnel and members of the public.
Barriers: security tape, barrier material (eg timber, metal, plastic), safety/warning (signs, lights)
Hazards: openings in (floors, walls, roofs), roof edges, operating machinery
- 32.7 Select and use protective clothing and safety equipment for specific tasks.
Equipment: overalls, gloves, eye protection, face mask, ear defenders/plugs, safety shoes, safety helmet (hard hat), machine guards, residual current device
Tasks: producing joints and components to form products, use of dangerous substances (preservatives, insecticides, insulating materials, adhesives, lubricants)
- 32.8 Use and store toxic materials in a safe manner.
Use: manufacturers' instructions, toxic effect
Materials: wood dust, preservatives/insecticides, insulating materials, adhesives, lubricants

- 32.9 Carry out a risk assessment and prepare a report identifying the potential hazards.
Risk assessment: working practices, hazard identification, dangerous substances, machinery, noise, scaffolding

Knowledge requirements

The instructor must ensure the candidate is able to:

- 32.10 State the methods used to prevent hazards and to ensure the safety of working personnel and members of the public.
Methods: warning notices, barriers
- 32.11 State the methods used to protect surrounding work areas from infringement or contamination.
Methods: dust extraction, ventilation, dust sheets, masking tapes/paper, shields (boards)
- 32.12 Explain the safe use of scaffold platforms less than 2m high.
Scaffolding: trestles, folding trestles, hop up stools, scaffold boards
Safe use: manufacturers' instructions, nationally/locally applied regulations
- 32.13 Explain the safe use of scaffold platforms over 2m high.
Scaffolding: quick assembly towers, scaffold boards, toe boards, hand rails, stabilisers/outriggers
Safe use: manufacturers' instructions, nationally/locally applied regulations
- 32.14 State the faults, possible hazards and dangerous practices when using ladders and steps.
Faults: metal components (corrosion), timber components (deterioration, splits, cracks)
Hazards: base fixing/stabilising, clip/lash at platform level, clear space around base
Dangerous practices: uneven/loose ground
- 32.15 Explain the purpose and use of barriers and warning signs/lights to protect working personnel and members of the public from possible accidents.
Barriers: security tape, barrier material (timber, metal, plastic), safety/warning (signs, lights)
Purpose: segregation of different work activities, segregation of work from members of the public, prevention of falls from heights above 2m

- 32.16 Describe the purpose and use of protective clothing and safety equipment for a range of applications.
 Equipment: overalls, gloves, eye protection, face mask, ear defenders/plugs, safety shoes, safety helmet (hard hat), machine guards, residual current device
 Purpose: handling corrosive/heavy materials, cutting /preparing timber products, using power tools, protecting feet from heavy objects, working below other workers or machines
 Applications: producing joints and components to form products, use of dangerous substances (preservatives, insecticides, insulating materials, adhesives, lubricants)
- 32.17 State the toxic effect of materials used in bench joinery.
 Effect: eyes, skin, breathing
 Materials: wood dust, preservatives, adhesives, lubricants, insecticides, insulating materials
- 32.18 Describe the preventative and remedial actions to be taken in the case of exposure to toxic materials.
 Exposure: ingested, contact with skin, inhaled
 Preventative action: dust extraction, ventilation, masks, protective clothing/equipment
 Remedial action: immediate first aid, report to supervisor
 Materials: wood dust, preservatives, adhesives, lubricants, insulating materials, insecticides, manufacturers' instructions
- 32.19 Explain the method by which a risk assessment is carried out.
 Method: identify task procedure, identify hazards, identify control actions to reduce hazard, assess final risk

Materials

The properties of locally manufactured materials or materials in local general use should be considered.

Practical competences

The candidate must be able to do the following:

- 32.20 Identify and select common softwoods for specific applications based on their technical properties.
Softwoods: eg pine, redwood, whitewood
Applications: joinery products (eg windows, doors, stairs, tables, units/fitments, roofs, partitions, flooring)
- 32.21 Identify and select common hardwoods for specific applications based on their technical properties.
Hardwoods: eg mahogany, oak, teak
Applications: joinery products (eg windows, doors, stairs, tables, units/fitments, roofs, flooring)
- 32.22 Identify and select manufactured boards and sheet materials for specific applications based on their technical properties.
Board/sheet: eg plywood (3 ply, multiply, block board, lamin board, batten board), medium density fibreboard (MDF), hardboard, particle board (chipboard, wafer board), veneered boards (melamine, Formica, cloth, real wood)
Applications: joinery products (eg doors, stairs, tables, units/fitments, roofs, partitions, flooring)
- 32.23 Identify and select wood preservatives and insecticides for specific applications based on their technical properties.
Preservatives/insecticides: water based, spirit based, tar/oil based
Applications: joinery products (eg windows, doors, stairs, tables, units/fitments, roofs, partitions, flooring), insect attack, fungal attack
- 32.24 Identify and select adhesives for specific applications based on their technical properties.
Adhesives: eg polyvinyl acetate (PVA), urea-formaldehyde (uf), hot melt, contact, animal
Applications: joinery products (eg windows, doors, stairs, tables, units/fitments)
- 32.25 Identify and select abrasive sheets for specific applications based on their technical properties.
Abrasive sheets: sand, glass, garnet, aluminium oxide
Applications: hand/machine surface finish
- 32.26 Identify and select wood screws/components and nails for specific applications based on their technical properties.
Screws/components: eg counter sunk, raised counter sunk, round-head, dome-head, twin fast, Phillips, posidrive, slotted, brass, bronze, chromium, sheradized, japanned, steel, alloy, cups, caps

Nails: eg lost head, oval, round wire, hardboard pins, panel pins, annular ring shank, masonry.
Applications: joinery products (eg windows, doors, stairs, tables, units/fitments, roofs, partitions, flooring)

- 32.27 Identify and select timber based doors for specific applications based on their technical properties.
Doors: eg FLB (framed, ledged, braced and battened), fire check, flush, panelled, glazed, panelled and glazed, internal, external
Applications: internal, external, fire resistant, security, lighting, decorative
- 32.28 Identify and select timber based windows for specific applications based on their technical properties.
Windows: eg storm proof, pivot, sliding sash, tilt and turn, shuttered, screened, features (eg bay, bow, bulls eye, arched)
Applications: security, lighting, insulating, decorative, ventilation
- 32.29 Prepare a report identifying the availability, suitability and relative costs of timber based products available in the country of study.
Timber: softwoods, hardwoods, manufactured boards
Suitability: climate, ecological effects
- 32.30 Prepare a report on the environmental effects of forestry and the manufacture of timber based products.
Forestry: managed, unmanaged
Manufactured products: manufactured boards
Environmental effects: forestry (soil erosion, water pollution, air pollution, landscape, photosynthesis), manufactured products (air pollution, water supplies/pollution)

Knowledge requirements

The instructor must ensure the candidate is able to:

Timber

- 32.31 Identify the machines used for converting timber (all with log carriage).
Machines: circular saw, horizontal saw, reciprocating saw, band saw/mill
- 32.32 Explain the various terms associated with the seasoning process.
Terms: moisture content, fibre saturation point, equilibrium moisture content, moisture gradient
- 32.33 Describe the different methods of seasoning timber.
Methods: kiln, dehumidifier, air
- 32.34 Identify the various defects associated with seasoning timber.
Defects: case hardening, honey combing, surface checks, splits

- 32.35 Identify and explain the terms used to describe timber characteristics.
Terms: grain (sloping, spiral, open, close, tight, interlocked, straight, curly, wavy), compression/ tension wood (growth, converted timber), permeability (permeable, moderately resistant, resistant, very resistant), durability (perishable, non-durable, moderately durable, durable, very durable), texture (coarse, fine, even, uneven, figuring)
- 32.36 State the technical properties of common softwoods.
Softwoods: pine, redwood, whitewood
Properties: colour, grain, structure, density, stability, strength, workability, permeability, durability, texture
- 32.37 State the technical properties of common hardwoods.
Hardwoods: mahogany, oak, teak
Properties: colour, grain, structure, density, stability, strength, workability, permeability, durability, texture
- Manufactured boards**
- 32.38 State the construction and technical properties of the various types of manufactured boards.
Boards: plywood (3 ply, multiply, block board, lamin board, batten board), fibreboard (medium density fibreboard/MDF, hardboard), particle board (chipboard, wafer board), veneered boards (melamine, Formica, cloth, real wood)
Properties: strength, stability, available sizes, moisture resistance, fire resistance, insect/fungal resistance
Construction: adhesives, particle size, laminates, additives (moisture resistance, fire resistance, insect/fungal resistance)
- 32.39 State the various terms used to describe manufactured boards and the reasons for this classification.
Terms: Grade, Int (interior), MR (moisture resistant), BR (boil resistant), WBP (weather and boil proof)
Reasons: adhesive type, material type, applications (internal, external)
- Preservatives**
- 32.40 Describe the life cycle and characteristics of common wood destroying fungus.
Fungus: wet rot, dry rot, sap stains
- 32.41 Describe the life cycle and characteristics of common beetles and insects that attack timber and timber based products.
Beetles/insects: beetles (furniture, death-watch, lyctus, house long horn, forest long horn, weevil, bark), insects (termites, wood wasp)
- 32.42 State the properties and uses of various types of preservatives.
Preservatives: water based, spirit based, tar/oil based
Properties: penetration, odour, method of cleaning applicator, toxicity
- Uses: suitability for application/location (eg non poisonous near animals)
- Adhesives**
- 32.43 State the properties and uses of various types of adhesives.
Adhesives: polyvinyl acetate (PVA), urea-formaldehyde (uf), hot melt, contact, animal
Properties: shelf life, pot life, moisture resistance, strength, curing time, open time, elasticity, film thickness, gap filling quality, surrounding conditions (frost, heat, moisture)
Uses: interior/exterior, suitability for application (eg sheet bonding, joint bonding)
- 32.44 Identify the effects adhesives have on tooling.
Effects: blunting, clogging
- Abrasives**
- 32.45 State the different backing materials used with abrasive sheets and explain their use.
Backings: paper, cloth
Use: machine, hand
- 32.46 Explain the terms open coat and closed coat.
- 32.47 Identify the uses of open coat and closed coat abrasive sheets.
Uses: dry, wet, resinous, hardwoods, softwoods, manufactured boards
- Fixings**
- 32.48 Identify the various types of wood screws/components and explain their use.
Screws: counter sunk, raised counter sunk, round-head, dome-head, twin fast, Phillips, posidrive, slotted, steel, alloy, brass, bronze, chromium, sheradized, japanned
Components: cups, caps
Use: strength, appearance, corrosion resistance, flush/raised head, suitability for material being fixed, driving method
- 32.49 Identify the various types of nails and explain their use.
Nails: lost head, oval, round wire, hardboard pins, panel pins, annular ring shank, masonry
Use: strength, appearance, corrosion resistance, flush/sunken head, suitability for material being fixed
- 32.50 Prepare a report on the environmental effects of forestry and the manufacture of timber based products.
Forestry: managed, unmanaged
Manufactured products: manufactured boards
Environmental effects: forestry (soil erosion, water pollution, air pollution, landscape, photosynthesis), manufactured products (air pollution, water supplies/pollution)

Calculations, setting out and drawing

Practical competences

The candidate must be able to do the following:

Calculations

32.51 Take off accurate dimensions from drawings of circular, semi circular and triangular structures/products.
Drawings: plans, sectional drawings
Dimensions: components (length, width, thickness)

32.52 Calculate areas from dimensions taken off drawings of circular, semi circular and triangular structures/products.
Areas: walls, floors, openings

32.53 Calculate volumes from dimensions taken off drawings of circular, semi circular and triangular structures/products.
Volumes: timber, logs

32.54 Calculate the quantity and cost of materials required from drawings of circular, semi circular and triangular structures/products.
Materials: timber, timber based products, fixings
Costs: product catalogues, price lists, discounts
Drawings: joinery components

32.55 Calculate component spacings of circular, semi circular and triangular structures/products.
Component: eg glazing bars, joists, palings, jambs, mullions

Setting out

32.56 Use tools and equipment to take measurements from site for the manufacture of components and products.
Tools/equipment: eg water level, spirit level, plumb line, straight edge, tape measure, rule
Measurements: eg windows, doors, frames, fitments, stairs, flooring, mouldings, surrounding influencing factors

32.57 Measure and set out components to produce workshop rods and drawings of complex linear, rectangular and triangular structures/products.
Workshop rods: vertical sections, horizontal sections
Drawings: elevations
Products: doors, windows, frames, linings, cupboards
Complex products: using rebated/grooved/moulded cross sectioned timbers

32.58 Draw cut away and hidden detail onto setting out rods of complex linear, rectangular and triangular structures/products.
Detail: eg mortice and tenon detail

32.59 Set out component spacings of complex linear, rectangular and triangular structures/products.
Component: eg glazing bars, joists, palings, mullions, transom, rails, muntins

32.60 Prepare cutting lists from setting out rods of complex linear, rectangular and triangular structures/products.
Setting out rods: eg doors, windows, frames, linings, cupboards

Drawing

32.61 Produce working drawings from plans and details of complex linear, rectangular and triangular structures/products.
Drawing: dimensions, detail (eg glazing bars, rails, stiles, heads, jambs, transom, mullion, muntin), exploded views, isometric

Knowledge requirements

The instructor must ensure the candidate is able to:

Calculations

32.62 Identify calculations involving areas and volumes of circular, semi circular and triangular structures/products.
Areas: walls, floors, openings, timber cross sections
Volumes: timber, logs
Complex products: using rebated/grooved/moulded cross sectioned timbers

32.63 Identify calculations involving quantities and costs of materials of circular, semi circular and triangular structures/products.
Materials: timber, timber based products, fixings
Costs: product catalogues, price lists, discounts

Setting out

32.64 Identify and explain the use of tools and equipment for measuring and levelling.
Tools/equipment: water level, spirit level, plumb line, straight edge, tape measure, rule

32.65 Identify components from setting out rods and drawings of complex linear, rectangular and triangular structures/products.
Components: jambs, mullions, transom, head, cill, glazing bars, rails, styles, muntins

Drawing

32.66 Identify scale working drawings of items taken from plans and details of complex linear, rectangular and triangular structures/products.
Drawings: dimensions, detail (eg glazing bars, rails, stiles, heads), exploded views, isometric

Practical skills

All operations involving powered tools and machines must comply with national/local standards.

Practical competences

The candidate must be able to do the following:

Woodworking machinery

Circular rip saw

- 32.67 Set and operate a hand fed circular ripsaw for cutting timber.
Cutting: flat, deep, bevel, angle
Timber: eg hardwood, softwood, sheet material
- 32.68 Use jigs, bed pieces, saddles and templates to aid the cutting of components.
Components: firing strips, wedges, angle fillets/glue blocks
- 32.69 Use feeding aids to assist cutting operations.
Aids: push stick, push spike
Operations: ripping
- 32.70 Select suitable blades for the material being cut.
Selection: tooth (parts, angles), blade material (alloy steel, tungsten carbide)
Materials: eg hardwood, softwood, sheet
- 32.71 Change blades, riving knife, mouth piece and packings.
- 32.72 Position the fence to suit the material being cut.
Position: in line with gullets, running through
Materials: eg solid timber, sheet material
- 32.73 Check and set the fence lead in to industry standards.
Set: 0.3mm over 600mm
- 32.74 Use safety equipment and machine guards in accordance with national/local standards.

Cross cut saw

- 32.75 Set and operate a cross cut saw for squaring ends, removing faults/defects and cutting timber to length.
Timber: eg hardwood, softwood
- 32.76 Set and operate a cross cut saw for trenching with the aid of a false bed/auxiliary table.
Trenching: 90°, angled
- 32.77 Select and change suitable blades for the material being cut.
Selection: tooth (parts, angles), blade material (alloy steel, tungsten carbide)
Materials: eg hardwood, softwood, sheet
- 32.78 Fit trenching equipment and make adjustments to width of cut.

- 32.79 Set and use fence stops for maintaining component length.

- 32.80 Use safety equipment and machine guards in accordance with national/local standards.

Narrow band saw

- 32.81 Set and operate a narrow band saw machine for cutting timber.
Cutting: straight cutting free hand to a line, straight cutting with fence and template or jigs, curved cutting free hand, curved cutting with templates or jigs, bevel cutting using canting table, bevel cutting with the aid of bed pieces and saddles
Timber: eg hardwood, softwood, sheet material
- 32.82 Select suitable blades for the material being cut.
Selection: tooth (parts, angles), blade material (alloy steel, tempered), thickness of material, curvature of cut
Materials: eg hardwood, softwood, sheet
- 32.83 Change blade/mouthpiece and set guides/thrust wheel.
- 32.84 Fold and store a blade in a safe and efficient manner.
- 32.85 Set and adjust tracking and tension devices to suit the blade.
- 32.86 Check the tension of the blade is within accepted limits.
Check: by hand
Limits: 9mm sideways movement from the centre line, 45% of twist
- 32.87 Use safety equipment and machine guards in accordance with national/local standards.

Surface planer

- 32.88 Set and operate a surface planing machine to prepare timber.
Operation: flattening, edging, rebating, chamfering, bevelling
Timber: eg hardwood, softwood
- 32.89 Select suitable blades for the material being planed.
Blades: high speed steel (HSS), tungsten carbide tipped
Material: eg hardwood, softwood, sheet
- 32.90 Change and set blades.
Set: ensuring all blades are clear of outfeed bed, cutting circle is parallel and in line with outfeed bed
- 32.91 Hone blades to remove burrs and produce a fine edge.
Blades: high speed steel (HSS)
- 32.92 Use safety equipment and machine guards in accordance with national/local standards.

Thickness planer (panel planer)

- 32.93 Set and operate a thickness planer to reduce timber.
Reduce: width, thickness, tapering, bevelling
Timber: eg hardwood, softwood
- 32.94 Use jigs and bed pieces to produce tapers and bevels.
- 32.95 Select suitable blades for the material being planed.
Blades: high speed steel (HSS), tungsten carbide tipped
Materials: eg hardwood, softwood, sheet
- 32.96 Change and set blades.
Set: to suit machine specifications
- 32.97 Hone blades to remove burrs and produce a fine edge.
Blades: high speed steel (HSS)
- 32.98 Use safety equipment and machine guards in accordance with national/local standards.

Chisel morticing machine

- 32.99 Set and operate a chisel morticing machine for cutting mortices in timber.
Set: table, fence, depth stop
Mortices: through (straight, angled), stubbed (straight, angled), haunched
Timber: eg hardwood, softwood
- 32.100 Select suitable components for the mortice being produced.
Selection: dimensions
Components: eg chisels, augers, bushes, collets
- 32.101 Change and set the components to suit the mortice being produced.
Components: eg chisels, augers, bushes, collets
Set: square, clearance, ejection slot direction
- 32.102 Lubricate the chisel and auger.
- 32.103 Use safety equipment and machine guards in accordance with national/local standards.

Portable powered hand tools

Circular saw

- 32.104 Set and operate a portable circular saw to cut material.
Cut: straight (angled, square)
Materials: eg hardwood, softwood, sheet
- 32.105 Select and change blades for the material being cut.
Selection: tooth (parts, angles), blade material (alloy steel, tungsten carbide tipped)
Materials: eg hardwood, softwood, sheet

Jig saw

- 32.106 Set and operate a portable jig saw to cut material.
Cut: straight, curved, canted
Materials: eg hardwood, softwood, sheet

- 32.107 Select and change blades for the material being cut.
Selection: tooth (parts, angles), blade material (carbon steel, high speed steel/HSS, tempered steel)
Materials: eg hardwood, softwood, sheet

Router

- 32.108 Set and operate a portable router to cut material.
Cut: straight, curved, internal, external
Materials: eg hardwood, softwood, sheet
- 32.109 Select and change cutters for the material being cut.
Selection: blade material (high speed steel, tungsten carbide tipped), shape
Materials: eg hardwood, softwood, sheet

Planer

- 32.110 Set and operate a portable planer to prepare timber.
Operation: flattening, edging, rebating, chamfering, bevelling
Timber: eg hardwood, softwood
- 32.111 Select and change blades for the material being cut.
Selection: blade material (high speed steel/HSS, tungsten carbide tipped)
Materials: eg hardwood, softwood

Power drills

- 32.112 Set and operate a portable power drill suitable for various materials.
Drills: eg mains electric, cordless (battery)
Materials: hardwood, softwood, sheet material, masonry/concrete, steel
- 32.113 Select and change drill bits suitable for the material being drilled.
Drill bits: twist, masonry, flat, material (carbon steel, high speed steel/HSS, tungsten carbide tipped)
Materials: eg hardwood, softwood, sheet material, masonry/concrete, steel

Sanding machines

- 32.114 Set and operate a portable sanding machine to produce a surface finish on various materials.
Machines: belt, orbital
Surface finish: smooth, clean, free from defects
Materials: eg hardwood, softwood, sheet
- 32.115 Select and change abrasive sheets/belts suitable for the material being sanded.
Selection: grade, abrasive (aluminium oxide, garnet, glass), backing material
Materials: eg hardwood, softwood, sheet
- 32.116 Clean, service and store portable power tools in accordance with the manufacturers' schedules.
Tools: circular saw, jig saw, router, planer, drill (mains electric, cordless), belt sander, orbital sander

32.117 Use safety equipment and machine guards for all portable powered tools in accordance with national/local standards.

Framed products

Doors

32.118 Set out an external door with solid panels, rails and muntins with tolerances to industry standards.
Tolerances: product overall dimensions ± 1 mm, component dimensions ± 0.5 mm

32.119 Prepare materials and mark out components with tolerances to industry standards.
Tolerances: product overall dimensions ± 1 mm, component dimensions ± 1 mm

32.120 Manufacture and assemble components to produce an external door with solid panels, rails and muntins with tolerances to industry standards.
Tolerances: product overall dimensions ± 3 mm, gaps not exceeding 0.5mm, diagonals ± 2 mm, free from twist

32.121 Finish door suitable for surface coatings using hand tools and portable power tools.

Windows

32.122 Set out a window incorporating an opener with tolerances to industry standards.
Tolerances: product overall dimensions ± 1 mm, component dimensions ± 0.5 mm

32.123 Prepare materials and mark out components with tolerances to industry standards.
Tolerances: product overall dimensions ± 1 mm, component dimensions ± 1 mm

32.124 Manufacture and assemble components to produce a window incorporating an opener with tolerances to industry standards.
Tolerances: product overall dimensions ± 3 mm, gaps not exceeding 0.5mm, diagonals ± 2 mm, free from twist

32.125 Finish window suitable for surface coatings using hand tools and portable power tools.

Fitments

32.126 Set out a framed construction storage unit with tolerances to industry standards.
Storage unit: incorporating a door and drawer
Tolerances: product overall dimensions ± 1 mm, component dimensions ± 0.5 mm

32.127 Prepare materials and mark out components with tolerances to industry standards.
Tolerances: product overall dimensions ± 1 mm, component dimensions ± 1 mm

32.128 Manufacture and assemble components to produce a framed construction storage unit with tolerances to industry standards.

Tolerances: product overall dimensions ± 3 mm, gaps not exceeding 0.5mm, door/drawer overall dimensions ± 2 mm with gaps not exceeding 0.5mm, diagonals ± 2 mm, free from twist

32.129 Finish framed construction storage unit suitable for surface coatings using hand tools and portable power tools.

Stairs

32.130 Set out a flight of stairs with newel posts, hand railing and balustrades with tolerances to industry standards.
Tolerances: product overall dimensions ± 1 mm, component dimensions ± 0.5 mm
Stairs: minimum 5 risers, straight flight

32.131 Prepare materials and mark out components with tolerances to industry standards.
Tolerances: product overall dimensions ± 1 mm, component dimensions ± 1 mm

32.132 Manufacture and assemble components to produce a flight of stairs with newel posts, hand railing and balustrades with tolerances to industry standards.
Tolerances: product overall dimensions ± 3 mm, gaps not exceeding 0.5mm, diagonals ± 2 mm, free from twist

32.133 Finish a flight of stairs with newel posts, hand railing and balustrades suitable for surface coatings using hand tools and portable power tools.

Knowledge requirements

The instructor must ensure the candidate is able to:

Woodworking machinery

Circular rip saw

32.134 State the types of operation that can be undertaken with a circular rip saw.
Operation: cutting (flat, deep, bevel, angle)

32.135 Identify and name the various components of a circular rip saw.
Components: main frame, fence, bed, blade, riving knife, finger plate, mouth piece, packings, extension table, switches (start, stop, isolator), guards, drive system

32.136 Explain the purpose of the finger plate, mouth piece and packings.

32.137 State the types of materials used for the mouth piece and packings.
Materials: hardwood, felt, hemp

- 32.138 Describe the correct positions of the fence in relation to the blade.
Positions: in line with gullets, running through
- 32.139 Explain the reason for having a 'fence lead in'.
Reason: prevent binding
- 32.140 Identify and describe the various types of blades.
Blades: spring set, alloy steel, parallel plate, tungsten carbide tipped
- 32.141 Identify the various angles and parts of circular rip saw teeth.
Angles/parts: hook angle, sharpness angle, clearance length, clearance angle, gullet, root, pitch, front, top, point
- 32.142 Explain the reasons for the different angles and proportions of circular rip saw tooth design.
Reasons: material being cut (type, density, thickness, moisture content), feed rate
- 32.143 Describe how set is applied to saw teeth and explain its function.
- 32.144 Identify calculations involving the maximum and minimum blade diameters allowed on machines.
Calculation: minimum diameter = 60% of maximum diameter
- 32.145 Explain the probable effects of using the wrong blade size.
- 32.146 Explain, with the aid of a sketch, how jigs, bed pieces, saddles and templates are used to assist in cutting components.
- 32.147 Explain the function of a riving knife.
Function: prevent binding, act as a guard
- 32.148 State the correct setting of guards and safety devices in accordance with national/local standards.
Guards/safety devices: crown guard, extension guard, riving knife, extension table, push stick, push spike
- Cross cut saw**
- 32.149 State the types of operation that can be undertaken with a cross cut saw.
Operation: trenching (90°, bevelled, compound bevelled), cross cutting (90°, bevelled, compound bevelled)
- 32.150 Identify and name the various components of a cross cut saw.
Components: table, saw unit, fence, false bed, auxiliary table, switches (start, stop, isolator)
- 32.151 Identify and describe the various types of blades.
Blades: spring set, alloy steel, parallel plate, tungsten carbide tipped, hollow ground, trenching heads
- 32.152 Identify the various angles and parts of cross cut saw teeth.
Angles/parts: hook angle, sharpness angle, clearance length, clearance angle, gullet, root, pitch, front, top, point
- 32.153 Explain the reason for the different angles and proportions of cross cut saw tooth design.
Reasons: material being cut (type, density, thickness, moisture content)
- 32.154 Explain the mechanics involved in the movement of the various components.
Components: head travel, rise/fall of head, tilting/canting of saw unit, swivelling of saw unit
- 32.155 Name the types of fence stop available.
Fence stops: disappearing, turnover, multiple component
- 32.156 Explain the use of an auxiliary/false table when trenching.
- 32.157 State the correct setting of guards and safety devices in accordance with national/local standards.
Guards/safety devices: extension guard, blade guard, belly guard, side flanges
- Narrow band saw**
- 32.158 Explain the types of operation that can be undertaken with a narrow band saw.
Operations: straight cutting free hand to a line, straight cutting with fence and template or jigs, curved cutting free hand, curved cutting with templates and jigs, bevel cutting using canting table, bevel cutting with the aid of bed pieces and saddles
- 32.159 Identify and name the various components of a narrow band saw.
Components: main frame, table, saw pulley wheels, saw guides, thrust wheel, blade, mouth piece, tracking device, straining device, guards, cleaning devices, brake
- 32.160 Explain the operating principles and function of various components.
Components: saw pulley wheels, straining devices (tension), tracking devices, saw guides, thrust wheels, cleaning devices, canting table, braking devices
- 32.161 Describe the method of checking the blade tension by hand.
Tension: limit (9mm sideways movement from the centre line, 45% of twist)

- 32.162 Identify and describe the various types of blade.
Blades: material (alloy steel, tempered steel, high speed steel ([HSS], stellite tipped), tooth types (skip, raker), tooth pitch
- 32.163 Identify the various angles and parts of narrow band saw teeth.
Angles/parts: hook angle, sharpness angle, clearance length, clearance angle, gullet, root, pitch, front, point
- 32.164 Explain the factors which influence blade size.
Factors: machine specification, curvature of cut, thickness of material
- 32.165 Explain, with the aid of a sketch, how jigs, bed pieces, saddles and templates are used to assist in cutting components.
- 32.166 State the correct setting of guards and safety devices in accordance with national/local standards.
Guards/safety devices: flanges, frontal plate, pulley guards, thrust wheel, saw guides
- Surface planer
- 32.167 State the types of operation that can be undertaken with a surface planer.
Operations: flattening, edging, rebating, chamfering, bevelling
- 32.168 Identify and name the various components of a surface planer.
Components: main frame, machine beds/tables, fence, cutter block, guards, switches (start, stop, isolator)
- 32.169 Explain the operating principles and functions of various components.
Components: machine beds, fence
- 32.170 Identify and describe the various types of cutter block.
Cutter block: cap hold, wedge bar hold, bar hold
- 32.171 Explain, with the aid of a sketch, the methods of setting cutters into the cutter block.
Methods: precision setting device, spider setting device, hardwood setting piece, steel straight edge
- 32.172 Explain the importance of allowing cutters to overhang the cutter block and out feed table.
- 32.173 State the correct position of the out feed table in relation to cutting circle.
Position: parallel, in line
- 32.174 Describe the correct methods of planing problem materials.
Problem materials: wide, cupped, bowed, twisted, abrasive
- 32.175 Explain how cutting speed, feed speed and depth of cut affects the surface finish.
- 32.176 State the correct setting of guards and safety devices in accordance with national/local standards.
Guards/safety devices: bridge guard, remote guard, beds, tunnel guard, push blocks, push stick
- Thickness planer
- 32.177 State the types of operation that can be undertaken with a thickness planer.
Operations: width, thickness, taper, bevel
- 32.178 Identify and name the various components of a thickness planer.
Components: main frame, thicknessing table, anti-friction rollers, pressure bar, chip breakers, feed rollers, anti-kick back device, switches (start, stop, isolator)
- 32.179 Explain the operating principles and functions of various components.
Components: table, anti-friction rollers, drive system (cutter block, gearbox, feed rollers), anti-kick back device, sectional feed rollers, feed speed selector
- 32.180 Identify and describe the various types of cutter block.
Cutter block: circular (cap hold, bar hold, wedge bar hold), square
- 32.181 Explain, with the aid of a sketch, the methods of setting cutters into the cutter block.
Methods: spider setting device, hardwood setting blocks, machine attachments/rollers
- 32.182 Explain the reason for adjusting the height of anti-friction rollers when feeding material.
Reason: material (sound, rough sawn, resinous, high moisture content)
- 32.183 Explain, with the aid of a sketch, how jigs, bed pieces, saddles and templates are used to assist in cutting components.
- 32.184 Describe the correct methods of planing problem materials.
Problem materials: thin, wide, abrasive, interlocked grain
- 32.185 Explain the reason for recalibrating the thickness scale after setting/changing cutters.
- 32.186 State the correct setting of guards and safety devices in accordance with national/local standards.
Guards/safety devices: cutter block guard, anti-kick back device, pulley guards

Chisel morticing machine

32.187 State the types of operation that can be undertaken with a chisel morticing machine.

Operations: through (straight, angled), stubbed (straight, angled), haunched

32.188 Identify and name the various components of a chisel morticing machine.

Components: chisel, auger, bush, collet, table, head stock, lever arm, main frame, fence, stops for depth of cut, cramp, switches (start, stop, isolator)

32.189 Explain the operating principles and functions of various components.

Components: chisel, auger, bush, collet, table, head stock, depth stops, drive system, machine cut off switches, cramp

32.190 Explain, with the aid of sketches, how jigs, bed pieces, saddles and templates are used to assist in cutting components.

32.191 Explain the function and use of fence/bed stops.

32.192 Explain the need for lubricating the chisel and auger.

32.193 Explain the correct cutting techniques and working practices.

Techniques/practices: face/edge positioning, through morticing, position of chisel (chip ejection window), methods of working machines (eg right to left), stops (fence, bed, template, depth), cramping pressure, clearance gaps for chisels/angers, not using depth stop for angled mortices

32.194 Identify defects caused by faulty setting or operating.

Defects: break out on underside of through mortices, sides of mortice out of parallel, chisel not square to fence, burning between chisel and auger, stepped sides of mortice when cutting through

32.195 Explain the ejection, removal and exhausting of waste.

32.196 State the correct setting of guards and safety devices in accordance with national/local standards.

Portable power tools

Tooling

32.197 Identify portable power tools.

Tools: circular saw, jig saw, router, planer, drills (battery, mains)

32.198 Identify various circular saw blades and describe their use.

Blades: cross cut, rip saw, tungsten carbide tipped, alloy steel

32.199 Identify various jig saw blades and describe their use.
Blades: tooth parts/angles, blade material (carbon steel, high speed steel, tempered steel)

32.200 Identify various router cutters and describe their use.
Cutters: tungsten carbide tipped, high speed steel, panel cutter, profiled cutter, chip limited, guide/roller bearings, disposable tips, hinge cutters, door sets

32.201 Identify various planer blades and describe their use.
Blades: disposable tip, tungsten carbide tipped, high speed steel

32.202 Identify various drill bits and describe their use.
Drill bits: twist, masonry, flat, saw tooth, Forster, drill material (carbon steel, high speed steel, tungsten carbide)

Abrasives

32.203 Identify the various types of abrasive used on sanding machines.
Abrasives: garnet, aluminium oxide, silicone carbide, glass

32.204 Describe the terms 'open coat' and 'closed coat'.

32.205 Identify and describe the reason for different backing material.
Material: cloth, paper

32.206 Identify and explain the use of different abrasive grit sizes or grades.
Size/grade: eg 180, 240

32.207 Explain the term clogged or loaded in relation to abrasive sheets/belts.

Safety in use

32.208 Describe the correct cutting techniques for all portable power hand tools.

Tools: circular saw, jig saw, router, planer, drill (mains electric, cordless), belt sander, orbital sander

Framed products

Doors and frames

32.209 Identify internal and external door types.

Types: panelled (solid ply), glazed, louvred, FLB, flush, fire check

32.210 Identify door components for internal and external doors.

Components: styles, rails, muntins, panels, beading, glazing, ledges, braces, battens, coverings, weather moulding (external)

32.211 Identify materials used to fill flush door cores.

Materials: honeycomb, chipboard, flaxboard, timber, skeleton frame, cement fibreboard

- 32.212 Identify material types to suit different locations.
Types: hardwoods, softwoods, unplasticised polyvinyl chloride (uPVC), built up cores
Locations: interior, exterior, security, safety
- 32.213 Identify ironmongery and fixings for internal and external doors.
Ironmongery: hinges (brass, nylon, pressed steel, cast, rising butts, parliament), door closers, letter plates, handles, latches, locks
- 32.214 State the suitable positions for various items of ironmongery.
Ironmongery: hinges, letter plates, handles, latches
- 32.215 Identify fire check door for half and one hour resistance.
Identification: colour coding, size
- 32.216 Explain the differences in the manufacture of fire check doors and standard flush doors
Differences: materials, construction details, sections
- 32.217 Explain the principles of retarding fire in timber components.
Principles: chemical treatment, intumescent (paints, strips), charring
- 32.218 Explain the methods and techniques used in the assembly of doors.
Methods/ techniques: wedges, sash cramps, squaring, diagonal sticks, winding strips, bench bearers, sequence of operations
- 32.219 Identify various types of door frame.
Types: internal, external, rebated, planted stops, standard height, storey height
- 32.220 Identify door frame components for internal and external doors.
Components: Sill, head, joints, jambs, transom, stops, weather bar (external)
- 32.221 Explain methods and techniques used in the assembly of door frames.
Methods/techniques: draw boring, nailing (through top of head), squaring, diagonal sticks, winding strips, bench bearers
- Windows**
- 32.222 Identify various types of windows.
Types: direct glazed, openers, stormproof, traditional casements, pivot, tilt and turn, louvred, shutters, screens
- 32.223 Identify various materials used in the manufacture of windows to suit different locations and requirements.
Materials: uPVC, hardwood, softwood
Location/requirements: security, safety, climate
- 32.224 Identify various window components.
Components: jambs, heads, cills, mullions, transom, rails, styles, glazing bars, louvers, shutters, screens, panels
- 32.225 Identify various joints and features of windows and explain their use.
Joints: mortice and tenon, comb, housing
Features: storm proofing, weathering moulds, drip moulds, drip grooves, screens, shutters, anti-capillary grooves, vents, draught strips
- 32.226 Identify various types of ironmongery and explain their use.
Ironmongery: stormproof hinges, butt hinges, pivot hinges, friction hinges (easy clean), stays, fasteners, locks (single, multi-point)
- 32.227 State suitable positions for various types of ironmongery.
Ironmongery: hinges, stays, fasteners, locks
- 32.228 Explain assembly methods and techniques for ensuring tight fitting joints, square and out of twist.
Methods: cramping blocks, blocks, bench bearers, winding strips, squaring laths
- Panelling**
- 32.229 Identify various types of panelling and state suitable locations for their use.
Types: dado, three quarter full height, flush, framed, sheet, spandrel framing
- 32.230 Explain the different construction methods and techniques used in the manufacture of panelling.
Panelling methods/techniques: flush, framed, sheet
- 32.231 Identify the component parts used in panelling.
Component parts: plate shelf, beads, panels, panel moulds, grounds, dado, cornice, architrave, plinth blocks, rails, styles, muntins
- Materials**
- 32.232 State the recommended moisture content of products to suit various applications.
Applications: internal, external, high humidity, heat exposure
- 32.233 Explain the effects of moisture on solid components.
Effects: differential shrinkage, movement
- 32.234 Identify the different types of mould and beading available for doors, windows and panelling.
Types: ovalo, scotia, bolection, raised and fielded, bead and butt, tongue and grooved, tongue/grooved and vee jointed

Fitments

- 32.235 Identify the various types of units and fitments.
Types: storage, kitchen, bedroom, framed, flat pack, modular
- 32.236 Identify the various types of carcass construction.
Types: framed, flat pack, free standing, built in, modular
- 32.237 Identify features and component parts of units and explain their function.
Features/component parts: plinths, pot board, kick board, cornice, shelves, tonk strips, shelf hangers, drawers, drawer rails, drawer stops, draw kicker, dust board, drawer runners/slides, doors
- 32.238 Identify the materials, fixings and ironmongery used in the manufacture of fitments.
Materials/fixings/ironmongery: ply wood, block board, lamin board, chip board, medium density fibre board, hard board, plastic laminated sheets, wood veneered sheets, trims (wood, plastic, metals), handles, hinges, locks, catches, knock down fittings
- 32.239 Describe the construction of drawers.
Construction: dovetailed, butted, dowelled, 'V' groove and fold, false fronts
- 32.240 Describe the construction of fitment doors.
Construction: framed, panelled, glazed
- 32.241 State the meaning of the term 'rigidity' as applied to units and fitments.
Rigidity: stable, with out raking or racking
- 32.242 Explain various methods used to maintain rigidity in units and fitments.
Methods: plinth boxes, frames, backs, cornice, cornice box, centre box, brackets shelves, corner webs, component dimensions
- 32.243 Identify situations that can encourage a fitment to loose its rigidity.
Situation: out of plumb, out of level, uneven floor, uneven weight distribution, poor fitting of component parts
- 32.244 Identify various types of ironmongery.
Ironmongery: hinges, handles, closers, cushioning, fixings, fasteners

Stairs

- 32.245 Identify various types of staircase.
Types: straight, free standing, built in, built in one side, open
- 32.246 Identify the joints and component parts of staircases.
Joints: mortice and tenor, twin mortice and tenor, housing, dowel
Component parts: string, going, tread, riser, newel

posts, nosing, hand rail, balustrades, shaped bottom steps

- 32.247 State and identify the materials used in the manufacture of stair components.
Materials: timber, sheet materials
Components: strings, treads, risers
- 32.248 Identify fixings used in the manufacture of stairs.
Fixings: hand rail bolts, nails, screws, dowels, glue blocks, wedges, bolts, connectors
- 32.249 Identify calculations involving the rise and going of staircases from given parameters.
Calculations: individual (rise, going), total number of steps
Parameters: total (rise, going), design
- 32.250 Describe methods and techniques used in assembling staircases.
Methods/techniques: cramping, wedging, drawer boring, squaring, preventing twist, preventing damage
- 32.251 Describe various methods of protecting finished stairs and steps.
Methods: guards, covers, shrink wrapping, base coat finishes

Communications and information technology

Practical competences

The candidate must be able to do the following:

Communications

32.252 Use language in written and oral forms to communicate needs clearly.

Written: technical/commercial letters (eg internal memos, technical reports, job applications, curriculum vitae/résumé), summarise (eg document, report)

Oral: telephone, work instructions, group, one to one

32.253 Interpret, use and draw diagrams in a routine work environment.

Interpret: graphical to written, written to graphical, graphical (eg bar charts, histograms, graphs)

32.254 Collect and select information on the use of national and international standards.

Standards: eg British Standards, International Standards Organization (ISO)

32.255 Collect and select technical information from different sources.

Information: eg technical drawings, schedules, data sheets/charts, manufacturers' information sheets/brochures, microfilm, micro fiche, libraries, library index systems/classification, video tape, CD ROM, computer systems (eg Internet)

32.256 Use information technology systems for communication.

Systems: word processor, fax

Information technology

32.257 Select a suitable software application for a given task.

Software: word processing, database, spreadsheet

32.258 Access a word processing applications software package.

32.259 Open a new word processing file and enter text.

32.260 Edit the contents of a document.

Edit: correct errors, insert words, delete words, insert paragraph breaks, delete paragraph breaks, sections of text (copy, cut, paste)

32.261 Use the spell-check function to check the document.

32.262 Enhance the appearance of a document.

Enhancement: font (size, bold, italics), text (centre, underline)

32.263 Close and save an edited document under an existing and a new file name.

32.264 Print a word processed file.

32.265 Exit the word processing applications package and switch off the equipment.

Knowledge requirements

The instructor must ensure the candidate is able to:

Communications

32.266 Explain the use of language in written and oral forms to communicate needs clearly.

Written: technical/commercial letters (internal memos, technical reports, job applications, curriculum vitae/résumé), summarise (documents/reports)

Oral: telephone, work instructions, group, one to one

32.267 Identify the use of national and international standards in the construction industry.

Standards: eg British Standards, International Standards Organization (ISO)

32.268 Identify the various sources of technical information.

Information: technical drawings, schedules, data sheets/charts, manufacturers' information sheets/brochures, microfilm, micro fiche, libraries, library index systems/classification, video tape, CD ROM, computer systems (eg Internet)

32.269 Explain the use of various electronic and information technology systems for communication.

Systems: word processor, fax, Internet, E-mail

Information technology

32.270 Identify the main functions of commonly used software applications packages.

Packages: word processing (document production), spreadsheets (numerical analysis, manipulation), database (file creation, updating, searching, sorting), computer aided design (line drawings used for architecture/engineering/construction)

32.271 Describe the various editing operations that can be performed on a word processing file.

Edit: correct errors, insert words, delete words, insert paragraph breaks, delete paragraph breaks, sections of text (copy, cut, paste)

32.272 Explain the use of the spell-check function to check word processing documents.

32.273 Explain the use of the various enhancements that can be used to improve the appearance of a document.

Enhancement: font (size, bold, italics), text (centre, underline)

- 32.274 Explain how to close and save an edited document under an existing and a new file name.
Save: hard disk, floppy disk
- 32.275 Explain how to print a word processing file.
- 32.276 Explain how to exit the word processing applications package and switch off the equipment.

Alteration, repair and renovation

Practical competences

The candidate must be able to do the following:

Doors and frames

22.277 Service, clean and change the handing of a mortice lock.

32.278 Splice a new section into a door style.

32.279 Remove and replace a door panel.
Remove/replace: cut out/remove moulding, remove panel, refit panel, cut/fit new beading

32.280 Insert sections into a door surface following the relocation of ironmongery.

General

32.281 Identify and select materials to match existing and surrounding areas.
Materials: timber, sheet materials, fixings, ironmongery, finishing, finishes

32.282 Remove and replace a section of flooring.
Remove/replace: cut out required section, refit section
Flooring: eg tongue/grooved floor boards, tongue/grooved sheets

32.283 Prepare suitable material and repair a section of damaged walling.
Repair: eg plaster, sand/cement mix
Damage: local to (eg window frame, door frame, skirting board)

Knowledge requirements

The instructors must ensure the candidate is able to:

Doors

32.284 Describe the procedure for refitting a mortice lock and door furniture following removal of material from the closing style.
Door furniture: handles, latches, key escutcheons

32.285 Describe the procedure for servicing and changing the handing of a mortice door lock.

32.286 Describe the procedure for splicing sections into existing products.
Products: doors, windows, frames

32.287 Describe the various faults associated with fitted doors.
Faults: incorrectly fitted hinges, oversized door, incorrectly fitted keep/striking plate, twisted/warped door

32.288 Describe the procedure for removing and replacing a door panel.
Procedure: cut out/remove moulding, remove panel, refit panel, cut/fit new beading

Staircases

32.289 Describe the procedure for repairing stair components.
Procedures: wedges/glue blocks, screw through tread/riser, secure existing fixings
Components: strings, treads, risers, wedges, glue blocks, balustrades, newels, hand rails

32.290 Describe the procedure for replacing stair components.
Components: treads, risers, wedges, glue blocks, balustrades, newels, hand rails

Fitments

32.291 Describe the various faults associated with cupboard drawers.
Faults: warped sections, damaged sections, lack of lubricant

General

32.292 Describe the various methods of taking site details to make repairs.
Methods: sketches, detailing, measuring, samples, notes, templates, finishes, decorations

32.293 Explain the remedial treatment for the eradication of insect and fungal attacks.
Treatment: chemical treatment of affected material, removal of affected material, treatment of surrounding areas (chemical, heat)

32.294 Describe the procedure for removing and replacing a section of flooring.
Procedure: locate hidden pipes/cables, cut out required section, refit section
Flooring: tongue/grooved floor boards, tongue/grooved sheet

Assessment

Test specification for written paper Timber Vocations 2 Principles I (6161-12-031)

This is a multiple choice examination paper lasting one and a half hours and comprising 50 questions. Candidates must answer all questions.

The examination paper is one of two for the Diploma in Timber Vocations and will cover the knowledge specifications for the following:

Topic	Approximate % examination weighting
Safety at work	20
Materials	40
Calculations, setting out and drawing	10
Communications and information technology	10
Alteration, repair and renovation	20

NB

Site Carpentry candidates will sit the same question papers as the Bench Joinery candidates. Therefore, the test specification given above is also included with the Site Carpentry syllabus.

Assessment

Test specification for written paper Timber Vocations 2 Principles II (6161-12-032)

This is a structured answer examination paper lasting two hours comprising 15 questions. Candidates must answer seven questions.

The examination paper is one of two for the Diploma in Timber Vocations and will cover the knowledge specifications for the following:

Topic	Approximate % examination weighting
Practical skills	
Portable power tools	15
and	
Carcassing and first fixing	55
Finishing and second fixing	30
or	
Woodworking machinery	50
Framed Products	35

NB

Site Carpentry candidates will sit the same question papers as the Bench Joinery candidates. Therefore, the test specification given above is also included with the Site Carpentry syllabus.

32 Bench Joinery 2: Safety at work

Practical competences

The candidate must be able to do the following:

- 32.1 Carry out safe working practices to prevent hazards and to ensure the safety of working personnel and members of the public.
- 32.2 Carry out safe working practices using various equipment/materials to protect surrounding work areas from infringement or contamination.
- 32.3 Carry out the safe erection, use and dismantling of scaffold platforms less than 2m high.
- 32.4 Carry out the safe erection, use and dismantling of scaffold platforms over 2m high.
- 32.5 Inspect for faults, set up and safely use steps and ladders in general use.
- 32.6 Set up safety barriers around a hazard to protect working personnel and members of the public.
- 32.7 Select and use protective clothing and safety equipment for specific tasks.
- 32.8 Use and store toxic materials in a safe manner.
- 32.9 Carry out a risk assessment and prepare a report identifying the potential hazards.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

32 Bench Joinery 2: Materials

Practical competences

The candidate must be able to do the following:

- | | | | | | |
|-------|--|--------------------------|-------|--|--------------------------|
| 32.20 | Identify and select common softwoods for specific applications based on their technical properties. | <input type="checkbox"/> | 32.29 | Prepare a report identifying the availability, suitability and relative cost of timber based products available in the country of study. | <input type="checkbox"/> |
| 32.21 | Identify and select common hardwoods for specific applications based on their technical properties. | <input type="checkbox"/> | 32.30 | Prepare a report on the environmental effects of forestry and the manufacture of timber based products. | <input type="checkbox"/> |
| 32.22 | Identify and select manufactured boards and sheet materials for specific applications based on their technical properties. | <input type="checkbox"/> | | | |
| 32.23 | Identify and select wood preservative and insecticides for specific applications based on their technical properties. | <input type="checkbox"/> | | | |
| 32.24 | Identify and select adhesives for specific applications based on their technical properties. | <input type="checkbox"/> | | | |
| 32.25 | Identify and select abrasive sheets for specific applications based on their technical properties. | <input type="checkbox"/> | | | |
| 32.26 | Identify and select wood screws/components and nails for specific applications based on their technical properties. | <input type="checkbox"/> | | | |
| 32.27 | Identify and select timber based doors for specific applications based on their technical properties. | <input type="checkbox"/> | | | |
| 32.28 | Identify and select timber based windows for specific applications based on their technical properties. | <input type="checkbox"/> | | | |

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature _____

Candidate name (please print) _____

Instructor signature _____

Instructor name (please print) _____

Completion date _____

32 Bench Joinery 2: Calculations, setting out and drawing

Practical competences

The candidate must be able to do the following:

Calculations

- 32.51 Take off accurate dimensions from drawings of circular, semi circular and triangular structures/products.
- 32.52 Calculate areas from dimensions taken off drawings of circular, semi circular and triangular structures/products.
- 32.53 Calculate volumes from dimensions taken off drawings of circular, semi circular and triangular structures/products.
- 32.54 Calculate the quantity and cost of materials required from drawings of circular, semi circular and triangular structures/products.
- 32.55 Calculate component spacings of circular, semi circular and triangular structures/products.

Setting out

- 32.56 Use tools and equipment to take measurements from site for the manufacture of components and products.
- 32.57 Measure and set out components to produce workshop rods and drawings of complex linear, rectangular and triangular structures/products.
- 32.58 Draw cut away and hidden detail onto setting out rods of complex linear, rectangular and triangular structures/products.
- 32.59 Set out component spacings of complex linear, rectangular and triangular structures/products.
- 32.60 Prepare cutting lists from setting out rods of complex linear, rectangular and triangular structures/products.

Drawing

- 32.61 Produce working drawings from plans and details of complex linear, rectangular and triangular structures/products.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

32 Bench Joinery 2: Practical skills

Practical competences

The candidate must be able to do the following:

Woodworking machinery

Circular rip saw

- 32.67 Set and operate a hand fed circular rip saw for cutting timber.
- 32.68 Use jigs, bed pieces, saddles and templates to aid the cutting of components.
- 32.69 Use feeding aids to assist cutting operations.
- 32.70 Select suitable blades for the material being cut.
- 32.71 Change blades, riving knife, mouth piece and packings.
- 32.72 Position the fence to suit the material being cut.
- 32.73 Check and set the fence lead in to industry standards.
- 32.74 Use safety equipment and machine guards in accordance with national/local standards.

Cross cut saw

- 32.75 Set and operate a cross cut saw for squaring ends, removing faults/defects and cutting timber to length.
- 32.76 Set and operate a cross cut saw for trenching with the aid of a false bed/auxiliary table.
- 32.77 Select and change suitable blades for the material being cut.
- 32.78 Fit trenching equipment and make adjustments to width of cut.
- 32.79 Set and use fence stops for maintaining component length.
- 32.80 Use safety equipment and machine guards in accordance with national/local standards.

Narrow band saw

- 32.81 Set and operate a narrow band saw machine for cutting timber.
- 32.82 Select suitable blades for the material being cut.
- 32.83 Change blade/mouthpiece and set guides/thrust wheel.

- 32.84 Fold and store a blade in a safe and efficient manner.

- 32.85 Set and adjust tracking and tension devices to suit the blade.

- 32.86 Check the tension of the blade is within accepted limits.

- 32.87 Use safety equipment and machine guards in accordance with national/local standards.

Surface planer

- 32.88 Set and operate a surface planing machine to prepare timber.

- 32.89 Select suitable blades for the material being planed.

- 32.90 Change and set blades.

- 32.91 Hone blades to remove burrs and produce a fine edge.

- 32.92 Use safety equipment and machine guards in accordance with national/local standards.

Thickness planer (panel planer)

- 32.93 Set and operate a thickness planer to reduce timber.

- 32.94 Use jigs and bed pieces to produce tapers and bevels.

- 32.95 Select suitable blades for the material being planed.

- 32.96 Change and set blades.

- 32.97 Hone blades to remove burrs and produce a fine edge.

- 32.98 Use safety equipment and machine guards in accordance with national/local standards.

Chisel morticing machine

- 32.99 Set and operate a chisel morticing machine for cutting mortices in timber.

- 32.100 Select suitable components for the mortice being produced.

- 32.101 Change and set the components to suit the mortice being produced.

- 32.102 Lubricate the chisel and auger.

- 32.103 Use safety equipment and machine guards in accordance with national/local standards.

Portable powered hand tools

Circular saw

32.104 Set and operate a portable circular saw to cut material.

32.105 Select and change blades for the material being cut.

Jigsaw

32.106 Set and operate a portable jig saw to cut material.

32.107 Select and change blades for the material being cut.

Router

32.108 Set and operate a portable router to cut material.

32.109 Select and change cutters for the material being cut.

Planer

32.110 Set and operate a portable planer to prepare timber.

32.111 Select and change blades for the material being cut.

Power drills

32.112 Set and operate a portable power drill suitable for various materials.

32.113 Select and change drill bits suitable for the material being drilled.

Sanding machines

32.114 Set and operate a portable sanding machine to produce a surface finish on various materials.

32.115 Select and change abrasive sheets/belts suitable for the material being sanded.

32.116 Clean, service and store portable power tools in accordance with the manufacturers' schedules.

32.117 Use safety equipment and machine guards for all portable powered tools in accordance with national/local standards.

Framed products

Doors

32.118 Set out an external door with solid panels, rails and muntins with tolerances to industry standards.

32.119 Prepare materials and mark out components with tolerances to industry standards.

32.120 Manufacture and assemble components to produce an external door with solid panels, rails and muntins with tolerance to industry standards.

32.121 Finish door suitable for surface coatings using hand tools and portable power tools.

Windows

32.122 Set out a window incorporating an opener with tolerance to industry standards.

32.123 Prepare materials and mark out components with tolerances to industry standards.

32.124 Manufacture and assemble components to produce a window incorporating an opener with tolerances to industry standards.

32.125 Finish window suitable for surface coatings using hand tools and portable power tools.

Fitments

32.126 Set out a framed construction storage unit with tolerances to industry standards.

32.127 Prepare materials and mark out components with tolerances to industry standards.

32.128 Manufacture and assemble components to produce a framed construction storage unit with tolerances to industry standards.

32.129 Finish framed construction storage unit suitable for surface coatings using hand tools and portable power tools.

Stairs

- 32.130 Set out a flight of stairs with newel posts, hand railing and balustrades with tolerances to industry standards.
- 32.131 Prepare materials and mark out components with tolerances to industry standards.
- 32.132 Manufacture and assemble components to produce a flight of stairs with newel posts, hand railing and balustrades with tolerances to industry standards.
- 32.133 Finish a flight of stairs with newel posts, hand railing and balustrades suitable for surface coatings using hand tools and portable power tools.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

32 Bench Joinery 2: Communications and information technology

Practical competences

The candidate must be able to do the following:

Communications

32.251 Use language in written and oral forms to communicate needs clearly.

32.252 Interpret, use and draw diagrams in a routine work environment.

32.253 Collect and select information on the use of national and international standards.

32.254 Collect and select technical information from different sources.

32.255 Use information technology systems for communication.

Information technology

32.256 Select a suitable software application for a given task.

32.257 Access a word processing applications software package.

32.258 Open a new word processing file and enter text.

32.259 Edit the contents of a document.

32.260 Use the spell-check function to check the document.

32.261 Enhance the appearance of a document.

32.262 Close and save an edited document under an existing and a new file name.

32.263 Print a word processed file.

32.264 Exit the word processing applications package and switch off the equipment.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

32 Bench Joinery 2: Alteration, repair and renovation

Practical competences

The candidate must be able to do the following:

Doors and frames

- 32.176 Service, clean and change the handing of a mortice lock.
- 32.177 Splice a new section into a door style.
- 32.178 Remove and replace a door panel.
- 32.179 Insert sections into a door surface following the relocation of ironmongery.

General

- 32.180 Identify and select materials to match existing and surrounding areas.
- 32.181 Remove and replace a section of flooring.
- 32.182 Prepare suitable material and repair a section of damaged walling.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

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33 Trowel Vocations 2 – Summary of syllabus sections

Page 70 Safety at work
(Objectives 33.1 to 33.17)

The aim of this unit is to enable the candidate to maintain safe working conditions and to adopt safe procedures for themselves and others.

Page 72 Materials
(Objectives 33.18 to 33.37)

The aim of this unit is to enable the candidate to :

- a identify and select materials for specific applications based on their technical properties
- b describe the technical properties of the main types of materials in use
- c identify environmental effects and benefits of quarrying/manufacturing trowel based materials and processes

Page 74 Calculations, setting out and drawing
(Objectives 33.38 to 33.47)

The aim of this unit is to enable the candidate to :

- a take off dimensions from drawings of circular, semi circular and triangular structures
- b calculate quantities to assist in preparing, costing and estimating
- c set out building details
- d produce working drawings

Page 75 Practical skills
(Objectives 33.48 to 33.142)

The aim of this unit is to enable the candidate to apply basic tool skills to carry out construction operations.

Page 80 Communications and information technology
(Objectives 33.143 to 33.167)

The aim of this unit is to enable the candidate to use:

- a communication skills in the workplace
- b information technology in the workplace

Page 82 Alteration, repair and renovation
(Objectives 33.168 to 33.191)

The aim of this unit is to enable the candidate to apply practical skills to carry out the alteration, repair and renovation to existing buildings.

Safety at work

The use of national/local regulations and working practices must be included in all practical competences.

Practical competences

The candidate must be able to do the following:

- 33.1 Carry out safe working practices to prevent hazards and to ensure the safety of working personnel and members of the public.
Hazards: excavations, obstructions, wet concrete, warning notices
- 33.2 Carry out the safe erection, use and dismantling of scaffold platforms less than 2m high.
Scaffolding: trestles, folding trestles, hop up stools, scaffold boards
- 33.3 Carry out the safe erection, use and dismantling of scaffold platforms over 2m high.
Scaffolding: quick assembly towers, scaffold boards, toe boards, hand rails, stabilisers/outriggers
- 33.4 Inspect for faults, set up and safely use steps and ladders in general use.
Faults: metal components (corrosion), timber components (deterioration, splits, cracks)
Set up: firm/level base, clip/lash down
- 33.5 Set up safety barriers around a hazard to protect working personnel and members of the public.
Barriers: security tape, barrier material (eg timber, metal, plastic), safety/warning (signs, lights)
Hazards: excavations, openings in (floors, walls, roofs), roof edges, operating machinery
- 33.6 Select and use protective clothing and safety equipment for specific tasks.
Equipment: overalls, gloves, eye protection, face mask, ear defenders/plugs, safety boots, helmet
Tasks: bricklaying, plastering, concreting, brick/concrete cleaning, use of dangerous substances (acids, alkali)
- 33.7 Use and store toxic materials in a safe manner.
Use: manufacturers' instructions, toxic effect
Materials: cements, limes, plasticisers, masonry cleaning fluids, waterproofing agents, concreting additives, lubricants, insulating materials, insecticides
- 33.8 Carry out a risk assessment and prepare a report identifying the potential hazards.
Risk assessment: working practices, hazard identification, dangerous substances, site machinery, noise, scaffolding

Knowledge requirements

The instructor must ensure the candidate is able to:

- 33.9 State the methods used to prevent hazards and to ensure the safety of working personnel and members of the public.
Methods: warning notices, barriers
- 33.10 Explain the safe use of scaffold platforms less than 2m high.
Scaffolding: trestles, folding trestles, hop up stools, scaffold boards
Safe use: manufacturers' instructions, nationally/locally applied regulations
- 33.11 Explain the safe use of scaffold platforms over 2m high.
Scaffolding: quick assembly towers, scaffold boards, toe boards, hand rails, stabilisers/outriggers
Safe use: manufacturers' instructions, nationally/locally applied regulations
- 33.12 State the faults, possible hazards and dangerous practices when using ladders and steps.
Faults: metal components (corrosion), timber components (deterioration, splits, cracks)
Hazards: base fixing/stabilising, clip/lash at platform level, clear space around base
Dangerous practices: uneven/loose ground
- 33.13 Explain the purpose and use of barriers and warning signs/lights to protect working personnel and members of the public from possible accidents.
Barriers: security tape, barrier materials (timber, metal, plastic), safety/warning (signs, lights)
Purpose: segregation of different work activities, segregation of work from members of the public, prevention of falls from heights above 2m
- 33.14 Describe the purpose and use of protective clothing and safety equipment for a range of applications.
Equipment: overalls, gloves, eye protection, face mask, ear defenders/plugs, safety boots, helmet
Purpose: handling corrosive/heavy materials, cutting bricks/stones/blocks, using power tools, protecting feet from heavy objects, working below other workers or machines
Applications: bricklaying, plastering, concreting, brick/concrete cleaning, use of dangerous substances (acids, alkali)
- 33.15 State the toxic effect of materials used in trowel vocations.
Effect: eyes, skin, breathing
Materials: cements, limes, plasticisers, masonry cleaning fluids, waterproofing agents, concreting additives, lubricants, insulating materials, insecticides

- 33.16 Describe the preventative and remedial actions to be taken in the case of exposure to toxic materials.
Exposure: ingested, contact with skin, inhaled
Preventative action: ventilation, masks, protective clothing/equipment
Remedial action: immediate first aid, report to supervisor
Materials: cements, limes, plasticisers, masonry cleaning fluids, waterproofing agents, concreting additives, lubricants, insulating materials, insecticides, manufacturers' instructions
- 33.17 Explain the method by which a risk assessment is carried out.
Method: identify task procedure, identify hazards, identify control actions to reduce hazard, assess final risk

Materials

The properties of locally manufactured materials or materials in local general use should be considered.

Practical competences

The candidate must be able to do the following:

- 33.18 Identify and select bricks for specific applications based on their technical properties.
Bricks: eg clay, concrete, calcium silicate
Applications: work below ground level in aggressive soils (sulphates, acidic), work above ground level in hostile environments (salt air), work in high temperatures (fireplaces), capping/coping (frost resistance)
- 33.19 Identify and select natural and reconstructed stones for specific applications based on their technical properties.
Stone: eg sedimentary, igneous, metamorphic, reconstructed
Applications: work below ground level in aggressive soils (sulphates, acidic), work above ground level in hostile environments (salt air), work in high temperatures (fireplaces), capping/coping (frost resistance)
- 33.20 Identify and select thermal insulating materials for specific applications based on their technical properties.
Insulating materials: eg mineral wool, fibreglass, polystyrene, foam boards, loose fill, insulating building blocks
Applications: wall, roof, floor
- 33.21 Identify and select street paving materials for specific applications based on their technical properties.
Materials: kerbs, flags, paving blocks, setts/cobbles, concrete
Applications: pavement, courtyard, patio, roads, high usage
- 33.22 Identify and select sands and aggregates for specific applications based on their technical properties.
Sands: fine, medium, coarse, cleanliness
Aggregates: natural, crushed rock, manufactured, lightweight, dense, cleanliness
Applications: bricklaying, plastering, concreting, paving, drainage bedding, work below ground level in aggressive soils (sulphates, acidic), work above ground level in hostile environments (salt air), work in high temperatures (fireplaces), capping/coping (frost resistance)
- 33.23 Identify and select cements, limes, plastering products and plasticisers for specific applications based on their technical properties.
Types: cement (ordinary, rapid hardening, high alumina, sulphate resistant), lime (hydraulic, non hydraulic), gypsum plasters, plasticisers (powder, liquid)
Applications: bricklaying, plastering, concreting, paving, work below ground level in aggressive soils (sulphates, acidic), work above ground level in hostile environments (salt air), work in high temperatures (fireplaces), capping/coping (frost resistance)
- 33.24 Identify and select damp-proof courses (dpc) and damp-proof membranes (dpm) for specific applications based on their technical properties.
Damp-proof courses: plastic (eg PVC, polythene, embossed polyethylene), bitumen, rubber (eg butyl), non-ferrous metals
Damp-proof membrane: plastic (eg PVC, polythene, polyethylene), rubber (eg butyl), nylon reinforced plastic, waterproofed fabric
- 33.25 Select insecticides which may be used below building foundations to prevent insect infestation.
- 33.26 Select termite shields which may be fitted above building foundations.
- 33.27 Prepare a report identifying the availability, suitability and relative costs of trowel based materials available in the country of study.
Materials: bricks, stone, insulating materials, sands, aggregates, cements, limes
Suitability: climate, corrosive atmosphere
- 33.28 Prepare a report on the environmental effects of quarrying and manufacturing various types of trowel based materials.
Quarrying: stone, sand, aggregates
Manufacture: cements, limes, bricks
Environmental effects: water supplies, landscape, pollution

Knowledge requirements

The instructor must ensure the candidate is able to:

- 33.29 State the technical properties of bricks.
Bricks: clay, concrete, calcium silicate
Properties: compressive strength, water absorption, sulphate resistance, acid resistance, resistance to soluble salts, resistance to efflorescence, heat resistance, frost resistance
- 33.30 State the technical properties of natural and reconstructed stones.
Stone: sedimentary, igneous, metamorphic, reconstructed
Properties: compressive strength, water absorption, sulphate resistance, acid resistance, resistance to soluble salts, resistance to efflorescence, heat resistance, frost resistance
- 33.31 State the technical properties of thermal insulating materials.
Insulating materials: mineral wool, fibreglass, polystyrene, foam boards, loose fill, insulating building blocks
Properties: density, thermal resistance, crushing strength, physical structure (rigid, flexible, granular, fibrous), water resistance, capillary action, rot resistance, vermin/insect resistance, health/environmental factors
- 33.32 State the technical properties of street paving materials.
Materials: kerbs, flags, paving blocks, setts/cobbles, concrete
Properties: tensile strength, crushing strength, oil resistance, frost resistance, abrasion/wear resistance, skid resistance
- 33.33 State the technical properties of sands and aggregates.
Sands: fine, medium, coarse, cleanliness
Aggregates: natural, crushed rock, manufactured, lightweight, dense, cleanliness
Properties: compressive strength, water absorption, sulphate resistance, acid resistance, resistance to soluble salts, resistance to efflorescence, heat resistance, frost resistance
- 33.34 State the technical properties of cements, limes, plastering products and plasticisers.
Types: cement (ordinary, rapid hardening, high alumina, sulphate resistant), lime (hydraulic, non hydraulic), gypsum plasters, plasticisers (powder, liquid)
Properties: initial/final setting time, compressive strength, water absorption, sulphate resistance, acid resistance, resistance to soluble salts, resistance to efflorescence, heat resistance, frost resistance
- 33.35 State the technical properties of damp-proof courses (dpc) and damp-proof membranes (dpm).
Damp-proof courses: plastic (eg PVC, polythene, embossed polyethylene), bitumen, rubber (eg butyl), non-ferrous metals
Damp-proof membrane: plastic (eg PVC, polythene, polyethylene), rubber (eg butyl), nylon reinforced plastic, waterproofed fabric
Properties: moisture resistance, tensile strength, flexibility, resistance to tearing/puncturing, temperature effects
- 33.36 Describe the construction of termite shields which may be fitted above building foundations.
Construction: materials, shape, method of installation
- 33.37 State the environmental effects of quarrying and manufacturing various types of trowel based materials.
Quarrying: stone, sand, aggregates
Manufacturing: cements, limes, bricks
Environmental effects: water supplies, landscape, pollution

Calculations, setting out and drawing

Practical competences

The candidate must be able to do the following:

Calculations

- 33.38 Take off accurate dimensions from drawings of circular, semi circular and triangular structures.
Drawings: plans, sectional drawings
Dimensions: lengths (walling, excavation), heights, depths
- 33.39 Calculate areas from dimensions taken off drawings of circular, semi circular and triangular structures.
Areas: walls, floors, openings, pavings, patios
- 33.40 Calculate volumes from dimensions taken off drawings of circular, semi circular and triangular structures.
Volumes: excavation, hardcore, concrete
- 33.41 Calculate the quantity and cost of materials required from drawings of circular, semi circular and triangular structures.
Materials: bricks, blocks, tiles, hardcore, mortar, concrete
Costs: product catalogues, price lists, discounts
Drawings: walls, floors, openings

Setting out

- 33.42 Measure and set out foundations from drawings of circular, semi circular and triangular structures.
Foundations: profiles, excavations, wall positions

Drawings

- 33.43 Produce working drawings from plans and details of circular, semi circular and triangular structures.
Drawings: dimensions, detail (eg archways, circular windows, landscape features, gable ends), exploded views

Knowledge requirements

The instructor must ensure the candidate is able to:

Calculations

- 33.44 Identify calculations involving the area and volumes of circular, semi circular and triangular structures.
Area: wall, floor, opening, pavings, patios
Volume: excavation, concrete, hardcore
- 33.45 Identify calculations involving the quantities and costs of materials of circular, semi circular and triangular structures.
Materials: bricks, blocks, tiles (wall, floor, roof), mortar, concrete, additives, adhesive, grout
Costs: product catalogues, price lists, discounts, waste allowances
Areas: walling, flooring, roofing, paving, patios

Setting out

- 33.46 Describe, with the aid of sketches, the various methods for setting out circular, semi circular and triangular structures.
Methods: trammel, template, tape/line

Drawings

- 33.47 Identify scale working drawings of items taken from plans and details of circular, semi circular and triangular structures.
Drawings: dimensions, detail (archways, circular windows, landscape features, gable ends), exploded views

Practical skills

Practical competences

The candidate must be able to do the following:

Substructure

- 33.48 Transfer building lines onto foundation concrete.
- 33.49 Set out and build brickwork up to ground floor level/damp-proof course (dpc) in solid and cavity walling with plumbing and levelling to industry standards.
Brickwork: bond (English, stretcher), corners, T junctions, stopped ends, racking back
Plumbing: 3mm in 1m height
Levelling: 3mm in 2m length
- 33.50 Set out and build blockwork up to ground floor level/damp-proof course (dpc) in solid and cavity walling with plumbing and levelling to industry standards.
Blockwork: stretcher bond, corners, T junctions, stopped ends, racking back
Plumbing: 3mm in 1m height
Levelling: 3mm in 2m length
- 33.51 Set out and build brick square return corners up to 1 1/2 bricks thick.
Brickwork: bond (English, Flemish)
- 33.52 Set out and build solid block square return corners.
Blockwork: half bond
- 33.53 Set out and build isolated and attached piers with plumbing and levelling to industry standards.
Piers: brickwork, blockwork
Plumbing: 3mm in 1m height
Levelling: 3mm in 1m length

Drainage and services

- 33.54 Install supports to trench sides.
Support: materials (eg steel sheeting, close boarding, open spaced supports), protection of workforce from machinery/vehicles
- 33.55 Use a set of boning rods to maintain the gradient of a trench bottom and the associated drainage pipework.
Gradient: over a minimum distance of 5m
- 33.56 Set up site rails for the levels and centre lines of drains.
Site rails: used in conjunction with a traveller
- 33.57 Lay and join drainage pipes and fittings in accordance with the manufacturers' instructions.
Pipes: eg concrete, clay, plastic
Drainage: domestic (foul, rainwater)
- 33.58 Use a laser to align drainage pipework to correct fall.
Fall: over a minimum distance of 5m
- 33.59 Spread and prepare drain pipe bedding, haunching and surrounds.

Bedding/haunching/surrounds: eg concrete, gravel, graded stone chippings

- 33.60 Build a manhole/inspection chamber.
Manhole/inspection chamber: eg brickwork, blockwork, precast concrete unit
- 33.61 Build an in-situ concrete manhole including the formwork.
Manhole: set up formwork, concrete (mix, fill, compact)
- 33.62 Install a glass fibre reinforced plastic (GRP) manhole together with a rodding eye and gully.
Manhole: bedding/surrounding (eg concrete, compacted gravel)
- 33.63 Carry out tests on a completed drainage system.
Tests: eg air pressure, water, smoke
- 33.64 Construct a catch pit suitable for a surface water or land drainage system.
Construction: eg brick, block, in-situ concrete
- 33.65 Install and build ducts to allow entry of services to a building.
Services: eg water, gas, electricity, telephone, drainage
- 33.66 Install a meter box for building services.
Services: eg water, gas, electricity

Superstructure

- 33.67 Set out and build solid or cavity walling 1 storey high with plumbing and levelling to industry standards
Walling: pointed finish, materials (eg blockwork, brickwork)
Plumbing: 3mm in 1m height
Levelling: 3mm in 2m length
- 33.68 Set out and build solid or cavity composite walling 1 storey high with plumbing and levelling to industry standards.
Walling: pointed finish, materials (eg facing/common blocks, facing/common bricks, reconstructed stone/blocks, natural stone/blocks)
Plumbing: 3mm in 1m height
Levelling: 3mm in 2m length
- 33.69 Form door and window openings in solid or cavity walls.
Openings: thresholds, steps, sills, heads/lintels, jambs
- 33.70 Build in and secure door and window frames with all necessary damp-proof courses (dpc) where appropriate.
Frames: eg timber, steel, plastic, aluminium
- 33.71 Form eaves in solid or cavity walls.
Eaves: fixing wall plates
- 33.72 Build gable ends in solid or cavity walls.
Build: profiles, pattern rafters, lines

- Tiling**
- 33.73 Prepare a wall surface suitable for cement rendering.
Preparation: cleaned, wire brushed, damped, keyed
- 33.74 Apply first cement rendering coat and scratch to ensure even surface for second coat.
- 33.75 Prepare surface and apply second cement rendering coat with a wood float surface finish.
Preparation: eg fix screeding battens, ruling off a plane surface, apply plumbed dots/mortar screeds to ensure a plumb/straight face plane
- 33.76 Hand trowel finish internal and external rendered angles.
- 33.77 Protect wall rendering work during application and for seven days after completion.
Protection: frost action, heavy rainfall, excessive heat, drying wind
- 33.78 Fix and grout wall tiles using manufactured tile adhesive/grout.
Adhesive/grout: manufacturers' instructions
- Concrete work**
- 33.79 Set out and position edge formwork or levelling battens for a concrete slab.
Concrete slab: eg ground floor slab, footpath, vehicle driveway.
Formwork: wood/steel supported, fixed to required finished level for tamping/screeding off, levelling battens for screeding off
- 33.80 Cut and place damp-proof membrane (dpm) and steel mesh reinforcement.
Reinforcement: placed on spacers on damp-proof membrane (dpm)
- 33.81 Batch and mix concrete and transport to placing position.
Concrete: materials accurately measured by volume or weight
Transport: avoid segregation
- 33.82 Place concrete in formwork, spread, level and compact.
Place: avoid segregation
Compacting: eg hand, vibrator
- 33.83 Surface finish by hand and cure the finished concrete.
Finish: eg trowelling, wood float, brush
Curing: protect from (eg rapid evaporation of water, frost, excessive heat, heavy rainfall, drying wind)
- Paving**
- 33.84 Set out lines and levels for paved areas and paths to ensure required falls.
Setting out: eg tapered straight edged, gradient pegs
- 33.85 Prepare and compact sub grade and sub base material.
Material: spread, compact to required level
- 33.86 Spread, level and compact bedding on prepared sub base.
Bedding: eg sand, dry mix cement/sand
- 33.87 Lay and compact bricks/precast blocks on prepared bedding and sand fill joints.
Compacting: eg plate vibrator, rubber mallet
Joints: silica sand
- 33.88 Cut paving materials using suitable equipment.
Materials: brick, block
Equipment: eg disk cutter, guillotine, block splitter
- Decorative features**
- 33.89 Build semi circular and segmental arches.
Arches: setting up centres/turning pieces, cutting to extrados, striking the centre, pointing face/soffit
Materials: eg brick, block, natural/reconstructed stone
- 33.90 Set up, support and build a soldier arch using standard walling materials.
Support: eg steel lintel supports, reinforcement
Materials: eg brick, block, natural/reconstructed stone
- 33.91 Set out and build brickwork to form feature patterns based on diaper work.
Features: eg contrasting colours, textures, projections
- 33.92 Set out and build decorative course features using standard walling materials.
Materials: eg brick, block, natural/reconstructed stone
Features: string courses, continuous band courses, projecting courses
- 33.93 Install copings to brick, block or stone walling.
Copings: eg natural/reconstructed stones, concrete, bricks (moisture/frost resistant), slate, tiles

Knowledge requirements

The instructor must ensure the candidate is able to:

Substructure and superstructure

- 33.94 Describe, with the aid of a sketch, a method of transferring ranging lines onto foundation concrete.
Method: plumb line, spirit plumb, optical plumb

- 33.95 Describe, with the aid of a sketch, the bonding arrangements for brick, block and composite walling.
Brick walls: bonding (stretcher, English, Flemish), up to 1½ bricks thick, square return corners, broken bonding
Block walls: half bonding, square return corners, double return corners, broken bonding
Composite: random bonding, broken bonding
- 33.96 Describe, with the aid of a sketch, the bonding arrangements for isolated and attached piers in brickwork.
Bond: stretcher, English, Flemish
Piers: up to 2 bricks wide, concrete filled
- 33.97 Describe, with the aid of a sketch, the bonding arrangements for isolated and attached piers in blockwork.
Bond: half bond
Piers: solid, hollow
- 33.98 Explain the reason for installing a damp-proof course between the substructure and superstructure walling materials.
Reason: rising damp
- 33.99 Describe the various types, spacing and reason for using cavity wall ties.
Types: epoxy coated, stainless steel, plastic
- 33.100 Describe the various types and reason for using cavity wall insulation materials.
Types: mineral wool, glass fibre, expanded polystyrene, rigid foam
- 33.101 Describe, with the aid of a sketch, the method for forming door and window openings in solid and cavity walling.
Openings: threshold, steps, sills, heads/lintels, reveals, jambs, damp-proof course (dpc), insulation
- 33.102 Describe the methods of fixing and building in door and window frames.
Methods: screw through frame, fixing cramps
- 33.103 Describe, with the aid of a sketch, the construction details of eaves and gables.
Setting out: types of roof fixing, wall plates, cavity closing
- 33.104 Describe, with the aid of a sketch, the method of setting out a gable end.
Setting out: methods of obtaining angle of raking cut to double pitch and monopitch roofs, setting up lines/templates
- Drainage and services
- 33.105 Describe, with the aid of a sketch, the method of installing supports to trench sides.
Support: materials (steel sheeting, close boarding, open spaced supports)
- 33.106 Explain the reason for using trench edge barriers.
Reason: protection of public/workers in the trench
- 33.107 Describe, with the aid of a sketch the method of using line of eyesight across boning rods or sight rails and traveller to maintain the gradient of a trench bottom.
Use: grading the bottom of trench to a fall
- 33.108 Describe the fitting of flexible joints to drainage systems.
Joints: rubber rings/sleeves, PVC sleeves with rubber seals, manufacturers' instructions
- 33.109 Describe how a laser can be used to align drainage pipework to the correct fall.
Alignment: centre lines, calculation of falls adjustment of laser, setting a string line for alignment
- 33.110 Describe the various types of drainage pipe bedding, haunching and surrounds.
Types: gravel, graded stone chippings, concrete
- 33.111 Describe, with the aid of a sketch, details of manholes including branches, steps and benching.
Manholes: material (brick, block, precast concrete), types of cover
- 33.112 Describe, with the aid of a sketch, details of in-situ concrete manholes.
Details: formwork construction, in-situ concrete, reinforcement
- 33.113 Identify suitable GRP and PVC manholes, rodding eyes and gullies for specific applications.
Applications: domestic foul/rainwater drainage
- 33.114 Describe the various methods of testing completed drainage systems.
Method: air pressure, water, smoke
- 33.115 Describe, with the aid of a sketch, surface water and land drainage systems.
System: gradients, pipes (perforated, porous, butt jointed, plastic, concrete, clay), catch pit
- 33.116 Identify the various types of ducting used to allow entry of services to domestic buildings.
Services: water, gas, electricity, telephone, drainage
Ducting: flexible PVC pipe with push fit joints, PVC sleeves, precast concrete ducting

- 33.117 Describe, with the aid of a sketch, the various types and methods of fitting/building in meter boxes.
Meter boxes: water, gas, electricity
- Tiling**
- 33.118 Describe the method of preparing surfaces for cement rendering.
Treatments: chipping, hacking, scraping, wire brushing, chemical cleaning of greasy/oil based contamination, wetting surface, PVA adhesive
- 33.119 Describe the method of applying the first coat.
First coat: mix ratios, trowelling/screeding off with straight edge, scratching key for second coat
- 33.120 Describe the method of applying the second coat.
Application: plumbing, surface finishing
- 33.121 Describe, with the aid of a sketch, the various types of angle trowel.
Types: internal, external
- 33.122 Explain the reasons for protecting wall rendering during application and for seven days after completion.
Protection: frost action, heavy rainfall, excessive heat, drying wind
Reasons: allow cement to harden fully
- 33.123 Describe, with the aid of a sketch, the method of fixing and grouting tiles.
Fixing: serrated trowelling of adhesive, bonding of tiles, spacers, marking for cut tiles, cutting tools
Grouting: squeegee, joint finishing, removing surplus grout
- Concrete work**
- 33.124 Describe, with the aid of a sketch, suitable formwork for laying a concrete slab.
Formwork: timber and pegs, steel forms with pins and wedges
- 33.125 State the various types of reinforcement material.
Reinforcement: mesh, bar
- 33.126 State the various types of damp-proof membrane (dpm).
Damp-proof membrane: plastic, nylon reinforced plastic, waterproofed fabric
- 33.127 Explain the reason insecticides may be used below the building foundations.
Reason: prevention of insect infestation
- 33.128 Explain the reason a termite shield is fitted above the building foundations.
Reason: prevention of termite damage to building timber
- 33.129 Describe the methods of batching and mixing concrete and transporting it to placement.
Batching: volume, weight, water cement ratios
Method: types of mixer (rotary, paddle)
Transport: types of transport (wheelbarrow, dumper truck, crane skip), concrete segregation
- 33.130 Describe the methods of placing, spreading, levelling and compacting concrete.
Placing: tipping, shovelling
Spreading: shovel, rake
Levelling/compacting: hand screed/tamping, vibrating beam
- 33.131 Describe, with the aid of a sketch, concrete surface finishing tools.
Tools: hand (wood/steel float, brush, margin trowel), machine (reciprocating blade)
- 33.132 State the methods and reasons for curing concrete.
Methods: membrane (polythene sheet, spray), water spray, wet sand, insulated quilt
Reasons: protect from (rapid evaporation of water, frost, excessive heat, heavy rainfall, drying wind)
- Paving**
- 33.133 Describe, with the aid of a sketch, the method of levelling and setting out paved areas.
Setting out: pegs/lines
Levelling: calculation of fall to required gradient
- 33.134 Describe the method of spreading, levelling, and compacting sub-base material.
Method: area pegs, scratch template
- 33.135 Describe bedding materials suitable for various types of paving.
Materials: dry mix ratios (cement/sand, lime/sand), graded sand
- 33.136 Describe, with the aid of a sketch, bonding patterns for block paving.
Bonding: herringbone (45%, 90%), basket weave, 45% basket weave, stretcher
- 33.137 Describe, with the aid of a sketch, the hand and power tools used for cutting brick and block paving materials.
Hand: hammer/bolster
Power: disc cutter, guillotine, block splitter
- Decorative features in brickwork**
- 33.138 Describe, with the aid of a sketch, details of semicircular and segmental arches.
Details: shape of voussoir template, angle of skewback, setting out of arch face
- 33.139 Describe, with the aid of a sketch, details of soldier arches in brick, block and stone.
Details: support methods, backing lintels

- 33.140 Describe, with the aid of a sketch, details of decorative brickwork features.
Details: diapers, diagonal patterns
- 33.141 Describe, with the aid of a sketch, details of decorative course features using standard walling materials.
Details: string courses, continuous band course, projecting courses
Materials: brick, block, natural/reconstructed stone
- 33.142 Describe, with the aid of a sketch, details of copings.
Details: drip grooves, damp-proof course (dpc), section profiles

Communications and information technology

Practical competences

The candidate must be able to do the following:

Communications

- 33.143 Use language in written and oral forms to communicate needs clearly.
Written: technical/commercial letters (eg internal memos, technical reports, job applications, curriculum vitae/résumé), summarise (eg document, report)
Oral: telephone, work instructions, group, one to one
- 33.144 Interpret, use and draw diagrams in a routine work environment.
Interpret: graphical to written, written to graphical, graphical (eg bar charts, histograms, graphs)
- 33.145 Collect and select information on the use of national and international standards.
Standards: eg British Standards, International Standards Organization (ISO)
- 33.146 Collect and select technical information from different sources.
Information: eg technical drawings, schedules, data sheets/charts, manufacturers' information sheets/brochures, microfilm, micro fiche, libraries, library index systems/classification, video tape, CD ROM, computer systems (eg Internet)
- 33.147 Use information technology systems for communication.
Systems: word processor, fax

Information Technology

- 33.148 Select a suitable software application for a given task.
Software: word processing, database, spreadsheet
- 33.149 Access a word processing applications software package.
- 33.150 Open a new word processing file and enter text.
- 33.151 Edit the contents of a document.
Edit: correct errors, insert words, delete words, insert paragraph breaks, delete paragraph breaks, sections of text (copy, cut, paste)
- 33.152 Use the spell-check function to check the document.
- 33.153 Enhance the appearance of a document.
Enhancement: font (size, bold, italics), text (centre, underline)
- 33.154 Close and save an edited document under an existing and a new file name.

- 33.155 Print a word processed file.

- 33.156 Exit the word processing applications package and switch off the equipment.

Knowledge requirements

The instructor must ensure the candidate is able to:

Communications

- 33.157 Explain the use of language in written and oral forms to communicate needs clearly.
Written: technical/commercial letters (internal memos, technical reports, job applications, curriculum vitae/résumé), summarise (documents/reports)
Oral: telephone, work instructions, group, one to one
- 33.158 Identify the use of national and international standards in the construction industry.
Standards: eg British Standards, International Standards Organization (ISO)
- 33.159 Identify the various sources of technical information.
Information: technical drawings, schedules, data sheets/charts, manufacturers' information sheets/brochures, microfilm, micro fiche, libraries, library index systems/classification, video tape, CD ROM, computer systems (eg Internet)
- 33.160 Explain the use of various electronic and information technology systems for communication.
Systems: word processor, fax, Internet, E-mail

Information Technology

- 33.161 Identify the main functions of commonly used software applications packages.
Packages: word processing (document production), spreadsheets (numerical analysis, manipulation), database (file creation, updating, searching, sorting), computer aided design (line drawings used for architecture/engineering/construction)
- 33.162 Describe the various editing operations that can be performed on a word processing file.
Edit: correct errors, insert words, delete words, insert paragraph breaks, delete paragraph breaks, sections of text (copy, cut, paste)
- 33.163 Explain the use of the spell-check function to check word processing documents.
- 33.164 Explain the use of the various enhancements that can be used to improve the appearance of a document.
Enhancement: font (size, bold, italics), text (centre, underline)

- 33.165 Explain how to close and save an edited document under an existing and a new file name.
Save: hard disk, floppy disk
- 33.166 Explain how to print a word processing file.
- 33.167 Explain how to exit the word processing applications package and switch off the equipment.

Alteration, repair and renovation

Practical competences

The candidate must be able to do the following:

- 33.168 Rake out joints in existing brick or masonry walling and repoint.
Rake out: eg hand, power tools
Repoint: compatible mortar/joint finish
- 33.169 Clean existing walls with cleaning fluids, steam/high pressure water jet or sand blasting.
Cleaning: safety procedures, manufacturers' instructions
- 33.170 Cut out and remove defective brick, block or stone material, replace with a matching unit and repoint.
Defect: eg cracked, eroded
- 33.171 Carry out hand finishing of pressure grouting and joint filling.
Finish: tooled, trowelled
- 33.172 Saw or hand cut mortar joints to produce toothing or block indents in existing walling.
Joints: cut out to remove (brick, block, stone)
- 33.173 Fix slip bricks or stone facings to existing walls with epoxy resin mortars.
Slip bricks/stone facings: eg purpose made/sawn
- 33.174 Cut back eroded stones and fix replacement stones dressed to match the existing finish.
Replacement: eg sawn off reclaimed stones from demolition, sawn off blocks of stone
- 33.175 Cut out and make good cracks in brick, block or stone walling.
- 33.176 Fix glass tell-tales across cracks in brick, block or stone walling.
- 33.177 Drill and fix replacement wall ties in an existing cavity wall.
Ties: types (expanding bolt, wedge)
- 33.178 Inject chemical damp proof course in an existing wall of brick, block or stone to prevent rising damp.
- 33.179 Apply treatments and water repellants to existing walls.
Treatments: cleaning, fungicide
Water repellants: chemical
- 33.181 Describe the method for mixing pointing mortar by hand or machine to produce a compatible mortar colour.
Method: types (cement, sand, lime, pigments, additives)
- 33.182 Explain the reason for using pointing mortar which is not as strong as the walling materials.
- 33.183 Explain the reason for using a joint finish which will be complementary to the wall.
- 33.184 Describe a method of cutting out and replacing one element of a wall without damaging surrounding materials.
Method: hand (hammer, jointing chisel), power tools (fix a temporary timber batten to act as a guide for power hammer chisel bit or disc cutter)
- 33.185 Describe the method of pressure grouting and filling joints.
Joints: seal edges to existing brick/stonewalling, hand finish, weather resistant finish
- 33.186 Describe 'building in' to toothings and indents ensuring solid jointing.
Building in: packing joints with semi dry mortar
- 33.187 Describe the method of setting out and positioning of slip bricks.
Method: temporary supports, pre-formed special slip bricks for corners/piers, mixing of epoxy mortar
- 33.188 Identify the various types of cracks which may occur in walling.
Cracks: settlement (cracks will normally taper as the building moves unevenly), expansion/ contraction (cracks normally have parallel sides), horizontal cracks along bed joints (due to tensile stress within the mortar joint)
- 33.189 Explain the use of glass tell tales fixed across cracks in walling.
Use: to detect further movement before remedial action is taken
- 33.190 State the reasons for installing replacement wall ties.
Reasons: corrosion, physical movement damage
- 33.191 Describe the various methods of injecting a chemical damp proof course into existing brick, block or stone walling.
Methods: pressure injection, trickle injection

Knowledge requirements

The instructor must ensure the candidate is able to:

- 33.180 Describe the correct procedures to be used when raking out joints by hand and using a power hammer.
Procedures: fix a temporary timber batten to act as a guide for power hammer chisel bit or disc cutter

Assessment

Test specification for written paper Trowel Vocations 2 Principles (6161-121-033)

This is a multiple choice examination paper lasting two and a half hours comprising 100 questions. Candidates must answer all questions.

The examination paper will cover the knowledge specifications for the following:

Topic	Approximate % examination weighting
Safety at work	10
Materials	20
Calculations, setting out and drawing	5
Practical skills	50
Communications and information technology	5
Alteration, repair and renovation	10

33 Trowel Vocation 2: Safety at work

Practical competences

The candidate must be able to do the following:

- 33.1 Carry out safe working practices to prevent hazards and to ensure the safety of working personnel and members of the public.
- 33.2 Carry out the safe erection, use and dismantling of scaffold platforms less 2m high.
- 33.3 Carry out the safe erection, use and dismantling of scaffold platforms over 2m high.
- 33.4 Inspect for faults, set up and safely use steps and ladders in general use.
- 33.5 Set up safety barriers around a hazard to protect working personnel and members of the public.
- 33.6 Select and use protective clothing and safety equipment for specific tasks.
- 33.7 Use and store toxic materials in a safe manner.
- 33.8 Carry out a risk assessment and prepare a report identifying the potential hazards.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

33 Trowel Vocations 2: Materials

Practical competences

The candidate must be able to do the following:

- | | | | |
|-------|--|--------------------------|--|
| 33.18 | Identify and select bricks for specific applications based on their technical properties. | <input type="checkbox"/> | 33.28 Prepare a report on the environment effects of quarrying and manufacturing various types of trowel based materials. <input type="checkbox"/> |
| 33.19 | Identify and select natural and reconstructed stones for specific applications based on their technical properties. | <input type="checkbox"/> | |
| 33.20 | Identify and select thermal insulating materials for specific applications based on their technical properties. | <input type="checkbox"/> | |
| 33.21 | Identify and select street paving materials for specific applications based on their technical properties. | <input type="checkbox"/> | |
| 33.22 | Identify and select sands and aggregates for specific applications based on their technical properties. | <input type="checkbox"/> | |
| 33.23 | Identify and select cements, limes, plastering products and plasticisers for specific applications based on their technical properties. | <input type="checkbox"/> | |
| 33.24 | Identify and select damp-proof courses (dpc) and damp-proof membranes (dpm) for specific applications based on their technical properties. | <input type="checkbox"/> | |
| 33.25 | Select insecticides which may be used below building foundation to prevent insect infestation. | <input type="checkbox"/> | |
| 33.26 | Select termite shields which may be fitted above building foundations. | <input type="checkbox"/> | |
| 33.27 | Prepare a report identifying the availability, suitability and relative costs of trowel based materials available in the country of study. | <input type="checkbox"/> | |

This is to confirm that the candidate has successfully completed the above tasks:

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Instructor signature

Instructor name (please print)

Completion date

33 Trowel Vocations 2: Calculations, setting out and drawing

Practical competences

The candidate must be able to do the following:

Calculations

33.38 Take off accurate dimensions from drawings of circular, semi circular and triangular structures.

33.39 Calculate areas from dimensions taken off drawings of circular, semi circular and triangular structures.

33.40 Calculate volumes from dimensions taken off drawings of circular, semi circular and triangular structures.

33.41 Calculate the quantity and cost of materials required from drawings of circular, semi circular and triangular structures.

Setting out

33.42 Measure and set out foundations from drawings of circular, semi circular and triangular structures.

Drawings

33.43 Produce working drawings from plans and details of circular, semi circular and triangular structures.

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Instructor signature

Instructor name (please print)

Completion date

33 Trowel Vocations 2: Practical skills

Practical competences

The candidate must be able to do the following:

Substructure

33.48 Transfer building lines onto foundation concrete.

33.49 Set out and build brickwork up to ground floor level/damp-proof course (dpc) in solid and cavity walling with plumbing and levelling to industry standards.

33.50 Set out and build blockwork up to ground floor level/damp-proof course (dpc) in solid and cavity walling with plumbing and levelling to industry standards.

33.51 Set out and build brick square return corners up to 1 1/2 bricks thick.

33.52 Set out and build solid block square return corners.

33.53 Set out and build isolated and attached piers with plumbing and levelling to industry standards.

Drainage and services

33.54 Install supports to trench sides.

33.55 Use a set of boning rods to maintain the gradient of a trench bottom and the associated drainage pipework.

33.56 Set up sight rails for the levels and centre lines of drains.

33.57 Lay and join drainage pipes and fittings in accordance with the manufacturers' instructions.

33.58 Use a laser to align drainage pipework to correct fall.

33.59 Spread and prepare drain pipe bedding, haunching and surrounds.

33.60 Build a manhole/inspection chamber.

33.61 Build an in-situ concrete manhole including the formwork.

33.62 Install a glass fibre reinforced plastic (GRP) manhole together with a rodding eye and gully.

33.63 Carry out tests on a completed drainage system.

33.64 Construct a catch pit suitable for a surface water or land drainage system.

33.65 Install and build ducts to allow entry of services to a building.

33.66 Install a meter box for building services.

Superstructure

33.67 Set out and build solid or cavity walling 1 storey high with plumbing and levelling to industry standards.

33.68 Set out and build solid or cavity composite walling 1 storey high with plumbing and levelling to industry standards.

33.69 Form door and window openings in solid or cavity walls.

33.70 Build in and secure door and window frames with all necessary damp-proof courses (dpc) where appropriate.

33.71 Form eaves in solid or cavity walls.

33.72 Build gable ends in solid or cavity walls.

Tiling

33.73 Prepare a wall surface suitable for cement rendering.

33.74 Apply first cement rendering coat and scratch to ensure even surface for second coat.

33.75 Prepare surface and apply second cement rendering coat with a wood float surface finish.

33.76 Hand trowel finish internal and external rendered angles.

33.77 Protect wall rendering work during application and for seven days after completion.

33.78 Fix and grout wall tiles using manufactured tile adhesive/grout.

Concrete work

33.79 Set out and position edge formwork or levelling battens for a concrete slab.

33.80 Cut and place damp-proof membrane (dpm) and steel mesh reinforcement.

33.81 Batch and mix concrete and transport to placing position.

33.82 Place concrete in formwork, spread, level and compact.

33.83 Surface finish by hand and cure finished concrete.

Paving

- 33.84 Set out lines and levels for paved areas and paths to ensure required falls.
- 33.85 Prepare and compact sub grade and sub base material.
- 33.86 Spread, level and compact bedding on prepared sub base.
- 33.87 Lay and compact bricks/precast blocks on prepared bedding and sand fill joints.
- 33.88 Cut paving materials using suitable equipment.

Decorative features

- 33.89 Build semi circular and segmental arches.
- 33.90 Set up, support and build a soldier arch using standard walling materials.
- 33.91 Set out and build brickwork to form feature patterns based on diaper work.
- 33.92 Set out and build decorative course features using standard walling materials.
- 33.93 Install copings to brick, block or stone walling.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature _____

Candidate name (please print) _____

Instructor signature _____

Instructor name (please print) _____

Completion date _____

33 Trowel Vocations 2: Communications and information technology

Practical competences

The candidate must be able to do the following:

Communications

- 33.143 Use language in written and oral forms to communicate needs clearly.
- 33.144 Interpret, use and draw diagrams in a routine work environment.
- 33.145 Collect and select information on the use of national and international standards.
- 33.146 Collect and select technical information from different sources.
- 33.147 Use information technology systems for communication.

Information technology

- 33.148 Select a suitable software application for a given task.
- 33.149 Access a word processing applications software package.
- 33.150 Open a new word processing file and enter text.
- 33.151 Edit the contents of a document.
- 33.152 Use the spell-check function to check the document.
- 33.153 Enhance the appearance of a document.
- 33.154 Close and save an edited document under an existing and a new file name.
- 33.155 Print a word processed file.
- 33.156 Exit the word processing applications package and switch off the equipment.

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Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

33 Trowel Vocations 2: Alteration, repair and renovation

Practical competences

The candidate must be able to do the following:

- | | | |
|--------|--|--------------------------|
| 33.168 | Rake out joints in existing brick or masonry walling and repoint. | <input type="checkbox"/> |
| 33.169 | Clean existing walls with cleaning fluids, steam/high pressure water jet or sand blasting. | <input type="checkbox"/> |
| 33.170 | Cut out and remove defective brick, block or stone material, replace with a matching unit and repoint. | <input type="checkbox"/> |
| 33.171 | Carry out hand finishing of pressure grouting and joint filling. | <input type="checkbox"/> |
| 33.172 | Saw or hand cut mortar joints to produce toothing or block indents in existing walling. | <input type="checkbox"/> |
| 33.173 | Fix slip bricks or stone facings to existing walls with epoxy resin mortars. | <input type="checkbox"/> |
| 33.174 | Cut back eroded stones and fix replacement stones dressed to match the existing finish. | <input type="checkbox"/> |
| 33.175 | Cut out and make good cracks in brick, block or stone walling. | <input type="checkbox"/> |
| 33.176 | Fix glass tell-tales across cracks in brick, block or stone walling. | <input type="checkbox"/> |
| 33.177 | Drill and fix replacement wall ties in an existing wall. | <input type="checkbox"/> |
| 33.178 | Inject chemical damp proof course in an existing wall of brick, block or stone to prevent rising damp. | <input type="checkbox"/> |
| 33.179 | Apply treatments and water repellants to existing walls. | <input type="checkbox"/> |

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

34 Painting and Decorating 2 – Summary of syllabus sections

Page 92 Safety at work
(Objectives 34.1 to 34.19)

The aim of this unit is to enable the candidate to maintain safe working conditions and to adopt safe procedures for themselves and others.

Page 94 Materials
(Objectives 34.20 to 34.55)

The aim of this unit is to enable the candidate to:

- a identify and select materials for specific applications based on their technical properties
- b describe the technical properties of the main types of materials in use
- c use colour schemes
- d identify environmental effects and benefits of painting and decorating materials and processes

Page 97 Calculations, setting out and drawing
(Objectives 34.56 to 34.64)

The aim of this unit is to enable the candidate to:

- a take off dimensions from drawings of circular, semi circular and triangular structures
- b calculate quantities to assist in preparing, costing and estimating
- c take off measurements from site
- d produce working drawings

Page 98 133 Practical skills
(Objectives 34.65 to 34.96)

The aim of this unit is to enable the candidate to apply basic tools skills to:

- a prepare substrates/surfaces and surrounding areas prior to the application of decorative effects
- b prepare and apply decorative effects
- c interpret written instructions to decorative materials
- d prepare surfaces to receive standard wall and ceiling hangings
- e identify and prepare standard wall and ceiling hanging adhesives
- f identify and hang standard wall and ceiling hangings

Page 100 Communications and information technology
(Objectives 34.97 to 34.121)

The aim of this unit is to enable the candidate to use:

- a communication skills in the workplace
- b information technology in the workplace

Page 102 Repair, restoration and glazing
(Objectives 34.122 to 34.143)

The aim of this unit is to enable candidates to apply tools skills to:

- a carry out the repair and restoration of existing buildings.
- b replace damaged glazing

Safety at work

The use of national/local regulations and working practices must be included in all practical competences.

Practical competences

The candidate must be able to do the following:

- 34.1 Carry out safe working practices to prevent hazards and to ensure the safety of working personnel and members of the public.
Hazards: fumes, obstructions, spillage, wet paint surfaces, warning notices
- 34.2 Carry out safe working practices using various equipment/materials to protect surrounding work areas from infringement or contamination.
Equipment/materials: dust sheets, masking tapes/paper, shields (boards)
- 34.3 Carry out the safe erection, use and dismantling of scaffold platforms less than 2m high.
Scaffolding: trestles, folding trestles, hop-up stools, scaffold boards
- 34.4 Carry out the safe erection, use and dismantling of scaffold platforms over 2m high.
Scaffolding: quick assembly towers, scaffold boards, toe boards, hand rails, stabilisers/outriggers
- 34.5 Inspect for faults, set up and safely use steps and ladders in general use.
Faults: metal components (corrosion), timber components (deterioration, splits, cracks)
Set up: firm/level base, clip/lash down
- 34.6 Set up safety barriers around a hazard to protect working personnel and members of the public.
Barriers: security tape, barrier material (eg timber, metal, plastic), safety/warning (signs, lights)
Hazards: openings in (floors, walls, roofs), roof edges
- 34.7 Select and use protective clothing and safety equipment for specific tasks.
Equipment/clothing: goggles, rubber gloves, gauntlets, face mask, ear defenders/plugs, safety helmet (hard hat), rubber apron, clothing, overalls, safety shoes, residual current device
Tasks: surface preparation, use of dangerous substances (acid, alkali, solvents)
- 34.8 Use and store toxic materials in a safe manner.
Use: manufacturers' instructions, toxic effect
Materials: solvents, spirits, thinners, acids, alkali, lubricants

- 34.9 Carry out a risk assessment and prepare a report identifying the potential hazards.
Risk assessment: working practices, hazard identification, dangerous substances, site machinery, noise, scaffolding

Knowledge requirements

The instructor must ensure the candidate is able to:

- 34.10 State the methods used to prevent hazards and to ensure the safety of working personnel and members of the public.
Methods: warning notices, ventilation
- 34.11 State the methods used to protect surrounding work areas from infringement or contamination.
Methods: dust sheets, masking tapes/paper, shields (boards)
- 34.12 Explain the safe use of scaffold platforms less than 2m high.
Scaffolding: trestles, folding trestles, hop-up stools, scaffold boards
Safe use: manufacturers' instructions, nationally/locally applied regulations
- 34.13 Explain the safe use of scaffold platforms over 2m high.
Scaffolding: quick assembly towers, scaffold boards, toe boards, hand rails, stabilisers/outriggers
Safe use: manufacturers' instructions, nationally/locally applied regulations
- 34.14 State the faults, possible hazards and dangerous practices when using ladders and steps.
Faults: metal components (corrosion), timber components (deterioration, splits, cracks)
Hazards: base fixing/stabilising, clip/lash at platform level, clear space around base
Dangerous practices: uneven/loose ground
- 34.15 Explain the purpose and use of barriers and warning signs/lights to protect working personnel and members of the public from possible accidents.
Barriers: security tape, barrier material (timber, metal, plastic), safety/warning (signs, lights)
Purpose: segregation of different work activities, segregation of work from members of the public, prevention of falls from heights above 2m

- 34.16 Describe the correct use of protective clothing and safety equipment for a range of applications.
Use: own safety, regulations
Equipment/clothing: goggles, rubber gloves, gauntlets, face mask, ear defenders/plugs, safety helmet (hard hat), rubber apron, clothing, overalls, safety shoes
Applications: handling corrosive/toxic materials, scaffolding area, atmospheric dust/fumes, flying particles (grit, sand)
- 34.17 State the toxic effect of materials used in painting and decorating.
Effect: on eyes, skin, breathing
Materials: solvents, spirits, thinners, acids, alkali
- 34.18 Describe the preventative and remedial actions to be taken in the case of exposure to toxic materials.
Exposure: ingested, contact with skin, inhaled
Preventative action: ventilation, masks, protective clothing/equipment
Remedial action: immediate first aid, report to supervisor
Materials: solvents, spirits, thinners, acids, alkali, lubricants, manufacturers' instructions
- 34.19 Explain the method by which a risk assessment is carried out.
Method: identify task procedure, identify hazards, identify control actions to reduce hazard, assess final risk

Materials

The properties of locally manufactured materials or materials in local general use should be considered.

Practical competences

The candidate must be able to do the following:

- 34.20 Recognise the physical properties of surfaces and substrates.
Properties: porous/non-porous, permeable/impermeable
Surfaces/substrates: timber, plaster, brick, concrete, stone, wall board, plastic, glass, ceramic tiles
- 34.21 Recognise the chemical nature of surfaces and substrates.
Chemical nature: efflorescence, saponification, base, alkaline, acid
Surfaces/substrates: timber, plaster, brick, concrete, stone, wall board, plastic, glass, ceramic tiles
- 34.22 Prepare a report comparing hardwoods and softwoods.
Comparisons: properties (texture, weathering, absorption), nature (oil/resin/acid content), decay
- 34.23 Prepare a report comparing ferrous metals and non-ferrous metals.
Comparisons: corrosion (rate, type)
- 34.24 Identify and select abrasives for specific applications based on their technical properties.
Abrasives: eg glass paper, carbon silicate, aluminous oxide, production paper
Applications: surfaces (new, previously painted)
- 34.25 Identify and select stoppers and fillers for specific applications based on their technical properties.
Stoppers: linseed oil putty
Fillers: eg water based, two pack wood filler, fine surface filler, acrylic caulk
Applications: surfaces (new, previously painted)
- 34.26 Identify and select knotting and sealers for specific applications based on their technical properties.
Knotting: shellac
Sealers: oil based, water based
Applications: surfaces (new, previously painted)
- 34.27 Identify and select paint removers for specific applications based on their technical properties.
Paint removers: spirit, solvent, alkaline
Applications: removal of previously painted surfaces
- 34.28 Identify and select liquid petroleum gas (LPG) flame surface preparation materials/equipment for specific applications based on their technical properties.
Liquid petroleum gas: butane, propane
Applications: removal of previously painted surfaces
- 34.29 Identify and select oil based surface coating materials for specific applications based on their technical properties.
Oil based coatings: non-reversible (convertible), primers, undercoats, sealers, finishes
Applications: new/previously painted (wood, metal, plaster), internal (cooking/washing, living), external
- 34.30 Identify and select water based surface coating materials for specific applications based on their technical properties.
Water based coatings: non-reversible (convertible), primers, undercoats, sealers, finishes
Applications: new/previously painted (wood, metal, plaster), internal (cooking/washing, living), external
- 34.31 Identify and select spirit based surface coating materials for specific applications based on their technical properties.
Spirit based coatings: reversible (non-convertible), knotting, lacquer, bitumen
Applications: new/previously painted (wood, metal), internal (furniture), sealing resinous material, external (waterproofing)
- 34.32 Identify and select surface coating materials using colour cards.
Colour cards: national/local standards (eg BS 4800)
- 34.33 Identify and select surface coating materials for identification applications.
Identification: national/local standards
Applications: eg pipeline identification, machinery parts
- 34.34 Identify and select surface coating materials for safety applications.
Safety: national/local standards
Applications: safety, warning, hazard
- 34.35 Mix subtractive colour to produce a colour wheel.
Mix: colour (primary, secondary)
- 34.36 Identify and select wall and ceiling hanging materials for specific applications based on their technical properties.
Materials: eg linings, ingrain, pulp, anaglyptas, 520mm vinyl, blown vinyl, single embossed, duplexes, washables, ready-pasted papers, insulating linings/tiles, damp-proofing materials
Applications: wall/ceiling (living, cooking, washing), damp proofing
- 34.37 Identify and select wall/ceiling hanging pastes and adhesives for specific applications based on their technical properties.
Paste/adhesives: starch, cellulose, starch ethers, polyvinyl acetate (PVA)

- 34.38 Prepare a report identifying the availability, suitability and relative cost of surface preparation and surface coating materials.
Materials: abrasives, stoppers, fillers, knotting, sealers, paint removers, primers, undercoats, finishers
Suitability: climate, ecological effects
- 34.39 Prepare a report on the environmental effects of oil, solvent and spirit based surface coatings.
Environmental effects: disposal (specialist disposal, kills organisms in sewage treatment plants, build up of potentially explosive gases), fumes (carcinogenic, toxic, irritant, flammability)

Knowledge requirements

The instructors must ensure the candidate is able to:

- 34.40 State the relationship between surface coating adhesion and the physical properties of the substrate.
Properties: porous (specific adhesion), non-porous (mechanical adhesion)
- 34.41 State the differences between permeable and impermeable substrates.
Differences: ability to act as a moisture barrier
- 34.42 State the causes and effect of efflorescence and saponification by various substrate materials.
Materials: plaster, brick, concrete, stone, wall board
Effect: on surface coatings
- 34.43 State the causes and effect of alkaline/acid attack by various substrate materials.
Materials: timber, plaster, wall board
Effect: on surface coatings
- 34.44 Describe the physical properties of water based paints.
Properties: solutions (suspension, emulsion), surface tension, capillary attraction
- 34.45 Describe the probable reaction of applying a water based paint to an oil based paint surface.
Reaction: cissing
- 34.46 Describe the corrosion characteristics of ferrous and non-ferrous metals.
Metals: ferrous (iron, steel), non-ferrous (aluminium, brass, copper, zinc, lead)
- 34.47 State the technical properties of thinners and solvents.
Thinners/solvents: turpentines, white spirit, alcohols, coal tar distillates, chlorinated hydrocarbons, esters, ethers, ketones, hydrogenated naphthalates, nitro paraffins, water
Properties: volatile, noxious, ability to evaporate without residue
- 34.48 State the technical properties, characteristics and storage requirements of oil based surface coating materials.
Material: alkali resisting primer, zinc chromate metal primer, aluminium sealers, calcium plumbate primer, zinc phosphate metal primer, oil resin-based primers, synthetic resin-based primers, chlorinated rubber paint, bronze/aluminium paint, eggshell finishes, full gloss finish, silicone solutions, polyurethane varnish, etch primer, epoxy resin paint, micaceous iron oxide, heat resistant paint, anti-condensation paint, glaze, scumbles, anti-fungus paint, multi-colour finishes, damp-proofing compounds, penetrating oily sealers, flame retardant paints
Properties: convertible (non-reversible), chemical resistance, satisfy absorption, provide key, weather resistance, heat resistance
Characteristics: decorative finish, colour, protection
Storage: manufacturers' instructions
- 34.49 State the technical properties, characteristics and storage requirements of water based surface coating materials.
Material: emulsion paints, emulsion varnish, acrylic primer undercoat, interior relief texture paint, wood preservatives, cement paints, wood stains, anti-condensation paint, glaze, acrylic (egg shell, gloss), anti-fungus paint, multi-colour finishes, flame retardant paints
Properties: convertible (non-reversible), chemical resistance, satisfy absorption, provide key, weather resistance, heat resistance
Characteristics: decorative finish, colour, protection, resistance to flow, raises grain on bare timber
Storage: not below freezing point, manufacturers' instructions
- 34.50 State the technical properties, characteristics and storage requirements of spirit based surface coating materials.
Material: shellac, chlorinated rubber paint, wood preservatives, bitumen, wood stains
Properties: non-convertible (reversible), chemical resistance, weather resistance, heat resistance, preservative, corrosion inhibitor
Characteristics: decorative finish, colour, protection
Storage: manufacturers' instructions
- 34.51 State the technical properties, characteristics and storage requirements of wall and ceiling hanging materials.
Materials: linings, ingrains, pulp, anaglyptas, 520mm vinyl, blown vinyl, single embossed, duplexes, washables, ready-pasted papers, insulating linings/tiles, damp-proofing materials
Properties: insulating, damp-proofing, washable, ready pasted
Characteristics: decorative finish
Storage: dry, cool, manufacturers' instructions

- 34.52 State the technical properties, characteristics and storage requirements of adhesives used for wall/ceiling hanging.
Adhesives: starch, cellulose, starch ethers, polyvinyl acetate (PVA)
Characteristics: high/low water content, high/low solid content
Properties: fungicidal (effect, safety), adhesive strength
Storage: dry, cool, not below freezing, manufacturers' instructions
- 34.53 Define the term subtractive mixture.
Definition: pigment mixture
- 34.54 Define colour terms.
Terms: primary colour, secondary colour, colour harmony, colour contrast, colour discord, colour (tints, shades, tones)
- 34.55 State the effects on the environment of oil, solvent and spirit based surface coatings.
Environmental effects: disposal (specialist disposal, kills organisms in sewage treatment plants, build up of potentially explosive gases), fumes (carcinogenic, toxic, irritant, flammability)

Calculations, setting out and drawing

Practical competences

The candidate must be able to do the following:

Calculations

- 34.56 Take off accurate dimensions from drawings of circular, semi circular and triangular structures.
Drawings: plans, sectional drawings
Dimensions: lengths, widths, heights, depths
- 34.57 Calculate areas from dimensions taken off drawings of circular, semi circular and triangular structures.
Areas: walls, ceilings, floors, openings
- 34.58 Calculate the quantity and cost of materials required from drawings of circular, semi circular and triangular structures.
Materials: surface coating materials, wall/ceiling hangings
Costs: product catalogues, price lists, discounts
Drawings: walls, ceilings, floors, openings

Setting out

- 34.59 Use tools and equipment to take measurements from site to calculate the area to be decorated.
Tools/equipment: tape measure, rule
Measurements: walls, ceilings, openings

Drawings

- 34.60 Produce working drawings from plans and details of circular, semi circular and triangular structures.
Drawings: dimensions, detail (eg door/window openings, ceilings, skirting boards, archways, circular windows), exploded views

Knowledge requirements

The instructor must ensure the candidate is able to:

Calculations

- 34.61 Identify calculations involving areas of circular, semi circular and triangular structures.
Area: walls, ceilings, floors, openings
- 34.62 Identify calculations involving quantities and costs of materials of circular, semi circular and triangular structures.
Materials: surface coating materials, wall/ceiling hangings
Costs: product catalogues, price lists, discounts, waste allowances
Areas: wall, ceilings, floors, openings

Setting out

- 34.63 Identify calculations involving surface areas using dimensions taken by tape measure.
Areas: rectangular, circular, semi circular, triangular

Drawings

- 34.64 Identify scale working drawings of items taken from plans and details of circular, semi circular and triangular structures.
Drawings: dimensions, detail (door/window openings, ceilings, skirting boards, archways, circular windows), exploded views

Practical skills

The properties of locally manufactured materials or materials in local general use should be considered.

Practical competences

The candidate must be able to do the following:

- 34.65 Prepare previously painted surfaces and new substrate to receive decorative effects.
Surfaces: oil based paint (gloss, semi-gloss, matt), water based paint (gloss, semi-gloss, matt)
Substrates: plaster, timber, metal, wall boards
- 34.66 Prepare and apply various types of glaze and stains to obtain decorative effects.
Prepare: manufacturers' instructions
Application: even distribution of material, even distribution of technique, area (minimum 400mm x 300mm)
Glaze/stains: water based, oil based
Decorative effect: sponging, combing, rag rolling on/off, ragging, dragging, bagging
- 34.67 Prepare and apply various types of colour wash to obtain decorative effects.
Prepare: manufacturers' instructions
Application: even distribution of material, even distribution of technique, area (minimum 400mm x 300mm)
Colour wash: water based, oil based
Decorative effect: colour washing, clouding
- 34.68 Apply decorative effects by stencil templates, lining fitches, tapes and sign writing brushes.
Application: even distribution of material, even distribution of technique, stencils (minimum 3 repeats)
Decorative effect: motifs, stencils (solid, shaded), painted lines/borders, free brush work
- 34.69 Prepare and apply various types of scumbles to obtain wood grain decorative effects.
Prepare: manufacturers' instructions
Application: even distribution of material, even distribution of technique, area (minimum 400mm x 300mm)
Scumbles: oil based
Decorative effect: heart wood (rocker), brush graining, comb effects
- 34.70 Prepare and apply various types of glaze and stains to obtain simple marbling decorative effects.
Prepare: manufacturers' instructions
Application: even distribution of material, even distribution of technique, area (minimum 400mm x 300mm)
Glaze/stains: water based, oil based
Marbling: black, white
Decorative effect: ragging, softening, splattering

- 34.71 Prepare and apply texture coatings to obtain decorative effects.
Prepare: manufacturers' instructions
Application: even distribution of material, even distribution of technique.
Coatings: water based (hot, cold)
Decorative effect: stipple, roller (tree bark), broken leather (eg plastic bag, chamois leather, stippler)
- 34.72 Prepare background surfaces to receive wall and ceiling hangings.
Preparation: removal of existing wall/ceiling coverings (hand, mechanical), filling, washing, neutralising, abrading, sizing, crosslining
- 34.73 Mix wall and ceiling hanging adhesives.
Mix: manufacturers' instructions
- 34.74 Store wall and ceiling hangings.
Store: manufacturers' instructions
- 34.75 Prepare wall and ceiling hanging materials for application.
Preparation: shade, measure, cut, paste, fold
- 34.76 Apply various types of wall and ceiling hangings.
Application: hanging, setting out, plumbing, centring, jointing, cutting techniques
Wall/ceiling hangings: lining, embossed, vinyl (repeat pattern)
- 34.77 Select, clean, maintain and store wall and ceiling hanging equipment.
Equipment: tools (cutting, trimming), applicator (brushes, spatulas), plumb bomb, measures (tape, rule)
Clean/store: wipe clean/dry, secure storage

Knowledge requirements

The instructor must ensure the candidate is able to:

- 34.78 Describe the characteristics of surface defects.
Defects: new timber (knots, shakes, resinous, oily, green timber, beetle, fungi), ferrous metal (scale, rust), dissimilar metals (corrosion/electro chemical action, weathering), non-ferrous metal (corrosion), plasters/cements (alkali attack, saponification, salts, efflorescent, porous nature), moisture (source, content), plaster board (nail heads, joints), glass/plastic (non-porous surface)
- 34.79 Explain the cause and cure of paint defects created by substrate or atmospheric conditions.
Defect: bleeding, loss of gloss, blistering, pattern staining, blooming, rain spotting, blushing, saponification, chalking, sulphiding, discolouration, yellowing, flaking, photo degradation

- 34.80 Explain the cause and cure of paint defects created during paint application.
Defect: bittiness, misses, cissing, lifting, cracking, crazing, rivelling, curtains/sags, runs, fatty edges, ropiness, flashing/sheariness, grinning
- 34.81 Explain the cause and cure of defects whilst paint is stored or in the tin.
Defect: freezing, livering, settling, skinning
- 34.82 Identify the major difference between oil based glazed and water based glazed decorative effects.
Difference: wet edge time
- 34.83 Describe the various decorative effects that can be obtained with oil or water based glazes and stains.
Decorative effects: sponging, combing, rag rolling on/off, ragging, dragging, bagging, colour washing, marbling
- 34.84 Describe the various types of decorative effects obtained by stencil templates, lining fitches, tape and sign writing brush.
Decorative effect: motifs, stencils (solid, shaded), painted lines/borders, free brush work
- 34.85 Describe the various types of wood grained decorative effects obtained with oil and water based scumbles.
Decorative effect: heart wood (rocker), brush graining, comb effects
- 34.86 Describe the preparation, use and composition of various types of texture coatings.
Types: water based (hot, cold) Use: decorative relief effect
Composition: inert fillers, gums, glues
- 34.87 Identify the various types of wall/ceiling hangings, coverings and fabrics.
Types: lining paper, ingrains, pulps, anaglyptas, grounds, 520mm vinyls, single embosses, duplexes, relief vinyls, washables, ready pasted, insulating lining/tiles, damp proof materials
- 34.88 Describe the reasons and procedures for treating background surfaces prior to applying wall and ceiling hangings.
Reasons: acidity, alkalinity, efflorescence, algae, lichen, fungi, porosity, capillarity
Procedures: removal (hand, mechanical), filling, washing, neutralising, abrading, sizing, crossing lining
- 34.89 State the uses of various wall/ceiling hanging pastes and adhesives.
Uses: impermeable hangings (fungicidal), hangings (light weight, heavy weight), vinyl overlap
Pastes/adhesives: starch, cellulose, starch ethers, polyvinyl acetate (PVA)
- 34.90 Describe the correct method of storing hangings, coverings and fabrics.
Storage: dry, clear of floor, not on edge
- 34.91 Identify wall hanging tools and equipment.
Tools/equipment: tools (cutting, trimming), applicator (brush, spatular), plumb bomb, measures (tape, rule)
- 34.92 List the procedures prior to applying wall and ceiling hangings.
Procedures: shading, trimming, soaking times (methods, reasons), matching/planning (setting out, measuring, cutting techniques, equipment), fielding (vertical application, horizontal application)
- 34.93 Explain the techniques for applying wall and ceiling hangings.
Techniques: determine starting point, matching/planning (drop, straight across, random, reversing alternate lengths, aesthetics)
- 34.94 State the method for cleaning, maintaining and storing wall and ceiling hanging equipment.
Method: wipe clean/dry, secure storage
- 34.95 Identify the causes and cures of defects during and after the application of wall/ceiling hangings.
Defect: blistering, loss of emboss, creasing, peeling, delamination, polishing, discolouration, shading, edges springing, staining, gaps in joints, tearing, joints splitting, poor matching
- 34.96 Identify the effects of thermal conductivity on wall and ceiling hangings.
Effects: linear expansion, pattern staining, condensation

Communications and information technology

Practical competences

The candidate must be able to do the following:

Communications

- 34.97 Use language in written and oral forms to communicate needs clearly.
Written: technical/commercial letters (eg internal memos, technical reports, job applications, curriculum vitae/résumé), summarise (eg document, report)
Oral: telephone, work instructions, group, one to one
- 34.98 Interpret, use and draw diagrams in a routine work environment.
Interpret: graphical to written, written to graphical, graphical (eg bar charts, histograms, graphs)
- 34.99 Collect and select information on the use of national and international standards.
Standards: eg British Standards, International Standards Organization (ISO)
- 34.100 Collect and select technical information from different sources.
Information: eg technical drawings, schedules, data sheets/charts, manufacturers' information sheets/brochures, microfilm, micro fiche, libraries, library index systems/classification, video tape, CD ROM, computer systems (eg Internet)
- 34.101 Use information technology systems for communication.
Systems: word processor, fax

Information technology

- 34.102 Select a suitable software application for a given task.
Software: word processing, database, spreadsheet
- 34.103 Access a word processing applications software package.
- 34.104 Open a new word processing file and enter text.
- 34.105 Edit the contents of a document.
Edit: correct errors, insert words, delete words, insert paragraph breaks, delete paragraph breaks, sections of text (copy, cut, paste)
- 34.106 Use the spell-check function to check the document.
- 34.107 Enhance the appearance of a document.
Enhancement: font (size, bold, italics), text (centre, underline)
- 34.108 Close and save an edited document under an existing and a new file name.

- 34.109 Print a word processed file.

- 34.110 Exit the word processing applications package and switch off the equipment.

Knowledge requirements

The instructor must ensure the candidate is able to:

Communications

- 34.111 Explain the use of language in written and oral forms to communicate needs clearly.
Written: technical/commercial letters (internal memos, technical reports, job applications, curriculum vitae/résumé), summarise (documents/reports)
Oral: telephone, work instructions, group, one to one
- 34.112 Identify the use of national and international standards in the construction industry.
Standards: eg British Standards, International Standards Organization (ISO)
- 34.113 Identify the various sources of technical information.
Information: technical drawings, schedules, data sheets/charts, manufacturers' information sheets/brochures, microfilm, micro fiche, libraries, library index systems/classification, video tape, CD ROM, computer systems (eg Internet)
- 34.114 Explain the use of various electronic and information technology systems for communication.
Systems: word processor, fax, Internet, E-mail

Information technology

- 34.115 Identify the main functions of commonly used software applications packages.
Packages: word processing (document production), spreadsheets (numerical analysis, manipulation), database (file creation, updating, searching, sorting), computer aided design (line drawings used for architecture/engineering/construction)
- 34.116 Describe the various editing operations that can be performed on a word processing file.
Edit: correct errors, insert words, delete words, insert paragraph breaks, delete paragraph breaks, sections of text (copy, cut, paste)
- 34.117 Explain the use of the spell-check function to check word processing documents.
- 34.118 Explain the use of the various enhancements that can be used to improve the appearance of a document.
Enhancement: font (size, bold, italics), text (centre, underline)

- 34.119 Explain how to close and save an edited document under an existing and a new file name.
Save: hard disk, floppy disk
- 34.120 Explain how to print a word processing file.
- 34.121 Explain how to exit the word processing applications package and switch off the equipment.

Repair, restoration and glazing

Practical competences

The candidate must be able to do the following:

- 34.122 Identify various defects to the external and internal superstructure of buildings.
External: weathering (eg photo degradation, wind, rain, ice), damp ingress, fungal attack, insect attack, lichen
Internal: condensation, damp ingress, fungal attack, insect attack
- 34.123 Use a protometer to measure the moisture content of an affected area of internal superstructure.
- 34.124 Carry out the temporary repair of an area of damp internal wall by applying foil backed paper.
Repair: sealant, foil backed coating
Area: minimum 1m length of foil
- 34.125 Select suitable material to match the existing finish.
Materials: paint (water based, oil based), wall hangings, textured finish
- 34.126 Apply and fix selected wall hanging materials to prepared surface.
Application: handle, apply, cut (without damaging foil backed paper), joint
Surface: previously prepared in 34.124 above
- 34.127 Remove and replace damaged mastic sealant from external joints.
- 34.128 Select, clean and store glazing tools.
Tools: hacking knife, putty knife/glazing tool, hammer, glass cutter, straight edge, pincers
Clean/store: wipe clean/dry, secure
- 34.129 Handle and store glass safely.
Safety: protective equipment (glasses, gloves)
- 34.130 Remove broken glass in a safe manner whilst avoiding damage to surrounding areas.
Safety: protective equipment (glasses, gloves), disposal of broken glass
- 34.131 Remove old putties, bedding or beadings in a safe manner whilst avoiding damage to surrounding area.
Safety: protective equipment (glasses, gloves)
- 34.132 Prepare and treat rebates ready to receive new bedding material.
Treatment: oil primer
- 34.133 Measure, cut and trim replacement glass.
- 34.134 Install replacement glass into existing frame.
Install: bed, secure, seal (eg putty)

Knowledge requirements

The instructor must ensure the candidate is able to:

- 34.135 State the various defects that may occur to the external and internal superstructure of buildings.
External: weathering (eg photo degradation, wind, rain, ice), damp ingress, fungal attack, insect attack, lichen
Internal: condensation, damp ingress, fungal attack, insect attack
- 34.136 Describe the operating principles of a protometer.
Principles: variation of resistance between two electrodes
- 34.137 Describe how to carry out the temporary repair of an area of damp internal wall by applying foil backed paper.
Repair: sealant, foil backed coating
- 34.138 State the problems associated with hanging wall and ceiling covering materials over damp-proofed surfaces.
Problems: handling, cutting, application, jointing, hanging (not to put at risk the integrity of the damp proofing)
- 34.139 Describe the types, uses and properties of wood preservatives.
Types: coal tar, organic solvent borne, organic water borne
Uses: external, internal
Properties: prevention (fungal attack, insect attack)
- 34.140 Describe the uses and properties of expanded polystyrene.
Uses: internal, control (pattern staining, condensation)
Properties: heat insulation
- 34.141 Describe the safe practices to be used when handling glass.
Practices: handling, storage, protective equipment (glasses, gloves)
- 34.142 Identify various glazing tools.
Tools: hacking knife, putty knife/glazing tool, hammer, glass cutter, straight edge, pincers
- 34.143 Define the terms associated with glazing.
Terms: tight size, glaze size, sight size, daylight size

Assessment

Test specification for written paper Painting and Decorating 2 Principles (6161-14-034)

This is a multiple choice examination paper lasting two and a half hours comprising 100 questions. Candidates must answer all questions.

The examination paper will cover the knowledge specifications for the following:

Topic	Approximate % examination weighting
Safety at work	10
Materials	35
Calculations, setting out and drawing	5
Practical skills	35
Communications and information technology	5
Restoration and glazing	10

34 Painting and Decorating 2: Safety at work

Practical competences

The candidate must be able to do the following:

- 34.1 Carry out safe working practices to prevent hazards and to ensure the safety of working personnel and members of the public.
- 34.2 Carry out safe working practices using various equipment/materials to protect surrounding work areas from infringement or contamination.
- 34.3 Carry out the safe erection, use and dismantling of scaffold platforms less than 2m high.
- 34.4 Carry out the safe erection, use and dismantling of scaffold platforms over 2m high.
- 34.5 Inspect for faults, set up and safely use steps and ladders in general use.
- 34.6 Set up safety barriers around a hazard to protect working personnel and members of the public.
- 34.7 Select and use protective clothing and safety equipment for specific tasks.
- 34.8 Use and store toxic materials in a safe manner.
- 34.9 Carry out a risk assessment and prepare a report identifying the potential hazards.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

34 Painting and decorating 2: Materials

Practical competences

The candidate must be able to do the following:

<p>34.20 Recognise the physical properties of surfaces and substrates. <input type="checkbox"/></p> <p>34.21 Recognise the chemical nature of surfaces and substrates. <input type="checkbox"/></p> <p>34.22 Prepare a report comparing hardwoods and softwoods. <input type="checkbox"/></p> <p>34.23 Prepare a report comparing ferrous metals and non-ferrous metals. <input type="checkbox"/></p> <p>34.24 Identify and select abrasives for specific applications based on their technical properties. <input type="checkbox"/></p> <p>34.25 Identify and select stoppers and fillers for specific applications based on their technical properties. <input type="checkbox"/></p> <p>34.26 Identify and select knotting and sealers for specific applications based on their technical properties. <input type="checkbox"/></p> <p>34.27 Identify and select paint removers for specific applications based on their technical properties. <input type="checkbox"/></p> <p>34.28 Identify and select liquid petroleum gas (LPG) flame surface preparation materials/equipment for specific applications based on their technical properties. <input type="checkbox"/></p> <p>34.29 Identify and select oil based surface coating materials for specific applications based on their technical properties. <input type="checkbox"/></p> <p>34.30 Identify and select water based surface coating materials for specific applications based on their technical properties. <input type="checkbox"/></p>	<p>34.31 Identify and select spirit based surface coating materials for specific applications based on their technical properties. <input type="checkbox"/></p> <p>34.32 Identify and select surface coating materials using colour cards. <input type="checkbox"/></p> <p>34.33 Identify and select surface coating materials for identification applications. <input type="checkbox"/></p> <p>34.34 Identify and select surface coatings materials for safety applications. <input type="checkbox"/></p> <p>34.35 Mix subtractive colour to produce a colour wheel. <input type="checkbox"/></p> <p>34.36 Identify and select wall and ceiling hanging materials for specific applications based on their technical properties. <input type="checkbox"/></p> <p>34.37 Identify and select wall/ceiling hanging pastes and adhesives for specific applications based on their technical properties. <input type="checkbox"/></p> <p>34.38 Prepare a report identifying the availability, suitability and relative cost of surface preparation and surface coating materials. <input type="checkbox"/></p> <p>34.39 Prepare a report on the environment effects of oil, solvent and spirit based surface coatings. <input type="checkbox"/></p>
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This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature _____

Candidate name (please print) _____

Instructor signature _____

Instructor name (please print) _____

Completion date _____

34 Painting and Decorating 2: Calculations, setting out and drawing

Practical competences

The candidate must be able to do the following:

Calculations

34.56 Take off accurate dimensions from drawings of circular, semi circular and triangular structures.

34.57 Calculate areas from dimensions taken off drawings of circular, semi circular and triangular structures.

34.58 Calculate the quantity and cost of materials required from drawings of circular, semi circular and triangular structures.

Setting out

34.59 Use tools and equipment to take measurements from site to calculate the area to be decorated.

Drawings

34.60 Produce working drawings from plans and details of circular, semi circular and triangular structures.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

34 Painting and Decorating 2: Practical skills

Practical competences

The candidate must be able to do the following:

- 34.65 Prepare previously painted surfaces and new substrate to receive decorative effects.
- 34.66 Prepare and apply various types of glaze and stains to obtain decorative effects.
- 34.67 Prepare and apply various types of colour wash to obtain decorative effects.
- 34.68 Apply decorative effects by stencil templates, lining fitches, tapes and sign writing brushes.
- 34.69 Prepare and apply various types of scumbles to obtain wood grain decorative effects.
- 34.70 Prepare and apply various types of glaze and stains to obtain simple marbling decorative effects.
- 34.71 Prepare and apply texture coatings to obtain decorative effects.
- 34.72 Prepare background surfaces to receive wall and ceiling hangings.
- 34.73 Mix wall and ceiling hanging adhesives.
- 34.74 Store wall and ceiling hangings.
- 34.75 Prepare wall and ceiling hanging materials for application.
- 34.76 Apply various types of wall and ceiling hangings.
- 34.77 Select, clean, maintain and store wall and ceiling hanging equipment.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature _____

Candidate name (please print) _____

Instructor signature _____

Instructor name (please print) _____

Completion date _____

34 Painting and Decorating 2: Communications and information technology

Practical competences

The candidate must be able to do the following:

- 34.97 Use language in written and oral forms to communicate needs clearly.
- 34.98 Interpret, use and draw diagrams in a routine work environment.
- 34.99 Collect and select information on the use of national and international standards.
- 34.100 Collect and select technical information from different sources.
- 34.101 Use information technology systems for communication.

Information technology

- 34.102 Select a suitable software application for a given task.
- 34.103 Access a word processing applications software package.
- 34.104 Open a new word processing file and enter text.
- 34.105 Edit the contents of a document.
- 34.106 Use the spell-check function to check the document.
- 34.107 Enhance the appearance of a document.
- 34.108 Close and save an edited document under an existing and a new file name.
- 34.109 Print a word processed file.
- 34.110 Exit the word processing applications package and switch off the equipment.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

34 Painting and Decorating 2: Repair, restoration and glazing

Practical competences

The candidate must be able to do the following:

- 34.122 Identify various defects to the external and internal superstructure of buildings.
- 34.123 Use a protometer to measure the moisture content of an affected area of internal superstructure.
- 34.124 Carry out the temporary repair of an area of damp internal wall by applying foil backed paper.
- 34.125 Select suitable material to match the existing finish.
- 34.126 Apply and fix selected wall hanging materials to prepared surface.
- 34.127 Remove and replace damaged mastic sealant from external joints.
- 34.128 Select, clean and store glazing tools.
- 34.129 Handle and store glass safely.
- 34.130 Remove broken glass in a safe manner whilst avoiding damage to surrounding areas.
- 34.131 Remove old putties, bedding or beadings in a safe manner whilst avoiding damage to surrounding area.
- 34.132 Prepare and treat rebates ready to receive new bedding material.
- 34.133 Measure, cut and trim replacement glass.
- 34.134 Install replacement glass into existing frame.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

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35 Plumbing 2 – Summary of syllabus sections

Page 112 Safety at work
(Objectives 35.1 to 35.24)

The aim of this unit is to enable the candidate to maintain safe working conditions and to adopt safe procedures for themselves and others.

Page 114 Materials
(Objectives 35.25 to 35.56)

The aim of this unit is to enable the candidate to:

- a identify and select materials for specific applications based on their technical properties
- b describe the technical properties of the main types of materials in use
- c identify environmental effects and benefits of plumbing materials and water treatment processes

Page 117 Calculations, setting out and drawing
(Objectives 35.57 to 35.71)

The aim of this unit is to enable the candidate to:

- a take off dimensions from drawings of below ground drainage pipework
- b calculate quantities of excavations and bedding to assist in preparing, costing and estimating
- c set out drainage systems
- d produce working drawings

Page 118 Practical skills
(Objectives 35.72 to 35.98)

The aim of this unit is to enable the candidate to apply basic tools skills to set out, fabricate, install, test and commission domestic:

- a water pipework
- b gas pipework
- c sanitation and drainage pipework
- d rainwater gutters and downpipes

Page 120 Communications and information technology
(Objectives 35.99 to 35.123)

The aim of this unit is to enable the candidate to use:

- a communication skills in the workplace
- b information technology in the workplace

Page 122 Alteration, repair and planned maintenance
(Objectives 35.124 to 35.149)

The aim of this unit is to enable the candidate to apply basic tool skills to carry out the alteration, repair and planned maintenance of existing systems.

Safety at work

The use of national/local regulations and working practices must be included in all practical competences.

Practical competences

The candidate must be able to do the following:

- 35.1 Carry out safe working practices to prevent hazards and to ensure the safety of working personnel and members of the public.
Hazards: excavations, obstructions, fumes, dust, warning notices
- 35.2 Carry out safe working practices using various equipment/materials to protect surrounding work areas from damage.
Equipment/materials: heat shields, dust sheets, shields (boards)
- 35.3 Carry out the safe erection, use and dismantling of scaffold platforms less than 2m high.
Scaffolding: trestles, folding trestles, hop-up stools, scaffold boards
- 35.4 Carry out the safe erection, use and dismantling of scaffold platforms over 2m high.
Scaffolding: quick assembly towers, scaffold boards, toe boards, hand rails, stabilisers/outriggers
- 35.5 Inspect for faults, set up and safely use steps and ladders in general use.
Faults: metal components (corrosion), timber components (deterioration, splits, cracks)
Set up: firm/level base, clip/lash down
- 35.6 Set up safety barriers around a hazard to protect working personnel and members of the public.
Barriers: security tape, barrier material (eg timber, metal, plastic), safety/warning (signs, lights)
Hazards: excavations, openings in (floors, walls, roofs), roof edges, operating machinery
- 35.7 Select and use protective clothing and safety equipment for specific tasks.
Equipment/clothing: glasses, goggles, visors, face mask, ear defenders/plugs, safety helmet (hard hat), overalls, safety shoes, knee pads, gloves, gauntlets, barrier cream, residual current device, machine guards
Tasks: plumbing installations, using power tools (drills, threading machines, bending machines, disc cutters/grinders), use of dangerous substances (solvents, flux, lead, jointing compounds), use of insulation materials

- 35.8 Locate and manually operate isolating valves to disconnect domestic services from the supply.
Operation: operate isolator valve, label
Services: water (mains, cold/hot distribution), gas
- 35.9 Use and store toxic materials in a safe manner.
Use: manufacturers' instructions, toxic effect
Materials: solvents, flux, lead, jointing compounds, insulating materials
- 35.10 Carry out a risk assessment and prepare a report identifying the potential hazards.
Risk assessment: working practices, hazard identification, dangerous substances, site machinery, noise, scaffolding

Knowledge requirements

The instructor must ensure the candidate is able to:

- 35.11 State the methods used to prevent hazards and to ensure the safety of working personnel and members of the public.
Methods: warning notices, barriers
- 35.12 State the methods used to protect surrounding work areas from infringement or contamination.
Methods: dust sheets, shields (boards)
- 35.13 State the method used to protect the surrounding work areas from damage due to portable heating equipment.
Method: heat shields, safe working practices
- 35.14 Explain the safe use of scaffold platforms less than 2m high.
Scaffolding: trestles, folding trestles, hop-up stools, scaffold boards
Safe use: manufacturers' instructions, nationally/locally applied regulations
- 35.15 Explain the safe use of scaffold platforms over 2m high.
Scaffolding: quick assembly towers, scaffold boards, toe boards, hand rails, stabilisers/outriggers
Safe use: manufacturers' instructions, nationally/locally applied regulations
- 35.16 State the faults, possible hazards and dangerous practices when using ladders and steps.
Faults: metal components (corrosion), timber components (deterioration, splits, cracks)
Hazards: base fixing/stabilising, clip/lash at platform level, clear space around base
Dangerous practices: uneven/loose ground

- 35.17 Explain the purpose and use of barriers and warning signs/lights to protect working personnel and members of the public from possible accidents.
Barriers: security tape, barrier material (timber, metal, plastic), safety/warning (signs, lights)
Purpose: segregation of different work activities, segregation of work from members of the public, prevention of falls from heights above 2m
- 35.18 Describe the purpose and use of protective clothing and safety equipment for a range of applications.
Equipment/clothing: glasses, goggles, visors, face mask, ear defenders/plugs, safety helmet (hard hat), overalls, safety shoes, knee pads, gloves, gauntlets, barriers cream, residual current device, machine guards
Purpose: handling corrosive/heavy materials, cutting/bending pipe, soldering pipe/fittings, using power tools, protecting feet from heavy objects, working below other workers or machines.
Applications: plumbing installations, using power tools (drills, threading machines, bending machines, disc cutters/grinders), use of dangerous substances (solvents, flux, lead, jointing compounds), use of insulation materials
- 35.19 Explain the requirement to isolate domestic water services from the main water supply.
Requirement: avoid (flood, damage)
- 35.20 Explain the requirement to isolate domestic gas services from the main supply.
Requirement: avoid (fire, explosion, asphyxiation/poisoning)
- 35.21 Identify domestic services isolating valves.
Valves: water (mains, hot/cold distribution), gas
- 35.22 State the toxic effect of materials used in plumbing installations.
Effect: eyes, skin, breathing
Materials: solvents, flux, lead, jointing compounds, insulating materials
- 35.23 Describe the preventative and remedial actions to be taken in the case of exposure to toxic materials.
Exposure: ingested, contact with skin, inhaled
Preventative action: ventilation, masks, barrier cream, protective clothing/equipment
Remedial action: immediate first aid, report to supervisor
Materials: solvents, flux, lead, jointing compounds, insulating materials, manufacturers' instructions
- 35.24 Explain the method by which a risk assessment is carried out.
Method: identify task procedure, identify hazards, identify control actions to reduce hazard, assess final risk

Materials

The properties of locally manufactured materials or materials in local general use should be considered.

Practical competences

The candidate must be able to do the following:

- 35.25 Identify and select copper pipe and fittings for specific applications based on their technical properties.
Pipe: grades (eg table W, X, Y, Z), sizes (diameter, wall thickness)
Fittings: joint types (eg compression, solder), materials (eg copper, brass), bends, elbows, tee, branches, connectors, traps
Applications: work below ground level, work above ground level, water (mains, hot/cold services), sanitary, gas
- 35.26 Identify and select steel pipe and fittings for specific applications based on their technical properties.
Pipe: grades (eg heavy, medium, light), diameter
Fittings: joint types (eg screw, welded, compression), materials (eg steel, brass), bends, elbows, tee, branches, connectors
Applications: work below ground level, work above ground level, water (mains, hot/cold services), gas
- 35.27 Identify and select plastic pipe and fittings for specific applications based on their technical properties.
Pipe: types (eg acrylonitrile butadiene styrene (ABS), polyvinyl chloride (PVC), unplasticised polyvinyl chloride (uPVC), chemically modified unplasticised polyvinyl chloride (MuPVC), MDPE), sizes (diameter, wall thickness)
Fittings: joint types (eg compression, solvent, push fit), materials (eg ABS, PVC, uPVC, MuPVC, MDPE, brass), bends, elbows, tee, branches, connectors, traps, inspection chambers, rodding access
Applications: work below ground level, work above ground level, water (mains, hot/cold services), sanitary, drainage
- 35.28 Identify and select iron pipe and fittings for specific applications based on their technical properties.
Pipe: types (eg cast, ductile, spun), sizes (diameter, wall thickness)
Fittings: joint types (eg caulked, clamped, compression), materials (eg steel, stainless steel, iron, brass), bends, elbows, tee, branches, connectors, traps, inspection chambers, rodding access
Applications: work below ground level, work above ground level, mains water, sanitary, drainage
- 35.29 Identify and select stainless steel pipe and fittings for specific applications based on their technical properties.
Pipe: sizes (diameter, wall thickness)
Fittings: joint types (eg compression, solder), materials (eg stainless steel, brass), bends, elbows, tee, branches, connectors, traps
Applications: work above ground level, water (mains, hot/cold services), sanitary
- 35.30 Identify and select solders and fluxes for specific applications based on their technical properties.
Solder: leaded, unleaded
Flux: acidic, non-acidic, paste, powder
Applications: copper pipework, stainless steel pipework, water (mains, hot/cold services), natural gas
- 35.31 Identify and select jointing compounds and tapes for specific applications based on their technical properties.
Jointing compounds: oil based, water based
Tapes: PTFE/teflon
Applications: water (mains, tank fed hot/cold services), gas
- 35.32 Identify and select valves for specific applications based on their technical properties.
Valves: isolating (gate, stop, ball), check (single, double), float, drain, vacuum break, materials (brass, plastic, bronze)
Applications: water (mains, hot/cold services), gas
- 35.33 Identify and select sanitary accessories and fittings for specific applications based on their technical properties.
Accessories/fittings: materials (ceramic, stainless steel, steel, cast iron, plastic, brass), sinks, shower, bath, basin, water closet (WC), cistern, drinking fountain, taps
Applications: kitchens, bath/shower rooms, water closet (WC)
- 35.34 Identify and select water storage tanks for specific applications based on their technical properties.
Tanks: cold, hot, materials (plastic, steel, cooper)
Applications: hot/cold services
- 35.35 Identify and select sands and aggregates for specific applications based on their technical properties.
Sands: fine, medium, coarse
Aggregates: natural, crushed rock, manufactured
Applications: drainage bedding, protection of below ground pipework
- 35.36 Identify and select various fixings for specific applications based on their technical properties.
Fixings: masonry, concrete, timber, plasterboard
Applications: pipework, sanitary fittings, water storage tanks

- 35.37 Identify and select insulating and protective materials for specific applications based on their technical properties.
Materials: insulating (fibreglass, mineral wool, foam), protective (tape, foam)
Applications: pipework, storage tanks, underground pipework, frost protection, heat retention, corrosion protection
- 35.38 Identify and select rainwater guttering and downpipes for specific applications based on their technical properties.
Guttering: material (eg plastic, iron, zinc, aluminium), fittings (stop end, coupling, outlet, clips, bends)
Downpipes: material (eg plastic, iron, zinc, aluminium), fittings (coupling, shoe/outlet, clips, bends)
- 35.39 Prepare a report identifying the availability, suitability and relative cost of plumbing materials available in the country of study.
Materials: pipe (copper, steel, stainless steel, plastic, iron), fittings (copper, brass, steel, stainless steel, plastic), valves, fluxes, solders
Suitability: water quality, atmospheric conditions
- 35.40 Prepare a report on the environmental effects of water supplies and effluent waste disposal.
Water supplies: bore hole, natural spring, well, desalination, water cycle
Effluent waste disposal: discharge to rivers/sea, treatment plant, cess pits
Environmental effects: pollution, contamination of water supplies, drought
- 35.43 State the technical properties of plastic pipe and fittings.
Pipe: types (eg ABS, PVC, uPVC, MuPVC, MDPE), sizes (diameter, wall thickness)
Fittings: joint types (eg compression, solvent, push fit), materials (eg ABS, PVC, uPVC, MuPVC, MDPE, brass), bends, elbows, tee, branches, connectors, traps, inspection chambers, rodding access
Properties: corrosion resistance, pressure, expansion, contraction, mechanical strength, compressive strength
- 35.44 State the technical properties of iron pipe and fittings.
Pipe: types (eg cast, ductile, spun), sizes (diameter, wall thickness)
Fittings: joint types (eg caulked, clamped, compression), materials (eg steel, stainless steel, iron, brass), bends, elbows, tee, branches, connectors, traps, inspection chambers, rodding access
Properties: corrosion resistance, pressure, expansion, contraction, mechanical strength, compressive strength
- 35.45 State the technical properties of stainless steel pipe and fittings.
Pipe: sizes (diameter, wall thickness)
Fittings: joint types (eg compression, solder), materials (eg stainless steel, brass), bends, elbows, tee, branches, connectors, traps
Properties: corrosion resistance, pressure, expansion, contraction, mechanical strength, compressive strength
- 35.46 State the technical properties of solders and fluxes.
Solder: leaded, unleaded
Flux: acidic, non-acidic, paste, powder
Properties: corrosive effect, material compatibility, toxic effect, water contamination, mechanical strength

Knowledge requirements

The instructor must ensure the candidate is able to:

- 35.41 State the technical properties of copper pipe and fittings.
Pipe: grades (eg table W, X, Y, Z), sizes (diameter, wall thickness)
Fittings: joint types (eg compression, solder), materials (eg copper, brass), bends, elbows, tee, branches, connectors, traps
Properties: corrosion resistance, pressure, expansion, contraction, mechanical strength, compressive strength
- 35.42 State the technical properties of steel pipe and fittings.
Pipe: grades (eg heavy, medium, light), diameter
Fittings: joint types (eg screw, welded, compression), materials (eg steel, brass), bends, elbows, tee, branches, connectors
Properties: corrosion resistance, pressure, expansion, contraction, mechanical strength, compressive strength
- 35.47 State the technical properties of jointing compounds and tapes.
Jointing compounds: oil based, water based
Tapes: PTFE/teflon
Properties: water resistance, temperature range, suitability (water, gas)
- 35.48 State the technical properties of valves.
Valves: isolating (gate, stop, ball), check (single, double), float, drain, vacuum break, materials (brass, plastic, bronze)
Properties: corrosion resistance, pressure, suitability (water, gas), mechanical strength
- 35.49 State the technical properties of sanitary accessories and fittings.
Accessories/fittings: materials (ceramic, stainless steel, steel, cast iron, plastic, brass), sinks, shower, bath, basin, water closet (WC), cistern, drinking fountain, taps
Properties: erosion/corrosion resistance, mechanical strength, appearance, colour

- 35.50 State the technical properties of water storage tanks.
Tanks: cold, hot, materials (plastic, steel, copper)
Properties: corrosion resistance, mechanical strength
- 35.51 State the technical properties of sands and aggregates.
Sands: fine, medium, coarse
Aggregates: natural, crushed rock, manufactured
Properties: density, water resistance, wear resistance, erosion resistance
- 35.52 State the technical properties of various fixings.
Fixings: masonry, concrete, timber, plasterboard
Properties: corrosion resistance, mechanical strength, suitability to substrate
- 35.53 State the technical properties of insulating and protective materials.
Materials: insulating (fibreglass, mineral wool, foam), protective (tape, foam)
Properties: density, thermal resistance, physical structure (rigid, flexible, fibrous), water resistance, rot resistance, vermin/insect resistance, mechanical strength, health/environmental factors
- 35.54 State the technical properties of rainwater guttering and downpipes.
Guttering: material (eg plastic, iron, zinc, aluminium)
Downpipes: material (eg plastic, iron, zinc, aluminium)
Properties: size, colour, profile, corrosion resistance, expansion, contraction, mechanical strength
- 35.55 State the environmental effects of water supplies and effluent waste disposal.
Water supplies: bore hole, natural spring, well, desalination, water cycle, septic tanks
Effluent waste disposal: discharge to rivers/sea, treatment plant, cess pits
Environmental effects: pollution, contamination of water supplies, drought
- 35.56 State various methods for conserving water in domestic water systems.
Methods: spray taps, dual flushing cisterns, hydraulically operated flush control valves

Calculations, setting out and drawing

Practical competences

The candidate must be able to do the following:

Calculations

- 35.57 Take off accurate dimensions from drawings of below ground drainage pipework.
Drawings: plans, sectional drawings
Dimensions: lengths of pipework, excavations (length, width, depth, gradient)
- 35.58 Calculate volumes from dimensions taken off drawings of excavations.
Volumes: bedding material, backfill material
- 35.59 Calculate the costs of materials required from drawings.
Materials: bedding material, backfill material
Costs: product catalogues, price lists, discounts
- 35.60 Calculate pipe sizes for specified domestic services.
Calculations: using flow rate charts
Services: water (mains, hot/cold services), drainage, sanitary, gas, rainwater
- 35.61 Carry out calculations involving the expansion and contraction of pipework.
Calculations: overall linear expansion/contraction

Setting out

- 35.62 Measure and set out domestic pipework systems from drawings.
Pipework: water (mains, hot/cold services), drainage, sanitary, gas, gradients

Drawings

- 35.63 Produce working drawings from plans and details of drainage systems.
Drawings: dimensions, detail (pipe, fittings, inspection chambers, manholes, rodding access points, gradients), exploded views
- 35.64 Produce working drawings from plans and details of domestic services.
Drawings: dimensions, detail (pipe, fittings, accessories, gradients), exploded views
Services: water (mains, hot/cold services), sanitary, gas, rainwater

Knowledge requirements

The instructor must ensure the candidate is able to:

Calculations

- 35.65 Identify calculations involving volume.
Volumes: bedding material, backfill material
- 35.66 Identify calculations involving the costs of materials.
Materials: bedding material, backfill material
Costs: product catalogues, price lists, discounts
- 35.67 Identify calculations involving pipe sizes.
Calculations: using flow rate charts
Services: water (mains, hot/cold services), drainage, sanitary, gas, rainwater
- 35.68 Identify calculations involving the expansion and contraction of pipework.
Calculations: overall linear expansion/contraction

Setting out

- 35.69 Explain the correct procedure for setting out domestic drainage pipework.
Setting out: tools (tape measure, site rails/traveller, boning rods, water level, laser level), gradients, inspection chamber/manhole positions, rodding access point positions

Drawings

- 35.70 Identify scale working drawings of plans and details of drainage systems.
Drawings: dimensions, detail (pipe, fittings, inspection chambers, manholes, rodding access points, gradients), exploded views
- 35.71 Identify scale working drawings of plans and details of drainage systems.
Drawings: dimensions, detail (pipe, fittings, accessories, gradients), exploded views
Services: water (mains, hot/cold services), sanitary, gas, rainwater

Practical skills

The use of national/local regulations and working practices must be included in all practical competences.

Practical competences

The candidate must be able to do the following:

Mains cold water supply

- 35.72 Set out, fabricate and install a domestic mains cold water pipework system on two levels.
Pipework: materials (eg copper, steel, plastic), bends (fittings, hand, machine)
Installation: outlet at each level, fittings (eg sink, water storage tank, washing machine)

Tank fed cold water supply

- 35.73 Set out, fabricate and install a domestic tank fed cold water pipework system on two levels.
Pipework: materials (eg copper, steel, plastic), bends (fittings, hand, machine)
Installation: multiple outlets at each level, multiple pipe sizes (eg 15mm, 22mm, 28mm), fittings (eg basin, bath, sink, water closet, shower, washing machine), pipework to be run in parallel to the pipework installed in 35.72 above

Tank fed hot water supply

- 35.74 Set out, fabricate and install a domestic tank fed hot water pipework system on two levels.
Pipework: materials (eg copper, steel, plastic), bends (fittings, hand, machine)
Installation: multiple outlets at each level, multiple pipe sizes (eg 15mm, 22mm, 28mm), fittings (eg basin, bath, sink, shower, washing machine), pipework to be run in parallel to the pipework installed in 35.72 and 35.73 above

Water pipework systems test and commissioning

- 35.75 Test and commission domestic water pipework systems.
Water supply: mains, tank feed (hot, cold)
Test: fill system, rectify faults
Commission: flush system, fill system, check (pressures, flow rates), report domestic gas pipework

Domestic gas pipework

- 35.76 Set out, fabricate and install a domestic gas pipework system.
Pipework: materials (eg copper, steel)
Installation: single outlet from supply to appliance, appliance (eg cooker, water heater/boiler, fire), national/local standards
- 35.77 Test and commission a domestic gas pipework system.
Test: soundness test (pneumatic), connect to gas supply, national/local standards
Commission: adequate ventilation, purge system, adjust pressure, to national/local standards

Sanitation pipework

- 35.78 Set out, fabricate and install a domestic sanitation pipework system on two levels.
Pipework: materials (eg plastic, iron) Installation: minimum two outlets at each level, multiple pipe sizes (eg 32mm, 40mm, 50mm, 110mm), fittings (eg basin, bath, sink, shower, washing machine, water closet)

Drainage pipework

- 35.79 Set out, fabricate and install a domestic drainage pipework system.
Drainage: domestic (foul, rainwater)
Pipework: materials (eg plastic, iron)
Installation: minimum (two outlets, 3m run), fittings (inspection chamber/manhole, rodding point), gradients

- 35.80 Spread and prepare drain pipe bedding.
Bedding: eg natural, crushed, manufactured

Sanitation and drainage pipework testing

- 35.81 Test domestic sanitation and drainage pipework systems.
Drainage: domestic (foul, rainwater)
Test: method (air pressure, water, smoke), alignment, sanitation traps, rectify faults

Sanitary accessories

- 35.82 Install a bathroom suite and connect to water and sanitary service pipework.
Bathroom suite: bath/shower, sink, water closet (WC)
- 35.83 Install a kitchen sink and connect to water and sanitary service pipework.
- 35.84 Install connections for a domestic appliance.
Connections: water pipework, sanitary pipework
Domestic appliance: eg washing machine, dishwasher

Rainwater gutters and downpipes

- 35.85 Set out, fabricate and install a domestic rainwater system.
System: gutters, downpipes
Installation: gutters (stop end, coupling, outlet, clips, bend, gradient), downpipe (coupling, shoe/outlet, clips, bends)
- 35.86 Test a domestic rainwater system.
System: gutters, downpipe

Knowledge requirements

The instructor must ensure the candidate is able to:

Mains and tank fed domestic water systems

35.87 Describe, with the aid of a sketch, the layout of a mains fed hot and cold domestic water system using a mains fed hot water tank.

System: mains supply, storage tank (hot), overflows, insulation, valves, taps, up to 4 levels

35.88 Describe, with the aid of a sketch, the layout of a tank fed hot and cold domestic water system using a mains fed cold water tank.

System: mains supply, storage tank (hot, cold), overflows, insulation, valves, taps, up to 4 levels

35.89 Describe a suitable method of supporting a plastic cold water tank.

Methods: solid floor (raised for ventilation, suitable ventilated platform), roof space (suitable ventilated platform, even distribution of load onto roof structure, tank supported over entire base)

35.90 Describe the method of testing and commissioning domestic water pipework systems.

Testing: hydraulic test, holding time
Commissioning: flush system, fill system, check (pressures, flow rates), report
Systems: mains, tank fed (hot, cold)

35.91 State the various methods of heating water in a domestic system.

Methods: electric, gas, solid fuel, oil, solar

Domestic gas pipework

35.92 Describe, with the aid of a sketch, the layout of a domestic gas pipework system.

Layout: supply/meter, valves, regulators, appliance (eg cooker, water heater/boiler, fire)

35.93 Describe a method of testing and commissioning domestic gas pipework.

Testing: soundness test (pneumatic), connect to gas supply, national/local standards
Commission: adequate ventilation, purge system, adjust pressure, national/local standards

Sanitation pipework

35.94 Describe, with the aid of a sketch, the layout of domestic sanitary pipework systems.

Layout: fittings (traps, bends, tees, clips, expansion joints, air admittance valves), appliances (basin, bath, sink, shower, washing machine, water closet), gradients, up to 4 levels

Drainage pipework

35.95 Describe, with the aid of a sketch, the layout of a domestic drainage pipework system.

Layout: fittings (inspection chamber, manhole, rodding point) gradients

System: domestic (foul, rainwater)

Sanitation and drainage pipework testing

35.96 Describe the various methods of testing domestic sanitation and drainage systems.

Testing: method (air pressure, water, smoke), alignment, gradient, sanitation traps, rectify faults

Rainwater gutters and downpipes

35.97 Describe, with the aid of a sketch, the layout of a domestic rainwater system.

Layout: gutters (stop end, coupling, outlet, clips, bend, gradient), downpipe (coupling, shoe/outlet, clips, bends)

35.98 Describe the method of testing a domestic rainwater system.

Testing: water test, gradient (gutters), alignment (downpipes)

Communications and information technology

Practical competences

The candidate must be able to do the following:

Communications

35.99 Use language in written and oral forms to communicate needs clearly.

Written: technical/commercial letters (eg internal memos, technical reports, job applications, curriculum vitae/résumé), summarise (eg document, report)

Oral: telephone, work instructions, group, one to one

35.100 Interpret, use and draw diagrams in a routine work environment.

Interpret: graphical to written, written to graphical, graphical (eg bar charts, histograms, graphs)

35.101 Collect and select information on the use of national and international standards.

Standards: eg British Standards, International Standards Organization (ISO)

35.102 Collect and select technical information from different sources.

Information: eg technical drawings, schedules, data sheets/charts, manufacturers' information sheets/brochures, microfilm, micro fiche, libraries, library index systems/classification, video tape, CD ROM, computer systems (eg Internet)

35.103 Use information technology systems for communication.

Systems: word processor, fax

Information technology

35.104 Select a suitable software application for a given task.

Software: word processing, database, spreadsheet

35.105 Access a word processing applications software package.

35.106 Open a new word processing file and enter text.

35.107 Edit the contents of a document.

Edit: correct errors, insert words, delete words, insert paragraph breaks, delete paragraph breaks, sections of text (copy, cut, paste)

35.108 Use the spell-check function to check the document.

35.109 Enhance the appearance of a document.

Enhancement: font (size, bold, italics), text (centre, underline)

35.110 Close and save an edited document under an existing and a new file name.

35.111 Print a word processed file.

35.112 Exit the word processing applications package and switch off the equipment.

Knowledge requirements

The instructor must ensure the candidate is able to:

Communications

35.113 Explain the use of language in written and oral forms to communicate needs clearly.

Written: technical/commercial letters (internal memos, technical reports, job applications, curriculum vitae/résumé), summarise (documents/reports)

Oral: telephone, work instructions, group, one to one

35.114 Identify the use of national and international standards in the construction industry.

Standards: eg British Standards, International Standards Organization (ISO)

35.115 Identify the various sources of technical information.

Information: technical drawings, schedules, data sheets/charts, manufacturers' information sheets/brochures, microfilm, micro fiche, libraries, library index systems/classification, video tape, CD ROM, computer systems (eg Internet)

35.116 Explain the use of various electronic and information technology systems for communication.

Systems: word processor, fax, Internet, E-mail

Information technology

35.117 Identify the main functions of commonly used software applications packages.

Packages: word processing (document production), spreadsheets (numerical analysis, manipulation), database (file creation, updating, searching, sorting), computer aided design (line drawings used for architecture/engineering/construction)

35.118 Describe the various editing operations that can be performed on a word processing file.

Edit: correct errors, insert words, delete words, insert paragraph breaks, delete paragraph breaks, sections of text (copy, cut, paste)

35.119 Explain the use of the spell-check function to check word processing documents.

35.120 Explain the use of the various enhancements that can be used to improve the appearance of a document.

Enhancement: font (size, bold, italics), text (centre, underline)

- 35.121 Explain how to close and save an edited document under an existing and a new file name.
Save: hard disk, floppy disk
- 35.122 Explain how to print a word processing file.
- 35.123 Explain how to exit the word processing applications package and switch off the equipment.

Alteration, repair and planned maintenance

Practical competences

The candidate must be able to do the following:

- 35.124 Carry out the inspection and repair of domestic water pipework.
Inspection: visual (clips, joints, physical damage, corrosion, insulation, earth bonding)
Repairs: eg leaking joint, fractured pipe
Pipework: mains, hot/cold services
- 35.125 Carry out the inspection and repair of domestic sanitation pipework.
Inspection: visual (clips, joints, physical damage), leakage tests (air, smoke)
Repairs: eg leaking joint, fractured pipe
- 35.126 Carry out the inspection and repair of domestic drainage pipework.
Inspection: visual (joints, physical damage, benching), leakage tests (air, water, smoke, ball)
Repairs: eg leaking joint, fractured pipe
- 35.127 Clear an obstruction in sanitation/drainage pipework.
- 35.128 Carry out the inspection and repair of domestic gas pipework.
Inspection: visual (clips, joints, physical damage, corrosion, earth bonding), leakage tests (gas, leak detector fluid, electronic leak detector)
Repairs: eg leaking joint, fractured pipe
- 35.129 Dismantle, service, reassemble and test domestic valves.
Valves: isolating, check, float, drain
Service: check operation, check for corrosion, replace washers, repack glands, lubricate
- 35.130 Dismantle, service, reseal, reassemble and test a domestic tap.
Service: check operation, check for corrosion, reseal, replace washer, repack gland, lubricate
- 35.131 Dismantle, service, reassemble and test a water closet (WC).
Service: check operation, check for corrosion, replace washer/diaphragm
- 35.132 Carry out the inspection of water storage tanks.
Inspection: visual (insulation, leakage, water level, dust cover, supports, overflow pipes)
- 35.133 Modify existing pipework to add a new sanitary fitting.
Modify: isolate/drain system, cut into existing pipework, extend pipework to new sanitary fitting, connect pipework, refill, test
Pipework: water (hot/cold services), sanitation

- 35.134 Complete a maintenance report for domestic services.
Report: flow rates, pressures, condition (insulation, storage tanks, pipework, fittings), operation of fittings, adjustments, leakage test results
Services: water (mains, hot/cold services), sanitation, drainage, gas

Knowledge requirements

Instructors must ensure the candidate is able to:

- 35.135 State the various types of corrosion that may occur in water systems.
Corrosion: atmospheric, dezincification, electrolytic, plumbo solvency, cupro solvency, bacterial
- 35.136 State the effects different soils and rocks have on water grade.
Effects: hard, soft
- 35.137 State the effects of temperature on water systems.
Effects: expansion, contraction, burst pipes, methods for allowing expansion/contraction
Temperature: freezing, boiling
- 35.138 Describe various faults that may occur in hot and cold domestic water pipework.
Faults: air locks, one pipe circulation, vibration
- 35.139 Describe the procedures for isolating and draining domestic water pipework systems to enable repairs to be undertaken.
Systems: mains, hot/cold services
Repairs: physical damage, corrosion, water closet, tap, valve
- 35.140 Describe the procedure for repairing leaking joints in domestic water pipework.
Joints: soldered, compression
- 35.141 Describe the procedure for using freezing equipment to isolate a section of domestic water pipework.
Equipment: electric, gas
- 35.142 Describe the procedure for repairing leaking joints in domestic sanitation pipework.
Joints: plastic pipework (push fit, compression, solvent), iron pipework (caulked, clamped, compression)
- 35.143 Describe the procedure for rectifying a faulty trap seal in sanitation pipework.
Procedure: alteration of pipework, replace trap
- 35.144 Describe the procedure for repairing leaking joints in domestic drainage pipework.
Joints: plastic pipework (push fit), iron pipework (caulked, clamped, compression), clay (caulked)

- 35.145 Describe the procedures for detecting leaks in domestic gas pipework.
Procedures: methods (fluid, electronic), safety procedures
- 35.146 Describe the procedure for isolating domestic gas pipework to enable repairs to be undertaken.
- 35.147 Describe the procedures for servicing domestic water taps/valves.
Valves: isolating, check, float, drain
Service: check operation, adjust (float valve), check for corrosion, reseal, replace washers, repack glands, lubricate
- 35.148 Describe the procedures for servicing domestic water closets (WC).
Service: check operation, check for corrosion, replace washer/diaphragm
- 35.149 State the items to be included in a maintenance report for domestic services.
Items: flow rates, pressures, condition (insulation, storage tanks, pipework, fittings), operation of fittings, adjustments, leakage test results.
Services: water (mains, hot/cold services), sanitation, drainage, gas

Assessment

Test specification for written paper Plumbing 2 Principles (6161-15-035)

This is a multiple choice examination paper lasting two and a half hours comprising 100 questions. Candidates must answer all questions.

The examination paper will cover the knowledge specifications for the following:

Topic	Approximate % examination weighting
Safety at work	10
Materials	30
Calculations, setting out and drawing	5
Practical skills	40
Communications and information technology	5
Alteration, repair and planned maintenance	10

35 Plumbing 2: Safety at work

Practical competences

The candidate must be able to do the following:

- 35.1 Carry out safe working practices to prevent hazards and to ensure the safety of working personnel and members of the public.
- 35.2 Carry out safe working practices using various equipment/materials to protect surrounding work areas from damage.
- 35.3 Carry out the safe erection, use and dismantling of scaffold platforms less than 2m high.
- 35.4 Carry out the safe erection, use and dismantling of scaffold platforms over 2m high.
- 35.5 Inspect for faults, set up and safely use steps and ladders in general use.
- 35.6 Set up safety barriers around a hazard to protect working personnel and members of the public.
- 35.7 Select and use protective clothing and safety equipment for specific tasks.
- 35.8 Locate and manually operate isolating valves to disconnect domestic services from the supply.
- 35.9 Use and store toxic materials in a safe manner.
- 35.10 Carry out a risk assessment and prepare a report identifying the potential hazards.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature _____

Candidate name (please print) _____

Instructor signature _____

Instructor name (please print) _____

Completion date _____

35 Plumbing 2: Materials

Practical competences

The candidate must be able to do the following:

35.25	Identify and select copper pipe and fittings for specific applications based on their technical properties.	<input type="checkbox"/>	35.35	Identify and select sands and aggregates for specific applications based on their technical properties.	<input type="checkbox"/>
35.26	Identify and select steel pipe and fittings for specific applications based on their technical properties.	<input type="checkbox"/>	35.36	Identify and select various fixings for specific applications based on their technical properties.	<input type="checkbox"/>
35.27	Identify and select plastic pipe and fittings for specific applications based on their technical properties.	<input type="checkbox"/>	35.37	Identify and select insulating and protective materials for specific applications based on their technical properties.	<input type="checkbox"/>
35.28	Identify and select iron pipe and fittings for specific applications based on their technical properties.	<input type="checkbox"/>	35.38	Identify and select rainwater guttering and downpipes for specific applications based on their technical properties.	<input type="checkbox"/>
35.29	Identify and select stainless steel pipe and fittings for specific applications based on their technical properties.	<input type="checkbox"/>	35.39	Prepare a report identifying the availability, suitability and relative cost of plumbing materials available in the country of study.	<input type="checkbox"/>
35.30	Identify and select solders and fluxes for specific applications based on their technical properties.	<input type="checkbox"/>	35.40	Prepare a report on the environmental effects of water supplies and effluent waste disposal.	<input type="checkbox"/>
35.31	Identify and select jointing compounds and tapes for specific applications based on their technical properties.	<input type="checkbox"/>			
35.32	Identify and select valves for specific applications based on their technical properties.	<input type="checkbox"/>			
35.33	Identify and select sanitary accessories and fittings for specific applications based on their technical properties.	<input type="checkbox"/>			
35.34	Identify and select water storage tanks for specific applications based on their technical properties.	<input type="checkbox"/>			

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

35 Plumbing 2: Calculations, Setting out and drawing

Practical competences

The candidate must be able to do the following:

Calculations

- 35.57 Take off accurate dimensions from drawings of below ground drainage pipework.
- 35.58 Calculate volumes from dimensions taken off drawings of excavations.
- 35.59 Calculate the costs of materials required from drawings.
- 35.60 Calculate pipe sizes for specified domestic services.
- 35.61 Carry out calculations involving the expansion and contraction of pipework.

Setting out

- 35.62 Measure and set out domestic pipework systems from drawings.

Drawings

- 35.63 Produce working drawings from plans and details of drainage systems.
- 35.64 Produce working drawings from plans and details of domestic services.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

35 Plumbing 2: Practical skills

Practical competences

The candidate must be able to do the following:

Mains cold water supply

35.72 Set out, fabricate and install a domestic mains cold water pipework system on two levels.

Tank fed cold water supply

35.73 Set out, fabricate and install a domestic tank fed cold water pipework system on two levels.

Tank fed hot water supply

35.74 Set out, fabricate and install a domestic tank fed hot water pipework system on two levels.

Water pipework systems test and commissioning

35.75 Test and commission domestic water pipework systems.

Domestic gas pipework

35.76 Set out, fabricate and install a domestic gas pipework system.

35.77 Test and commission a domestic gas pipework system.

Sanitation pipework

35.78 Set out, fabricate and install a domestic sanitation pipework system on two levels.

Drainage pipework

35.79 Set out, fabricate and install a domestic drainage pipework system.

35.80 Spread and prepare drain pipe bedding.

Sanitation and drainage pipework testing

35.81 Test domestic sanitation and drainage pipework systems.

Sanitary accessories

35.82 Install a bathroom suite and connect to water and sanitary service pipework.

35.83 Install a kitchen sink and connect to water and sanitary service pipework.

35.84 Install connections for a domestic appliance.

Rainwater gutters and downpipes

35.85 Set out, fabricate and install a domestic rainwater system.

35.86 Test a domestic rainwater system.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature _____

Candidate name (please print) _____

Instructor signature _____

Instructor name (please print) _____

Completion date _____

35 Plumbing 2: Communications and information technology

Practical competences

The candidate must be able to do the following:

Communications

- 35.99 Use language in written and oral forms to communicate needs clearly.
- 35.100 Interpret, use and draw diagrams in a routine work environment.
- 35.101 Collect and select information on the use of national and international standards.
- 35.102 Collect and select technical information from different sources.
- 35.103 Use information technology systems for communication.

Information technology

- 35.104 Select a suitable software application for a given task.
- 35.105 Access a word processing applications software package.
- 35.106 Open a new word processing file and enter text.
- 35.107 Edit the contents of a document.
- 35.108 Use the spell-check function to check the document.
- 35.109 Enhance the appearance of a document.
- 35.110 Close and save an edited document under an existing and a new file name.
- 35.111 Print a word processed file.
- 35.112 Exit the word processing applications package and switch off the equipment.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

35 Plumbing 2: Alteration, repair and planned maintenance

Practical competences

The candidate must be able to do the following:

- 35.124 Carry out the inspection and repair of domestic water pipework.
- 35.125 Carry out the inspection and repair of domestic sanitation pipework.
- 35.126 Carry out the inspection and repair of domestic drainage pipework.
- 35.127 Clear an obstruction in sanitation/drainage pipework systems.
- 35.128 Carry out the inspection and repair of domestic gas pipework.
- 35.129 Dismantle, service, reassemble and test domestic valves.
- 35.130 Dismantle, service, reseal, reassemble and test a domestic tap.
- 35.131 Dismantle, service, reassemble and test a water closet (WC).
- 35.132 Carry out the inspection of water storage tanks.
- 35.133 Modify existing pipework to add a new sanitary fitting.
- 35.134 Complete a maintenance report for domestic services.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

36 Refrigeration and Air Conditioning – Summary of syllabus sections

Page 132 Safety at work
(Objectives 36.1 to 36.26)

The aim of this unit is to enable the candidate to maintain safe working conditions and to adopt safe procedures for themselves and others.

Page 134 Materials (Plant and refrigerants)
(Objectives 36.27 to 36.38)

The aim of this unit is to:

- a identify and select materials for specific applications based on their technical properties
- b describe the technical properties of the main types of materials in use
- c identify environmental effects and benefits of refrigeration and air conditioning materials and processes

Page 135 Calculations, science and drawing
(Objectives 36.39 to 36.65)

The aim of this unit is to enable the candidate to:

- a carry out simple calculations associated with the refrigeration and air conditioning processes
- b understand the scientific principles of refrigeration and air conditioning processes
- c produce line diagrams, drawings and sketches of refrigeration and air conditioning systems and plant

Page 137 Practical skills
(Objectives 36.66 to 36.90)

The aim of this unit is to enable the candidate to:

- a install refrigeration systems to national/local standards
- b carry out pre commissioning tests
- c prepare a system for operation
- d select and use various instruments and controls

Page 139 Communications and information technology
(Objectives 36.91 to 36.115)

The aim of this unit is to enable the candidate to use:

- a communication skills in the workplace
- b information technology in the workplace

Page 141 Alteration, repair and planned maintenance
(Objectives 36.116 to 36.146)

The aim of this unit is to enable the candidate to:

- a modify systems as part of a maintenance or repair requirement
- b carry out fault diagnosis
- c repair defective systems or components of systems
- d carry out routine planned preventative maintenance

Safety at work

The use of national/local regulations and working practices must be included in all practical competencies, as must the environmental impact of all processes and materials used.

Practical competences

The candidate must be able to do the following:

- 36.1 Carry out safe working practices to prevent hazards and to ensure the safety of working personnel and members of the public.
Hazards: ladders, platforms, fumes, asphyxiating gases, hot surfaces, liquified gases under pressure, warning notices
- 36.2 Carry out safe working practices using various equipment/materials to protect surrounding work areas from damage.
Equipment/materials: barriers, heat shields, dust sheets, shields (boards)
- 36.3 Carry out the safe erection, use and dismantling of scaffold platforms less than 2m high.
Scaffolding: trestles, folding trestles, hop-up stools, scaffold boards
- 36.4 Carry out the safe erection, use and dismantling of scaffold platforms over 2m high.
Scaffolding: quick assembly towers, scaffold boards, toe boards, hand rails, stabilisers/outriggers
- 36.5 Inspect for faults, set up and safely use steps and ladders in general use.
Faults: metal components (corrosion), timber components (deterioration, slits, cracks)
Set up: firm/level base, clip/lash down
- 36.6 Set up safety barriers around refrigeration and air conditioning hazards to protect working personnel and members of the public.
Barriers: security tape, barrier material (eg timber, metal, plastic), safety/warning (signs, lights)
- 36.7 Select and use protective clothing and safety equipment for specific tasks.
Equipment/clothing: glasses, goggles, visors, face mask, respirator, ear defenders/plugs, safety helmet (hard hat), flame retarding overalls, safety shoes, knee/elbow pads, gauntlets, barrier cream, residual current device, machine guards, electrically insulated hand tools
Tasks: pipe cutting/bending, brazing, using power tools to drill holes in timber/metal/masonry, use of hazardous substances (refrigerants, solvents, fluxes), use of insulating materials

- 36.8 Locate and manually operate the isolating switch to disconnect a refrigeration/air conditioning system/circuit from the electrical supply.
Operation: operate isolator switch, lock off isolator switch, fit warning notice
System/circuit: refrigeration/air conditioning plant, defrost circuit, lighting system, fans, motorised dampers
- 36.9 Locate and manually operate refrigeration and air conditioning system service valves to isolate components/fluid circuits for service/maintenance.
Operation: operate valve, fit warning notice
Components/fluid circuits: compressor service valves, pump down systems, liquid receiver/line stop valves
- 36.10 Use and store toxic, hazardous and environmentally unfriendly materials in a safe manner.
Use: manufacturers' instructions, environmental protection guidelines, toxic effect
Materials: refrigerants, brazing material, fluxes, solvents, oils
- 36.11 Carry out a risk assessment and prepare a report identifying the potential hazards.
Risk assessment: working practices, hazard identification, dangerous substances, machinery, noise, scaffolding

Knowledge requirements

The instructor must ensure the candidate is able to:

- 36.12 State the methods used to ensure the safety of working personnel and members of the public.
Methods: safe working practices, warning notices, barriers
- 36.13 State the methods used to protect surrounding work areas from infringement or contamination.
Methods: barriers, dust sheets, shields
- 36.14 State the method used to protect the surrounding work areas from damage due to portable heating equipment.
Method: safe working practices, heat shields
- 36.15 Explain the safe use of scaffold platforms less than 2m high.
Scaffolding: trestles, folding trestles, hop-up stools, scaffold boards
Safe use: manufacturers' instructions, nationally/locally applied regulations
- 36.16 Explain the safe use of scaffold platforms over 2m high.
Scaffolding: quick assembly towers, scaffold boards, toe boards, hand rails, stabilisers/outriggers
Safe use: manufacturers' instructions, nationally/locally applied regulations

- 36.17 State the faults, possible hazards and dangerous practices when using steps and ladders.
 Faults: metal components (corrosion), timber components (deterioration, splits, cracks)
 Hazards: base fixing/stabilising, clip/lash at platform level, clear space around base
 Dangerous practices: uneven/loose ground, unlashd ladders
- 36.18 Explain the purpose and use of barriers and warning signs/lights to protect working personnel and members of the public from possible accidents.
 Barriers: security tape, barrier material (timber, metal, plastic), safety/warning (signs, lights)
 Purpose: segregation of different work activities, segregation of work from members of the public, prevention of falls from heights above 2m
- 36.19 Describe the correct use of protective clothing and safety equipment for a range of applications.
 Use: own safety, regulations
 Equipment/clothing: glasses, goggles, visors, face mask, respirator, ear defenders/plugs, safety helmet (hard hat), flame retarding overalls, safety shoes, knee/elbow pads, gauntlets, barrier cream, residual current device, machine guards, electrically insulated hand tools
 Applications: pipe cutting/bending, brazing, using power tools, use of hazardous substances (refrigerants, solvents, fluxes, oils), use of insulating materials
- 36.20 Identify the means of isolating electrical equipment/circuits.
 Means of isolation: isolators, fuses, miniature circuit breakers
- 36.21 Identify the dangers associated with the use of electrical equipment.
 Dangers: electrical shock, burns, fire
- 36.22 Identify the means of isolating refrigerant circuits.
 Means of isolation: compressor service valves, pump down systems, liquid receiver/line stop valves
- 36.23 Identify the dangers associated with the release of refrigerant from a system.
 Dangers: frost bite, asphyxiation, toxic products of decomposition, harmful to the environment
- 36.24 State the toxic effect of materials used in refrigeration and air conditioning systems.
 Effect: eyes, skin, breathing
 Materials: refrigerants, brazing material, fluxes, solvents, oils
- 36.25 Describe the preventative and remedial action to be taken in the case of exposure to hazardous material.
 Type of exposure: ingested, contact with skin, inhaled, burns
 Preventative action: masks/respirators, good ventilation, barrier cream, protective clothing/equipment
 Remedial action: immediate first aid, report to supervisor
 Materials: refrigerants, brazing material, flux, products of decomposition due to combustion, oils
- 36.26 Explain the method by which a risk assessment is carried out.
 Method: identify task procedure, identify hazards, identify control actions to reduce hazard, assess final risk

Materials (Plant and refrigerants)

Practical competences

The candidate must be able to do the following:

- 36.27 Identify and select refrigeration compressors for specific applications based on their technical properties.
Compressor: eg reciprocating, rotary, screw, scroll, centrifugal
Applications: temperature (high, low), industrial, commercial
- 36.28 Identify and select refrigeration condensers for specific applications based on their technical properties.
Condensers: eg air cooled (natural convection), air cooled (forced convection), water cooled
Applications: temperature (high, low), industrial, commercial
- 36.29 Identify and select refrigerant evaporators for specific applications based on their technical properties.
Evaporators: eg finned, plate, natural convection, forced convection, bare pipe
Applications: temperature (high, low), industrial, commercial
- 36.30 Identify and select refrigerant expansion devices for specific applications based on their technical properties.
Expansion devices: eg thermostatic, automatic, capillary tube, hand
Applications: temperature (high, low), industrial, commercial
- 36.31 Identify and select refrigerants for specific applications based on their technical properties.
Refrigerants: eg hydrofluoro carbon (HFC), hydrochloro carbon (HC), azeotropic, zeotropic
Applications: temperature range
- 36.32 Prepare a report identifying the availability, suitability and relative costs of refrigeration and air conditioning products available in the country of study.
Products: compressors, condensers (air cooled, water cooled), evaporators, expansion devices, refrigerants
- 36.33 Prepare a report comparing the environmental impact of traditional and modern refrigerants.

Knowledge requirements

The instructor must ensure the candidate is able to:

- 36.34 State the construction and technical properties of refrigeration compressors.
Construction: open, semi hermetic, hermetic
Properties: ease of access for repair/maintenance
Compressor: reciprocating, rotary, screw, scroll, centrifugal
- 36.35 State the technical properties of refrigeration condensers.
Properties: air flow, refrigerant flow
Condenser: air cooled (natural convection), air cooled (forced convection), water cooled
- 36.36 State the technical properties of refrigerant evaporators.
Properties: refrigerant flow, application, operating temperature, method of defrosting
Evaporator: finned, plate, natural convection, forced convection, bare pipe
- 36.37 State the technical characteristics of refrigerant expansion devices.
Characteristics: constant superheat, constant pressure, starting torque
Expansion device: thermostatic, automatic, capillary tube, hand
- 36.38 State the technical properties of refrigerants.
Properties: operating range, toxicity, flammability, environmental impact, stability, effect on system materials
Refrigerants: HFC, HC, azeotropic, zeotropic

Calculations, science and drawing

Practical competences

The candidate must be able to do the following:

Calculations

- 36.39 Determine the operating values of refrigeration cycling controls by arithmetic manipulation of set point values.
Set point values: cut in point, cut out point, differential
- 36.40 Select and use the formulae needed to calculate the heat added or removed in simple (non complex) heat transfer processes.
Processes: sensible (heating, cooling), latent heat (addition, removal)
- 36.41 Identify and use the formula needed to establish the safe storage capacity of a refrigerant cylinder.
Capacity: maximum capacity x fill ratio.

Science

- 36.42 Identify the areas, in refrigeration and air conditioning applications, where the various modes of heat transfer takes place.
Heat transfer: conduction, convection, radiation
- 36.43 Identify, in refrigeration and air conditioning systems, the direction of heat transfer.
Direction: heat transfer to the system, heat transfer from the system
- 36.44 Identify, in refrigeration and air conditioning systems, the areas where sensible heat transfer takes place.
Sensible heat transfer: suction lines, discharge lines, liquid lines
- 36.45 Identify, in refrigeration and air conditioning systems, the areas where latent heat transfer takes place.
Latent heat transfer: evaporator, condenser
- 36.46 Identify the condition of the refrigerant at various points in a refrigeration cycle.
Condition: saturated, superheated, sub cooled, high temperature, low temperature

Drawing

- 36.47 Produce line diagrams of refrigeration and air conditioning systems.
Systems: vapour compression refrigeration systems, unit/split air conditioning systems
- 36.48 Produce sketches of psychrometric charts which show the constant property lines.
Properties: dry bulb temperature, wet bulb temperature, specific volume, enthalpy, percentage saturation, moisture content

- 36.49 Show by sketch how the condition of an air sample is located on a psychrometric chart.
Location: intersection of two property lines
- 36.50 Produce sketches of psychrometric charts which show simple psychrometric processes.
Processes: sensible (heating, cooling), cooling (humidification, dehumidification)
- 36.51 Sketch, in oblique projection, components of refrigeration and air conditioning plant.
Components: eg filter driers, fans, compressor bodies, evaporators
- 36.52 Produce scale drawings of simple machined components.
Drawings: third angle projection
Scale: eg twice full size
- 36.53 Produce sectional drawings of simple machined components.

Knowledge requirements

The instructor must ensure the candidate is able to:

Calculations

- 36.54 Identify calculations involving the various values needed to set the operating points for controls.
Values: cut in, cut out, differential
Operating points: cut out = (cut in – differential)
- 36.55 Identify calculations to determine the heat transfer during a sensible heat transfer process.
Heat transfer: heat transfer (Q) = mass (m) x specific heat capacity (C) x temperature change (td)
- 36.56 Identify calculations to determine the heat transfer during a latent heat process.
Heat transfer: heat transfer (Q) = mass (m) x latent heat (L)
- 36.57 Identify calculations involving the mass of substance that can be contained in a specified rectangular or circular section container.
Mass: mass = volume x density
- 36.58 Identify calculations involving the mass of refrigerant that can be safely stored in a refrigerant cylinder.
Mass: mass = volume x density x fill ratio

Science

- 36.59 Explain the methods by which heat is transferred.
Methods: conduction, convection, radiation
- 36.60 State that heat is transferred from a high energy to a low energy level.
- 36.61 Explain the applications of sensible heat transfer in refrigeration and air conditioning systems.
Applications: air cooling, product cooling, refrigerant heating/cooling
- 36.62 Explain the applications of latent heat transfer in refrigeration and air conditioning systems.
Applications: evaporator, condenser, product freezing
- 36.63 Describe the condition of the refrigerant for a refrigeration cycle.
Condition: saturated, superheated, sub cooled, hot, cold, warm, liquid, vapour, liquid/vapour mixture

Drawing

- 36.64 Identify components on line diagrams by the use of drawing symbols.
Symbols: compressor, expansion device, evaporator, condenser, stop valves
- 36.65 Identify international drawing standards and conventional notation and symbols.
Drawing: 3rd angle projection, views through sections, hidden detail

Practical skills

Practical competences

The candidate must be able to do the following:

- 36.66 Set out and install the components of a refrigeration system.
Components: compressor, condenser, evaporator, expansion device, receiver, filter drier
- 36.67 Fabricate and install all interconnecting pipework for a refrigeration system.
- 36.68 Install all wiring for a refrigeration system.
Wiring: mains supply, control
- 36.69 Install a wall mounted split system air conditioning unit.
- 36.70 Install a ceiling cassette split system air conditioning unit.
- 36.71 Select, connect and use a gauge manifold to access a refrigeration system.
Access: high pressure side, low pressure side
- 36.72 Carry out pressure and vacuum tests on a refrigeration system with standard industry equipment.
Equipment: gauge manifold, inert gas, vacuum pump
- 36.73 Select and use appropriate equipment to remove air/inert gas from a refrigeration system.
Equipment: vacuum pump
- 36.74 Use standard service equipment to add refrigerant to a refrigeration system.
Equipment: service cylinder of refrigerant, gauge manifold, refrigerant balance/spring balance, service tools
- 36.75 Select and connect basic system controls.
Controls: high pressure switch, low pressure switch, combined high/low pressure switch, thermostat
Connection: compressor switching circuits
- 36.76 Measure the wet and dry bulb temperatures of an air sample and determine the relative humidity.
Relative humidity: wet/dry bulb temperatures, wet bulb depression scale
- 36.77 Measure air stream velocity using an anemometer.
Anemometer: vane, hot wire

Knowledge requirements

The instructor must ensure the candidate is able to:

- 36.78 Identify the components required to assemble a refrigeration system.
Components: compressor, condenser, evaporator, expansion device, receiver, filter drier
- 36.79 Describe, with the aid of a sketch, the correct method for connecting a gauge manifold to a refrigeration system.
Connections: flexible hoses from manifold to machine
- 36.80 Describe the valve settings on a gauge manifold for various service operations.
Service operations: add refrigerant, add oil, remove refrigerant, remove air/water vapour, check operating pressures
- 36.81 State the equipment and materials required to test a newly installed refrigeration system.
Equipment: gauge manifold set, vacuum pump, inert gas
Tests: pressure, vacuum
- 36.82 Describe the procedure for testing a newly installed refrigeration system.
Tests: pressure, vacuum
- 36.83 Describe the process for removing air/inert gas from a refrigeration system.
Process: evacuation
- 36.84 State the equipment required to charge a refrigeration system with refrigerant.
Equipment: charging station, service cylinder, manifold, balance, service tools
- 36.85 Describe the process for charging a refrigeration system with refrigerant.
Process: connect equipment without air ingress/refrigerant egress, add refrigerant, disconnect equipment without air ingress/refrigerant egress
- 36.86 Describe the method for connecting and setting basic system controls.
Connections: controls (pressure, temperature)
Setting: cut in point, cut out point, differential
- 36.87 Describe, with the aid of a sketch, the method for determining relative humidity of an air sample.
Relative humidity: wet/dry bulb temperatures, wet bulb depression scale
- 36.88 Describe the method for measuring air stream velocity using an anemometer.
Anemometer: vane, hot wire

- 36.89 Identify the correct scale and method needed to determine circuit continuity using a multimeter
Scale: ohms
- 36.90 Describe, with the aid of a sketch, the method for using a multimeter to measure the winding resistance of a single phase motor.
Winding resistance: start, run, start and run

Communications and information technology

Practical competences

The candidate must be able to do the following:

Communications

36.91 Use language in written and oral forms to communicate needs clearly.

Written: technical/commercial letters (eg internal memos, technical reports, job applications, curriculum vitae/résumé), summarise (eg document, report)

Oral: telephone, work instructions, group, one to one

36.92 Interpret, use and draw diagrams in a routine work environment.

Interpret: graphical to written, written to graphical, graphical (eg bar charts, histograms, graphs)

36.93 Collect and select information on the use of national and international standards.

Standards: eg British Standards, International Standards Organization (ISO)

36.94 Collect and select technical information from different sources.

Information: eg technical drawings, schedules, data sheets/charts, manufacturers' information sheets/brochures, microfilm, micro fiche, libraries, library index systems/classification, video tape, CD ROM, computer systems (eg Internet)

36.95 Use information technology systems for communication.

Systems: word processor, fax

Information technology

36.96 Select a suitable software application for a given task.

Software: word processing, database, spreadsheet

36.97 Access a word processing applications software package.

36.98 Open a new word processing file and enter text.

36.99 Edit the contents of a document.

Edit: correct errors, insert words, delete words, insert paragraph breaks, delete paragraph breaks, sections of text (copy, cut, paste)

36.100 Use the spell-check function to check the document.

36.101 Enhance the appearance of a document.

Enhancement: font (size, bold, italics), text (centre, underline)

36.102 Close and save an edited document under an existing and a new file name.

36.103 Print a word processed file.

36.104 Exit the word processing applications package and switch off the equipment.

Knowledge requirements

The instructor must ensure the candidate is able to:

Communications

36.105 Explain the use of language in written and oral forms to communicate needs clearly.

Written: technical/commercial letters (internal memos, technical reports, job applications, curriculum vitae/résumé), summarise (documents/reports)

Oral: telephone, work instructions, group, one to one

36.106 Identify the use of national and international standards in the construction industry.

Standards: eg British Standards, International Standards Organization (ISO)

36.107 Identify the various sources of technical information.

Information: technical drawings, schedules, data sheets/charts, manufacturers' information sheets/brochures, microfilm, micro fiche, libraries, library index systems/classification, video tape, CD ROM, computer systems (eg Internet)

36.108 Explain the use of various electronic and information technology systems for communication.

Systems: word processor, fax, Internet, E-mail

Information technology

36.109 Identify the main functions of commonly used software applications packages.

Packages: word processing (document production), spreadsheets (numerical analysis, manipulation), database (file creation, updating, searching, sorting), computer aided design (line drawings used for architecture/engineering/construction)

36.110 Describe the various editing operations that can be performed on a word processing file.

Edit: correct errors, insert words, delete words, insert paragraph breaks, delete paragraph breaks, sections of text (copy, cut, paste)

36.111 Explain the use of the spell-check function to check word processing documents.

36.112 Explain the use of the various enhancements that can be used to improve the appearance of a document.

Enhancement: font (size, bold, italics), text (centre, underline)

- 36.113 Explain how to close and save an edited document under an existing and a new file name.
Save: hard disk, floppy disk
- 36.114 Explain how to print a word processing file.
- 36.115 Explain how to exit the word processing applications package and switch off the equipment.

Alteration, repair and planned maintenance

Practical competences

The candidate must be able to do the following:

- 36.116 Dismantle and rebuild accessible refrigeration compressors.
Compressors: types (open, semi hermetic)
- 36.117 Diagnose, locate and replace worn or defective compressor valve reeds.
Defect: cracked, split, distorted, burned
- 36.118 Remove and replace gasket material.
Gaskets: eg cylinder head, base plate, service valve
- 36.119 Inspect and repair compressor shaft seals.
Repairs: reface shaft seal, replace shaft seal
- 36.120 Remove and replace compressor piston rings.
Piston rings: compression rings, oil rings
- 36.121 Carry out routine maintenance on system service valves.
Maintenance: gland packing, valve seat, valve face
- 36.122 Check and adjust the tension/alignment of drive belts.
Drive belts: compressor, fan
Tension/alignment: manufacturers' data, maintenance schedules, drive belt guards (remove, replace, secure)
- 36.123 Inspect and maintain air cooled condensers.
Maintenance: remove accumulated debris (mechanically, chemically), safety (electrical isolation, refrigerant not to be used as a cleaning agent)
- 36.124 Safely remove and replace a liquid line filter drier.
Safety: refrigerant handling competence (refrigerant removal, risk assessment)
Replace: size, direction of flow
- 36.125 Carry out field service on various expansion valves.
Service: clean filter, superheat (thermostatic expansion valves), phial location (thermostatic expansion valves)
- 36.126 Inspect, maintain and refit/replace evaporator fans and defrost heaters.
Fans/heaters: cleaning, check mountings, safety (electrical isolation)
- 36.127 Test and adjust an evaporator pressure regulator (EPR).
Adjust: manufacturers' data, maintenance schedules
- 36.128 Test and adjust a crankcase pressure regulator (CPR).
Adjust: manufacturers' data, maintenance schedules
- 36.129 Inspect and maintain air filters.
Filters: inlet air, return air
Maintenance: clean, refit, replace

- 36.130 Inspect and maintain humidifiers.
Maintenance: clean, descale

- 36.131 Adjust dampers and diffusers to provide the correct air flow.
Air flow: design data, maintenance schedules

Knowledge requirements

The instructor must ensure the candidate is able to:

- 36.132 Identify accessible compressors and their various component parts.
Compressors: open type, semi hermetic type
Component parts: crankcase, crankshaft pistons, connecting rod, bearings, valves, valve plate, thrust bearings
- 36.133 Describe the symptoms that would indicate a compressor valve is defective.
Symptoms: poor system performance
- 36.134 Identify, with the aid of a sketch, the areas of a shaft seal most susceptible to leakage.
Areas: bellows, seal face
- 36.135 Describe the symptoms that would indicate worn or defective compressor piston rings.
Symptoms: poor compressor performance
- 36.136 Describe the faults that may occur on system service valves.
Faults: leaking past valve, leaking from valve
- 36.137 Explain the procedure and reasons for keeping belt drives correctly tensioned and aligned.
Procedure: adjustment (manufacturers' data, service schedules)
Reasons: belt wear, efficiency
- 36.138 Describe the symptoms that would indicate a fouled condenser.
Faults: poor system performance
- 36.139 Describe the symptoms that would indicate a faulty liquid line drier.
Faults: poor system performance
- 36.140 State the safe working practices to be employed when a liquid line filter drier.
Safe working practices: do not use portable heating equipment, refrigerant handling competence (refrigerant removal, risk assessment)
- 36.141 Describe the symptoms that would indicate a faulty expansion valve.
Faults: poor system performance

- 36.142 Describe the symptoms that would indicate a faulty evaporator fan or defrost system.
Faults: poor system performance, defrost failure
- 36.143 Describe the method for adjusting low side pressure controls to meet the system requirements.
Controls: evaporator pressure regulator, crankcase pressure regulator
Adjustments: manufacturers' data, service schedules
- 36.144 Recognise the symptoms that would indicate that filters are in need of maintenance.
Filters: inlet filters, return air filters, types (dry, viscous, electrostatic)
Symptoms: air flow, instrument readings
- 36.145 Describe the method for removing scale from humidifiers.
Method: mechanical, chemical (chemical manufacturers' safety data)
- 36.146 Describe the method for checking and adjusting the air flow to suit the system requirements.
Check: air flow measurement instruments
Adjustment: manufacturers' data, system performance data

Assessment

Test specification for written paper Refrigeration and Air Conditioning 2 Principles (6161-16-036)

This is a multiple choice examination paper lasting two and a half hours comprising 100 questions. Candidates must answer all questions.

The examination paper will cover the knowledge specifications for the following:

Topic	Approximate % examination weighting
Safety at work	15
Materials (Plant and refrigerants)	10
Calculations, science and drawing	25
Practical skills	25
Communications and information technology	5
Alteration, repair and planned maintenance	20

36 Refrigeration and Air Conditioning 2: Safety at work

Practical competences

The candidate must be able to do the following:

- 36.1 Carry out safe working practices to prevent hazards and to ensure the safety of working personnel and members of the public.
- 36.2 Carry out safe working practices using various equipment/materials to protect surrounding work areas from damage.
- 36.3 Carry out the safe erection, use and dismantling of scaffold platforms less 2m high.
- 36.4 Carry out the safe erection, use and dismantling of scaffold platforms over 2m high.
- 36.5 Inspect for faults, set up and safely use steps and ladders in general use.
- 36.6 Set up safety barriers around refrigeration and air conditioning hazards to protect working personnel and members of the public.
- 36.7 Select and use protective clothing and safety equipment for specific tasks.
- 36.8 Locate and manually operate the isolating switch to disconnect a refrigeration/air conditioning system/circuit from the electrical supply.
- 36.9 Locate and manually operate refrigeration and air conditioning system service valves to isolate components/fluid circuits for service/maintenance.
- 36.10 Use and store toxic, hazardous and environmentally unfriendly materials in a safe manner.
- 36.11 Carry out a risk assessment and prepare a report identifying the potential hazards.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

36 Refrigeration and Air Conditioning 2: Materials (Plant & refrigerants)

Practical competences

The candidate must be able to do the following:

- 36.27 Identify and select refrigeration compressors for specific applications based on their technical properties.
- 36.28 Identify and select refrigeration condensers for specific applications based on their technical properties.
- 36.29 Identify and select refrigerant evaporators for specific applications based on their technical properties.
- 36.30 Identify and select refrigerant expansion devices for specific applications based on their technical properties.
- 36.31 Identify and select refrigerants for specific applications based on their technical properties.
- 36.32 Prepare a report identifying the availability, suitability and relative costs of refrigeration and air conditioning products available in the country of study.
- 36.33 Prepare a report comparing the environmental impact of traditional and modern refrigerants.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

36 Refrigeration and Air Conditioning 2: Calculations, science and drawing

Practical competences

The candidate must be able to do the following:

Calculations

- 36.39 Determine the operating values of refrigeration cycling controls by arithmetic manipulation of set point values.
- 36.40 Select and use the formulae needed to calculate the heat added or removed in simple (non complex) heat transfer processes.
- 36.41 Identify and use the formula needed to establish the safe storage capacity of a refrigerant cylinder.
- 36.42 Identify the areas, in refrigeration and air conditioning applications, where the various modes of heat transfer takes place.
- 36.43 Identify, in refrigeration and air conditioning systems, the direction of heat transfer.
- 36.44 Identify, in refrigeration and air conditioning systems, the areas where sensible heat transfer takes place.
- 36.45 Identify, in refrigeration and air conditioning systems, the areas where latent heat transfer takes place.
- 36.46 Identify the condition of the refrigerant at various points in a refrigeration cycle.

Drawing

- 36.47 Produce line diagrams of refrigeration and air conditioning systems.
- 36.48 Produce sketches of psychrometric charts which show the constant property lines.
- 36.49 Show by sketch how the condition of an air sample is located on a psychrometric chart.
- 36.50 Produce sketches of psychrometric charts which show simple psychrometric processes.
- 36.51 Sketch, in oblique projection, components of refrigeration and air conditioning plant.
- 36.52 Produce scale drawings of simple machined components.
- 36.53 Produce sectional drawings of simple machined components.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

36 Refrigeration and Air Conditioning 2: Practical skills

Practical competences

The candidate must be able to do the following:

- 36.66 Set out and install the components of a refrigeration system.
- 36.67 Fabricate and install all interconnecting pipework for a refrigeration system.
- 36.68 Install all wiring for a refrigeration system.
- 36.69 Install a wall mounted split system air conditioning unit.
- 36.70 Install a ceiling cassette split system air conditioning unit.
- 36.71 Select, connect and use a gauge manifold to access a refrigeration system.
- 36.72 Carry out pressure and vacuum tests on a refrigeration system with standard industry equipment.
- 36.73 Select and use appropriate equipment to remove air/inert gas from a refrigeration system.
- 36.74 Use standard service equipment to add refrigerant to a refrigeration system.
- 36.75 Select and connect basic system controls.
- 36.76 Measure the wet and dry bulb temperatures of an air sample and determine the relative humidity.
- 36.77 Measure air stream velocity using an anemometer.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

36 Refrigeration and Air Conditioning 2: Communications and information technology

Practical competences

The candidate must be able to do the following:

Communications

- 36.91 Use language in written and oral forms to communicate needs clearly.
- 36.92 Interpret, use and draw diagrams in a routine work environment.
- 36.93 Collect and select information on the use of national and international standards.
- 36.94 Collect and select technical information from different sources.
- 36.95 Use information technology systems for communication.

Information technology

- 36.96 Select a suitable software application for a given task.
- 36.97 Access a word processing applications software package.
- 36.98 Open a new word processing file and enter text.
- 36.99 Edit the contents of a document.
- 36.100 Use the spell-check function to check the document.
- 36.101 Enhance the appearance of a document.
- 36.102 Close and save an edited document under an existing and a new file name.
- 36.103 Print a word processed file.
- 36.104 Exit the word processing applications package and switch off the equipment.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature _____

Candidate name (please print) _____

Instructor signature _____

Instructor name (please print) _____

Completion date _____

36 Refrigeration and Air Conditioning 2: Alteration, repair and planned maintenance

Practical competences

The candidate must be able to do the following:

- 36.116 Dismantle and rebuild accessible refrigeration compressors.
- 36.117 Diagnose, locate and replace worn or defective compressor valve reeds.
- 36.118 Remove and replace gasket material.
- 36.119 Inspect and repair compressor shaft seals.
- 36.120 Remove and replace compressor piston rings.
- 36.121 Carry out routine maintenance on system service valves.
- 36.122 Check and adjust the tension/alignment of drive belts.
- 36.123 Inspect and maintain air cooled condensers.
- 36.124 Safely remove and replace a liquid line filter drier.
- 36.125 Carry out field service on various expansion valves.
- 36.126 Inspect, maintain and refit/replace evaporator fans and defrost heaters.
- 36.127 Test and adjust an evaporator pressure regulator (EPR).
- 36.128 Test and adjust a crankcase pressure regulator (CPR).
- 36.129 Inspect and maintain air filters.
- 36.130 Inspect and maintain humidifiers.
- 36.131 Adjust dampers and diffusers to provide the correct air flow.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

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37 Electrical Installation 2 – Summary of syllabus sections

Page 152 Safety at work
(Objectives 37.1 to 37.31)

The aim of this unit is to enable the candidate to maintain safe working conditions and to adopt safe procedures for themselves and others.

Page 154 Materials
(Objectives 37.32 to 37.63)

The aim of this unit is to enable the candidate to:

- a identify and select materials for specific applications based on their technical properties
- b describe the technical properties of the main types of materials in use for single phase and three phase circuits
- c identify environmental effects and benefits of electrical power

Page 157 Calculations, setting out and drawing
(Objectives 37.64 to 37.83)

The aim of this unit is to enable the candidate to:

- a calculate quantities and costs of materials to assist in preparing, costing and estimating
- b calculate values and quantities for single phase and three phase circuits
- c set out single phase and three phase circuits
- d produce working drawings of single phase and three phase circuits

Page 159 Practical skills
(Objectives 37.84 to 37.122)

The aim of this unit is to enable the candidate to:

- a install electrical systems to national/local standards
- b carry out the inspection and testing of single phase domestic installations

Page 162 Communication and information technology
(Objectives 37.123 to 37.147)

The aim of this unit is to enable the candidate to use:

- a communication skills in the workplace
- b information technology in the workplace

Page 164 Alteration, repair and planned maintenance
(Objectives 37.148 to 37.178)

The aim of this unit is to enable the candidate to:

- a safely undertake alterations to an existing installation
- b diagnose, locate and repair faults within an electrical installation
- c conduct planned maintenance procedures

Safety at work

The use of national/local regulations and working practices must be included in all practical competences.

Practical competences

The candidate must be able to do the following:

- 37.1 Carry out safe working practices to prevent hazards and to ensure the safety of working personnel and members of the public.
Hazards: obstructions, exposed live electrical parts, warnings notices
- 37.2 Carry out safe working practices using various equipment/materials to protect surrounding work areas from damage.
Equipment/materials: dust sheets, shields (boards)
- 37.3 Carry out the safe erection, use and dismantling of scaffold platforms less than 2m high.
Scaffolding: trestles, folding trestles, hop-up stools, scaffold boards
- 37.4 Carry out the safe erection, use and dismantling of scaffold platforms over 2m high.
Scaffolding: quick assembly towers, scaffold boards, toe boards, hand rails, stabilisers/outriggers
- 37.5 Inspect for faults, set up and safely use steps and ladders in general use.
Faults: metal components (corrosion), timber components (deterioration, splits, cracks)
Set up: firm/level base, clip/lash down
- 37.6 Set up safety barriers around electrical hazards to protect working personnel and members of the public.
Barriers: security tape, barrier material (timber, metal, plastic), safety/warning (signs, lights)
- 37.7 Select and use protective clothing and safety equipment for specific tasks.
Equipment/clothing: glasses, goggles, face mask, ear defenders/plugs, safety helmet (hard hat), overalls, safety shoes, residual current device, electrically insulated hand tools
Tasks: connecting electrical circuits to single phase supply, using power tools to drill holes in walls/floors, use of dangerous substances (solvents)
- 37.8 Locate and manually operate the isolating switch to disconnect a domestic single phase installation or circuit from the electrical supply.
Operation: operate isolator switch, lock off isolator switch
Installation/circuits: heating, lighting, cooking, power

- 37.9 Check the correct operation of electrical test equipment and carry out a test of a domestic single phase circuit to confirm that it has been isolated from the electrical supply.
Test equipment: volt meter, voltage indicator, approved test lamp
- 37.10 Carry out the procedure to isolate a person in contact with a simulated live single phase electrical supply.
Procedure: isolate electrical supply before making contact with victim
- 37.11 Use and store toxic materials in a safe manner.
Use: manufacturers' instructions, toxic effect
Materials: solvents, polyvinyl chloride (PVC) compounds (burning)
- 37.12 Carry out a risk assessment and prepare a report identifying the potential hazards.
Risk assessment: working practices, hazard identification, dangerous substances, site machinery, noise, scaffolding

Knowledge requirements

The instructor must ensure the candidate is able to:

- 37.13 State the methods used to prevent hazards to ensure the safety of working personnel and members of the public.
Methods: warning notices, insulate/enclose live electrical parts, barriers
- 37.14 State the methods used to protect surrounding work areas from infringement or contamination.
Methods: dust sheets, shields (boards)
- 37.15 Explain the safe use of scaffold platforms less than 2m high.
Scaffolding: trestles, folding trestles, hop-up stools, scaffold boards
Safe use: manufacturers' instructions, nationally/locally applied regulations
- 37.16 Explain the safe use of scaffold platforms over 2m high.
Scaffolding: quick assembly towers, scaffold boards, toe boards, hand rails, stabilisers/outriggers
Safe use: manufacturers' instructions, nationally/locally applied regulations
- 37.17 State the faults, possible hazards and dangerous practices when using steps and ladders.
Faults: metal components (corrosion), timber components (deterioration, splits, cracks)
Hazards: base fixing/stabilising, clip/lash at platform level, clear space around base
Dangerous practices: uneven/lose ground

- 37.18 Explain the purpose and use of barriers and warning signs/lights to protect working personnel and members of the public from possible accidents.
Barriers: security tape, barrier material (timber, metal, plastic), safety/warning (signs, lights)
Purpose: segregation of different work activities, segregation of work from members of the public, prevention of falls from heights above 2m
- 37.19 Describe the correct use of protective clothing and safety equipment for a range of applications.
Use: own safety, regulations
Equipment/clothing: goggles, face mask, ear defenders/plugs, safety helmet (hard hat), overalls, safety shoes, residual current device, electrically insulated hand tools
Applications: connecting electrical circuits to single phase supply, using power tools to drill holes in walls/floors, use of dangerous substances (solvents)
- 37.20 Identify the dangers associated with the use of electrical equipment.
Dangers: electrical shock, fire, burns
- 37.21 Describe how the human body can become part of an electrical circuit.
Circuit: body resistance, current paths at different voltages, body connection between live terminal/earth or live terminals
- 37.22 State the effects upon the human body caused by a single phase electrical shock.
Effect: threshold of perception (1-3mA), tightening of muscles (10-15mA), extension of tightening (25-30mA), fibrillation of the heart (50mA and above)
- 37.23 Identify the requirement to isolate a single phase domestic installation or circuit from the electrical supply.
Requirement: avoid electrical shock/fire/burns
- 37.24 Identify domestic single phase electrical supply isolating equipment.
Equipment: mains isolator, switch fuse, distribution board
- 37.25 Describe the procedure for testing the correct operation of electrical test equipment.
Equipment: volt meter, voltage indicator, approved test lamp
Procedure: test on known electrical supply
- 37.26 Describe the procedure for testing a domestic single phase circuit to confirm that it has been isolated from the electrical supply.
Procedure: check correct operation of test equipment, check isolation of supply between phase and neutral
- 37.27 Describe the procedure to isolate a person in contact with a live single phase electrical supply.
Procedure: isolate electrical supply before making contact with victim
- 37.28 State the reason why it may be necessary to apply resuscitation to a person having received an electric shock.
Reasons: stopped breathing, heart failure
- 37.29 State the toxic effect of materials used in electrical installations.
Effect: eyes, skin, breathing
Materials: solvents, PVC compounds (burning)
- 37.30 Describe the preventative and remedial actions to be taken in the case of exposure to toxic materials.
Exposure: ingested, contact with skin, inhaled
Preventative action: ventilation, masks, protective clothing/equipment
Remedial action: immediate first aid, report to supervisor
Materials: solvents, PVC compounds (burning), manufacturers' instructions
- 37.31 Explain the method by which a risk assessment is carried out.
Method: identify task procedure, identify hazards, identify control actions to reduce hazard, assess final risk

Materials

Practical competences

The candidate must be able to do the following:

- 37.32 Identify and select cables for specific applications based on their technical properties.
Cable: insulated and sheathed single/multi-core, insulated and metal sheathed multi core, single/twin/three core, insulating materials (PVC, silicon rubber, synthetic rubbers, magnesium oxide, thermo setting compounds, impregnated paper), armoured
Applications: lighting, socket outlet, fixed appliances, supply to distribution board, surface mounted, concealed in building fabric, conduit, mains, sub-mains, extremes of temperature, retention of insulating properties after burning, current rating
- 37.33 Identify and select flexible cord for specific applications based on their technical properties.
Cord: insulated and sheathed multi-core, twin/three core, armoured
Applications: lighting pendants, lamps, fixed appliances, fixed machinery, current rating
- 37.34 Identify and select electrical accessories for specific applications based on their technical properties.
Accessories: mounting box, switches (single pole, double pole, with/without neon indicators), ceiling rose, lamp holder, joint box, socket outlet, cable clips, cable ties, control equipment
Applications: lighting, socket outlet, fixed appliance, fixed machinery
- 37.35 Identify and select conduits and trunking for specific applications based on their technical properties.
Conduits: materials (steel, PVC), types (rigid, flexible), fixing methods (saddles, clips), jointing methods Trunking: materials (steel, PVC), types (mini, dado, under floor, skirting, bench), fixing methods (direct, suspended), compartmentalised, jointing methods Applications: lighting, socket outlet, fixed appliance, fixed machinery, cable sizes
- 37.36 Identify and select cable trays for specific applications based on their technical properties.
Cable trays: steel (enamelled, galvanised, sheradised, PVC coated), fixing methods (spacing bracket, suspended), jointing methods (overlapping, return edge connection, couplers), fittings (bends, intersections, reducers)
Applications: cable distribution
- 37.37 Identify and select single phase and three phase distribution boards with isolating switches for specific applications based on their technical properties.
Distribution board: fused (cartridge, rewirable, high breaking capacity/HBC), miniature circuit breaker, residual current device/rcd, consumer control units (metal clad, all insulated)
Applications: lighting, socket outlet, fixed appliance, fixed machinery, external outlets, rating
- 37.38 Identify and select single phase and three phase switchgear for specific applications based on their technical properties.
Switchgear: metal clad switch fuses, fused switches, on-load/off-load isolators, moulded case circuit breakers
Applications: control, protection
- 37.39 Identify and select insulating sleeving and tapes for specific applications based on their technical properties.
Sleeving: protective conductor, live conductors, heat resistant
Tapes: adhesive, heat shrink
- 37.40 Identify and select cord grips and glands for specific applications based on their technical properties.
Applications: entry to plugs, entry to fixed appliances, entry to fixed machinery
- 37.41 Identify and select incandescent and discharge lighting fittings for specific applications based on their technical properties.
Lighting: tungsten filament, tungsten halogen, low pressure mercury vapour (fluorescent tube)
Applications: domestic, commercial, industrial, security
- 37.42 Identify and select intruder and fire alarm systems for specific applications based on their technical properties.
Intruder alarm: control panel, alarm sounder, sensors (eg reed switch, passive infra red, microwave, pressure mat, glass vibration/break), entry/exit time delay, minimum 4 core cable, open/closed circuits, tamper resistant circuits, battery backup
Fire alarm: control panel, alarm sounder, sensors (eg optical smoke, ionization chamber, heat, break glass), cable (national/local standards), battery backup
Applications: domestic, light commercial, industrial, sensors (suitable for environment)
- 37.43 Prepare a report identifying the availability, suitability and relative cost of electrical materials available in the country of study.
Materials: cable, conduit, trunking, cable trays, distribution boards, switch gear
Suitability: climate, corrosive atmosphere

- 37.44 Prepare a report on the environmental effects of electrical generation, transmission and distribution.
Environmental effects: pollution (smoke, fumes, particulates, radioactive leakage/contamination, noise), waste products (ash, coke, radioactive), siting (aesthetics, access to water sources, access to fuel, transport of fuel, removal of waste)
Generation: fossil fuels (coal, oil, gas), nuclear, wind, hydro-electric, solar
Transmission/distribution: lines (underground, overhead), transformers, switching stations
- 37.45 Prepare a report on the benefits to be gained from the use of electricity and electrically operated equipment.
Benefits: comfort, safety, health, welfare, security (home, workplace), leisure, entertainment, labour saving (home, workplace), communications, data storage

Knowledge requirements

The instructor must ensure the candidate is able to:

- 37.46 State the various types of cable conductor materials and their properties.
Conductors: materials (copper, aluminium), construction (solid, stranded, shaped)
Properties: resistivity, cross-sectional area, current rating, temperature range, flexibility
- 37.47 State the various types of cable insulating materials and their properties.
Insulating materials: PVC, silicon rubber, synthetic rubbers, magnesium oxide, thermo setting compounds, impregnated paper
Properties: resistivity, temperature range, effects when overheated, flexibility, durability
- 37.48 State the various types of cable sheathing materials and their properties.
Sheathing: PVC, seamless aluminium, seamless copper
Properties: temperature range, effects when overheated, flexibility, durability, resistivity, mechanical properties
- 37.49 State the various types of cable armouring materials and their properties.
Armouring: materials (steel wire, steel tape, aluminium tape), construction (wound), corrosion protection (bitumastic, PVC)
Properties: flexibility, durability, mechanical properties, corrosion resistance
- 37.50 State the properties of flexible cable.
Cable: insulated and sheathed multi-core, twin/three core, armoured
Properties: resistivity, cross-sectional area, current rating, temperature range, flexibility, tensile strength
- 37.51 State the properties of electrical accessories.
Accessories: mounting box, switches (single pole, double pole, with/without neon indicators), ceiling rose, lamp holder, joint box, socket outlet, cable clips, cable ties, control equipment
Properties: rating, enclosure method, method of terminating cables, mechanical properties, appearance, materials (insulating, metallic), electrical continuity, corrosion resistance
- 37.52 State the properties of conduits and trunking.
Conduits: materials (steel, PVC), types (rigid, flexible), fixing methods (saddles, clips), jointing methods
Trunking: materials (steel, PVC), types (mini, dado, under floor, skirting, bench), fixing methods (direct, suspended), compartmentalised, jointing methods
Properties: mechanical properties, appearance, materials (insulating, metallic), electrical continuity, corrosion resistance, size, segregation
- 37.53 State the properties of cable trays.
Cable trays: steel (enamelled, galvanised, sheradised, PVC coated), fixing methods (spacing bracket, suspended), jointing methods (overlapping, return edge connection, couplers), fittings (bends, intersections, reducers)
Properties: mechanical properties, appearance, electrical continuity, corrosion resistance, size, segregation
- 37.54 State the properties of single phase and three phase distribution boards with isolating switches.
Distribution board: fused (cartridge, rewirable, high breaking capacity/HBC), miniature circuit breaker, residual current device/rcd, consumer control units (metal clad, all insulated)
Properties: circuit isolation/separation, rating (current, voltage, single/three phase), disconnection time, short circuit protection, earth leakage detection, electrical continuity, safety
- 37.55 State the properties of single phase and three phase switchgear.
Switchgear: metal clad switch fuses, fused switches, on-load/off-load isolators, moulded case circuit breakers, weatherproof, water tight, dust proof, flame proof (including IP codes)
Properties: circuit isolation/separation, rating (current, voltage, single/three phase), disconnection time, short circuit protection, earth leakage detection, electrical continuity, safety
- 37.56 State the properties of insulating sleeving and tapes.
Sleeving: protective conductor, live conductors, heat resistant
Tapes: adhesive, heat shrink
Properties: colour code, temperature range, size

- 37.57 State the properties of cord grips and glands.
Properties: weather/dirt protection, mechanical properties, type of cable/flex to be secured, temperature range, size, electrical continuity (armoured cable)
- 37.58 State the properties of incandescent and discharge lighting fittings.
Incandescent: tungsten filament, tungsten halogen, gas (types, action)
Discharge: low pressure mercury vapour (fluorescent tube)
Properties: power rating, lumen output, colour, temperature, physical size
- 37.59 State the properties of intruder and fire alarms system components.
Intruder alarm: control panel, alarm sounder, sensors (reed switch, passive infra red, microwave, pressure mat, glass vibration/break), entry/exit time delay, minimum 4 core cable, open/closed circuits, tamper resistant circuits, battery backup
Fire alarm: control panel, alarm sounder, sensors (optical smoke, ionization chamber, heat, break glass), cable (national/local standards), battery backup
Properties: sensors (suitable for environment, automatic/manual), control panels (zones, entry/exit delays), sounders (dB rating, single/multiple tones)
- 37.60 State the various methods of generating electrical power.
Generation: fossil fuels (coal, oil, gas), nuclear, wind, hydro-electric, solar
- 37.61 Describe the various methods of transmitting and distributing electrical power.
Transmission/distribution: lines (underground, overhead), transformers, switching stations
- 37.62 State the various environmental effects of electrical generation, transmission and distribution.
Environmental effects: pollution (smoke, fumes, particulates, radioactive leakage/contamination, noise), waste products (ash, coke, radioactive), siting (aesthetics, access to water sources, access to fuel, transport of fuel, removal of waste)
Generation: fossil fuels (coal, oil, gas), nuclear, wind, hydro-electric, solar
Transmission/distribution: lines (underground, overhead), transformers, switching stations
- 37.63 Identify the benefits to be gained from the use of electricity and electrically operated equipment.
Benefits: comfort, safety, health, welfare, security (home, workplace), leisure, entertainment, labour saving (home, workplace), communications, data storage

Calculations, setting out and drawing

Practical competences

The candidate must be able to do the following:

Calculations

- 37.64 Calculate the quantity and cost of materials required from drawings.
Costs: product catalogues, price lists, discounts
Materials: trunking, cable trays, switchgear, distribution boards, insulated and metal sheathed cable, armoured
- 37.65 Calculate reactance and impedance values for single phase series and parallel circuits.
Circuits: loads (resistive, inductive, capacitive)
- 37.66 Calculate power factors for single phase series and parallel circuits.
Circuits: loads (resistive, inductive, capacitive)
- 37.67 Calculate phase quantities for single phase connected resistive loads.
Quantities: voltage, current, power
- 37.68 Calculate phase and line quantities for three phase Delta and Star connected resistive loads.
Quantities: voltage, current, power
- 37.69 Select suitable fuses and circuit breakers for single phase and three phase resistive loads.
Select: calculated load current from 37.67 and 37.68, use of published selection sheets, national/local regulations
- 37.70 Calculate the voltage drop within single phase and three phase circuits.
Calculation: calculated load current from 37.67 and 37.68, use of published data sheets
Circuits: resistive loads
- 37.71 Select suitable cable sizes for single phase and three phase circuits.
Selection: voltage drop calculated from 37.67, use of published data sheets, national/local regulations
Circuits: resistive loads

Setting out

- 37.72 Measure and set out single phase and three phase circuits and ancillaries from drawings.
Circuits: lighting, heating, power
Ancillaries: conduit, trunking, cable trays, switch gear, distribution boards, fixed appliances, fixed equipment, outlets

Drawings

- 37.73 Produce working drawings from plans and details of single phase and three phase circuits.
Drawings: dimensions, detail (conduit, trunking, cable trays, cable routes, outlet positions, fixed appliances, fixed equipment, switch gear, distribution boards), exploded views

Knowledge requirements

The instructor must ensure the candidate is able to:

Calculations

- 37.74 Identify calculations involving the quantity and cost of materials required from drawings.
Costs: product catalogues, price lists, discounts
Materials: trunking, cable trays, switchgear, distribution boards, insulated and metal sheathed cable, armoured
- 37.75 Identify calculations involving reactance and impedance values for single phase series and parallel circuits.
Circuits: loads (resistive, inductive, capacitive)
- 37.76 Identify calculations involving power factors for single phase series and parallel circuits.
Circuits: loads (resistive, inductive, capacitive)
- 37.77 Identify calculations involving phase quantities for single phase connected resistive loads.
Quantities: voltage, current, power
- 37.78 Identify calculations involving phase and line quantities for three phase Delta and Star connected resistive loads.
Quantities: voltage, current, power
- 37.79 Identify calculations involving the selection of suitable fuses and circuit breakers for single phase and three phase resistive loads.
Calculations: calculated load current from 37.4c and 37.5c, use of published selection sheets
- 37.80 Identify calculations involving the voltage drop within single phase and three phase circuits.
Calculation: calculated load current from 37.4c and 37.5c, use of published data sheets
Circuits: resistive loads
- 37.81 Identify calculations involving the selection of suitable cable sizes for single phase and three phase circuits.
Calculation: voltage drop calculated from 37.7c, use of published data sheets
Circuits: resistive loads

Setting out

- 37.82 Explain the correct procedure for measuring and setting out single phase and three phase circuits and ancillaries.
Setting out: tools (tape measure, water level, laser level, spirit level, plumb bob), positions (ancillaries)
Circuits: lighting, heating, power
Ancillaries: conduit, trunking, cable trays, switch gear, distribution boards, fixed appliances, fixed equipment, outlets

Drawings

- 37.83 Identify scale working drawings from plans and details of single phase and three phase circuits.
Drawings: dimensions, detail (conduit, trunking, cable trays, cable routes, outlet positions, fixed appliances, fixed equipment, switch gear, distribution boards), exploded views

Practical skills

The use of national/local regulations and working practices must be included in all practical competences.

Practical competences

The candidate must be able to do the following:

- 37.84 Prepare cables for termination.
Preparation: removal (insulation, sheathing, armouring), tools (rotary stripping, hacksaw, knife, wire stripper, pliers)
Cable: eg insulated and sheathed single/multi-core, insulated and metal sheathed multi core, single/twin/three core, insulating materials (PVC, silicon rubber, synthetic rubbers, magnesium oxide, thermo setting compounds, impregnated paper), armoured
- 37.85 Terminate cables into equipment and switchgear.
Terminations: tag, tunnel, screw, lug (crimped, soldered), pin, insulation displacement
Cable: eg insulated and sheathed single/multi-core, insulated and metal sheathed multi core, single/twin/three core, insulating materials (PVC, silicon rubber, synthetic rubbers, magnesium oxide, thermo setting compounds, impregnated paper), armoured
- 37.86 Protect cable terminations against strain or circuit interruption.
Protection: clips, cleats, glands, movement allowance at termination
Cable: eg insulated and sheathed single/multi-core, insulated and metal sheathed multi core, single/twin/three core, insulating materials (PVC, silicon rubber, synthetic rubbers, magnesium oxide, thermo setting compounds, impregnated paper), armoured
- 37.87 Install various cable supports appropriate to the building and type of installation.
Cable: eg insulated and sheathed single/multi-core, insulated and metal sheathed multi core, single/twin/three core, insulating materials (PVC, silicon rubber, synthetic rubbers, magnesium oxide, thermo setting compounds, impregnated paper), armoured
Supports: single cables (clips, cleats, saddles, brackets), multiple cables (eg ladder racking, cable basket, cable tray)
- 37.88 Install various conduit systems.
Installation: minimum 2m length, 1 manufactured 90° bend/elbow, 1 fabricated 90° bend/elbow, 1 inspection/drawing box, 1 fabricated crossover set using 20mm high obstacle, 2 different methods of terminating conduit into outlet boxes
Conduit systems: steel (eg enamelled, galvanised), PVC (light gauge, high impact)
- 37.89 Install various trunking systems.
Installation: minimum 2m length, 1 manufactured 90° bend, 1 fabricated 90° bend, 1 outlet box, 1 item of switchgear
Trunking systems: sheet steel (eg enamelled, galvanised), PVC
- 37.90 Install various cable tray systems.
Installation: minimum 2m length, 1 manufactured 90° bend, 1 fabricated 90° bend, 1 fabricated crossover set using 50mm high obstacle, 1 manufactured fixing bracket, 1 fabricated fixing bracket
Cable trays: steel (eg enamelled, galvanised, PVC coated), PVC
- 37.91 Install and connect various types of single phase and three phase switchgear.
Switchgear: eg metal clad switch fuses, fused switches, on-load/off-load isolators, moulded case circuit breakers, weatherproof, water tight, dust proof, flame proof, maximum rating 100A
- 37.92 Install incandescent and discharge lighting circuits and fittings.
Incandescent: tungsten filament, tungsten halogen, maintained emergency light, non-maintained emergency light
Discharge: low pressure mercury vapour (fluorescent tube), inductors, capacitors, starters
- 37.93 Install intruder and fire alarm systems.
Intruder alarm: control panel, alarm sounder, sensors (eg reed switch, passive infra red, microwave, pressure mat, glass vibration/break), entry/exit time delay, minimum 4 core cable, open/closed circuits, tamper resistant circuits, battery backup
Fire alarm: control panel, alarm sounder, sensors (eg optical smoke, ionization chamber, heat, break glass), cable (national/local standards), battery backup
- 37.94 Install an access control system.
Access control: telephone/CCTV link, remote lock release
- 37.95 Install a three phase radial circuit to an electric motor.
Installation: isolator, direct on-line starter, flexible conduit link to motor
- 37.96 Connect an electrical installation to a suitable earthing point and cross bond all metal work.
Earthing point: eg earth electrode, terminal provided by electrical supplier (eg metallic sheath/armouring of supply cable), directly to neutral of supply
- 37.97 Install overcurrent and earth leakage protective devices.
Protective devices: fuses (rewirable, cartridge, high breaking capacity/HBC), circuit breakers, residual current device/rcd, maximum rating 100A

- 37.98 Collect the data required prior to carrying out the inspection and testing of a single phase domestic installation.
Data: installation diagrams, charts, tables, schedules, drawings
- 37.99 Carry out the safe inspection and testing of a single phase domestic installation in accordance with national/local standards.
Safe inspection/testing: liaise with building occupants, isolate supply, warning notices, barriers, testing sequence (isolated/live tests)
Inspection: use of senses (sight, touch, smell, hearing)
Testing: conductor continuity (live, protective conductors), insulation resistance, polarity, earth loop impedance, earth electrode resistance, functional, approved test equipment
- 37.100 Record test results for a single phase domestic installation in accordance with national/local standards.
- 37.104 Determine the correct spacing for various cable supports.
Spacing: horizontal, vertical, using published data
Cable: insulated and sheathed single/multi-core, insulated and metal sheathed multi core, single/twin/three core, insulating materials (PVC, silicon rubber, synthetic rubbers, magnesium oxide, thermo setting compounds, impregnated paper), armoured
Supports: single cables (clips, cleats, saddles, brackets), multiple cables (ladder racking, cable basket, cable tray)
- 37.105 Determine the minimum bending radii for various cables.
Bending radii: using published data
Cable: insulated and sheathed single/multi-core, insulated and metal sheathed multi core, single/twin/three core, insulating materials (PVC, silicon rubber, synthetic rubbers, magnesium oxide, thermo setting compounds, impregnated paper), armoured

Knowledge requirements

The instructor must ensure the candidate is able to:

- 37.101 State the correct method of preparing cables for termination into equipment.
Preparation: removal (insulation, sheathing, armouring), tools (rotary stripping, hacksaw, knife, wire stripper, pliers)
Cable: insulated and sheathed single/multi-core, insulated and metal sheathed multi core, single/twin/three core, insulating materials (PVC, silicon rubber, synthetic rubbers, magnesium oxide, thermo setting compounds, impregnated paper), armoured
- 37.102 State the correct method of terminating cables into various equipments and switchgear.
Terminations: tag, tunnel, screw, lug (crimped, soldered), pin, insulation displacement
- 37.103 Identify the various methods of protecting cable terminations against strain or circuit interruption.
Protection: clips, cleats, glands, movement allowance at termination
Cable: insulated and sheathed single/multi-core, insulated and metal sheathed multi core, single/twin/three core, insulating materials (PVC, silicon rubber, synthetic rubbers, magnesium oxide, thermo setting compounds, impregnated paper), armoured
- 37.106 Describe the methods of installing various conduit systems.
Methods: system fully erected prior to installing conductors, adequate provision of access points, terminations (lock nut with female bush, coupler with male bush, push fit adaptors with locking rings, adhesives), electrical continuity (steel conduit), tools (pipe grips, hacksaw, reamer, bush spanner, files, pipe thread stocks/dies, pipe bending machine, setting block, steel spring, former)
Conduit systems: steel (enamelled, galvanised), PVC (light gauge, high impact)
- 37.107 Determine the appropriate size of conduit to accommodate a given number of cables.
Conduit size: using published data, national/local standards
- 37.108 Describe the methods of installing various trunking systems.
Methods: system fully erected prior to installing conductors, joints, change of direction, change of cross section, electrical continuity (steel trunking)
Trunking systems: sheet steel (enamelled, galvanised), PVC
- 37.109 Determine the appropriate size of trunking to accommodate a given number of cables.
Trunking size: using published data, national/local standards
- 37.110 Describe the methods of installing various cable tray systems.
Methods: system fully erected prior to installing cables, joints, change of direction, change of cross section, electrical continuity (steel tray)
Cable trays: steel (enamelled, galvanised, PVC coated), PVC

- 37.111 Describe the operating principles of incandescent and discharge lighting circuits.
Principles: circuits (components, control, protection), power factor correction
Incandescent: tungsten filament, tungsten halogen, maintained emergency light, non-maintained emergency light
Discharge: low pressure mercury vapour (fluorescent tube), inductors, capacitors, starters
- 37.112 State the various types and principles of operation of detectors available for intruder detection systems.
Detectors: reed switch, micro switch, passive infra red, microwave, pressure mat, glass vibration/break
- 37.113 State the principles of the various types of circuits used in intruder alarm systems.
Circuits: open, closed, tamper resistant, battery backup
- 37.114 State the various types and principles of operation of detectors available for fire detection systems.
Detectors: optical smoke, ionization chamber, heat, break glass
- 37.115 Describe, with the aid of a sketch, a three phase radial circuit for an electric motor.
Circuit: isolator, direct on-line starter, cable, flexible conduit link to motor
- 37.116 Describe, with the aid of a sketch, the path taken by an earth fault current.
Path: within the installation, outside the installation
- 37.117 Identify various suitable earthing points.
Earthing point: earth electrode, terminal provided by electrical supplier (metallic sheath/armouring of supply cable), directly to neutral of supply
- 37.118 State the purpose of supplementary bonding metal work within a building.
Purpose: all metal work at same potential, reduction of electrical shock risk
- 37.119 State the differences between overcurrent and earth leakage protective devices.
Overcurrent: types (fuses, circuit breakers), protection against (overload, phase/earth, short circuit)
Residual current device/rcd: protection against earth leakage, operating current 30 mA for supplementary shock protection
- 37.120 State the data required prior to carrying out the inspection and testing of a single phase domestic installation.
Data: installation diagrams, charts, tables, schedules, drawings
- 37.121 Describe the method for carrying out the safe inspection and testing of a single phase domestic installation.
Safe inspection/testing: liaison with building occupants, isolate supply, warning notices, barriers, testing sequence (isolated/live tests)
Inspection: use of senses (sight, touch, smell, hearing)
Testing: conductor continuity (live, protective conductors), insulation resistance, polarity, earth loop impedance, earth electrode resistance, functional, approved test equipment
- 37.122 State the details required in a test report for a single phase domestic installation.
Details: type of supply to installation, means of earthing, results of listed tests

Communications and information technology

Practical competences

The candidate must be able to do the following:

Communications

37.123 Use language in written and oral forms to communicate needs clearly.

Written: technical/commercial letters (eg internal memos, technical reports, job applications, curriculum vitae/résumé), summarise (eg document, report)

Oral: telephone, work instructions, group, one to one

37.124 Interpret, use and draw diagrams in a routine work environment.

Interpret: graphical to written, written to graphical, graphical (eg bar charts, histograms, graphs)

37.125 Collect and select information on the use of national and international standards.

Standards: eg British Standards, International Standards Organization (ISO), International Electrotechnical Commission (IEC)

37.126 Collect and select technical information from different sources.

Information: eg technical drawings, schedules, data sheets/charts, manufacturers' information sheets/brochures, microfilm, micro fiche, libraries, library index systems/classification, video tape, CD ROM, computer systems (eg Internet)

37.127 Use information technology systems for communication.

Systems: word processor, fax

Information Technology

37.128 Select a suitable software application for a given task.

Software: word processing, database, spreadsheet

37.129 Access a word processing applications software package.

37.130 Open a new word processing file and enter text.

37.131 Edit the contents of a document.

Edit: correct errors, insert words, delete words, insert paragraph breaks, delete paragraph breaks, sections of text (copy, cut, paste)

37.132 Use the spell-check function to check the document.

37.133 Enhance the appearance of a document.

Enhancement: font (size, bold, italics), text (centre, underline)

37.134 Close and save an edited document under an existing and a new file name.

37.135 Print a word processed file.

37.136 Exit the word processing applications package and switch off the equipment.

Knowledge requirements

The instructor must ensure the candidate is able to:

Communications

37.137 Explain the use of language in written and oral forms to communicate needs clearly.

Written: technical/commercial letters (internal memos, technical reports, job applications, curriculum vitae/résumé), summarise (documents/reports)

Oral: telephone, work instructions, group, one to one

37.138 Identify the use of national and international standards in the construction industry.

Standards: eg British Standards, International Standards Organization (ISO), International Electrotechnical Commission (IEC)

37.139 Identify the various sources of technical information.

Information: technical drawings, schedules, data sheets/charts, manufacturers' information sheets/brochures, microfilm, micro fiche, libraries, library index systems/classification, video tape, CD ROM, computer systems (eg Internet)

37.140 Explain the use of various electronic and information technology systems for communication.

Systems: word processor, fax, Internet, E-mail

Information Technology

37.141 Identify the main functions of commonly used software applications packages.

Packages: word processing (document production), spreadsheets (numerical analysis, manipulation), database (file creation, updating, searching, sorting), computer aided design (line drawings used for architecture/engineering/construction)

37.142 Describe the various editing operations that can be performed on a word processing file.

Edit: correct errors, insert words, delete words, insert paragraph breaks, delete paragraph breaks, sections of text (copy, cut, paste)

37.143 Explain the use of the spell-check function to check word processing documents.

37.144 Explain the use of the various enhancements that can be used to improve the appearance of a document.

Enhancement: font (size, bold, italics), text (centre, underline)

37.145 Explain how to close and save an edited document under an existing and a new file name.

Save: hard disk, floppy disk

37.146 Explain how to print a word processing file.

37.147 Explain how to exit the word processing applications package and switch off HKequipment.

Alteration, repair and planned maintenance

The use of national/local regulations and working practices must be included in all practical competences.

Practical competences

The candidate must be able to do the following:

- 37.148 Replace existing electrical accessories with upgraded units.
Accessories: insulated/metal clad switches (wall mounted, ceiling mounted), socket outlets, controls, thermostats
Upgraded units: identify/select suitable units
- 37.149 Replace existing incandescent light fittings with discharge light fittings.
Light fittings: low pressure mercury vapour (eg single, twin, multiple, modular), mounting (eg surface, built in to suspended ceilings)
- 37.150 Convert a lighting outlet from one-way switching to two-way switching.
Conversion: extend circuit wiring, replace existing switch, install additional switch
- 37.151 Extend a socket outlet circuit.
Extension: extend circuit wiring, install additional socket outlet
- 37.152 Extend an existing lighting circuit to supply an externally located light fitting.
Extension: extend circuit wiring to new locations (new light fitting, control switch), install additional light fitting, install control switch (eg standard switch, time switch, passive infra red sensor/switch)
- 37.153 Diagnose the cause of a fault in a low pressure mercury vapour light fitting and carry out repairs.
Fault: lamp is heavily blackened at each end and repeatedly flashes on and off (replace lamp), lamp does not light but both electrodes glow continuously (faulty starter, faulty radio interference capacitors), fuse blows when light fitting is switched on (faulty power factor capacitor, phase-earth, short circuit)
- 37.154 Diagnose the cause of a fault in a non-pressurised type water heater and carry out repairs.
Fault: water boiling in unit
Repairs: check/replace thermostat (length, range)
- 37.155 Diagnose and remedy a fault in a socket outlet circuit which does not allow the circuit to be switched off by the indicated circuit breaker in the distribution board.
Fault: incorrectly marked circuit breaker, circuit interconnected to another circuit
- 37.156 Diagnose and remedy a fault in a new ceiling mounted lighting circuit which does not allow the light to be

switched off by the control switch.

Fault: faulty switch, light fitting supply connected to phase conductor instead of switch line

- 37.157 Diagnose, by following a logical sequence of procedures, the fault which caused the fuse protecting a 2.4 kW electric kettle to fail.
Fault: location (lead, kettle)
- 37.158 Conduct maintenance of portable equipment flexible cords.
Maintenance: examine sheathing/braiding for obvious mechanical damage, open plug terminations to examine quality of conductor terminations/effectiveness of cord grips
- 37.159 Carry out the maintenance of various types of incandescent and discharge light fittings.
Incandescent: effects of heat (plastic parts, flexible cables, insulation) clean (lamps, shades, reflectors)
Discharge: condition of lamps, replace lamps on a regular basis to maintain lumin output, clean (body of fitting, reflectors, diffusers), ensure correct type of reflector is fitted for special locations (personal computer, VDU)
- 37.160 Carry out the maintenance of distribution boards.
Maintenance: conductor terminations (damage, tightness), insulation damage, moving parts (operation, corrosion, ingress of dust/dirt, lubrication)
- 37.161 Carry out the maintenance of Direct-on-line (D.O.L.) motor starters.
Maintenance: check/adjust settings of overload protection devices (manufacturers' data), remove dirt/dust from enclosure
- 37.162 Check and adjust the tension/alignment of drive belts.
Tension/alignment: manufacturers' data, drive belt guards (remove, replace, secure)

Knowledge requirements

The instructor must ensure the candidate is able to:

- 37.163 State the advantage of replacing incandescent light fittings with discharge type fittings.
Advantage: higher light output for power consumption, lower heat output, variety of light output colours available
- 37.164 Describe the procedure for replacing incandescent light fittings with discharge type fittings.
Procedure: marking out (alignment, fixings), lifting fitting into position/fixing, consideration of (circuit loadings, effects of switching surges on circuit breaker), possible assistance required (marking out, lifting/fixing fitting)

- 37.165 Describe, with the aid of a sketch, the circuitry involved and equipment required to convert a one-way switched lighting outlet to two-way switching.
Circuitry: alternative switched lines, additional cables, replacement/additional 2 way switches
- 37.166 Describe, with the aid of a sketch, the procedure for installing an additional socket outlet into an existing socket outlet circuit.
Sketch: connections, cable, accessories
Procedure: circuit connections, accessories (joint box, mounting block, socket outlet, cable clips)
- 37.167 Describe, with the aid of a sketch, the procedure for installing an exterior light fitting.
Procedure: extend wiring (from existing loop-in ceiling outlet, from consumer control unit), install new light fitting, install control switch (standard switch, time switch, passive infra red sensor/switch)
- 37.168 Describe, with the aid of a circuit diagram, the working principles of the various components in a low pressure mercury vapour light fitting.
Light fitting: switch-start type
Components: starter switch (normally closed contacts, gas filled envelope, inductive choke/ ballast), lamp (electrodes, gas, ionic discharge, phosphor coating), radio interference capacitor, power factor correction capacitor
- 37.169 Describe, with the aid of a diagram, the construction of a typical non-pressure type water heater.
Construction: components (water vessel, heating element, thermostat, insulation, inlet valve, overflow pipe, electrical terminals)
- 37.170 Describe the construction and operating principles of a rod type water heater thermostat.
Construction/operating principles: bi-metal rod (invar), contacts (magnetically assisted)
- 37.171 Explain the importance of correctly connecting and identifying individual circuits and associated conductors within a distribution board.
Importance: circuit with heaviest loading to be connected to controlling switch/incoming mains connection, remaining circuits to be sequenced in descending order of rating, phase/neutral conductors must follow same sequence for each circuit, outlets/conductor size for each circuit identified on circuit chart, type/rating of each protective device
- 37.172 Describe, with the aid of a sketch, how a lighting circuit may be installed using the loop-in or 3-plate method.
Loop-in method: no junction boxes required, joints/terminations accessible at ceiling outlets, errors (incorrect connection of switchlines/flexible cords at ceiling rose)
- 37.173 Describe, with the aid of sketches, how to test various portable appliances and associated flexible cords for defects.
Tests: insulation, function
Portable appliances: kettle, iron, toaster
- 37.174 Identify the different types of flexible cables used within an electrical installation and state the various types/location of damage that may occur.
Flexible cables: PVC insulated and sheathed, high temperature
Damage: strain, heat, abrasion, compression
- 37.175 State the reasons for regularly cleaning light fittings and replacing lamps/tubes.
Reasons: maintain designed level of light output, (dirt, reduction in efficiency of lamp/tube)
Light fittings: lamps, shades, diffusers, reflectors
- 37.176 State the reasons for regularly maintaining distribution equipment.
Reasons: effective continuity of all electrical connectors (avoids hot-spots), electrical continuity of metal enclosures (test requirements/specifications), lubrication/cleaning of moving parts/ enclosures (mechanical efficiency, corrosion protection)
- 37.177 Describe, with the aid of diagrams, the operation of a direct on-line starter.
Operation: built-in thermal overload trip (function, adjustment), coil, control circuit, start/stop buttons
- 37.178 Explain the procedure and reasons for keeping belt drives correctly tensioned and aligned.
Procedure: adjustment (manufacturers' data)
Reasons: belt wear, efficiency

Assessment

Test specification for written paper Electrical Installation 2 Principles (6161-17-037)

This is a multiple choice examination paper lasting two and a half hours comprising 100 questions. Candidates must answer all questions.

The examination paper will cover the knowledge specifications for the following:

Topic	Approximate % examination weighting
Safety at work	15
Materials	22
Calculations, setting out and drawing	15
Practical skills	25
Communications and information technology	5
Alteration, repair and planned maintenance	18

37 Electrical Installation 2: Safety at work

Practical competences

The candidate must be able to do the following:

- 37.1 Carry out safe working practices to prevent hazards and to ensure the safety of working personnel and members of the public.
- 37.2 Carry out safe working practices using various equipment/materials to protect surrounding work areas from damage.
- 37.3 Carry out the safe erection, use and dismantling of scaffold platforms less 2m high.
- 37.4 Carry out the safe erection, use and dismantling of scaffold platforms over 2m high.
- 37.5 Inspect for faults, set up and safely use steps and ladders in general use.
- 37.6 Set up safety barriers around electrical hazards to protect working personnel and members of the public.
- 37.7 Select and use protective clothing and safety equipment for specific tasks.
- 37.8 Locate and manually operate the isolating switch to disconnect a domestic single phase installation or circuit from the electrical supply.
- 37.9 Check the correct operation of electrical test equipment and carry out a test of a domestic single phase circuit to confirm that it has been isolated from the electrical supply.
- 37.10 Carry out the procedure to isolate a person in contact with a simulated live single phase electrical supply.

- 37.11 Use and store toxic materials in a safe manner.
- 37.12 Carry out a risk assessment and prepare a report identifying the potential hazards.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature _____

Candidate name (please print) _____

Instructor signature _____

Instructor name (please print) _____

Completion date _____

37 Electrical Installation 2: Materials

Practical competences

The candidate must be able to do the following:

- | | | | | | |
|-------|---|--------------------------|-------|---|--------------------------|
| 37.32 | Identify and select cables for specific applications based on their technical properties. | <input type="checkbox"/> | 37.42 | Identify and select intruder and fire alarm systems for specific applications based on their technical properties. | <input type="checkbox"/> |
| 37.33 | Identify and select flexible cord for specific applications based on their technical properties. | <input type="checkbox"/> | 37.43 | Prepare a report identifying the availability, suitability and relative cost of electrical materials available in the country of study. | <input type="checkbox"/> |
| 37.34 | Identify and select electrical accessories for specific applications based on their technical properties. | <input type="checkbox"/> | 37.44 | Prepare a report on the environmental effects of electrical generation, transmission and distribution. | <input type="checkbox"/> |
| 37.35 | Identify and select conduits and trunking for specific applications based on their technical properties. | <input type="checkbox"/> | 37.45 | Prepare a report on the benefits to be gained from the use of electricity and electrically operated equipment. | <input type="checkbox"/> |
| 37.36 | Identify and select cable trays for specific applications based on their technical properties. | <input type="checkbox"/> | | | |
| 37.37 | Identify and select single phase and three phase distribution boards with isolating switches for specific applications based on their technical properties. | <input type="checkbox"/> | | | |
| 37.38 | Identify and select single phase and three phase switchgear for specific applications based on their technical properties. | <input type="checkbox"/> | | | |
| 37.39 | Identify and select insulating sleeving and tapes for specific applications based on their technical properties. | <input type="checkbox"/> | | | |
| 37.40 | Identify and select cord grips and glands for specific applications based on their technical properties. | <input type="checkbox"/> | | | |
| 37.41 | Identify and select incandescent and discharge lighting fittings for specific applications based on their technical properties. | <input type="checkbox"/> | | | |

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

37 Electrical Installation 2: Calculations, setting out and drawing

Knowledge requirements

The candidate must be able to do the following:

Calculations

- 37.64 Calculate the quantity and cost of materials required from drawings.
- 37.65 Calculate reactance and impedance values for single phase series and parallel circuits.
- 37.66 Calculate power factors for single phase series and parallel circuits.
- 37.67 Calculate phase quantities for single phase connected resistive loads.
- 37.68 Calculate phase and line quantities for three phase Delta and Star connected resistive loads.
- 37.69 Select suitable fuses and circuit breakers for single phase and three phase resistive loads.
- 37.70 Calculate the voltage drop within single phase and three phase circuits.

Setting out

- 37.71 Select suitable cable sizes for single phase and three phase circuits.
- 37.72 Measure and set out single phase and three phase circuits and ancillaries from drawings.

Drawings

- 37.73 Produce working drawings from plans and details of single phase and three phase circuits.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

37 Electrical Installation 2: Practical skills

Practical competences

The candidate must be able to do the following:

- 37.84 Prepare cables for termination.
- 37.85 Terminate cables into equipment and switchgear.
- 37.86 Protect cable terminations against strain or circuit interruption.
- 37.87 Install various cable supports appropriate to the building and type of installation.
- 37.88 Install various conduit systems.
- 37.89 Install various trunking systems.
- 37.90 Install various cable tray systems.
- 37.91 Install and connect various types of single phase and three phase switchgear.
- 37.92 Install incandescent and discharge lighting circuits and fittings.
- 37.93 Install intruder and fire alarm systems.
- 37.94 Install an access control system.
- 37.95 Install a three phase radial circuit to an electric motor.
- 37.96 Connect an electrical installation to a suitable earthing point and cross bond all metal work.
- 37.97 Install overcurrent and earth leakage protective devices.
- 37.98 Collect the data required prior to carrying out the inspection and testing of a single phase domestic installation.

37.99 Carry out the safe inspection and testing of a single phase domestic installation in accordance with national/local standards.

37.100 Record test results for a single phase domestic installation in accordance with national/local standards.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

37 Electrical Installation 2: Communications and information technology

Practical competences

The candidate must be able to do the following:

Communications

- 37.123 Use language in written and oral forms to communicate needs clearly.
- 37.124 Interpret, use and draw diagrams in a routine work environment.
- 37.125 Collect and select information on the use of national and international standards.
- 37.126 Collect and select technical information from different sources.
- 37.127 Use information technology systems for communication.

Information technology

- 37.128 Select a suitable software application for a given task.
- 37.129 Access a word processing application software package.
- 37.130 Open a new word processing file and enter text.
- 37.131 Edit the contents of a document.
- 37.132 Use the spell-check function to check the document.
- 37.133 Enhance the appearance of a document.
- 37.134 Close and save an edited document under an existing and a new file name.
- 37.135 Print a word processed file.
- 37.136 Exit the word processing applications package and switch off the equipment.

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

37 Electrical Installation 2: Alteration, repair and planned maintenance

Practical competences

The candidate must be able to do the following:

- | | | | | | |
|--------|--|--------------------------|--------|--|--------------------------|
| 37.148 | Replace existing electrical accessories with upgraded units. | <input type="checkbox"/> | 37.160 | Carry out the maintenance of distribution boards. | <input type="checkbox"/> |
| 37.149 | Replace existing incandescent light fittings with discharge light fittings. | <input type="checkbox"/> | 37.161 | Carry out the maintenance of Direct-on-line (D.O.L.) motor starters. | <input type="checkbox"/> |
| 37.150 | Convert a lighting outlet from one-way switching to two-way switching. | <input type="checkbox"/> | 37.162 | Check and adjust the tension/alignment of drive belts. | <input type="checkbox"/> |
| 37.151 | Extend a socket outlet circuit. | <input type="checkbox"/> | | | |
| 37.152 | Extend an existing lighting circuit to supply an externally located light fitting. | <input type="checkbox"/> | | | |
| 37.153 | Diagnose the cause of a fault in a low pressure mercury vapour light fitting and carry out repairs. | <input type="checkbox"/> | | | |
| 37.154 | Diagnose the cause of a fault in a non-pressurised type water heater and carry out repairs. | <input type="checkbox"/> | | | |
| 37.155 | Diagnose and remedy a fault in a socket outlet circuit which does not allow the circuit to be switched off by the indicated circuit breaker in the distribution board. | <input type="checkbox"/> | | | |
| 37.156 | Diagnose and remedy a fault in a new ceiling mounted lighting circuit which does not allow the light to be switched off by the control switch. | <input type="checkbox"/> | | | |
| 37.157 | Diagnose, by following a logical sequence of procedures, the fault which caused the fuse protecting a 2.4 kW electric kettle to fail. | <input type="checkbox"/> | | | |
| 37.158 | Conduct maintenance of portable equipment flexible cords. | <input type="checkbox"/> | | | |
| 37.159 | Carry out the maintenance of various types of incandescent and discharge light fittings. | <input type="checkbox"/> | | | |

This is to confirm that the candidate has successfully completed the above tasks:

Candidate signature

Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

Appendix A

Assessments

Two assessment methods are used in the 6161 Awards in The Construction Industry programme – set examinations by question paper and practical assessments.

Practical assessments

Each unit (assessment component) in this programme has one or more practical assessments which are derived from the practical components that make up the first part of each syllabus module. The competence checklists (tick boxes), given at the end of each unit, serve as the marking criteria for these assessments and should be used to record the outcome of each candidate's performance. The use of local materials, tools, equipment or practice is allowed within the specifications of the 'range' supporting each practical competence statement. The results of the assessment must be documented and available for audit by the visiting verifier. ALL assessments must be successfully completed.

The assessments may be held at any time agreed by the instructor and the candidate so that each candidate has a personal record of his/her practical assessments.

The competence checklists in this publication are intended to be photocopied.

Preparation, supervision and marking

It is essential that the instructor ensures all necessary preparations are carried out. This will involve ensuring:

- the candidate is ready to demonstrate his or her practical skills
- every candidate understands what is involved
- any necessary materials, tools or equipment are available for the assessment.

Marking of the practical performance is determined on outcomes as defined by the practical competences. Each tick box will show either 'yes – the candidate achieved this' or 'no – the candidate did not achieve this'. The candidate must be successful in all competences included in the checklist before it can be 'signed off' and its results transferred to the summative record.

All assessments require supervision to ensure that the results reflect only the work of the individual candidate concerned. You must keep all assessment documentation and material in a file for each candidate until the results have been agreed by the visiting verifier and until confirmation of result has been received from City & Guilds.

Records, results and certification

When all the required practical assessments for a specific award have been achieved, then the result must be sent to City & Guilds. We suggest that you keep a record of each individual's achievements which may then be transferred to the entry forms. A model is given at the end of this section but you may use any form of record keeping that is convenient and accessible.

Results for practical assessments are entered onto Form S which must be countersigned by the visiting verifier and sent to us.

Question paper assessments

The knowledge requirements in the modules of each unit are tested by question papers which are set and marked by us. Candidates will sit multiple choice question papers at the certificate and diploma levels of this programme, and short answer question papers at the advanced diploma level.

Entries for these examinations must be made in accordance with the timetable for entries given in the 'Directory' and must be sent in on Form S.

An advantage of this programme is that candidates who successfully complete a component of assessment for a single unit may, if they wish, claim a Certificate of Unit Credit. This may be beneficial for those candidates who only wish to complete part of this programme.

Candidates wishing to gain the full award (Certificate, Diploma or Advanced Diploma) must successfully complete all forms of assessment. We recommend that the practical results are sent at the time of, or shortly before, the date of the written examinations.

Visiting Verifier

The operation of this programme requires the appointment of a visiting verifier. The visiting verifier must countersign the results of the practical assessments on Form S. The visiting verifier should also be able to inspect records and candidates' work to verify the results before submission.

12 Diploma in Timber
Vocations – Site Carpentry
Practical competence assessment record

Candidate's name and number

Centre name and number

Assessment reference	Date completed	Instructor signature	Instructor name
131 Safety at Work			
131 Materials			
131 Calculations, Setting Out and Drawing			
131 Practical Skills			
131 Communications and Information Technology			
131 Alteration, Repair and Renovation			

And, if needed to satisfy full Diploma award requirements, any ONE of
(See page 06 of the Regulations)

103 Trowel Vocations Basic Skills Practice			
104 Painting and Decorating Basic Skills Practice			
105 Plumbing Basic Skills Practice			
106 Refrigeration and Air Conditioning Basic Skills Practice			
107 Electrical Installation Basic Skills Practice			

* See page 06 of the Regulations

12 Diploma in Timber Vocations – Bench Joinery Practical competence assessment record

Candidate's name and number

Centre name and number

Assessment reference	Date completed	Instructor signature	Instructor name
132 Safety at Work			
132 Materials			
132 Calculations, Setting Out and Drawing			
132 Practical Skills			
132 Communications and Information Technology			
132 Alteration, Repair and Renovation			
And, if needed to satisfy full Diploma award requirements, any one of (See page 06 of the Regulations)			
103 Trowel Vocations Basic Skills Practice			
104 Painting and Decorating Basic Skills Practice			
105 Plumbing Basic Skills Practice			
106 Refrigeration and Air Conditioning Basic Skills Practice			
107 Electrical Installation Basic Skills Practice			

13 Diploma in Trowel Vocations Practical competence assessment record

Candidate's name and number

Centre name and number

Assessment reference	Date completed	Instructor signature	Instructor name
133 Safety at Work			
133 Materials			
133 Calculations, Setting Out and Drawing			
133 Practical Skills			
133 Communications and Information Technology			
133 Alteration, Repair and Renovation			
And, if needed to satisfy full Diploma award requirements, any one of (See page 07 of the Regulations)			
102 Timber Vocations Basic Skills Practice			
104 Painting and Decorating Basic Skills Practice			
105 Plumbing Basic Skills Practice			
106 Refrigeration and Air Conditioning Basic Skills Practice			
107 Electrical Installation Basic Skills Practice			

14 Diploma in Painting and Decorating Practical competence assessment record

Candidate's name and number

Centre name and number

Assessment reference	Date completed	Instructor signature	Instructor name
134 Safety at Work			
134 Materials			
134 Calculations, Setting Out and Drawing			
134 Practical Skills			
134 Communications and Information Technology			
134 Repair, Restoration and Glazing			
And, if needed to satisfy full Diploma award requirements, any ONE of (See page 07 of the Regulations)			
102 Timber Vocations Basic Skills Practice			
103 Trowel Vocations Basic Skills Practice			
105 Plumbing Basic Skills Practice			
106 Refrigeration and Air Conditioning Basic Skills Practice			
107 Electrical Installation Basic Skills Practice			

15 Diploma in Plumbing

Practical competence assessment record

Candidate's name and number

Centre name and number

Assessment reference	Date completed	Instructor signature	Instructor name
135 Safety at Work			
135 Materials			
135 Calculations, Setting Out and Drawing			
135 Practical Skills			
135 Communications and Information Technology			
135 Alteration, Repair and Planned Maintenance			
And, if needed to satisfy full Diploma award requirements, any ONE of (See page 08 of the Regulations)			
102 Timber Vocations Basic Skills Practice			
103 Trowel Vocations Basic Skills Practice			
104 Painting and Decorating Basic skills Practice			
106 Refrigeration and Air Conditioning Basic Skills Practice			
107 Electrical Installation Basic Skills Practice			

16 Diploma in Refrigeration and Air Conditioning

Candidate's name and number

Centre name and number

Assessment reference	Date completed	Instructor signature	Instructor name
136 Safety at Work			
136 Materials (Plant and Refrigerants)			
136 Calculations, Science and Drawing			
136 Practical Skills			
136 Communications and Information Technology			
136 Alteration, Repair and Planned Maintenance			
And, if needed to satisfy full Diploma award requirements, any ONE of (See page 08 of the Regulations)			
102 Timber Vocations Basic Skills Practice			
103 Trowel Vocations Basic Skills Practice			
104 Painting and Decorating Basic Skills Practice			
105 Plumbing Basic Skills Practice			
107 Electrical Installation Basic Skills Practice			

17 Diploma in Electrical Installation Practical competence assessment record

Candidate's name and number _____

Centre name and number _____

Assessment reference	Date completed	Instructor signature	Instructor name
137 Safety at Work			
137 Materials			
137 Calculations, Setting Out and Drawing			
137 Practical Skills			
137 Communications and Information Technology			
137 Alteration, Repair and Planned Maintenance			
And, if needed to satisfy full Diploma award requirements, any ONE of (See page 09 of the Regulations)			
102 Timber Vocations Basic Skills Practice			
103 Trowel Vocations Basic Skills Practice			
104 Painting and Decorating Basic Skills Practice			
105 Plumbing Basic Skills Practice			
106 Refrigeration and Air Conditioning Basic Skills Practice			

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